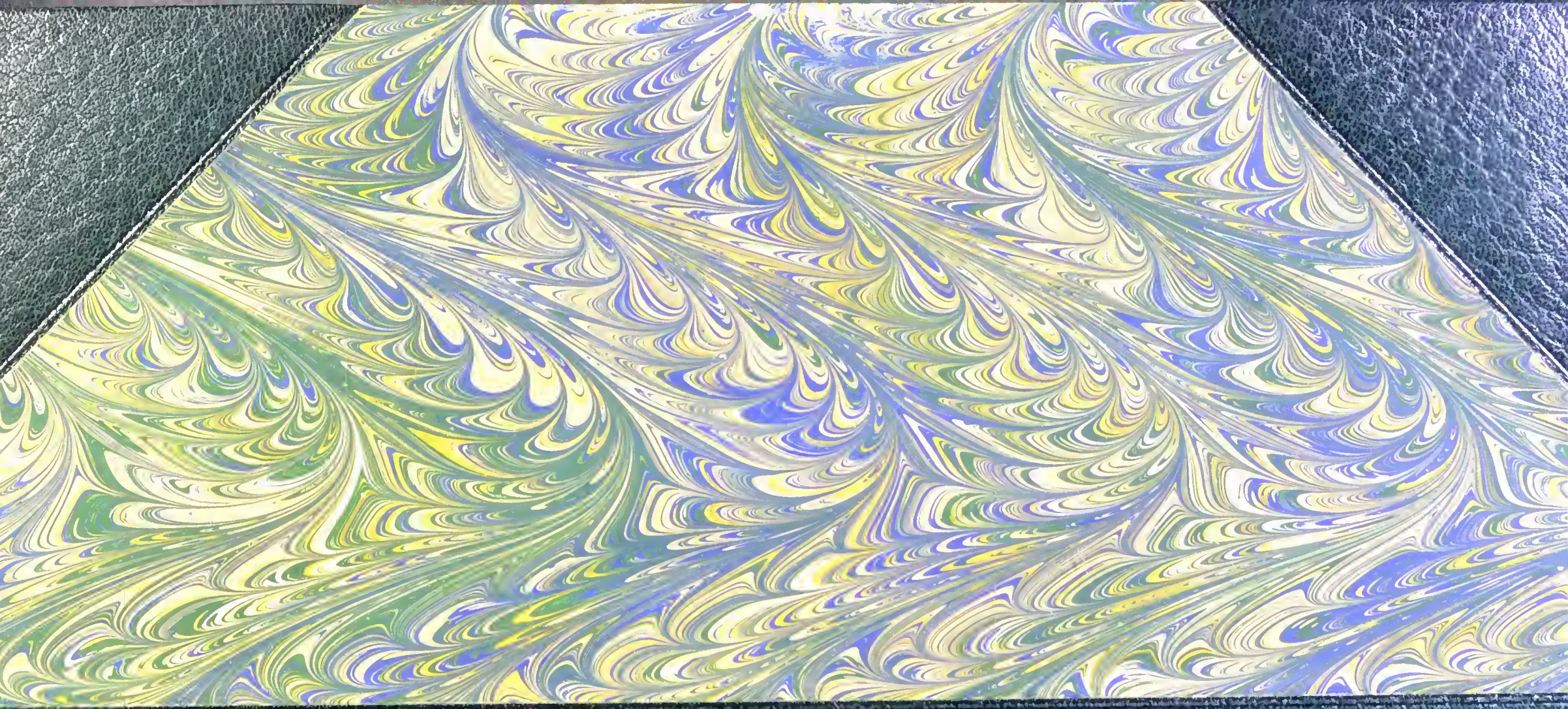

THE

CYCLOPÆDIA

OF

PRACTICAL MEDICINE.

VOL. III.

LONDON:
MARCHANT, PRINTER, INGRAM-COURT.

THE

CYCLOPÆDIA

OF

PRACTICAL MEDICINE;

COMPRISING

TREATISES ON THE NATURE AND TREATMENT OF DISEASES,

MATERIA MEDICA AND THERAPEUTICS,

MEDICAL JURISPRUDENCE,

ETC. ETC.

EDITED BY

JOHN FORBES, M.D. F.R.S.

PHYSICIAN TO THE CHICHESTER INFIRMARY, ETC.

ALEXANDER TWEEDIE, M.D.

PHYSICIAN TO THE LONDON FEVER HOSPITAL, ETC.

JOHN CONOLLY, M.D.

LATE PROFESSOR OF MEDICINE IN THE LONDON UNIVERSITY, ETC.

" Hæc demum sunt quæ non subgessit phantasiæ imaginatricis temeritas sed phænomena practica edocuere."—SYDENHAM.

VOL. III.

JAU —— SMA.

LONDON:

SHERWOOD, GILBERT, AND PIPER, AND BALDWIN AND CRADOCK,
PATERNOSTER-ROW;

WHITTAKER, TREACHER, AND CO., AVE-MARIA-LANE.

1834.

CONTENTS OF THE THIRD VOLUME.

THE

CYCLOPÆDIA

OF

PRACTICAL MEDICINE.

JAUNDICE. (Ἴκτερος, *icterus*, *morbus regius*, *aurigo*, *&c.*) Jaundice is a disease of rather frequent occurrence, characterized by a yellow colour of the eyes, skin, and urine, and by the white appearance of the alvine evacuations. In addition to these general symptoms, the malady is frequently attended with extreme depression of spirits, languor, inactivity, and watchfulness; with a bitter taste in the mouth, thirst, loss of appetite, nausea, or vomiting; a sense of fulness or other uneasiness, if not also actual pain, at the epigastrium; occasional shiverings and profuse perspirations; a distressing degree of itching in the skin, and rapid emaciation. The urine soon becomes of a deep mahogany colour, yet gives a bright yellow tinge to substances immersed in it. The state of the bowels is variable, being in some cases relaxed, in other cases confined, but generally acted upon with facility by mild aperients.

The circumstances which *predispose* the system to an attack of jaundice are numerous. The melancholic or leucophlegmatic temperament, under mental excitement, whether of a pleasant or painful nature; an indolent mode of life, sedentary occupations, a full and stimulating diet, and habitual constipation, are among the most powerful. The occasional or *exciting* causes of the disease are chiefly such as either suddenly stimulate the liver to an increased secretion of bile, or obstruct the free egress of that fluid. Thus, a heated atmosphere, strong muscular exertions, sudden and powerful emotions of mind, spirituous or other fermented potations, a large and indigestible meal, fæces impacted in the transverse colon, pressure from a gravid uterus, may induce an attack of jaundice.

The *proximate* cause or essential nature of the disease evidently consists in an obstruction to the passage of bile in its course from the liver or gall-bladder to the duodenum, in consequence of which it either retrogrades into the bloodvessels of the liver, or is absorbed from the surfaces of the biliary ducts. There are many morbid conditions of the liver and its appendages, as well as of the adjacent organs, which may induce such an impediment. Not a few of these have been ascertained by the most conclusive evidence. Others, originally devised by the fertile imaginations of nosologists, and considered as adequate to the production of jaundice, have been successively handed down from author to author, not as merely probable causes, but as legitimate deductions from established facts. Instead, however, of specifying the greatest number of morbid conditions which may *possibly* give rise to jaundice, we shall endeavour to comprise, under a few leading divisions, those phenomena alone which pathology has clearly ascertained. Such, we think, may be conveniently arranged under four general heads.

1. Obstructions arising from biliary concretions or other altered conditions of the bile, as well as from worms, hydatids, or other foreign bodies.

2. Obstructions arising from diseased states of the liver, gall-bladder, or biliary ducts.

3. Obstructions arising from morbid conditions of the duodenum.

4. Obstructions produced by the pressure of enlarged contiguous viscera.

1. The first class of obstructions — *those arising from biliary concretions or other altered conditions of the bile itself*—have received an almost disproportionate share of attention from medical writers. The learned Heberden, for example, scarcely seemed to recognize any other causes of jaundice. There can be little doubt that a highly inspissated state of the bile

may alone produce temporary jaundice. In some instances, after great depression of mind and torpor of bowels, the stools become white, and the skin of a dusky-yellow colour. Under the operation of a brisk mercurial purgative, the patient voids a quantity of dark, pitchy, viscid matter, of sufficient tenacity to be drawn out in threads. He becomes immediately relieved, the skin and the alvine dejections gradually resuming their natural colour. Such cases we may warrantably refer to a thickened and vitiated state of the bile, which, in other instances, has been found of the same pitchy tenacious character while contained in the gall-bladder itself.

Biliary calculi unquestionably form a very frequent cause of jaundice. Their mere presence in the gall-bladder does not usually seem to produce either general or local inconvenience. Out of nineteen instances of biliary calculi, which occurred to Morgagni, besides four to Valsalva, in post-mortem examinations, not one had experienced jaundice. Yet a general failure of health has been observed, where, after death, no morbid appearance could be discovered except that of calculi in the gall-bladder.* Dr. Heberden remarks that, "in nearly twenty persons, a supposed pain of the stomach, which had frequently afflicted them for months or years, was at length joined by a jaundice."† In those cases, it is probable that the occasional pain arose from some change in the position of the calculi in the gall-bladder. That they do not always remain in the bile-receptacle with impunity is clearly proved by the testimony of morbid anatomists. Soemmering repeatedly found the mucous lining of the gall-bladder in a state of ulceration, occasioned by the irritation of the contained calculi; while other pathologists have observed a general thickening of its coats, and disorganization of its whole texture.

The *number* of calculi sometimes contained in the gall-bladder is almost incredible. Morgagni took out of one body 3616; and in the Hunterian museum at Glasgow, 1000 are preserved which are stated to have been extracted from one gall-bladder. The form and size of these calculi are very various. In a few instances they have nearly taken the shape and attained the magnitude of the gall-bladder itself, but, generally, are from an eighth to a one-half of an inch in diameter, and of a polygonal form.‡ The broken or divided portions of the larger calculi have sometimes corresponding convexities and concavities, proving that they were once united. And it is not improbable that the smaller calculi are often subdivisions of a larger mass, formed into distinct calculi before consolidation was completed. The sides of these calculi are often flattened as if from close contact and pressure.

The chemical and physical characters of biliary calculi have been already described in this work under the general title of Calculus. In that condensed but highly-interesting article the distinguished author has given a very perspicuous account of the more frequent forms of biliary calculi; but may not have thought it necessary to allude to one or two kinds of uncommon occurrence, which yet, we conceive, may prove of some importance in a pathological point of view. We, therefore, make no apology for introducing them in this place.

The first of these, as we are informed by Professor Turner, was discovered by M. Bizio, of Venice, in a peculiar fluid, quite different from bile, which was found in the gall-bladder of a person who had died of jaundice. It is of a green colour, transparent, tasteless, and of the odour of putrid fish. It is unctuous to the touch, may be scratched or cut with facility, and has a specific gravity of 1.57. M. Bizio has given it the name of *erythrogen*.*

Another remarkable kind of biliary concretion is described by Dr. Marcet, in the following words.† "Within the last few days, I have seen and analysed a large biliary calculus entirely different in its chemical composition from the above description, and, as far as I know, presenting a new fact in the history of these bodies. This concretion contained no adipocire (cholesterine), and consisted wholly of carbonate of lime tinged by bile. It was of a bright yellow colour. It was heavier than water, and measured two inches five-eighths in length, and two inches and a quarter in its largest circumference." This extraordinary production was found in the gall-bladder of a dead body by Mr. Green, (now Professor Green,) demonstrator of anatomy in St. Thomas's Hospital.

The *formation* of biliary calculi is still involved in much obscurity. Many of the circumstances before enumerated as predisposing to jaundice generally, are found peculiarly to favour the formation of calculous concretion. Such are depressing emotions, deficient bodily exercise, a full diet and frequent constipation. Had biliary concretions been always found to consist merely of inspissated bile, there would have been no difficulty in conceiving how the want of exercise and similar causes, by favouring the retention of bile and the gradual absorption of its thinner parts, should ultimately lead to an actual concretion of the residual mass. And that this has sometimes occurred is sufficiently proved. Van Swieten, in his Commentaries, relates the case of a boy whose gall-bladder contained eight pounds of a thick sort of bile, consisting of a number of concentric strata, each stratum becoming firmer as it approached the circumference. There had, however, been no jaundice, although the stools were of a white colour. Biliary con-

* Abercrombie on the Diseases of the Abdominal Viscera, p. 370.

† Transactions of the College of Physicians, vol. vii. p. 171.

‡ See Mr. Brayne's very interesting cases in the Medico-Chir. Trans., vol. xii.

* Dr. Turner's Elements of Chemistry, p. 656.

† Marcet on Calculous Diseases, p. 151, Note.

cretions, however, very rarely consist of bile alone; and even where an admixture of bile or a distinct stratum of bile does exist, the central portion is generally of a very different nature. Something more, therefore, than consolidation must take place. Either the original secretion of bile must be faulty, or, in consequence of long retention in the gall-bladder, it must undergo some changes by which its constituent parts become disunited or converted into new products. Probably these different states of bile occur in different cases; inasmuch as calculi are sometimes found in the liver itself, and inasmuch, too, as some kinds of calculi approach nearly to the known constituent principles of the bile, whereas others exhibit characters of a very dissimilar kind. May not also the mucous secretion of the gall-bladder become so altered in its nature, in consequence of the long retention of vitiated bile, as itself to furnish nuclei around which the dissociated constituents of the bile, or new formations from it, arrange themselves? The peculiar nature of some of the nuclei, as well as the effect of long-retained secretions on other mucous surfaces, afford some countenance to this idea; although it must be admitted that the gall-bladder, from the adaptation of its structure to its peculiar function as a receptacle, is less likely to suffer from the detention of its contents than other mucous tissues exposed to the long-continued contact of their secretions.

An inquiry into the power by which biliary calculi are propelled forward necessarily involves some interesting points connected with the structure of the gall-bladder and the biliary ducts, which would lead us into a discussion somewhat foreign to the practical object of this paper. We shall merely remark that the effort of vomiting, whether spontaneous or otherwise, has probably a considerable influence in the extrusion of these concretions. Dr. Pemberton, indeed, does not ascribe any such effect to vomiting, unless where a calculus, from its peculiar size and form, entirely blocks up the duct, and obliges the bile to accumulate behind it, thus forming a kind of wedge which thrusts it further forward. To us, on the contrary, the impulse given in the act of vomiting would promise to be more effectual if the calculus did not very firmly or entirely close up the duct, but rather permitted the fluid bile, when strongly impelled, to slip along its sides; in which case, if the quantity of bile were too considerable to pass off quickly by the portion of the duct anterior to the calculus, it must necessarily swell it out, and thus prepare a way for the freer egress of the descending concretion.

We are not aware that any examples are recorded of very large calculi having passed through the biliary ducts; yet there is ample proof of the great distensibility of these passages. Dr. Baillie has seen both the ductus hepaticus and the ductus choledochus enlarged to the diameter of half an inch. When such a degree of distention takes place, there is generally a proportional thickening; in truth, an actual growth in every direction. Most commonly, however, if not always, when concretions much exceed the diameter just mentioned, they are expelled from the system by a different process; an adhesion is formed between the gall-bladder and the duodenum, and a sufficient opening effected by ulceration. The calculus thus brought into the duodenum is either then propelled along the intestinal tube and evacuated by the bowels, or a further adhesion takes place between the duodenum and the abdominal parietes; an abscess is formed; ulceration proceeds; and, at length, the irritating substance is protruded through the opening in the integuments.

The cases related by Mr. Brayne, to which we have before adverted, afford beautiful and striking illustrations of the former and more perfect mode of extrusion. The patients, in at least two instances, recovered. Of the *latter* mode of expulsion, to wit, that by an external opening, many examples are recorded, from which we may adduce one as related by the venerable Heberden. The patient, after having suffered for years from a discharging tumour near the umbilicus, was seized with acute pain, nausea, and vomiting, "et post paucos dies exiit calculus fellis tres pollices longus, totidemque ambitu, quique pendebat grana ccxlv."*

Jaundice may be presumed to arise from biliary calculi, or other similarly acting obstructions, when its accession is sudden and accompanied by acute pain either in the epigastrium, or shooting towards that part from the back or right hypochondrium; especially if there be also vomiting and occasional shiverings, or profuse perspirations, without any manifest fever or an increased force or frequency in the pulse. Not uncommonly, the pain precedes the appearance of jaundice, returning, perhaps, with great severity for several successive days, and remaining for several hours at each return. Unlike the rigors which forebode an attack of inflammation, the shiverings in jaundice rarely precede the pain, but occur irregularly during a paroxysm, and seem to mark a further propulsion of the calculus along the irritated canal, or its final extrusion through the distended opening of the common duct into the duodenum. The character of the pain is very important; it is acute, and occurs in paroxysms. Sometimes it is intense and excruciating in the highest degree, far exceeding what is felt in the most acute inflammation. The perspiration which sometimes drops from the patient may be ascribed chiefly to the severity of his suffering. The position of the patient also deserves attention. He bends the body forward upon his knees, when not writhing in other directions, and seems to find some relief from pressing upon the seat of pain. Not unfrequently the pain subsides on the appearance of jaundice. The state of the pulse will materially assist in the diagnosis. During the state of simple irritation it is seldom much accelerated or preternaturally firm. When, indeed, it becomes materially harder and quicker, the utmost vigi-

* Commentarii de Morborum Historiâ, &c., p. 213.

lance should be exercised lest irritation should proceed to inflammation; in which case, the pain usually becomes more constant, the tongue whiter, and vomiting more incessant. These symptoms sometimes rise to such a degree as to resemble those of ileus, to which, indeed, they then become nearly allied.

It may be proper here to intimate that the entire subsidence of the pain, vomiting, and other characteristic symptoms, does not necessarily imply the passage of the calculus into the duodenum. Very frequently it slips back again into the gall-bladder, there to remain for a time, with little comparative inconvenience to the patient. We need scarcely add, therefore, that the evacuations from the bowels should be carefully examined, inasmuch as the discovery of a calculus cannot fail to afford relief and comfort to the mind of the patient.

The *treatment* of calculous jaundice should be specially directed to three points:—

1. To facilitate the progress of the inhering concretion.

2. To mitigate the pain and other symptoms of irritation.

3. To guard against the inflammation which is to be apprehended from the irritation of the calculus.

In endeavouring to fulfil these indications, opium may be regarded as our sheet-anchor. The first dose, consisting of one or two grains, or an equivalent proportion of the sulphate or acetate of morphia, may be advantageously combined with five or six grains of calomel. If the pain and sickness do not abate, a grain of opium may be repeated at the end of the first hour, and reiterated, after similar or shorter intervals, until ease be procured. After a few doses have been given, a solution of some neutral salt, particularly the sulphate of magnesia, either with or without the carbonate, or the carbonate of magnesia with lemon-juice in an effervescing form, may be administered, in combination with some aromatic water, and repeated at fitting intervals, until a free evacuation from the bowels is obtained. Soda-water, well charged with carbonic-acid gas, or simple saline draughts in a state of effervescence, are sometimes useful in allaying the urgent vomiting. If opium by the mouth should not procure ease, a drachm of the tincture may be mingled with a few ounces of thin starch or barley-water, and administered as an enema: prior to which, however, it is sometimes advisable to throw up a large quantity of warm water, which alone sometimes proves very soothing to the patient. As soon as possible, recourse should be had to a warm bath, in which the patient may remain until a degree of faintness supervene,—a state of relaxation peculiarly favourable to the passage of the calculus. Should these various methods be unavailing, and the patient be in a state to bear depletion, it will be expedient to withdraw from ten to sixteen ounces of blood from the arm, in a full stream, and, if practicable, while in the bath and in a half-erect posture. Topical bleeding may be also needful if the continued irritation of the calculus indicate inflammatory action, which may be apprehended from the pain becoming more constant, and accompanied with tenderness on pressure.

Emetics have been strongly recommended in calculous jaundice, and are doubtless powerful agents, though not always safe ones. When we consider the structure and the tortuous course of the common bile ducts, as well as the sharp and angular forms of the calculi, we shall not regard, without considerable apprehension, the action of a powerful emetic. In many instances inflammation, adhesion, and actual obliteration of the ducts, have resulted from the spontaneous passage of a calculus. Is it not, then, highly hazardous forcibly to impel these irritating substances against the already irritated mucous lining of the tubes?

Nauseating doses of ipecacuan may, however, prove safer and more availing, if the patient be not already in a state of nausea. Such an exception is, however, very uncommon. The advantage to be expected from nauseating doses is of a two-fold character. We may hope to promote more general relaxation, as well as to augment the biliary secretion; and thus, while relaxing the affected duct, and carrying down an increased flow of bile, nature may be assisted not a little in her efforts to expel the irritating substance.

We have already stated that the bowels are sometimes in a relaxed state. In other cases, however, they are obstinately constipated, and require strong and repeated doses of active purgatives, such as calomel, with the compound extract of colocynth, and an additional quantity of aloes. Even after the expulsion or retreat of the calculus, it will be desirable to exhibit occasionally a mercurial purgative, at the same time supporting the tone and regular action of the chylopoietic organs by small doses of a neutral salt in some mild bitter infusion.

We have mentioned hydatids, worms, and other extraneous matters, as occasionally producing jaundice. In some instances substances may be passed by stool which will enable the physician, in subsequent attacks, to form a reasonable conjecture respecting the nature of the obstruction. But, generally, no such intimation can be obtained. The treatment, however, of jaundice from such causes must be very similar to that recommended for the removal of calculi.

II. *Jaundice arising from diseased states of the liver, gall-bladder, or biliary ducts*, will of course be attended by the symptoms peculiar to each affection, in addition to those which characterise an obstructed state of the biliary passages. General or partial hypertrophy of the liver, (a state not uncommon in great eaters); a tuberculated or scirrhous condition of that organ; with many other forms of disorganization, may so interrupt the egress of the bile as to occasion jaundice. When the disease is dependent on such causes, there is sometimes no pain, or pain of a less acute, though more continued, character. The approach of the supervening jaundice is also generally gradual; and symptoms of hectic

fever too often succeed. It is a remarkable circumstance that, notwithstanding the prevalence of liver-complaints, calculi are rarely found in the interior of that organ. Morgagni affirms, "vix uno in jecinore mihi olim accidit ut invenirem; Valsalvæ autem in nullo, quod sciam."*

Diseased conditions of the ducts themselves form, we believe, more common cases of jaundice than is generally supposed. Of these, inflammation and its consequence are among the principal. The mucous tissue of the ducts may become ulcerated, or so adherent as actually to obliterate the canal. It may, also, be so studded with tubercles as to be no longer permeable to the bile. Jaundice from such causes is often incurable and fatal.

III. Our third general division of jaundice comprises those *morbid states of the duodenum which have been found to occasion the disease.* Of such we may specify the following:—1. viscid mucus adhering to the inner membrane of the bowel, and scaling up the opening of the ductus communis choledochus: 2. a highly turgid or inflamed state of its mucous membrane: 3. a thickened, tuberculated, or otherwise disorganized condition of the duodenum.

"1. Viscid mucus, we are persuaded, is a frequent cause of temporary jaundice. Many of the cases which have been gratuitously attributed to spasm, were probably of this nature.† If we attentively observe the peculiar structure of the termination of the common duct in the duodenum, we shall more accurately conceive how readily its small orifice, in the midst of a papillary projection, may be closed up by a thick and tenacious layer of mucus. Such a cause may be reasonably inferred when the disease has come on rather suddenly, has been unattended by acute pain or other inflammatory indication, yet has been preceded by dyspepsia and a torpid state of bowels. A mucous film upon the tongue, and the absence of the usual marks of chronic visceral disease, will give additional probability to the opinion. A large dose of calomel, followed by a draught containing magnesia and rhubarb in infusion of senna or some other vehicle, will sometimes quickly remove the disease. Much circumspection as to diet, the regular use of active exercise, with an occasional recourse to purgatives, may equally ensure a freedom from relapse.

2. A turgid or inflamed condition of the mucous membrane of the duodenum probably seldom exists without the lower portion of the common bile-duct being similarly affected. This form of disease is characterized by uneasiness or pain in the course of the bowel, which sometimes becomes tender on pressure, the uneasiness being more particularly felt at the expiration of three or four hours after eating, and being often accompanied with vomiting. The tongue has usually a white or yellow surface, and there is considerable thirst. The pulse is also somewhat accelerated. In distinguishing this affection from a diseased state of the pylorus, attention should be paid to the period after eating at which the vomiting occurs. Where the pylorus is alone affected, vomiting generally commences within two or three hours of the meal, and affords almost immediate relief. In the chronic inflammation of the duodenum, of which we are treating, the vomiting seldom occurs until four or five hours have elapsed, and does *not* alleviate the distressing sensations of the patient. He gains, however, sensible relief by taking a tea-cup full of warm fluid, which seems to excite an increased peristaltic action, and thus to liberate the oppressed duodenum from the undigested mass.

It is of extreme importance to overcome this kind of jaundice as soon as possible, lest disorganization of the duodenum, obliteration of the orifice of the bile-duct, or adhesion of its sides should ensue.

Whether simple turgescence or actual inflammation be the cause, the treatment should be essentially the same, varying only in degree. A moderate bleeding from the arm, if the strength of the patient admit of it; repeated local depletion; the warm bath; counter-irritants, particularly in the form of the antimonial ointment; with mild doses of saline aperients, and the most scrupulous attention to diet,—constitute the treatment which experience, no less than general principles, points out as best adapted for the purpose.

IV. *Jaundice produced by the pressure of enlarged contiguous viscera* is of frequent occurrence, although less susceptible of relief from medicine. Cases of simple distention of the transverse colon from a collection of impacted fæces are, of course, to be generally removed by appropriate remedies. Compression, too, by the gravid uterus, obviously admits of a natural cure. But a scirrhous enlargement of the pylorus, or of the round head of the pancreas—two of the most frequent causes of this species of jaundice—are among the most intractable as well as the most distressing disorganizations which human nature can sustain. In these cases, the most deplorable depression of mind, and an extreme degree of emaciation, are often observable. We have already alluded to some points of diagnosis in reference to the enlargement of the pylorus. As the disease advances, the tumefaction will be distinguishable by the hand: so may also, generally, though with more difficulty, the enlargement of the pancreas.

Affections of the head, irrespective of any previous disease in the biliary organs, have been supposed to occasion jaundice. Where, however, a serious injury has been inflicted on the head, such, for example, as is sometimes occasioned by a jump or a fall, it is highly probable that the liver or its appendages received some simultaneous injury, although the

* Ep. xxxvii. Art. xi.

† No special reference is made in this article to "spasmodic jaundice," because we have no evidence of its existence.

effect was not so quickly perceived. This is also the opinion of the judicious Abercrombie. We have, however, long felt assured that the state of the brain and nervous system has been too little considered in the pathology of jaundice. When we regard the influence of the brain and nerves in secretion generally, as well as their influence upon the moving powers, we may reasonably suppose that any considerable deviation from their sound and vigorous condition will be likely to lessen or deteriorate the biliary fluid; and also, by withholding a due supply of nervous energy from the moving forces, retard its transmission through the biliary passages into the duodenum. The remarkable influence which powerful emotions have upon the secretion of bile, and, probably also, on its propelling powers, should lead us more attentively to mark this connexion, and the morbid changes thence resulting; by which attention, we may hope, at some future period, to clear up many obscure points relating to the biliary secretion, both in its healthy and diseased states, and ultimately arrive at more successful methods, not only of removing jaundice, but also, in many instances, of preventing its occurrence.

(T. H. Burder.)

KIDNEYS, DISEASES OF. Notwithstanding the activity with which the kidneys perform their functions, the constancy of their action, and the extraordinary rapidity with which their secretion becomes affected, not only when other parts of the system are suffering under actual disease, but even when they are simply and slightly disordered, these organs are not peculiarly liable to alteration of structure. On the contrary, as it has been well observed by a distinguished pathologist of the present day, "in the greater number of diseases, whether chronic or acute, we cannot discover by dissection any change in the structure of the kidneys."

Of the diseases incidental to the kidneys, the most important, perhaps, are ischuria renalis, nephralgia, and nephritis. To these might be added diabetes, were pathologists agreed as to its primary seat; but though several eminent writers have considered it to originate in the kidneys, there are others of equal name and authority who have referred it to a different source. Ischuria renalis has been discussed in a former article; and it is proposed, likewise, to treat, under their respective titles, both nephralgia and nephritis.

In the present article it will be our object briefly to notice those other renal affections which, on account of the rareness of their occurrence, or the obscurity and uncertainty of their symptoms, or their hitherto uncontrollable nature, may probably be deemed of minor importance so far as practice is concerned; yet which, by those who are truly devoted to medicine as a science, can never be deemed insignificant or uninteresting. The renal affections which we are about to consider may conveniently be arranged, after the plan adopted by M. Andral, under three heads; the first comprising morbid conditions of the circulation of the kidneys, the second lesions of nutrition, the third morbid formations.

1. *Lesions of circulation.*—The kidneys are sometimes found gorged with blood—in that state to which the term hyperæmia has been appropriated, without any other alteration. One or both organs may be thus congested, and the congestion may affect both the cortical and tubular parts, or only one of them. When they are in a high state of hyperæmia, they assume a dark chocolate hue.

The kidneys are also found in a state precisely opposite to that just mentioned, namely, in a state of paleness or anæmia, either partial or general, either complete or incomplete; sometimes existing in a few scattered points only. This is the condition of the kidneys which is frequently observed in persons who have sunk under chronic diseases, especially in dropsical patients, and those who have been the subjects of the affection named by Dr. Good marasmus anæmia. When this paleness exists in an exquisite degree, it may be regarded as in itself a disease, but hitherto it has not been discovered to occasion any functional derangement during life.

The yellow colour, either general or partial, which is occasionally observed in the kidneys, is probably owing, as M. Andral has remarked, to a less advanced stage of anæmia.

It may suffice thus briefly to have noticed that congestion of the kidneys, or extreme paleness of them, may occur without their presenting any other morbid appearance. Such instances, however, are rare: hyperæmia, as well as anæmia, is usually found in connexion with other degenerations of those organs: the former, for example, conjoined with softening, or with induration together with hypertrophy; the latter with softening, or occasionally with induration and atrophy.

2. *Lesions of nutrition.*—The kidneys are sometimes much larger than natural, though otherwise unaltered. Both kidneys may be thus affected, but more commonly the hypertrophy is confined to one only. As was observed while treating of ischuria renalis, great augmentation of volume of one kidney is not unfrequently met with when the other is, by disease or obstruction, rendered incapable of performing its office. The enlarged gland takes upon itself the duty of its fellow. Hypertrophy of the kidney seems occasionally to depend upon its being doubly nourished, by receiving its supply of blood from two renal arteries. This state of kidneys, generally combined with increased vascularity, is the most usual morbid appearance observed in cases of diabetes. An extreme paleness of their tissue, with softening, has indeed been often mentioned as the principal alteration which takes place in them in that disease; but in various cases upon record, and in every instance which has occurred in our own experience, the kidneys have been more vascular, and generally larger than natural.

To this variety of morbid alteration—hypertrophy—may, perhaps, be referred those cases where the kidneys are united by an intermediate substance; a sort of middle lobe, resembling them in its texture, and passing over the vertebral column from the one to the other.

With respect to the nature of those hard, whitish, globular bodies, of various sizes, which are mentioned by authors as existing in the cortical substance of the kidneys, and which, in some few instances, have been detected in the tubular substance also, little is known. Some have regarded them as serving to secrete the urine, while others have supposed them to consist of a mass of vessels interlaced; but it is clear that granulations like these sometimes constitute a really morbid state. They nearly resemble the yellow granulations of the liver, which Laennec thought an accidental tissue, and to which he gave the name of *cirrhosis;* but which, in all probability, are the result of an unusual development of one of its elementary tissues, namely, of its white substance. These granulations in the kidneys are sometimes thinly scattered, sometimes so very numerous as to leave hardly any trace of their cortical portion, and even to occupy the intervals between the cones of the tubular portion of them. Such a state of the kidneys may, it would seem, produce dropsy; for in various cases of dropsical patients no other morbid appearance of importance has been detected. Although, as M. Andral observes, it is difficult to comprehend how dropsy is produced by this affection, the fact is nevertheless certain.

The kidneys, again, are subject to general or partial atrophy. In the former case one or both of them may be diminished in size, without being altered in structure, and without any symptom of disorder of the urinary apparatus having been present during life. Such a condition of kidney may have been coeval with the patient's birth; or the atrophy may have been the result of mechanical compression; of a tumour in the vicinity of the gland; or of a collection of pus formed around it. One kidney may be wholly wanting; and this defect may be either congenital, or the consequence of disease. Of the former occurrence a remarkable example has been given by Morgagni, Letter 31, Art. 25. In the patient there referred to there was no trace of the left kidney, but the deficiency was supplied by the right, which was double the natural size, and furnished with a double pelvis and ureter; and both ureters went to the right side of the bladder. When one kidney has been destroyed by disease, no inconvenience may arise provided the remaining one be sound; but if that be also degenerated, it is obvious that the patient will experience much and severe suffering. An instance is given by M. Andral, where dropsy, of which the organic cause could not be discovered during life, was ascertained to have arisen from great disease of the urinary apparatus; the left kidney was totally gone; the right was enlarged, softened, and studded with those whitish granulations which have been already noticed.

Several curious varieties in the form and the situation of the kidneys are occasionally met with; but they can scarcely be considered as diseases, or, if they be so considered, they are not to be recognized by any peculiar symptoms, nor can they ever be influenced by medical treatment.

The morbid states we are next to mention are softening and induration. The former state is not unfrequently conjoined with turgescence or hyperæmia, and this combination may be regarded as affording strong evidence of inflammation. In patients who during life have suffered under symptoms of nephritis, a very soft state of the kidneys, with intense redness, has been observed. The same condition has also been found accompanying certain chronic affections of the bladder, as thickening of its inner membrane, &c.

There is a peculiar softening of the kidneys which has been described by Dr. Baillie, and by Mr. Wilson in his lectures. The kidneys are converted into a soft loose mass, resembling in appearance common sponge. When shaken in water, the parts all separate from each other, somewhat like the unravelling of the shaggy vessels of the placenta. In one such case small shreds, apparently portions of blood-vessels, had been passed by the urethra; and upon examination after death, Mr. Wilson conceived that they might have come from the kidneys during life. This is one of those lamentable states of disease over which, even if known to exist, our art can exercise no power.

There is another kind of softening in which the substance of the kidneys is extremely pale, or of a grey tint. This alteration has been found where no symptoms of disease of the urinary organs had manifested themselves.

Induration of the kidneys may be attended by congestion or by paleness of their tissue. In the former variety the organs are generally enlarged; in the latter they are also occasionally enlarged, but most commonly diminished in size. In the pale induration the kidneys, though firmer than ordinary, may yet retain their natural structure; or they may be almost as hard and as white as cartilage, their natural structure being entirely lost. This is the state which has been called scirrhus of the kidney. It is very rarely met with, and the symptoms attending it are not to be distinguished from those which belong to other renal affections. When both kidneys are thus diseased, very little urine will be secreted, or there may be complete ischuria renalis. The remedies we must employ must of course be those which have been found useful in nephralgia and in suppression of urine. Opium and hyoscyamus are more likely to afford relief than any other medicines.

3. *Morbid formations.*—Of the diseases belonging to this division of our subject, the most important is that very formidable and intractable malady first accurately described by Mr.

J. Burns, under the title of spongoid inflammation; but more generally known by the appellation of fungus hæmatodes, assigned to it by Mr. Hey. Until of late years it was commonly confounded with cancer, of which indeed it is still reputed a species by some writers of high reputation. In this light it is regarded by M. Roux. Mr. Wardrop has named it soft cancer, and Mr. Langstaff has remarked that sometimes the scirrhous, medullary, and fungoid structures, are so blended in various parts of the same subject that they appear like different stages of morbid growth, and the difficulty the pathologist experiences is in deciding whether the disease is of the cancerous or hæmatodal kind, or *whether they are not of the same class*. The same author refers to Sir Everard Home as stating that the fungoid and the cancerous sore are the effects of one disease, only varying according to the structure of the parts which it attacks. As, however, it is now ascertained that the same structure, the female breast for example, is liable to either disease, and that fungus hæmatodes has been observed in almost every part of the body, the position of the last-mentioned pathologist is no longer tenable. It may be admitted that, in the malignancy of their character, as well as in some other points, fungus hæmatodes and cancer bear a strong resemblance to each other; but at the same time we must maintain that the former disease wants the pathognomonic signs by cancers are which distinguished. (See Fungus Hæmatodes.)

Mr. Wardrop first noticed fungus hæmatodes as affecting the kidney; but he acknowledges that, in the case he relates, the morbid alterations of structure would not have been alone sufficient to warrant him in calling it fungus hæmatodes. He conjectured it to be such because there was fungus hæmatodes over the hip joint. Since the publication of his work, however, several well-marked cases have been given in detail by Mr. Langstaff. In one of these, the subject of which was a man aged seventy, affected by hemiplegia for several years, the symptoms were, for a length of time, difficulty of voiding the urine, which was usually tinged with blood, and afterwards retention; great pain in the region of the left kidney, and uneasiness of the rectum. He died apoplectic.

In another very interesting case, that of a young lady, the symptoms were frequent desire to relieve the bladder, and in the course of a few hours an immense quantity of limpid urine was discharged without alleviation of the urgent propensity to void more: then, the irritability of the bladder increasing, arterial-looking blood was discharged in considerable quantity. Some doubt existed at first as to the source of this hemorrhage; there was some reason for suspecting it might proceed from the uterus, but the introduction of the catheter at once settled the question. After several recurrences of hemorrhage, accompanied by great irritability of stomach and bilious vomitings, the discharge of blood ceased for a time, but then the urine was very turbid, and deposited a muco-purulent sediment. About six weeks subsequent to the first attack, dull pain was complained of in the right side, and upon examination a tumour was distinctly felt in the right hypochondrium, and traced into the iliac region: there was pain upon pressure, and pulsation of the part. The discharge of blood afterwards returned at intervals, and the tumour increased greatly in despite of all the means that could be devised for checking its growth. The patient's general health of course suffered dreadfully, and sometimes she appeared to be reduced to the last degree; yet, in the intervals of the attacks of pain, sickness, and hemorrhage, she rallied in a surprising manner; nor was it until five years and a half from the commencement of her sufferings that she sank under them. Upon examination after death it was found that the right kidney occupied the principal part of the abdominal cavity: the diseased mass, with a portion of the liver which adhered to it, weighed eleven pounds and thirteen ounces. It was almost entirely formed into protuberances of different sizes, and the peritoneal surface was greatly condensed. When that part of the tumour which constituted its chief bulk was cut into, it was found to contain a coagulum of blood, not adhering to the sac, and weighing three pounds, and composed of concentric layers, as in an aneurism which has formed rapidly.

The left kidney, which weighed twelve ounces, was much altered in structure, being chiefly occupied by pulpy tubera, which were rendered red by minute injection.

In the Medical Gazette for May 1831 is related a case of fungus hæmatodes of the kidney, in a subject only four years of age. In this instance the symptoms of renal affection were so trifling that no suspicion existed in the mind of the medical attendant that such affection was the sole, or even the chief cause of the little patient's distress. It had been conjectured, as in Mr. Langstaff's case just mentioned, that the liver was enlarged, but the apparent hypertrophy of that viscus was occasioned by the enlarged kidney, which pushed it upwards and outwards towards the diaphragm. These unhappy cases have hitherto resisted every mode of treatment. When fungus hæmatodes attacks external parts, it is still one of the opprobria medicinæ; what, therefore, can be expected from our art when its ravages are obscurely going on in internal organs?

The formation of hydatids has been stated as being no uncommon disease of the kidney. It would, however, seem that the true hydatid is not often met with in that situation; while those cysts with thin and nearly transparent parietes, and which contain a limpid colourless fluid, very like water, but having some coagulable matter, are of frequent occurrence. These may be dispersed over the surface of the kidney, or be imbedded in any part of its substance. They often attain an enormous size, so as to occupy by much the larger portion of the gland; and they vary in number, from a single one to many

hundreds. Each is a distinct bag, and does not contain others within it. It is probable that these cysts depend upon a morbid alteration of the structure of the kidney.

In the true hydatid the cyst is thicker and much firmer; and, when cut into, appears laminated. Within the bag there is sometimes only one hydatid, but generally there are a considerable number; some attached to its parietes, others loose and floating in the fluid. These hydatids sometimes have numerous others adhering to their inner surface, or floating freely in their cavity. (See HYDATIDS.)

We possess no other distinct evidence of the presence of hydatids than that which their being passed by the urethra with the urine affords. All the other symptoms, such as pain of back, symptomatic fever, nausea and vomiting, belong equally to other renal diseases. Every modification of treatment has been tried, when their existence has been positively known, or has been suspected, but in vain. An artificial outlet cannot be made for them. When they obstruct the flow of urine, as sometimes happens, the bougie or catheter must be employed. Under the steady exhibition of turpentine the pain of the loins has been known to cease, as well as the passing of hydatids; but in many instances the same remedy has totally failed. The muriated tincture of iron has been given, but with no permanent good effect.

Of the remaining morbid formations in the kidneys, tubercle is the only one which merits the least attention. It is very rarely found in them, and, when it is, generally exists in other organs also. The tubercle of the kidney is said by Dr. Baillie to resemble exactly the common tubercle of the lungs.

Fatty matter and gelatiniform matter are now and then observed in the kidneys, and they have been found converted into a bony or earthy substance. But these morbid appearances are of extreme rarity.

We have thus endeavoured to furnish a sketch of those diseases of the kidneys which, though hitherto little understood, could not, in a work like the present, be passed over with propriety. In the actual state of our knowledge our descriptions must necessarily be imperfect. The period may be distant in which their nature and symptoms will be thoroughly comprehended. The most patient attention to the phenomena of certain diseases, the most diligent search into the morbid changes produced in the structure of parts by morbid actions, may for a long time seem to be unproductive of any important practical results; still, patient investigation should never be abandoned. It may be the good fortune of others hereafter to elucidate what is obscure in the affections of which we have just given a brief account; it was our duty to record what is already known respecting them.

(H. W. Carter.)

LACTATION. — Lactation in the human female, when naturally conducted, cannot be called a disease; but even under the most favourable aspect there are often circumstances which require attention and regulation, both for the purpose of alleviating pain and of preventing mischief. There are, moreover, so frequently interruptions to this usually healthy process, and there are so many important questions connected with the flow of milk at various periods, that it becomes necessary, in a work on practical medicine, to discuss them, although somewhat briefly.

The close sympathy between the uterus and the mammæ is evident even in the unimpregnated condition. At puberty the breasts enlarge and their glandular structure is developed; a day or two before menstruation, and during the period itself, the breasts become tumid and more or less painful. There is an affection which may be termed *spurious pregnancy*, described by Dr. Gooch, where, apparently from uterine irritation, the breasts are swollen and affected with shooting pains, and even a serous fluid resembling thin milk oozes from the nipple, being precisely what takes place in real pregnancy, wanting only the darkened areola. In some diseases of the uterus, particularly in hypertrophy of that organ, a similar state of the breasts is often observed. In real pregnancy the alteration in the breasts is strongly marked, and the quantity of milky serum which is secreted is sometimes very copious, especially towards the close of utero-gestation. Sauvages mentions an instance where as much as a pint and a half was daily poured out as early as the fifth month. Many women, however, shew no appearance of milk at all before delivery, who yet have abundance afterwards. After parturition it is usual to place the child to the breast within the first twenty-four hours, partly to draw out and form the nipple before any hardness of the breast occurs to render that difficult, and partly to encourage the flow of milk,—for at a later period the contact of the child's mouth will immediately excite it. With first children there is rarely any quantity secreted before the third day; about that period, but often a day or two later, the breasts become hard and swollen, hot and painful; the pulse is quickened, the skin above the natural temperature, the thirst urgent, the sleep broken and troubled with unpleasant dreams, and the sensorium disturbed, so that the patient, whilst yet awake, will fancy strange objects about the bed. The process goes on, more or less rapidly, till the milk is at the height, as it is termed, when the breasts are extremely hard, and the gland is felt knotted and loaded, and is at the same time very tender; the swelling may extend quite to the clavicles and under the arms, the axillary glands being similarly affected; a small quantity of milk will often ooze out from the nipples, particularly if the breasts be fomented, or gently pressed with the hand. If the child be put to the breast, the action of suckling is attended with great pain to the mother, but followed by much relief. As the milk flows, the hardness diminishes, and the swelling subsides. After a few hours, if the milk be freely and frequently drawn off, the sensations become more comfortable, the pain

is removed, the breasts are only distended when the child has been long away, the pulse and skin are restored to their natural state, and the process of lactation is then fairly established.

In the management, up to this period, much may be done for the relief of the patient. As soon as the symptoms begin, a purgative may be administered with great advantage, and one which contains the neutral salts in combination, as it will promote watery discharges from the bowels, is preferable: this should be repeated in twenty-four hours, or earlier, if the case is severe. There is distressing thirst, but if we allow a too free indulgence in liquids, the distention of the breasts is increased; it is therefore better to allow only a small quantity of drink at a time, and perhaps nothing is so effectual in a small bulk as an effervescing saline draught frequently repeated. As a newborn infant will often experience much difficulty in drawing out the nipple of a hard and swollen breast, or in extracting the thick milk itself, it is often advisable to have this done by an older child or a grown person, or by artificial means. These consist of various sorts of breast-pumps, where a smooth-edged glass tube is placed over the nipple, and a vacuum being produced by suction or by syringes, or by heat, the milk is thus drawn off, and the buried nipple made to project. Great benefit may be obtained by fomenting the hardened breasts with hot water, or by applying mild poultices, which promote the easy flow of the milk and relieve the distention. This is also often effected by small wooden bowls soaked in boiling water, and wrapped up in flannel, which are then placed over each breast. As a more permanent application, hare-skins are often used; cabbage-leaves were also formerly much in vogue to promote a copious perspiration over the surface; the smell, however, is very unpleasant, and the same advantage may be gained by oiled silk.

The milk first drawn has a purgative quality, and thus serves to carry off the meconium which is loading the large intestines. On this account, when a child does not get the first draught of the breast, from being nursed by a wet-nurse, or from being brought up by hand, a gentle purgative should always be given; diarrhœa of an irritable character, and even convulsions, often being produced from retained meconium. In this country it is usual to give a purgative under all circumstances, but it is not customary in many parts of the continent, and it is doubtful whether it be not often superfluous. By the experiments of Dr. Robert Lee, it would appear that the meconium is an excrement, and does not contribute to nourishment; but that above the situation of the meconium a quantity of highly nutritious albumen is found in the intestines, serving for the sustenance of the infant till lactation is established. A purgative given before that period will therefore carry off this substance, and artificial nourishment must be given to make up for the loss of the natural provision.

The milk varies considerably in condition during lactation. At first it is thick, yellowish, and having a very large proportion of cream; several days elapse before it possesses its natural appearance, which should be thin, bluish, and sweet. The quantity of cream varies very much according to the diet, and the frequency with which the breasts are drawn. Some milk has a decidedly saline taste; and at other times it has been distinctly bitter, so that the child will turn away from the breast in disgust. Its taste and qualities may be easily affected by articles of diet, by passions of the mind, repletion, hot rooms, &c. and the child is more or less disordered by the alteration. Medicines will often affect the milk in a very striking manner; a purgative given to the nurse will frequently act violently upon the child, without in the last affecting the individual herself; in the same way, alkalies given to the nurse will relieve acidity in the child's stomach; and mercury given through a similar medium will cure syphilitic symptoms in the infant at the breast.*

Milk has been said to be sometimes black or green, but there is in such cases most probably a mixture of blood, from the exterior or interior of the nipple. The writer has seen four instances where it was of a golden yellow colour, and where, upon standing, a thick layer of bitter cream, as yellow as pure bile, floated on the surface. In neither of these cases was the patient jaundiced; but a very copious flow of bile being kept up from the intestines by mercurial purgatives, after a few days the yellowness gradually disappeared; the child, till then, having been much griped and affected with diarrhœa. In no cases where wet-nurses have been jaundiced, has the writer seen the milk yellow; and it is no uncommon thing for them to become thus disordered, upon a sudden transition from poverty and a scanty diet to a full and luxurious mode of living. Milk will disorder an infant from merely being too rich, without its being otherwise altered in character. The remedy here will consist in purging the nurse, making her take plenty of active exercise, and putting her upon a more spare diet. The properties of the milk will also be considerably influenced by pregnancy or by menstruation.

There are some popular errors upon this point, which it is not difficult to expose. One is, that women will not become pregnant during lactation. This is far from being the case, and Mr. Roberton of Manchester† has taken the trouble to enquire minutely into the result of 160 cases, in which he found that eighty-one women had become pregnant once or oftener during suckling. Mr. Roberton has stated "that the appearance of the catamenia during

* On the authority of Mr. Keate, it may be here stated that a foreign gentleman, a patient of his, was in the habit of regulating his hepatic system, when there was a deficiency of bile in his motions, by taking asses' milk medicated by giving the animal a certain quantity of a mercurial preparation (the nitrate of mercury.) The effect was very marked, and he could bear mercury in no other shape.

† Vide Edinb. Med. and Surg. Journal, No. 110.

lactation does not appear to have any influence in disposing to conception." In this respect the writer's experience leads him to a different conclusion: he is decidedly of opinion that those women who menstruate during pregnancy will more readily conceive than those who do not; and he has also remarked, as Dr. Hamilton has done, that both these occurrences are more common with first children; hence women under such circumstances are not, *cæteris paribus*, so eligible for wet-nurses. Dr. Mason Good has recommended cohabitation with the husband during lactation, as likely to increase the quantity of milk; arguing upon the fact that the Tartars are accustomed to irritate the vagina of their mares for a similar purpose. The objection to his proposal will only apply to hired wet-nurses, lest they should become pregnant. Wet-nurses have very frequently recommended themselves to the writer on the plea that they have still continued to menstruate, by which they believe that their milk is *renewed*, as they term it, every month, so as to be rendered fit for much younger children than it would otherwise have been. This occurrence, however, much impairs the milk, in its probable duration, and in its properties at the period itself. The infant becomes unusually fretful, brings up the milk by vomiting, and has frequent watery motions of a spinach-green colour. These symptoms are so peculiar, when arising from no very obvious cause, that it may be generally safely guessed that the nurse is either menstruating at the moment, or will do so on that day month; for it is not uncommon to find the effects on the child brought on, although the alteration in the uterine condition of the nurse is not complete.

One of the most early and most troublesome attendants upon suckling is soreness of the nipples, as the pain recurs as often as the infant is put to the breast. Very few escape some degree of tenderness, with first children especially, but the inconvenience is soon obviated, and the delicate skin becomes callous, like the fingers of a harp-player—an effect which may be hastened by some slightly astringent or gently stimulating lotion, as green tea, brandy, weak solutions of the sulphate of zinc or of alum. If more severe and intractable, a solution of one to two grains of nitrate of silver in one ounce of rose-water will be found of service. Should the skin become excoriated, or should a crack take place at the junction of the nipple to the areola, a shield of glass, wood, ivory, or silver, should be used, with an artificial or prepared cow's teat, through which the child may suck without biting or much disturbing the nipple. The surface of the sore may then be freely touched once a day or oftener with the lunar caustic, and in the intervals the part may be kept well smeared with ointment containing honey, or a minute quantity of Peruvian balsam. Preparations containing lead or mercury in any form are scarcely advisable, as they may be swallowed by the infant. Where the surface of the nipple is not chapped, but unusually hot and dry, and very tender to the touch, all astringent lotions and stimulating applications aggravate the mischief; the simplest ointments, of wax and oil alone, will be found to agree best, or the part may be covered with powdered gum arabic or a bread-and-water poultice. The dress should, in all cases, be carefully kept from irritating the sore nipple, by means of wax cups, shells, or glasses for the purpose.

There is one species of sore nipple not often noticed by practitioners, (who are too apt to leave these cases to the management of the nurses,) which the writer has found more intractable than any others, and the means frequently of inducing the mother to give up suckling entirely, from the constant torture to which she is exposed. There is little or nothing to be seen but a small spot at the orifice of the nipple, which is elevated and irregular in appearance, extremely painful to the touch, and exuding a sanious ichor. When the child is put to the breast, the pain is most acute, and seems to come from the interior of the nipple and breast; and the first and last milk is generally mixed with blood. It would appear as if the interior or lining membrane of the lactiferous tubes was in a morbid condition. Little or nothing can be done for this affection. The free application of caustic to the external orifice, and poulticing the breast, has now and then effected a cure, along with careful attention to the stomach, bowels, and general health, which is highly essential. Those who have uniformly suffered from sore nipples on former occasions have frequently seemed to prevent them by using, previously to parturition, for several weeks, either an astringent or demulcent lotion, according to the state of the skin.

Inflammation will occasionally attack the breast itself at any time during lactation, but most frequently at a very early period, when there has been exposure to cold, much trouble in the first management of the milk, or soreness of nipples; it does not so frequently happen where the milk is at once driven back without suckling the child. If not immediately treated by leeches, by fomentations, and poultices, hot and frequently changed, or, as some prefer, by cold lotions, abscess will take place, accompanied by great pain and much constitutional disturbance. The treatment of this state comes within the immediate province of the surgeon; but there are one or two circumstances respecting *milk* abscess deserving of notice in this place. It is very customary, when abscess is threatened, to persevere in keeping the child to the breast, or otherwise drawing the milk off; partly to enable the patient to continue suckling, and partly to prevent the milk collecting in and distending the inflamed breast. If the inflamed portion be not extensive, there is no objection to this, as a small abscess will not much interfere with the functions of the remaining sound parts; but if the whole, or nearly the whole, of the breast be implicated, the pain of suckling will be very violent indeed, and the frequent disturbance and irritation will contribute to increase the inflammation, and diminish or

entirely obviate the chances of preventing the formation of matter. Should abscess be formed, and matter be felt fluctuating, the most experienced practitioners agree upon the propriety of puncturing early and freely; otherwise in such a peculiar structure most extensive mischief will take place, and the surface remain disfigured afterwards in the most unsightly manner. It is curious to notice in subsequent confinements how little the real glandular apparatus has been destroyed, even where large collections of pus have formerly been evacuated, so that the patient will sometimes be enabled to nurse with but little trouble; although from some partial obliteration of the ducts, there is always rather more difficulty in the flow of the milk.

Milk fever.—What is called *milk fever*, is an aggravated and morbid form of the healthy and natural excitement which takes place at the onset of lactation. The febrile symptoms are much more severe; there is a well-marked precursory rigor; there is great pain and throbbing of the head; a flushed countenance; intolerance of light and sound; the pulse is full, hard, and rapid; the thirst excessive; the skin hot and dry, and the tongue covered with a thick fur. These attacks may be usually traced to a too stimulating diet, a heated atmosphere, much exertion and disturbance, or mental agitation. They are much less frequent than formerly, when great fires, loads of blankets, and brandy caudle, were the usual appendages to a lying-in chamber. If the flow of milk be encouraged, and gently yet freely drawn off; if the room be kept cool; agitation soothed or avoided; purgatives duly administered, and perhaps diaphoretic medicines; a remission of the symptoms will usually take place in a few hours, accompanied by a copious perspiration and tranquillity of pulse. On the contrary, by bad management phrenitis may supervene, of a very dangerous character; when the milk will be entirely suppressed, and nothing but the free use of the lancet will save the patient.

A very common expression is, that in such cases *the milk flies to the head.* In phlegmasia dolens the milk was also supposed to fly to the leg, and hence the French writers formerly called it, "depôt du lait." It has several times happened in the writer's experience, that where bleeding has been had recourse to in inflammatory diseases with sudden suppression of milk, the serum of the blood, when separated by rest, has been white, opaque, and bearing nearly all the characters of milk, except the formation of cream on the surface. It may here be observed, also, that where the milk is driven back artificially, and active purgatives are employed, a great quantity of milk-like fluid may be generally seen in the motions. Depressing passions, fear, and anxiety, will suddenly drive off every vestige of milk; but the only genuine *translation* may be said to be those extraordinary instances where the milk has receded more or less rapidly from the breasts, and a vicarious discharge has taken place from other parts, the general health remaining but little affected. The most common example of this is where the discharge has taken place from the vagina in the form of leucorrhœa; but it has also occurred from the fauces, the navel, the eyes, the kidneys, the whole surface of the mammæ, &c.

Where the child is to be weaned, or where a mother does not wish to suckle, or is not able from constitutional debility or local defect, or where the death of the child has taken place, it becomes necessary to "*backen*" the milk, as it is vulgarly termed. This may be done the most safely for the mother by her not being too impatient. If cold evaporating lotions are applied to the breasts, there is a more rapid dispersion of the milk, but there is more risk of fever, phrenitis, &c. It so happens, however, that these cold lotions rarely are allowed to act as such, for nurses in general are so particularly careful to cover up the patient's neck with the bedclothes and wrappers, that the lotions very rapidly become warm fomentations. In the writer's opinion, the best and safest applications consist of stimulating liniments, applied warm and also constantly, by means of layers of lint or flannel. The breasts should also occasionally be gently pressed and rubbed with warm oil; and if they are very hard and distended, a small quantity may be now and then squeezed out or drawn off artificially. The bowels are to be actively kept open by saline purgatives; the diet is to be low, and the quantity of drink lessened. It will be but a few hours before the extreme distress is mitigated, but it will be often several days before the milk is thoroughly dispersed, or the remedies can be discontinued. The sensation of "draught of milk" in the breasts will sometimes be felt two or three times a-day for weeks afterwards. In weaning a child, however, it is often the plan to do it so gradually, by accustoming it to partial feeding for some time previously, that little trouble is at last experienced in dispersing the milk. It is still very desirable that opening medicine should be plentifully given, even under such circumstances; as from this discipline being neglected, patients will often suffer for months afterwards, with great depression of spirits, loss of appetite, feeling of weight and lassitude, and general ill health,—sensations which are soon relieved by having recourse to opening medicine.

An excessive secretion of milk will sometimes be met with; but in nearly all these cases there is apparently some defect in the organization of the nipple, or the lactiferous tubes have lost their elastic property of retention, for in the intervals of suckling a constant and very copious discharge of the milk takes place. The daily waste and drain cannot exist long without materially affecting the health and strength; and unless the flow can be kept in check, there is no remedy except weaning the child and repelling the milk altogether. Various plans have been proposed, but the trial is not often successful. Local strong astringent applications, as lotions of alum, oak-bark, zinc, &c., sometimes do good, but they are apt to

effect too much, and drive away the secretion entirely. The astringent tonics internally, particularly the mineral acids, steel, kino, and alum, have occasionally been of service. Belladonna has been advised, both locally and in small doses internally. The breasts should be kept as cool as possible, and cold bathing be daily had recourse to.

The period of lactation is generally one of the most healthy of a woman's life; but there are many exceptions to this; and many who have begun with success, by continuing to suckle too long, by a too limited diet, by much loss of rest, or by other causes, have had their own health and that of their infants considerably and even fatally impaired. A recent writer has attempted to define the exact period to which suckling should be limited, as far as the advantage of the infant is concerned; but all such definitions are constantly contradicted by experience. There is much fallacy also in the arguments to prove that protracted lactation is the cause of various infantile diseases, especially hydrocephalus. Putting aside altogether the striking fact that the dangerous disturbance of dentition is proceeding at the same time, it may be allowed that hydrocephalus and the other diseases mentioned may and often do occur after or during protracted lactation; but they happen quite as frequently, and indeed more so, where a child has been brought up by hand, without the breast at all; or where it has been badly fed, or over-fed, whilst still suckling. In all the cases of mothers who have nursed their children for two years and upwards, in the class of life alluded to by Dr. Morton, it may be, perhaps, fairly assumed, from the known habits of the parents, that the children have been fed at the same time, and generally fed upon exactly the same sort of food as would be more adapted to older children. "The child eats whatever we eat" is the common expression, though the child is still allowed to apply to the breast at pleasure, to prevent the chance of a fresh pregnancy. Many children, particularly in the higher classes, where hired wet-nurses are employed, are kept for a long time at the breast because they are backward with their teeth, have had their bowels disordered by a premature attempt at weaning, or because they are in delicate health; but if hydrocephalus supervene in such instances, it is quite as likely that the previous disordered health may have been the cause, as the protracted lactation. In savage nations, in many parts of America, the east, and the polar regions, it is the constant custom for mothers to suckle their infants for two years at least, and without any of the pernicious consequences which Dr. Morton has imagined.*

It is certainly true, that if the mother's health be impaired by undue lactation at either an early or a late period, the child will suffer from defective nutrition, but in no other manner.

Dr. Marshall Hall has well described the state of disorder of the general health in females, which is induced by exhaustion of the frame, arising from protracted lactation, or from the original powers not having been equal to the continual drain on the system. One of the earliest symptoms of failure is a dragging sensation in the back, when the child is in the act of sucking, and an exhausted feeling of sinking and emptiness at the pit of the stomach afterwards. The appetite fails gradually, but entirely; there are thirst, a dry tongue, a quick feeble pulse; costive bowels, headach, with giddiness, lightness, and failure of sight. The skin is hot and cold alternately; there are profuse night-perspirations; generally leucorrhœa, great debility, and emaciation. The memory is impaired; the spirits are weak, irritable, and depressed. Symptoms resembling phthisis will sometimes come on, and mania is not an unusual result. Though much may be done in the first instance by the proper use of tonics, cold or sea bathing, change of air, a regulated diet, and local applications, to restrain the leucorrhœa; and though we may now and then effect a portion of good by partially feeding the child, yet the quickest and most effectual remedy is to wean the child. The different symptoms resulting from the exhausting process require appropriate treatment, according to circumstances; but all treatment will generally fail, unless we remove the cause of exhaustion.

Before leaving the subject of lactation, it may be remarked that males have also the organs for supplying milk, in a dormant state, which under peculiar circumstances have been excited into action, and have supplied milk in abundance, sufficient to suckle children. Instances have been given in recent times by Humboldt and Captain Franklin, and many others are on record. Very old women* and virgins have also had milk in considerable quantities, the nipples in all these cases having been frequently stimulated by the contact of the child's mouth purposely applied. It is by no means uncommon to meet with newly born infants, of either sex, who have their breasts turgid with a milk-like fluid, which is dispersed with difficulty.

(C. Locock.)

LARYNGITIS.—Of inflammations of the larynx there are many varieties, to which we mean briefly to allude before we enter upon a description of that formidable disease which has of late years obtained the title of laryngitis, and is the proper subject of this article.

Beginning with the slighter inflammations, we may, 1st, advert to that affection of the

* See Edinburgh Medical and Surgical Journal, No. 110.

* A very interesting account is given (in the Medico-Chirurgical Review, for July, 1832) by Dr. Kennedy of Ashby-de-la-Zouch, of Judith Waterford, of that place, and now alive, with milk still in her breasts at the age of eighty-one: the summary may be given in Dr. Kennedy's own words. "Here, then, are the remarkable circumstances of a woman who menstruated during lactation, who suckled children (many not her own) *uninterruptedly* through the full course of *forty-seven* years (three years of which time she was a widow), and who in her eighty-first year has a moderate but regular secretion of milk."

membrane lining the larynx, which is distinguished by hoarseness, or complete loss of voice, and by slight cough, an affection which, arising from exposure of the body, or part of it, to a current of cold or damp air; from partial or general wetting; or from an incautious laying aside of some article of dress, especially during changes of the weather, is so slight, as seldom formally to be brought under the observation of the physician.

2dly. Similar symptoms not unfrequently occur in connection with common sore throat (cynanche tonsillaris), and for the most part they also form a case for domestic prescription, unless the inflammation is so considerable as to threaten suppuration.

These two affections are chiefly prevalent about the beginning of winter and in the spring, and for the most part yield to confinement to the house for a day or two, and the antiphlogistic regimen. The latter affection, like the former, is of little importance, unless considered in connection with laryngitis, which has sometimes commenced like an ordinary sore throat attended with hoarseness; or unless it give rise to chronic disease of the affected part; for it is observable of both these slight inflammatory attacks, that when neglected, or when, from exposure to frequent vicissitudes of temperature, to foggy and cold weather, or to the night-air, they are from to time renewed, a state of permanent irritation is sometimes produced which is indicated by hoarseness, slight muco-sibilant inspiration, and cough, and by some difficulty of swallowing; symptoms which, especially in persons advanced in life, end in chronic laryngitis, a disease always intractable and often fatal. In these attacks, relief, if sought in time, may in general be obtained by bleeding, especially topically, and blistering; by a course of calomel and ipecacuanha; or calomel and antimonial powder, one grain of each given three times a day, and continued until the gums become slightly affected by the mercurial; by pure air of moderate and equable warmth; and rest and quiet.

3dly. Sometimes the membrane of the larynx is inflamed in gastric fever, and in various fevers of the exanthematous order, especially in small-pox, measles, scarlatina, and erysipelas, fevers which we apprehend are all essentially gastric. In small-pox, the epiglottis and larynx are often inflamed and beset with pustules, from which very great distress arises. In the beginning of measles, inflammation of the upper part of the windpipe is so considerable as to give rise to an attack which, for a short time, advances with all the violence of croup. In the winter of 1807, and more especially in the spring of 1808, when measles were epidemical in Edinburgh and the neighbourhood of that city, and of so unfavourable a kind that we witnessed the death of more than 100 patients in the course of a few months, the disease corresponding with the putrid measles of Watson,* not only was the larynx often affected before the efflorescence took place, but in several instances after the rash had disappeared it became inflamed; in all which cases, to the best of our recollection, the patients died. In one dissection which we procured, of laryngitis after measles, the following were the appearances discovered. The investing membrane of the epiglottis was considerably thickened, particularly at its edges; such also was the state of the membrane of the glottis; the sacculus laryngeus was nearly obliterated, and, below the sacculus, ulceration had taken place. When the epidemic commenced, bleeding was often useful, but after it had continued for some time, and had become more fatal, the attending fever being typhoid, bleeding appeared injurious; indeed we then observed that scarcely a child recovered which had been bled, so that bleeding was not had recourse to when the larynx became inflamed. Nor were blisters applied, most blistered surfaces having a strong tendency to run into ulceration and gangrene. Were we again to be called to such cases, we would recommend immediate change of dwelling, a remedy not yet duly appreciated in acute diseases; an emetic and calomel, with small additions of opium.

We have frequently known inflammation in scarlatina and in some forms of cynanche to affect the fauces, whereon perhaps a plastic membrane was formed, and to ascend into the nares and descend into the windpipe. Several soldiers of a militia regiment, stationed at Woolwich, were daily brought into the general hospital with scarlatina. The disease was unusually fatal. One of these patients, who had been only a few hours in the hospital, died after symptoms which the surgeon on duty thought proper to investigate by dissection. He cut out the trachea, and found it lined with a membrane as in croup. The preparation was preserved, and afterwards presented to the writer of this article by his late friend Dr. Rollo, surgeon-general to the artillery: an engraving of it was given by the writer in his work on the "Pathology of the Membrane of the Larynx." At page 37 of the same work, will be found an account of two cases of inflammation of the larynx, one occurring about the eighth or ninth day of fever in a girl eight years of age, who was relieved by bleeding; the other in a girl of eleven, in whom an attack of bilious remittent fever was ushered in by laryngeal inflammation. A fatal case of laryngitis occurring during apparent convalescence from remittent fever, published in the first volume of the Transactions of the Physico-Medical Society of New York, was republished in the Medico-Chirurgical Review for April 1827.

In erysipelas the fauces are often inflamed, and the inflammation extends to the larynx, in which case the respiration resembles that of croup, and the disease is generally fatal. A female thirty-four years of age, had been in the hospital Cochin for disease of the heart, when, on the 23d of February, she was seized with violent rigor; 24th, erysipelatous eruption of the face with febrile reaction; 25th, 26th, the erysipelas was extended to the hairy

* Med. Obs. and Inquiries, vol. iv. p. 132.

sealp and to the neck, eyes closed; 27th, acute pain in the throat, difficult deglutition, respiration impeded; 28th, swelling and inflammation in the anterior part of the throat; inability to expectorate; suffocation threatened. March 1st, swelling of the neck enormous—asphyxia—death.

Dissection. The mucous membrane lining the mouth, larynx, and pharynx, red and inflamed. The epiglottis and its ligaments thickened; the rima glottidis nearly annihilated by the swelling and by tough mucus. The cellular tissue of the larynx, face, and neck injected, red, and œdematous; the lungs sound.*

4thly. The larynx is often inflamed in those diseases in which the inflammation extends over the whole of the mucous membranc of the lungs. In common and also in epidemic bronchitis, the inflammation, apparently commencing in the Schneiderian membrane and fauces, often affects the larynx in its descent into the bronchi. The membrane of the larynx is also liable to be affected in those varieties of chronic bronchitis, which, according to the season or age at which they occur, or according to the symptoms of the attack, have been termed winter cough, catarrhus senilis, suffocative catarrh, or peripneumonia notha. In pertussis, inflammation often obtains in the mucous membrane of the larynx as well as in that of the trachea and bronchi. Lastly, in croup, the symptoms referable to inflammation of the larynx are so obvious and remarkable as to have exclusively engrossed the attention of most observers, leading them to overlook proofs, scarcely less equivocal, of an inflamed condition of the bronchi.

5thly. We have known many cases of inflammation of the glottis arising from an accident, to which the children of the poor are liable. Slatternly mothers often permit their children to drink from the spout of the tea-kettle, and the children are thus led to a habit which, if the kettle should happen to contain boiling water, may prove fatal. The symptoms produced by this accident are inflammation and vesication of the fauces, difficult breathing, audible inspiration, whispering voice, leaden countenance, watery eyes, and cold extremities—symptoms which we were wont to think were as much dependent upon bronchitis as upon inflammation of the glottis; but a dissection published by Dr. Marshall Hall, in his satisfactory account of this affection in the twelfth volume of the Medico-Chirurgical Transactions, would lead to a conclusion that the inflammation does not extend even to the trachea. We have been accustomed to treat this affection by bleeding, blistering, and a preparation of calomel and ipecacuanha. Our confidence in bleeding is not, however, very great. The children soon acquire that peculiar expression which livid paleness with œdema imparts, when asphyxia, in an advanced state of bronchitic inflammation, is impending, a state which contra-indicates free bleeding. Bronchotomy is recommended by Dr. M. Hall, and this operation his view of the case would amply justify. He also recommends scarifying the epiglottis. Probably small doses of opium, given at an interval of two or three hours, would be useful, as they generally are in burns attended with much suffering. In the third volume of the Dublin Hospital Reports there is a case given by Dr. Burgess, of a girl of three years of age, who drank boiling water from the pipe of a tea-kettle, by which great swelling of the parts immediately ensued, thereby preventing deglutition and impeding respiration. In about two hours after the accident, in looking into the mouth, it appeared as if a large piece of raw flesh had been forced into the fauces, and had completely filled up the passage. Respiration was performed with very great difficulty, and was rapidly becoming more laborious,—in fact the child appeared to be dying, when bronchotomy was performed, by which life was saved.

6thly. Inflammation of the mucous membrane of the larynx sometimes arises when the system is under the influence of mercury. We think we have seen inflammation extending to the windpipe in severe cases of mercurial glossitis, and hence we are unwilling to reject, as one of the species of laryngitis, that caused by mercury. But we are not satisfied that the cases of alleged mercurial laryngitis, which have been recently published, did not owe their origin to other influences, such as lues venerea, or exposure to cold, rather than to the mercury.

7thly and 8thly. There are yet two inflammatory affections of the membrane lining the larynx which must be briefly described, in order to complete this part of the subject: these are scrofulous inflammation of that portion of the mucous membrane, and inflammation symptomatic of secondary syphilis.

Scrofulous inflammation is an affection of a very dangerous nature, not, as we apprehend, generally accompanied with tuberculated lungs. This affection is not confined to youth or adolescence; sometimes it appears at or after the meridian of life, as the commencement of a very chronic variety of phthisis, which some physicians have imagined depends upon indigestion, and is to be cured by blue pill, &c. We have frequently witnessed this affection in an acute form in persons who had abandoned themselves to the habitual use of ardent spirits, in *muddlers*, as they are called, who drink at all times, but seldom to complete intoxication. Such patients lose their appetite; become emaciated; usually have a patchy purplish complexion; gradually acquire a dry hard cough, which at first appears nothing more than an aggravation of that cough observable in drunkards, which is attended with white and scanty expectoration, and is followed, especially in the morning, by retching or even vomiting of a little clear ropy fluid. If we examine these patients, we shall find the pulse accelerated, the tongue and fauces florid, the former glazed. This disease is always fatal,

* *Bouillaud.*

but generally not until purulent expectoration, colliquative diarrhœa, and night sweats, have existed for some time. It often is to be met with in publicans, and such as are engaged in the occupation of vending ardent spirits. It is attended with a sense of exhaustion, a depression of mind, a fear of death, and a consciousness of the disease being self-produced, which it is most painful to witness. The patient may, in the commencement, derive some advantage from change of air, exercise on horseback, very small topical bleedings, not more than three or four leeches being applied, followed by counter-irritants and light bitters. The bowels must be properly regulated, avoiding all medicines which lower the strength; and a mild alterative pill may be given for ten days or a fortnight, namely,

℞ Pilulæ hydrargyri, scrupulum.
Pulveris conii, scrup. ii.
Ipecacuanhæ, gr. xv.

Ammoniaci contriti, sesquidrachmam, M. et divide in pilulas xl. Sumat duas mane et meridie; superbibendo poculum lactis asinini.

Milk, shell-fish, broiled, tender but lean meat, and vegetable jellies will form the most suitable nourishment.

The more common form of scrofulous inflammation of the larynx and trachea belongs to youth, and occurs in those families of which the members are liable to consumption. It has seemed to us often to arise from night-air and fatigue, especially when these causes operate during a season of mental anxiety and over-exertion. This is a frequent disease with those wretched females who frequent the streets of our cities in the night, and their obscene haunts during the day. The hue which may be observed on their cheeks is not always the glow of intemperance or of shame, nor yet the factitious blush of effrontery, but is often the crimson of a consuming hectic, which is rapidly hurrying them from misery to misery. It is little known how large a portion of the tenants of the brothel actually labour under consumption, but the subject is too horrible to be pursued.

At first the disease is attended with a dry barking cough, a single bark, often supposed to be a stomach cough; but the symptom which is most distinctive of this very treacherous complaint, and which in consumptive families ought ever to excite the liveliest apprehension of danger, is a change in the sound of the voice, which the patient can no longer extend without difficulty. It is slightly raucous, and acquires that hollowness which, both as if proceeding from a vault and in reference to its tendency, is not unaptly called sepulchral. When, the attention being arrested by the cough and the sound of the voice, which often have existed for many weeks or even months before they become objects of regard, we more closely examine the patient, we shall find that there is some uneasiness in the region of the larynx, or in the superior part of the thorax; a degree of quickness of the pulse is discoverable, as also some emaciation and decay of the strength, but the latter so slight as to have escaped notice. Indeed so insidious is this disease, that in many instances it has passed undiscovered until some acquaintance, who had not for a considerable time seen the patient, discerning a great change in his looks, expresses his apprehension. Then the truth, in all its nakedness, flashes on his alarmed relatives, and a physician is obtained who detects the nature of the disease by discovering that there are irregular chills followed by heats and perspirations, and confirms all their fears. The patient soon loses the power of extending his voice; he can only speak in a whisper; his cough becomes stridulous, his expectoration purulent, and laryngeal or tracheal consumption is incurably established. If a patient, fortunately for himself, should in the commencement of his disease be visited by a person possessed of medical skill, his life may sometimes be saved. In the treatment of this complaint, if the disease should not have reached the suppurative stage, we must disregard the diathesis, and address ourselves to the local affection. First, we must apply leeches to the upper part of the sternum; we prefer three or four leeches every third or fourth day to a greater number; secondly, the tartar emetic ointment (taking care that it does not reach the leech-bites) to the sides of the larynx, first to one side and then to another; thirdly, we must give the solution of tartar emetic (so as to excite slight nausea) with the addition of nitre.

℞ Antimonii tartarizati, gr. duo.
Nitratis potassæ, scrup. ii.
Aquæ distill. unc. sex: M. et divide in haustus sex. Sumat unum, ter, quaterve de die.

Lastly, a diet consisting of milk, farinacea, and fruits, will be necessary. This plan may be followed for eight or ten days; if without efficacy, new measures must be tried, as change of air and scene, and restoratives, such as a return to the use of animal food, a glass or two of claret, and sponging the surface with very diluted nitro-muriatic acid, which may also be taken internally. If the expectoration be considerable, a drachm of Riga balsam in a glass of water may be taken three times a day, or the following draught:

℞ Tinct. benzoini compositæ, ʒi.
Mucilaginis acaciæ, ʒii.
Syrupi papav. albi, ʒi.
Aquæ cinnamoni, ʒvi. M.

together with such treatment as would apply to impending laryngeal or tracheal phthisis.

There are certain cases of scrofulous inflammation of the windpipe that are invariably overlooked in the first stage, of which the first symptom detected are round and pretty deep ulcers in the fauces. The affection of the larynx so commencing, according to our observation, always ends in phthisis.

The syphilitic inflammation of the larynx, like the last variety, is seldom discovered in its very beginning. This disease is introduced by anomalous symptoms of constitutional dis-

order, and an obscure febrile state. The patient's expression appears altered and anxious, his complexion pale or mixed, his skin opaque and, as it were, dirty, his eyes hollow, the tarsi slightly inflamed; some degree of emaciation takes place; then the voice becomes husky. These symptoms will naturally suggest that line of inquiry which we adopt when we are endeavouring to detect a syphilitic taint; and here it will not be irrelevant to observe that a change in the sound of the voice, whenever it accompanies a cachectic state of the body, demands the utmost attention,—attention which will sometimes be rewarded by enabling us to discover the approach of a disease that would shortly assume a hopeless expression. In syphilitic inflammation of the larynx, when the head is suddenly turned to a side, uneasiness will be felt in the organ, which, when pressed, feels tender. The patient suffers much from a stridulous cough, attended with little or no expectoration. These symptoms being neglected, ulceration of the membrane of the larynx next ensues, which may be discovered by difficult and suffocative inspiration and cough, by purulent expectoration, and by unequivocal hectic, attended with great irritability of the nervous system, and, lastly, by permanent loss of voice. In the commencement of this affection we must endeavour to subdue the inflammation by means of leeches, blisters, and the antiphlogistic regimen. Then we must give the muriate of mercury in decoction of sarsaparilla, and employ mercurial fumigations.

In this manner, with the help of change of air, a remedy often of surprising efficacy in specific inflammations, a cure may sometimes be accomplished; but syphilitic inflammation of the larynx, which we apprehend will be most likely to occur in strumous habits, will, in general, like the proper scrofulous inflammation, terminate in laryngeal consumption, unless a termination should take place in the inflammatory stage, such as was exemplified in one of Bouillaud's patients, who died of suffocation so early as the fifth day, the cellular membrane being so thickened, infiltrated, and gorged, as almost to obliterate the rima glottidis; and on the left side of the larynx an ulceration being formed with the characters of chancre.* When syphilitic ulcers exist, they will generally be found in the sacculi laryngis. We have, in a specimen of diseased larynx, seen fimbriated excrescences in the glottis, which were probably syphilitic, but we were not able to obtain a history of the preparation.

As we learn from an ably written paper by the late Mr. Wood, in the seventeenth volume of the Medico-Chirurgical Transactions, on the effects of inflammation of the larynx, that a patient lately died in St. Batholomew's Hospital, of a disease of the larynx, which was discovered after death to be cancerous; and as Dr. Monro, in the 2d volume of his Outlines of Anatomy, informs us that he has seen in some cases the arytenoid and thyroid cartilages thickened and covered by a scirrhous substance, by which the glottis was straitened; it is probable that our successors in pathology, when facts accumulate, will add a *ninth* species, viz. scirrhous inflammation of the larynx, to the foregoing catalogue of diseases of that organ.

We proceed to the consideration of laryngitis, which is a more suitable designation for the disease now under review, than angina œdematosa, as applied to it by some authors: it has been well observed that "the term *œdematosa* is unnecessary, as œdema constitutes no fundamental character of laryngitis, but is an effect or consequence of inflammation of the affected organ,"* in what manner soever excited.

Of laryngitis, it is true, notices and cases were previously published, but the disease was not generally understood prior to the publication, by Dr. Farre, of a valuable paper on cynanche laryngea in the third volume of the Medico-Chirurgical Transactions.

Our knowledge will often be advanced by examining a specimen of a disease before we apply ourselves to the study of its general history. We therefore beg to call the attention of the reader to a case of laryngitis in every way interesting, but especially so to the pathologist, as being the first accurately reported history of that disease which, as far as we know, is to be found in the annals of medicine.

"Some time on the night of Friday, the 10th Dec. 1799, having been exposed to rain on the preceding day, General Washington was attacked with an inflammatory affection of the upper part of the windpipe, called in technical language cynanche trachealis. The disease commenced with a violent ague, accompanied with some pain in the upper and fore part of the throat, a sense of stricture in the same part, a cough, and a difficult rather than a painful deglutition, which were soon succeeded by fever and a quick and laborious respiration. The necessity of bloodletting suggesting itself to the General, he procured a bleeder in the neighbourhood, who took from his arm in the night, twelve or fourteen ounces of blood. He could not by any means be prevailed on by the family to send for the attending physician till the following morning, who arrived at Mount Vernon at about eleven o'clock on Saturday. Discovering the case to be highly alarming, and foreseeing the fatal tendency of the disease, two consulting physicians were immediately sent for, who arrived, one at half after three, and the other at four o'clock in the afternoon. In the mean time were employed two pretty copious bleedings, a blister was applied to the part affected, two moderate doses of calomel were given, and an injection was administered, which operated on the lower intestines, but all without any perceptible advantage, the respiration becoming still more

* Med. Chir. Journal for July 1825, p. 206.

* Med. Chir. Journal for July 1825, p. 206.

difficult and distressing. Upon the arrival of the first of the consulting physicians, it was agreed, as there were yet no signs of accumulation in the bronchial vessels of the lungs, to try the result of another bleeding, when about thirty-two ounces of blood were drawn, without the smallest apparent alleviation of the disease. Vapours of vinegar and water were frequently inhaled; ten grains of calomel were given, succeeded by repeated doses of emetic-tartar, amounting in all to five or six grains, with no other effect than a copious discharge from the bowels. The powers of life seemed now manifestly yielding to the force of the disorder; blisters were applied to the extremities, together with a cataplasm of bran and vinegar to the throat. Speaking, which was painful from the beginning, now became almost impracticable; respiration grew more and more contracted and imperfect, till half after eleven on Saturday night, retaining the full possession of his intellect, when he expired without a struggle. He was fully impressed at the beginning of his complaint, as well as through every succeeding stage of it, that its conclusion would be mortal; submitting to the several exertions made for his recovery, rather as a duty than from any expectation of their efficacy. He considered the operations of death upon his system as coeval with the disease; and several hours before his death, after repeated efforts to be understood, succeeded in expressing a desire that he might be permitted to die without further interruption. During the short period of his illness, he economized his time, in the arrangement of such few concerns as required his attention, with the utmost serenity; and anticipated his approaching dissolution with every demonstration of that equanimity for which his whole life had been so uniformly conspicuous."*

The violent ague with which this case commenced was doubtless the rigor of incipient inflammation; the pain in the upper and fore part of the throat, the sense of stricture in the same part, and the labour of respiration, showed that inflammation was seated in the larynx. The difficult deglutition arose from the state of the tonsils, in which probably the inflammation commenced. The inflammation did not descend into the bronchial vessels of the lungs, wherein we are told there were no signs of accumulation. It may be inferred, therefore, as will be apparent from the sequel, that this was a genuine specimen of laryngitis.

Laryngitis generally arises from exposure of the body, or a part of it, to cold or wet, or from sudden transitions of temperature. It affects those persons who are liable to cynanche tonsillaris, and often commences as one of their accustomed attacks; and hence the patients are seldom alive to danger until a feeling of suffocation convinces them that their illness is one of unusual severity. In the Richmond Surgical Hospital, House of Industry, Dublin, we saw a case of inflammation of the larynx, which commenced in the tonsils, and was by malepractice extended to the larynx. The patient was a robust young man; his face was much flushed, his pulse quick. He was completely hydrophobiac. When he tried to swallow, the effort was followed by extraordinary difficulty of inspiration, and every attempt to articulate was productive of a sense of strangling. There was pain and great tenderness on pressure on either side of the pomum Adami. He was attacked, two days before he entered the hospital, with cynanche tonsillaris, when an old woman, partial to stimulants, as such practitioners generally are, rubbed the inflamed tonsils with pepper and salt, and immediately difficult deglutition came on, which was followed by constriction of the glottis. He fell under the care of an excellent surgeon, the late Mr. Todd, who soon restored him to health by copious general and local bleeding.

If, when the throat first becomes sore, the patient is examined, probably the uvula will appear inflamed, and the tonsils and arch of the soft palate redder than natural; and in some few instances exudations of coagulable lymph will be seen on those parts; the tongue perhaps is swelled; the face flushed; the pulse frequent, full, and hard; and the skin hot. The breathing soon becomes affected; the inspiration "is long in being completed," audible, and as if the air were drawn through a dry and narrow reed; the patient points to the larynx as the seat of uneasiness; he frequently coughs, and the cough is very peculiar in sound, not so ringing as that of croup, but harsher and more stridulous, and attended with scanty, viscid, and transparent expectoration. Pain is sometimes complained of in the chest. The voice, at first acute and piping, gradually becomes thick, then hoarse and whispering, and at last it is completely suppressed. There is sometimes great difficulty in swallowing, from the epiglottis ceasing to perform its valvular office, whence it happens that, when the patient begins to drink, a portion of the fluid escapes into the larynx, and produces a fit of coughing, which seems to threaten instant suffocation.

Laborious respiration and an inadequate supply of air before long affect the appearance of the patient. His expression becomes full of anxiety; his countenance pallid; his lips leaden; his eyes protruding and watery; his pulse is quick, feebler, and less uniform; and the surface of his body colder. Sometimes the integuments which surround the larynx, especially in the fore part of the neck, are swollen. In a case operated upon by Mr. Macnamara of Dublin, the trachea was laid bare at a depth of two inches and a half below the surface, to such an extent had the integuments of the neck become œdematous. The patient is restless and apprehensive, often changing his position, in the vain hope of obtaining relief; walking or rather staggering to and fro, or from one room to another, in

* This account is dated Alexandria (Virg.), Dec. 21, 1799, and signed by Dr. James Craik, attending physician, and Dr. Elisha E. Dick, consulting physician.

great distress: feeling that he is on the point of suffocation, he cannot be ignorant of the danger to which he is exposed; hence he is willing to submit to any means of relief, and is impatient of delay.

In this stage of the complaint the patient seldom sleeps for many minutes at a time; when he begins to dose, he starts up in a state of the utmost agitation, gasping for breath, every muscle being brought into action which can assist respiration, now a convulsive struggle. He is quite enfeebled, becomes delirious, drowsy, and at last comatose, the circulation being more and more languid, and he dies on the fourth or fifth day of the disease, or even earlier. Instances have come to our knowledge in which the disease has terminated fatally within twelve hours, (one of Dr. Armstrong's patients died in eight hours, and another in seven;) and therefore, if a person dies suddenly in the night, who had complained on the foregoing day of sore throat, laryngitis may be suspected as the cause of his death. Instances have also come under our observation, in which the disease has lasted three or four weeks, of which the following case is an example.

We have inserted the first recorded case of laryngitis, that of General Washington; and we beg to insert the first case of the disease recorded as such.* In so doing, the reader will obtain a glimpse of the second Monro, who, at a time when the most eminent of his contemporaries in England were ignorant of its existence, perfectly understood and explained to the writer of this article the nature of laryngitis.

Mr. A. æt. forty-three, robust and corpulent, in the spring and summer of 1805 was for three months under a mercurial course for secondary symptoms of syphilis. In spring 1806, he was affected with fever and pains in his limbs. In July 1806, he laid aside his flannel shirt, and thought he caught cold. July 10th, severe fits of coughing in the night; 11th, 12th, 13th, troublesome nights from the cough. V. S. ad ℥xvi. 14th to 19th, emetic, squills, opiates; 20th, respiration not quickened, but difficult, constriction felt in the larynx; long-continued fits of stridulous cough; tongue white and swelled; pulse 120; by an effort he can completely inflate the lungs without raising a cough. On this day the patient was first seen by the writer of the case, at whose request Dr. Monro was called into consultation, whose opinion was *that the symptoms arose from inflammation and thickening of the mucous membrane of the windpipe.* Twelve leeches to the left of the windpipe, and a blister to the right, pulv. jalapæ comp. ʒiß. calomelanos gr. v. July 22d, during the night he slept not many minutes at a time; cough threatening suffocation; expectoration of clear ropy mucus; hissing inspiration; tongue furred and swelled; evident fulness as well as tenderness on the left side, and in front of the thyroid cartilage, which is painful when the head is turned. When in bed his head is low, and thrown to the left side; when sitting, his chin is projected; countenance anxious. Opinion: *as the disease appears to be confined to the upper part of the windpipe, it was resolved, should suffocation be imminent, to perforate the larynx between the thyroid and cricoid cartilages.*

* Abridged from the Pathology of the Larynx and Bronchia, by J. Cheyne, M.D. Edin. 1809.

May we be permitted to introduce Dr. Monro to the student of pathology as a physician worthy of the closest imitation. In his writings we have somewhat too much of the ardor of controversy, into which he was betrayed in support of his reputation as a physiologist, ungenerously assailed; but in the common intercourse of professional life he was scrupulously correct in conduct, and in his manners urbane. He was a strict economist of time,—a man of industry and order. His mind was unceasingly occupied in the acquisition of knowledge, so that no allurement, not even the pleasure of his garden, for which he had a genuine relish, was permitted to seduce him from his daily task of recording the results of his observation, by carefully arranging and registering the facts which he judiciously collected; and hence, after he had passed the common period of life, when between his seventieth and eightieth year, he was still to be found in his study, with his case-book before him, adding to his stock of pathological knowledge. In the investigation of disease he could not be viewed without admiration. His digested experience, his keen observation, and the excellent method of inquiry which he pursued, rendered him a personification of medical sagacity, and enabled him, in consultation, to tower above the great competitors of his youth and age, the one a man of genius, the other of talent—Cullen and Gregory, who were children compared with Monro in the power of discovering the nature and predicting the course of an obscure and uncommon disease. He was remarkable for the possession of tact, employing the term not merely as expressive of discrimination, but also of that quality which, in the exploration of diseases in the thorax, abdomen, and pelvis, enables the physician, by manual examination, to detect the nature of the altered structure of the organs contained in these cavities. Monro, in his inquiries, brought not merely his touch, but all his senses to his aid in an extraordinary manner. Long before the time of Laennec he availed himself of the aid of auscultation (immediate) in ascertaining the existence and nature of diseased conditions of the heart. We have known him sit for a long time, with his ear applied to the thorax, deriving information from a mode of inquiry at that time peculiar to himself. Finally, though remarkable for caution, he possessed great decision of character, of which his practice, never rash, but often extremely bold, afforded sufficient evidence. The therapeutic agents which he employed were skilfully combined, and while mere effect was despised by him,—while

> "His vigorous remedy displayed
> The power of art without the show"—

nothing was omitted in weak compliance with the prejudices of his patient. This sketch will be pardoned by all those who think that, even with advancing age, there ought to be no abatement of zeal in the cultivation of professional science; that improvement in all things is promoted by placing models of excellence before the eyes of the student; and that an expression of gratitude is seemly. The writer, having derived many useful lessons from studying the character of Monro, has never lost an opportunity of paying an humble tribute to his memory. It appears surprising that this great pathologist should have been allowed to retire from the theatre of his usefulness without receiving one valedictory plaudit.

Leeches, blister, steam of warm water and vinegar. July 24th, miserable nights; often on the point of suffocation; pain on pressure in every part of the trachea, pulse 128; tongue more swelled. July 27th, in the last three days a pound of blood was drawn each day. The first blood sizy and cupped. Laudanum produced sleep, but he awoke gasping, dyspnœa being then more severe. Sometimes he started from his chair, and staggered from one room to another; then his face was quite livid; his pulse, an hour after a paroxysm, was 136. Tongue swelled, and indented from the impression of the teeth. Emetic of ipecacuanha proved nearly fatal. When he began to vomit, his inspiration was interrupted and crowing; his face was pale, and his lips livid. Gr. ii. calomelanos ter quotidie. Evening, haustus cum tinct. opii et vini ant. gutt. x. August 4th, sickness after the evening draught, which lasted all night. At 7 A. M. breathed with great difficulty; extremities cold. He was taken out of bed and seated on a sofa, supported with cushions and pillows, after which his head fell upon his breast, and he ceased to respire. When his head was raised, respiration was resumed, but it was stertorous, and his complexion was changed from the purple of imperfect respiration to the paleness of a cadaver. Bronchotomy was performed without effect; he died in about two hours after the operation. We were not permitted to examine the body, but concluded that death arose from closure of the rima glottidis, owing *to thickening of its lining membrane*.

At one time it was conjectured that this case was connected with syphilis; but if such complication had existed, it is probable that the inflammation would, in four weeks, have reached the ulcerative stage, of which the expectoration afforded no evidence. This case, with several others which fell under our care, induced us to attempt a definition of the disease in the following terms. "Pain in the larynx not very acute, unless on pressure; some degree of fulness externally; a change in the sound of the voice, difficult and even crowing inspiration, but slow rather than quick; an altered, sometimes stridulous voice; fits of suffocative coughing; and all those symptoms which arise from obstructed circulation in the lungs."*

Causes.—Persons advanced in life are more liable to laryngitis than the youthful; and of the former the disease most frequently occurs in such as are liable to indigestion, connected with a disordered condition of the liver. Several of our patients had been habitually intemperate. The exciting causes of laryngitis, as we have already mentioned, are such as usually are productive of common cynanche or catarrh, the principal being exposure to cold.

Prognosis.—In some few cases of laryngitis the inflammation recedes, and the disease terminates favourably. This favourable change we may presume is taking place when we discover that the swelling of the epiglottis is subsiding, that the difficulty of breathing and pain of the larynx are abating, and when freedom of expectoration is restored, and deglutition becomes easy. On the other hand, the danger increases with an increasing struggle of breathing. Paleness and lividity of the complexion, a prominent watery eye, and lethargy or stupor, are symptoms which indicate great urgency of danger. It may fairly be affirmed that laryngitis is the most fatal of the phlegmasiæ; consequently the prognosis, in every stage of the disease, must be delivered with the utmost caution. "Of seventeen cases of laryngeal angina observed by Bayle during six years, only one ended favourably."

Diagnosis.—The diseases which are most liable to be mistaken for laryngitis are—

1. Ossifications and caries of the cartilages of the larynx. This state of these bodies gives rise to extensive ulceration, of which the diseased cartilage is the centre. This affection is often of slow growth, beginning with uneasiness in the region of the larynx, followed by hoarseness; then occur cough, difficulty of breathing, which is croaking, sibilous, and in paroxysms; and difficulty of swallowing; purulent expectoration, which is often of extraordinary fetor; sometimes diseased portions of cartilage on which the fetor depends, being expectorated. We learn from Dr. Monro's Outlines of Anatomy, that the cartilages of the larynx, especially the thyroid, and sometimes even those of the trachea, are occasionally found ossified. In examining the body of an old man, who for the last six years of his life had been subject to a severe and almost unremitting cough, "I found," says Dr. Monro, "the cartilages of the larynx ossified, a considerable quantity of viscid mucus within the trachea, and its internal coat thickened, spongy, and red. In such cases, the mobility of the different component parts of the larynx being lessened or destroyed, the voice becomes much feebler; and there have been instances, as I have been informed by my father, of these morbid ossifications exfoliating internally, and portions of the bony matter expelled by coughing." By a patient labouring under disease of the cartilages of the larynx, who was under the care of Dr. Colles of Dublin, one of the arytenoid cartilages was expectorated; and Dr. Hunter, as we learn from Dr. Baillie, "knew an instance in which the cricoid being converted into bone was separated by exfoliation, and afterwards coughed up." Abscesses thus formed sometimes burst into the œsophagus, sometimes into the cavity of the windpipe, and sometimes they open externally. When the patient escapes sudden suffocation, this disease, which admits of treatment similar to that of simple laryngitis, usually ends in hectic fever. In general it is not attended with inflammation of the epiglottis, and instead of terminating within four or five days, its course is tardy. To this disease, rather than to simple laryngitis, we apprehend belonged the case of the Right Hon. Isaac Corry, as detailed by the late amiable and accomplished Dr. Edward Percival, in the fourth volume of the Medico-Chirurgical Transactions. In Mr. Corry's case,

* Vide Pathology of the Larynx, p. 161.

as we learn from Dr. Colles, who was one of his attendants, the epiglottis was in a natural state, and the rima glottidis little if at all reduced in its capacity. Of the same nature appears to have been the first of Mr. Lawrence's cases, published in the sixth volume of the Medico-Chirurgical Transactions, and the case furnished by Dr. Latham, and published in the same paper, in which, on dissection, there were found two distinct ulcerations through the substance of the thyroid cartilage, which contained pus. Mr. Goodeve's case, published in the London Medical Journal, July, 1825, was probably of the same nature, as the patient's voice and respiration improved after the expulsion of a piece of bone from the glottis.

2. Abscesses in the vicinity of the windpipe, compressing that tube, are sometimes formed in the neck, under the fascia, and are discoverable by hardness, swelling, and pain on pressure, œdema, and inability to open the mouth widely; they are often accompanied with fever of a typhoid nature, which we have more than once considered as the primitive disease;* but as, by an incision, relief may occasionally be obtained, the treatment chiefly belongs to surgery. The usual situation of these abscesses, according to Mr. Porter, is behind the broad portion of the cricoid cartilage, where it presses on the rima glottidis. The progress of this disease is sometimes rapid; sometimes the abscess bursts behind the rima glottidis, and hectic ensues.

3. It will be necessary to recollect that aneurismal tumours have given rise to symptoms resembling those of laryngitis, of which there is an example in Mr. Lawrence's paper. We learn from that eminent surgeon that a patient laboured under great difficulty of drawing air into the chest, coming on in fits, which Mr. Lawrence supposed might be relieved by bronchotomy, and therefore he desired that he might be sent for on the occurrence of a fit. After the patient's death, her disease was found to be an aneurism of the arteria innominata, situated between the first bone of the sternum, and pressing on the trachea. Mr. Wood knew an instance, in which tracheotomy was performed, which was attended with bursting of the aneurism into the trachea, and he refers to several such cases.

Pathology.—In several dissections which we have superintended, we have observed appearances corresponding with those described by Drs. Farre and Baillie, and Mr. Porter. Swelling and other remains of inflammation of the tongue, velum, arch of the palate, and fauces, may occasionally be seen. The following appearances are always visible. The epiglottis thickened and erect, by which it ceases to protect the aperture of the windpipe; the mucous membrane of the glottis and larynx, as well as the epiglottis, thickened and vascular; underneath the mucous membrane an infiltration of serum. This thickening of the mucous membrane and distention of the submucous tissue, from inflammation and effusion, bring the sides of the rima glottidis nearly into contact, and thus at length almost obliterate the passage.

Coagulable lymph has occasionally been found on the free surface of the mucous membrane. In the second case related by Dr. Farre, in the third volume of the Medico-Chirurgical Transactions, coagulable lymph was effused from the inflamed surfaces about the glottis and epiglottis, and thus assisted in closing the rima. The tumefaction of the mucous membrane generally ceases at the junction of the larynx and trachea, but increased vascularity may sometimes be discovered in the trachea and bronchi.

The two phenomena which invariably characterize the anatomy of laryngitis, (the latter a consequence of the former,) are—1st, inflammation and some thickening of the mucous membrane; and 2dly, œdema underneath, which latter state, although it cannot be called peculiar to this affection, is a very unusual attendant upon any other disease of the mucous membrane.

That laryngitis is an inflammatory affection, we have abundant proof. The fever which belongs to the disease is attended with increased heat of surface, and frequent and strong pulse. The blood is sizy. The parts affected are swelled and painful, and we may sometimes obtain a view of a portion of the affected organ in a state of intense inflammation. When the tongue is not much swelled, by depressing its root, by pushing the root downwards and forwards by means of a spatula, elevating at the same time the handle of the spatula, we can discover the epiglottis erect, florid, swelled, and rounded. One writer on the disease has well described the epiglottis as being enlarged, red, glossy, and nearly of the size and appearance of a plum:* inflammation, thus denoted by swelling and glossy redness, is, doubtless, the state of the glottis as well as of the epiglottis.

Mere inflammation of the membrane will be productive of uneasiness and occasional difficulty of breathing from spasmodic stricture. But effusion into the submucous tissue must render the difficulty of breathing permanent, and lead to asphyxia, when, from narrowing of the glottis, the supply of atmospheric air becomes insufficient to effect the removal of the venous character of the blood during its passage through the lungs, and when, consequently, those functions which depend upon the arterial properties of the blood being restored, and more especially the function of the brain, are interrupted.

In laryngitis, asphyxia may take place under a variety of circumstances. 1st. We have known asphyxia take place, in the course of the first night of the disease, from strangulation, the patient being found in the morning quite dead. 2dly. Asphyxia much more generally

* These abscesses are frequently fatal, as in a case related by Dr. Tweedie, which occurred during convalescence from fever. Dr. Tweedie has also met with cases of symptomatic laryngitis, both in continued and scarlet fever, which generally rapidly destroys life by causing œdema of the glottis.—*Clinical Illustrations of Fever.*

* *Mr. Wilson,* vol. v. Medico-Chirurg. Transactions, p. 158.

arises from gradual depravation of the circulating fluid. 3dly. Death may also take place after the obstruction has been removed by means of a surgical operation, as in the case of Mr. A. In such case the brain, in consequence of the transmission to it of blood in a state of imperfect oxidation, receives a shock from which it never recovers, even when the lungs are again abundantly supplied with air. This is like the shock from submersion, which we have known to be fatal after the pulse and respiration had been restored. In the two latter cases the patient dies from disease of the brain, and not from strangulation. Œdema productive of death may be the work of one night; yet, generally, the morbid process is prolonged for four or five days; the difficulty of breathing, at first often remitting, we apprehend must be referred partly to spasm caused by inflammation of the membrane. In the progress of the disease, however, the dyspnœa becomes unremitting, which cannot be accounted for unless on the supposition of a permanent narrowing, the effect of œdema. If we had any certain means of ascertaining when the membrane is merely inflamed, and when it is œdematous as well as inflamed, much of the difficulty which attends the treatment of the disease would be removed.

Treatment.—But as we have no certain means of establishing the condition of the windpipe, we must be guided by the symptoms of the disease in deciding the question of bloodletting, which is one of the most difficult points in therapeutics. Although bloodletting may be expected to remove the inflammation of the mucous membrane, it cannot be expected to remove the effusion from the tissue beneath it: as well might we expect that bloodletting would remove phlegmon after matter is formed, as that it will remove laryngitis after œdema is established. It may prevent the further deposition of serum, and render it easier for the absorbents to act upon that which has been already effused; but more than this we are not to expect.

The practice of the physicians who attended the great American President during his last illness, was, we conceive, very unfairly decried by some of their professional brethren on this side of the Atlantic; and this is the more remarkable, as medical criticism was not so grossly vituperative thirty years ago as it is now. In a medical journal of 1800 we find the following specimen of gratuitous illiberality:—"Think of a man being, within the brief space of little more than twelve hours, deprived of eighty or perhaps ninety ounces of blood, after swallowing two moderate American doses of calomel, which were accompanied by an injection; then five grains of calomel, and five or six of emetic tartar; vapours of vinegar and water frequently inhaled; blisters applied to the extremities; a cataplasm of bran and vinegar to his throat, upon which a blister had been already fixed: is it surprising that, when thus treated, the afflicted general, after various ineffectual struggles for utterance, at length articulated a desire that he might be allowed to die without interruption! To have resisted the fatal operation of such Herculean remedies, one should imagine that this venerable old man ought at least to have retained the vigour of his earliest youth. A British physician may be deemed not competent to ascertain the propriety of transatlantic practice; the current of blood in the inhabitants of the new world may bear some proportion to the current of its rivers; in that case the medical treatment ought likewise to be conducted on a larger scale," &c. In answer to this rhapsody, in which the writer has tried to destroy the character of two respectable physicians, it may with truth be affirmed, that when these gentlemen pronounced the disease of which their illustrious patient died to be cynanche trachealis, they proved that they were not ignorant men. They shewed that they were not ignorant of the seat and nature of the disease; they knew it to be seated in the upper part of the windpipe, and to be of an inflammatory nature. We venture to say that their critic would not have been nearer the mark. Perhaps there was not in Britain more than one individual, namely Monro, who was acquainted with the true nature of the disease of which General Washington died. The late Dr. Pitcairn, a physician in London, of deserved reputation and character, ten years after the death of General Washington being attacked with the same disease, when no longer able to articulate, "wrote down with a pencil on a slip of paper that his complaint was to be considered as croup." Nay more; Dr. Pitcairn's case was the first which the late Dr. Baillie, then at the head of the medical profession in England, had ever witnessed; and that great physician, with his characteristic candour, admits that he was ignorant of the nature of the disease of which his friend Dr. Pitcairn was dying. Dr. Pitcairn, the day before he died, did not consider himself in danger, but thought that he was suffering under an attack of cynanche, such as he had often experienced, with a little more than its usual severity; and this, adds Dr. Baillie, was so much impressed on my mind, "that I did not even examine his throat, nor did he seem to wish it." Moreover, four hours before his death, when drowsiness was coming on, Dr. Baillie "thought him somewhat better." Hence it is probable that the best informed physicians in England, prior to the publication of Dr. Farre and Dr. Baillie's papers on cynanche laryngea, would have pronounced General Washington's case to be one of cynanche trachealis. This being admitted, the American physicians ought not to have been charged with ignorance, nor their practice so mercilessly impugned. What are the most approved remedies for croup? Bleeding, tartar emetic, blisters, and, according to many, calomel: these were the remedies which General Washington's physicians prescribed, and which they administered, it must be admitted, with boldness. Whatever injury the patient sustained from the measures employed ought to be charged, not to the account of the intelligent physicians who attended him, but to the less perfect state of pathology at the end of the eighteenth century than at present.

General Washington died within twenty-four hours of the commencement of his illness; and we cannot deny that in this supposed case of croup, the remedies employed, however justifiable in the then state of medical information, probably shortened the general's life. If bleeding fails to subdue an inflammatory disease, it will be hurtful "by depressing the power by which the muscles act;" and on the vigorous action of the muscles which expand the chest, depends a continuance of that struggle by which the lungs are supplied with air sufficient for the arterialization of the blood.

We acquire a juster view of laryngitis by contrasting that disease with croup. They are both truly inflammatory diseases, but in that point alone do they resemble each other. Croup is a disease occurring before puberty, generally affecting, not merely the larynx, but the whole of the bronchial membrane, ending in an effusion of lymph on the free surface of the membrane, to be cured, probably, in ninety-nine cases of a hundred, by emetics and bleeding timely employed; and it is a disease in which a surgical operation will only add to the danger, to which in the second stage the patient is exposed. Laryngitis, on the other hand, is a disease which rarely occurs before puberty; is confined to the upper extremity of the windpipe; ends in a serous effusion into the cellular tissue beneath the mucous membrane; will probably terminate unfavourably in a great majority of cases under any method of treatment, in which emetics aggravate the danger and bleeding is often a doubtful remedy, and in which, when the patient is *in extremis*, bronchotomy will afford the only reasonable hope of safety.

Bloodletting has been successfully practised in this disease, as the reader may be convinced by several recorded cases: for example, by a case to be found in a paper on laryngitis, published by Dr. Beck of New York, in the twelfth number of Dr. Beck's Journal. The case occurred in the person of Dr. Francis, one of the editors of the journal, who, having for three days had soreness of the fauces and thirst, was attacked with pain, difficulty of breathing and swallowing, and a sense of strangulation, for which symptoms 152 ounces of blood were abstracted.* For three or four days after, the patient was still in a precarious condition, and required a repetition of the bloodletting. Other cases are published, in which the lancet was successfully employed: in one of these, to be found in the sixth volume of the Medico-Chirurgical Transactions, viz. that of Sir J. Macnamara Hayes, as reported by Dr. Roberts of Bishop Stratford, we learn that the first bleeding "was attended with considerable relief," the second "with manifest advantage," by the third "his safety appeared to be ensured." In the case of a young woman who earned a pittance by gathering cockles on the strand at ebb-tide, and afterwards hawking them through the streets of Dublin, who, on the 13th of July 1813, presented herself at the county of Dublin Infirmary on the second day of laryngitis, pale, scarcely able to articulate or swallow, the effort producing a convulsion as when a crumb enters the windpipe, the voice sounding as if she were throttled, inspiration being slower than natural and sibilous, the following treatment proved successful. At noon, she was bled ad deliquium, which by the way had nearly proved fatal. The venesection was repeated twice in the course of the evening. On the following day respiration was rendered difficult by the least exertion; hitherto unable to swallow. She was again bled, and a purgative enema and blister prescribed. Next day she began to expectorate yellow mucus, and could swallow fluids. On the 16th July convalescent.

It is observable that the lividity of complexion which, especially in the more advanced stages of laryngitis, arises from imperfect arterialization of the blood, did not exist in any of these cases.

On the other hand, bloodletting has been unsuccessfully practised in laryngitis, not only in the case of General Washington, but also in many others. In the second attack of laryngitis, that to which Sir John Hayes fell a victim, he was three times bled from the arm on the second day of his illness, and the result of his case and the other cases reported by Dr. Baillie, in which also bloodletting was practised, led Dr. Baillie to affirm that "venesection, even when employed strenuously and early, was of no real use." But the most remarkable instance of the inefficacy of bloodletting may be found in Dr. Armstrong's Practical Illustrations of Typhous Fever, p. 393. The loss of one hundred and sixty ounces of blood within six hours gave temporary respite to the difficulty of breathing, yet was so far from arresting the inflammation that death took place within twenty-four hours. As, then, there are cases in which bloodletting is salutary, and cases in which it is hurtful, let us try to ascertain when and to what extent that remedy ought to be practised; and let us be permitted to premise that cases will occur in which it may be difficult to come to a satisfactory conclusion with respect to bloodletting—in which the considerations for and against that remedy will be balanced, so as to make the most skilful and experienced physician pause. In such a dilemma, however, it will be well that the physician should not allow his doubts to transpire; as doubts which may be the result of an accurate weighing of indications against contra-indications, and which prove that he is a pathologist, will, perhaps, by the world and by his unreflecting brethren, be thought to proceed from inexperience and perplexity.

We conclude, first, that bloodletting will be more clearly indicated in youth than in age: it may be observed that the same means by which Sir John Hayes was relieved during his first attack which took place in the meridian of life, failed fifteen years after:—and, secondly, that we may bleed with most hopes of success when the symptoms of inflammatory fever are

* On the 17th Nov. 1823, V.S. ad ℥xl.; evening, ℥xx. 18th Nov. ℥xvi.; evening, ℥xvi. 19th Nov. ℥xvi.; evening, ℥xvi. 20th Nov. ℥xvi. 22d Nov. ℥xii.—Total ℥clii.

most evident: in Sir John Hayes, during the first attack, the face was swollen and flushed, the eyes were protruding and bloodshot; there was fulness about the neck, the muscles feeling very turgid, and the breast being suffused with a purplish colour; whereas in the second attack, we find that his skin was not hot, nor his pulse more frequent than in health.

"At the beginning of the attack, it may be advisable," says Dr. Baillie, "to take as much blood at once as to produce fainting. We beg to submit to the reader, that blood in laryngitis is sometimes so imperfect a stimulus to the heart, that if the action of that organ is interrupted, it is not improbable that it will never be resumed. In certain conditions of the circulation in this disease, I have found bloodletting a very dangerous measure. I think it was fatal to a patient who came to the County of Dublin Infirmary about twenty years ago, when I was one of the physicians to that hospital. By my orders he was let blood, not till he fainted, but till he became pale and fainty; very shortly after the operation, which sensibly reduced his strength, he was seized, upon slightly exerting himself, with a paroxysm of difficult breathing, not more violent than many from which he had emerged during the two or three previous days, and expired." In Dr. Beck's paper, already referred to, we learn that Dr. Hoffman of the United States Navy was called to a patient in laryngitis whose countenance was anxious, flushed, and covered with sweat; eyes staring, and dyspnœa insufferable; that a vein was opened in each arm, which bled freely, and that death took place in a few minutes after. Mr. Porter, in the eleventh volume of the Medico-Chirurgical Transactions, after drawing a very lively and accurate portrait of laryngitis in a man about thirty years of age, who came to the Meath Hospital with his face pale and swollen, his lips livid, his mouth closed, his nostrils widely extended, his eyes protruded and starting from their sockets, but at the same time with the conjunctiva very white and covered with a watery suffusion, and with an expression of indescribable anxiety; his pulse hurried, and his breathing very laborious, making two or three or even more attempts at inspiration for one expiration, and his convulsive struggles for breath truly painful to behold, breathing with a hissing or whistling sound, while the utmost endeavour at speech was only an indistinct whisper;—tells us that he ordered from thirty to forty ounces of blood to be taken from both arms, and adds that in about two hours afterwards, when he returned to the hospital to perform bronchotomy, there was scarcely a pulse to be felt at the wrist; the extremities were cold; the patient lay on his back almost insensible, and seemed sinking with amazing rapidity. Knowing the candour of the intelligent and skilful reporter of this case, we are not afraid to observe that this was a combination of symptoms in which bloodletting was not likely to improve the condition of the patient, for whose sufferings the proper remedy was the knife, which was afterwards successfully employed. Indeed, Mr. Porter, in his valuable remarks on the case, has affirmed that it presents a strong illustration of the inefficacy, in laryngitis, of bleeding, blisters, and the various internal means usually resorted to for the purpose of subduing inflammation. We conclude, that although we may bleed in certain states of the disease so as to influence the pulse, it would be unsafe under any circumstances to bleed usque ad deliquium.

The question of bleeding may with most safety be determined by the condition of the circulating fluid. We may, with comparative safety, bleed while the complexion is good, or, in other words, so long as the quantity of atmospheric air admitted into the lungs is sufficient to produce that chemical change by which venous blood, in passing from the right ventricle to the left auricle, is converted into arterial; but when the alteration in the appearance of the patient takes place remarked in the advanced stages of the disease, which indicates that the blood is no longer arterialized in its passage through the lungs; when the face and lips, especially the latter, become livid, the expression anxious, the eyes protruded and watery, and when these appearances are established permanently, we may conclude that the stricture of the glottis is of a nature not to be relieved by bloodletting, and if so, that the patient will be injured thereby.

In the early stages of laryngitis, would not the application of leeches to the palate and tonsils be deserving of a trial? This question the reader will be better able to answer after he shall have read a short but valuable paper by Surgeon General Crampton, in the third volume of the Dublin Hospital Reports, on the application of leeches to internal surfaces. Mr. Crampton informs us, that in no instance in which leeches have been applied to the tonsils within the first twelve hours of the attack of inflammation, has the disease proceeded to suppuration.

We would bleed the patient freely during the first twenty-four hours; we should be disposed to do more—so long as the complexion of the patient is good, we would have recourse to venesection, keeping a finger on the artery while the blood flows, and closing the orifice when the pulse is reduced; we would have leeches applied, or blood removed from the nucha by cupping; and should be disposed to bleed again, or even a third time, so as to abstract forty or fifty ounces of blood, and at the same time let the patient have a powder containing two or three grains of calomel, three or four of pulvis Jacobi veri, and one-half or one-third of a grain of opium, every third or fourth hour, till the gums become affected. This we prefer to an exhibition of tartar emetic, not wishing to expose the patient to the danger of vomiting, which is productive of a frightful struggle in laryngitis. Blistering the neck is of very questionable efficacy, and by the inflammation, stiffness, and soreness which it occasions, adds much to the sufferings of the patient, and, when bronchotomy becomes necessary, to the inconveniences which attend that operation. If the physician reposes much confidence in the antiphlogistic power of a

blister, let it be deferred till bleeding has been carried as far as is expedient, and then let it be applied to the upper part of the sternum.

"From bleeding and opiates," says Dr. Baillie, "if no substantial advantage is produced in thirty hours, it might be advisable to perform the operation of bronchotomy at the upper part of the trachea, just under the thyroid gland." We apprehend, however, that a consideration of the mere duration of the disease will lead us astray; thirty hours may be too long to wait, or it may be too short. If the circumstances of the patient, especially the condition of the circulating fluid, be such as to contra-indicate bleeding, and to show that asphyxia is imminent, it may be improper to put off the operation for thirty minutes. If the complexion is good, if asphyxia is not threatened, the operation may be delayed for thirty days.

In Dr. Baillie's second case already referred to, it is stated, "in the night time, the patient becoming much worse, Mr. Tegart, who scarcely ever left him night or day, went for Mr. Home and Mr. Wilson to perform the operation of bronchotomy. Mr. Wilson was out of town on professional business, but Mr. Home came about four in the morning. The patient, however, was beginning to sink, so that no advantage from an operation was now to be expected." It is, indeed, probable that bronchotomy would not have saved the patient; but as that operation in an adult can be performed without difficulty, and as there are instances of its having been successful even when the brain was oppressed, which is the most alarming symptom in this disease, we humbly think that no patient who is not in the article of death ought to be deprived of the chance of escape which it affords. The patient operated upon by Mr. Goodeve, surgeon to the Clifton Dispensary, was quite insensible when the operation was performed; "no pulse could be found at the wrist, his face was suffused with blood and his lips livid, and it was hard to say whether he breathed or not," and yet he recovered.

There can be little doubt but that in most cases the aperture ought to be made between the thyroid and cricoid cartilages, but in this matter the surgeon must be the arbiter.* The operation has often proved perfectly successful, and a canula has been worn for a long time without much inconvenience. Thus the patient operated upon by Mr. Goodeve wore a tube for more than six months; he was then able to lay it aside, and his voice was quite restored. In the fourth volume of the Dublin Hospital Reports, we learn from Mr. White that one of his patients was wearing a tube without being prevented from working at his trade, which was that of a cabinet-maker, two years after the operation; the sides of the opening, which was of an oval shape, and one inch in depth to the trachea, being perfectly healed, smooth, and covered with a thin cuticle. But the most remarkable proof of the relief which the canula is capable of affording, is that which is supplied by the case of Mr. Price of Portsmouth; we learn in the twenty-ninth number of the Medico-Chirurgical Review, in which journal there is much valuable information to be found on laryngitis, that Mr. Price had been breathing for about fifteen years through a canula.

Laryngitis sometimes is more of a chronic than acute affection, in which case the affected organ probably undergoes a considerable change of structure; in the case in Mr. Lawrence's paper, which we have already alluded to, which continued for nearly four months, the mucous membrane had assumed a thick and puckered condition, and had partially thrown out coagulable lymph of a stringy and fimbriated texture, which obliterated the ventricles of the larynx. In one of our cases which had lasted four months, the membrane lining the glottis, and arytenoid cartilage, was like a thin layer of flexible cartilage. In chronic laryngitis, *mutatis mutandis*, the same principles of treatment are applicable as in the acute species. Bronchotomy may be necessary to prevent that fatal exhaustion arising from continued disturbance of the respiratory function, as it was in the case related by Dr. M. Hall in the tenth volume of the Medico-Chirurgical Transactions; but medical means alone will often prove sufficient for the removal of the inflammation if it be unaccompanied with ulceration. The remedies chiefly to be relied on in chronic succeeding acute laryngitis, are, change of air—this remedy we again specify, even at the risk of being thought to harp a little too much upon one string;—the establishment of a discharge from both sides of the larynx by means of small caustic issues; and mild mercurials, with the infusum sarsaparillæ compositum of the Dublin pharmacopœia.

(J. Cheyne.)

LEGITIMACY. See Succession.

LEPRA.—Λέπρα: from λεπρὸς -ρα, *scaly; th.* λέπις, or λέπος, *a scale.* A scaly disease of the skin, occurring generally in circular patches. At a very early period of medical literature, the

* On this subject consult Mr. Lawrence's paper in the sixth vol. of the Medico-Chirurgical Transactions.

The writer of this article many years ago recommended the introduction of a trocar and canula, without previous incision. This operation is justly condemned by Mr. Wood in his valuable paper published in the seventeenth vol. of the Medico-Chirurgical Transactions. Mr. Wood observes: "Dr. Cheyne has advocated an operation equally reprehensible with that of Pessault, (who recommended the introduction of an elastic tube through the nostril into the trachea,) *that of introducing into the trachea a trocar and canula without previous incision.* The reflection that the canula must irritate by being moved up and down with the larynx, which does not move in association with the skin, combined with the danger of wounding a large bloodvessel irregular in its course, the œsophagus and contiguous important parts, and the depth it may be necessary to penetrate in consequence of the unusual depth of the trachea from the surface, ought to preclude this use of the trocar," &c. This quotation is introduced as an *amende* for the inconsideration that led to the proposal of an operation which is so objectionable.

confusion, which afterwards became "worse confounded," began to reign concerning the terms *lepra* and *leprosy*. The Arabian physicians had described the tubercular elephantiasis, the elephantiasis of the lower extremity, and some varieties of scaly disease, under distinct appellations, which became frequently misapplied. When, at the revival of learning, their works were rendered into the European languages, the Latin translator multiplied the perplexity by interpreting the Arab word *juzam* by the term *lepra*, which the Greeks had applied to designate the scaly disease defined above. In the middle ages the term leprosy was indiscriminately applied to the different forms of elephantiasis, the scaly diseases, and, in fact, to any form of chronic skin-disease which was bad enough to entitle the subject of it to admission to the lazar-houses which were established over Europe at that time, where the indigent were glad to get the subsistence they provided at the expense of being called lepers. This confusion has been a subject of complaint with writers from age to age, yet it became perpetuated. Hensler's learned treatise,* written with a view to elucidate the subject, left it nearly as complicated as ever; for he and Sprengel treated under the term leprosy the various forms of elephantiasis, the Greek leuce, and the proper scaly lepra. Many modern writers do not appear to desire the removal of this obscurity, as they persist in describing the former of those under the name of leprosy. We trust, however, that medical men will now see the expediency of adhering to Willan's correct nomenclature in this instance, which restores to the term lepra its proper and original signification, namely, the scaly disease, the subject of this article.

History of the disease.—Lepra generally begins on the extremities, below the larger joints, where the skin covers but thinly the tibia and ulna respectively. It commences by small, roundish, smooth points, slightly prominent above the surface of the skin, which soon become red and shining from being overlaid by minute transparent scales. These become soon detached and replaced by others. The eminences by degrees enlarge; the scales become thicker, and are chiefly formed on the circumference of each spot. They observe the circular form in spreading, and attain the size of a shilling or a half-crown piece; and as they increase, the circular border becomes raised and encloses a red area, which is free from the squamous development. A red areola is also perceived external to the raised circumference where the scales collect. These orbicular patches, in spreading, touch and intersect one another; and though in this stage the circular form is lost, we may still trace the segments sufficiently well to shew their original conformation. They unite usually first at the elbows and knees, the parts, as we have said, where the disease first shews itself. In the progress of the affection, while the existing patches are enlarging in this manner, new ones arise; the abdomen, the back, and the chest become affected; and in some cases it spreads to the head, face, and hands.

The scales fall off and are renewed very frequently. Sometimes they are so easily detached and form so rapidly, that the patient's clothes and bed are filled with scales, which cause some irritation: in other instances they adhere more firmly, and accumulate in such quantity as to impede the motions of the joints,—a still greater source of troublesome annoyance.

By their multiplication the scales become aggregated apparently in an irregular manner; yet each one is propagated from a centre, and is attached by a pulp to the dermoid tissue: this fact is proved by tearing one off, when a slight red speck is seen to project from the middle of the inferior surface, corresponding to a depression in the spot whence it has been displaced. When the disease has lasted long, or is in process of cure, the scales, as they fall, present the reticular eminences proper to the cuticle, and leave the surface red, smooth, and marked by corresponding reticulations.

The description here given will apply to the great majority of cases of lepra, but it presents varieties derived from its extent, duration, and treatment. The accidental circumstances of situation and colour also impart to it certain peculiarities.

It sometimes covers the whole body, commencing for the most part from the extremities; it begins usually on the two arms and legs at once, and propagates itself, as described, to the trunk; it rarely spreads to any extent on the face: the forehead, the temples, and the external angles of the orbits are, however, often the seat of some scaliness spreading from the hairy scalp. When the scalp becomes affected, the scales are very minute, and generally cover an exudation derived from the inflamed bulbs of the hair; a moisture is also remarked to accompany the scaliness when the disease invades parts where there is a necessary friction, or places furnished with many sebaceous follicles,—as the nates and inside of the thighs, the axilla, the verge of the arms, &c. These form exceptions, however; for it is one of the essential characters of the disease that the desquamation is quite dry.

In cases of a very chronic nature, where the disease is of such extent as to spread over the hands and invade the root of the nails, these become much altered in structure, curved, and of a dirty yellow colour. It has been observed in some rare instances that the dermoid tissue which secretes the nail has become inflamed and furnished a sanious discharge (*Rayer*). In the cases which are complicated by any of those accidental secretions, the lymphatic glands sometimes inflame and swell, as Richter remarks; but we cannot admit into the description of lepra the rhagades and ulcerations which are mentioned in his excellent work.*

* *P. G. Hensler.* Vom Abendländischen aussatz im Mittelalter, nebst einem Beitrag zur Kentniss und Geschichte des Aussatzes. Hamburg, 1792.

* Specielle Therapie, vol. vi. p. 440.

A remarkable appearance which lepra sometimes assumes has induced accurate observers to recognise in it a peculiar species of the disease. It has been observed on parts of the trunk that a complete desquamation over a considerable surface takes place without being followed by any reproduction of scales in this particular place: it remains red and smooth, and still affects the circular form; and not only is the whole area round and bordered by a slightly raised margin, but it contains within it some patches, either circular or obviously shewing a disposition to that form, yet without scales either on the centres or the raised borders—their usual nidus. What makes this variety more remarkable is, that whilst the patches exhibit this feature probably on the back, it is as scaly as ever on the extremities. We must not, however, suppose that this partial absence of scaliness in such rare cases makes any exception worth notice in the history of lepra; in some instances it probably depends on idiosyncrasy, but we think it is more frequently a partial curative effort of nature, or the effect of medicine, which from some unaccountable cause is arrested after having proceeded only so far as to check the morbid secretion of the cuticle, the vascularity still remaining. This explanation is rendered the more plausible if we consider the locality of the phenomenon, and the manner in which the disease usually advances towards a cure in the cases where we can trace its disappearance under the influence of medicine. Its situation, as we have said, is on the trunk, almost invariably on the back; and it is here that, when lepra begins to yield to any of the methods of treatment to be mentioned afterwards, the effect is first visible.*

The constitutional disturbance attending on lepra is for the most part very trifling, particularly when we consider the large cutaneous surface which is frequently engaged; sometimes a slight fever, accompanied with gastric symptoms, coincides with its first attack; but when established, it goes on for months and years without constitutional symptoms of any import arising from it. Its most troublesome accompaniment is a disagreeable pruritus, which attends its commencement and increase. This occurs particularly when the circulation is excited by exercise or full diet, and when the warmth of bed exalts the cutaneous action: it is sometimes aggravated to a burning heat which is almost intolerable. This itching and tingling is not peculiar to lepra, but is met with in most diseases of the skin attended with inflammation, and is often present in a greater or less degree as a symptom of internal disease. Mr. Plumbe's explanation of this phenomenon is too mechanical, and, though ingenious, inadmissible. He thinks that it is to be referred to the raising up of the scales by the increasing development of the "inflamed margin, and fresh growth of scales, the centre which was attached to the cutis being thus forcibly torn from such attachment." He supports this opinion by the observation that the pricking occurs most constantly at the commencement, when the new scales are oftenest detached, and seldom happens when the disease is subsiding. We consider this pruritus to be a morbid sensation, depending probably on an altered secretion in the skin, and the reason appears to be very obvious why it happens in the commencement. The morbid secretion which forms the scale affects the sensibility of the skin more strongly at first, when the impression is new, than afterwards, when the squamous deposits become an accustomed stimulus to it, and besides at this period the cutaneous sensibility becomes somewhat impaired: the subsidence of the disease is of course not marked by pruritus, as the vascular irregularity producing the scaly secretion is now returning to the physiological state. This explanation is applicable to the itching and tingling of other cutaneous affections, and to that which is symptomatic of hepatic and other visceral derangement.* Hippocrates remarked that the pruritus increased before rain.

Although much constitutional disturbance be rare, yet if lepra spread over the whole body, and is severe in degree, it often produces some anxiety and febrile excitement, partly from the general extension of the subinflammatory state of the skin, and partly from the mere mechanical annoyance that the scaly incasement gives rise to by obstructing the free motion of the joints, which become sometimes painfully tense, and so stiff as to oblige the patient to keep his bed.

Willan and Bateman, endeavouring to systematise different terms used by the Greek writers, divide their genus lepra into three species, a division which is considered unnecessary by the most judicious writers. Their lepra vulgaris is the disease we have described here, and comprehends all the varieties.

Lepra alphoides is a mere variety of the common lepra, possessing the same essential characters, and requiring similar treatment. It is a form in which there is less redness of the skin and elevation of the circular margins: the scales also are smaller and of a more pearly whiteness. It seldom reaches the trunk, and it generally attacks children, aged persons, or those

* It appears to be a law in pathology that the resolution of a disease commences from the place to which it has last extended: of this pneumonia is an instance familiar to stethoscopists, yielding first where it is most recent. It also sometimes affords an example of a state which we think is analogous to the appearance of lepra which we are discussing,—we mean those cases which will, no doubt, present themselves to the memory of accurate observers, where the pneumonia, after proceeding a certain way towards resolution, remains stationary, neither going backwards nor forwards. This appears to us to be the nature of the appearance adverted to particularly by MM. Cazenave and Schedel.

* There is an analogy between those morbid sensations of itching, pricking, tingling, &c. and the muscæ volitantes, flashes of light, and tinnitus aurium. They are all irregular impressions on the sentient extremities of the nerves; in the latter on those of vision and hearing, in the former on the nerves of touch. Diseases of the chylopoietic viscera and the brain give rise to both class of vitiated sensations.

of a weakly habit of body. It appears to be a variety of the disease in which the morbid action is less energetic, modified probably by some constitutional peculiarity.

Lepra nigricans is confessedly a rare form. M. Biett insists that this has invariably a syphilitic origin, and we agree with him in this view of it.

Secondary syphilis, as it assumes almost every form of cutaneous disease, appears sometimes under that of lepra. It is a question with pathologists whether the syphilitic diseases of the skin are to be separated from the others in nosological arrangement: they agree in anatomical characters, put on the same form, and in many instances yield, temporarily at least, to the same treatment. Notwithstanding these points of agreement, however, the most esteemed authors consider that they should form a separate class. Their venereal origin furnishes a much more important reason for distinguishing them than any consideration arising from their agreement in form affords for keeping them together, as it is an indication for a special line of treatment, the disregard of which might be attended with disastrous consequences.

Lepra more commonly affects men than women, but the difference as to sex is inconsiderable. Youth and middle life are more liable to it than infancy or old age; but no age is exempt from it, after the first dentition to the latest period of life. It appears to be less affected than the other skin-diseases by the influence of seasons; but it is observed to be most common in autumn. Differences of condition and circumstances in life have not a decided influence on it, except so far as they favour the development of the predisposing cause. Willan considered cold and moisture to be a frequent cause of it, and says that it is often excited by external irritants and dry sordes on the skin. Bateman differs with him in this, as he has seen it frequently in persons whose respectable rank and circumstances precluded these causes, while he has not observed that certain classes of workmen, necessarily exposed to them, were particularly affected with it. Like the other cutaneous diseases, it has been known to succeed to a disordered state of the digestive tube and of the biliary organs; but we must consider in these cases that there has been a great predisposition present; and it is one of the diseases where the latter acts a principal part. Where a predisposition prevails, the slightest causes are sufficient to give rise to it; thus it has been produced by highly seasoned food, spirituous potations, violent exercise, and strong emotions of the mind; anger is said to be a frequent exciting cause of it: mental depression also produces it, especially that arising from unexpected poverty and the bad diet accompanying it, as in the interesting case narrated by Dr. Mackintosh.*

It is quite certain that lepra is not contagious; and discussions on the subject could only have been entertained when a total disregard of precision permitted diseases of the most distinct nature to be classed under this most abused term.

Pathology.—It is sufficiently obvious from the enumeration of occasional causes, that we are not aware of any determinate conditions in its origin. That lepra is an inflammatory disease there can be no doubt; but as the term inflammation does not convey any very defined notion as to proximate causes, this is but a vague account to give of its etiology. We cannot in fact conceive any change taking place in the organization of the skin without a change in the organic action of its ultimate tissue or capillary vessels; and wherever this takes place, it constitutes a phenomenon which has hitherto been denominated inflammation. Observation of the mottled arms of healthy infants shews that the cutaneous capillaries in their physiological state affect something like an orbicular arrangement; and this might be in some measure connected with the fact, that most inflammations of the skin originally observe a rounded form. Further than such a simple step, however, our knowledge does not permit us to advance in the etiology of this, or indeed of any other skin-diseases. In Mr. Plumbe's work an attempt is made to ground the pathology of cutaneous diseases on the part of the dermoid tissue affected, and to specify the class of vessels diseased in each morbid alteration. This would be very desirable, but is wholly unattainable in our present state of knowledge. Anatomy teaches us hardly any thing about the arrangement of the capillaries of the skin. We are totally ignorant as to whether there be separate vessels for the secretion of the tissue of the corium, the rete mucosum, and cuticle; and whether the transpiration and sebaceous matter are furnished by these, or have separate vessels for their elaboration: it is gratuitous, therefore, to say that the seat of the inflammatory action which constitutes lepra is in the vessels which secrete the cuticle, merely because cuticle is the product of the inflammation; for this is to assume that the different tissues are formed by different vessels, a conclusion which has never been proved, and which modern physiology gives reason to suspect is untrue. If the argument were admitted, it would infer a separate set of vessels for every product of inflammation of the skin. It is, however, unsuitable to proceed with a discussion of this nature in this place.

Diagnosis.—The disease which most resembles lepra is psoriasis. The earliest observers of squamous diseases marked the difference which exists between them. Paul of Egina marks the distinction which depends on their form, in these words: "λέπρα per profunditatem corporum cutem depascitur *orbiculatiori modo*, et squamis piscium squamas similes dimittit. Ψώρα (psoriasis of the moderns) autem magis in superficie hæret, et *varie figurata est;*" but if no other difference existed than their configuration, we might be induced to follow the example of some respectable authorities, and to describe them together as mere varieties of the same disease. They differ,

* Practice of Physic, vol. ii. p. 217.

however, in more essential respects. Lepra is a more chronic disease than psoriasis, both as to duration and effects; it does not excite the same amount of sympathetic disturbance in the constitution, and is less affected by the relations of temperament, seasons, climate, &c.: in fact when it once sets in, it appears to become more inveterately wedded to the constitution than its congener, which, although it produces greater local and general irritation, is yet more amenable to the resources of medicine. Its general aspect, indeed, sufficiently distinguishes it from every species of psoriasis except one. The circular margins enclosing the central red part free from scales are quite contrasted with the irregular scaliness of psoriasis, cracked often by rhagades and ulcerations. The psoriasis guttata, however, appears to be a near approach to the character of lepra, and to constitute a natural alliance between them: the same round spots, gradually increasing and becoming covered with scales, characterise both, but it is only at the very first stage and at its declension that they are very similar; for when it is fully formed, the patches are much larger, and have assumed the annular form mentioned above, whereas the smallness of the patches, their *whole* surface being covered with minute furfuraceous scales in psoriasis, is sufficiently characteristic, so that whilst their agreement in some things shews them to belong to the same family, yet there appear to be sufficient points of peculiarity in each to enable a careful observer to make a tolerably confident diagnosis. Several eminent writers are strenuous advocates for their being united on the grounds of similarity, and lean much on the fact that sometimes in psoriasis there are present some patches which have all the characters of lepra. We acknowledge this fact, but we do not think it a valid argument, as it would hold good for uniting many cutaneous diseases which all agree to separate, as, for instance, eczema and impetigo, because the vesicles of the former are frequently intermixed with the pustules of the latter. While, therefore, we acknowledge their affinity, and that their treatment is similar, yet, from the differences detailed above, and these as particularly affecting their prognosis, we are for maintaining them distinct, and the weight of authority is on our side.

There is a possibility of confounding some other diseases, which affect a circular form, with lepra. In the state of the ringworm of the scalp, when the purulent incrustations are detached, a red ring remains, which is sometimes covered with a slight scaliness. This might be mistaken for a lepra of the scalp, and the more so if the porrigo be a little developed on the body; but a little attention will detect the difference between the aspect of the ring-worm and the leprous patches; the former is covered over with a small laminar scab rather than a semi-transparent scale: the hair, which falls in the ringworm, is preserved in lepra, and a few days' watching will develope the favous pustules from which the scab is secreted. If contagion can be established, as it generally can in the porrigo scutulata, it decides the question at once; but the chief element in the diagnosis is derived from considering that it is much rarer for the porrigo to be found on the trunk and extremities, than for lepra to be seen on the head, and that respectively they for the most part spread in contrary ways, the lepra from the extremities and trunk to the head, the porrigo from the head to the body.*

With respect to the syphilitic eruptions which assume the guise of lepra, their diagnosis is not difficult, and this fortunately, as it is of more importance to be positive in this case than the former, the consequences of mistake being much more serious. The syphilitic squamous disease, called by Willan and others lepra *nigricans*, represents the figure of lepra; but the violet, coppery, or black colour, which is its essential characteristic, is quite sufficient to stamp its origin. The round, flattened, circumscribed concretions constituting the tubercular syphilis, called sometimes by us incorrectly pustular eruption, might impose on us also for lepra; but here the coppery colour, which is happily for our diagnosis an inseparable companion to the venereal taint, comes again to our aid. But even if we had not this unerring distinction, a little examination evinces that the tubercular spots, although disposed in rings, are very different from the circular patches; and the thin squamous lamina, which is sometimes observed on the tubercles, is disposed just the reverse of the leprous scales: it spreads from the centre, and is only a partial covering, never large enough to conceal the circumscribed induration which projects beneath.

Prognosis.—Lepra is to be reckoned, under the most favourable circumstances, as a disease very difficult of cure, and in many cases incurable. In old or debilitated subjects, scarcely any means are sufficient to eradicate it; but in those of an opposite habit success is never to be despaired of, as there are many cases on record of its being quite removed after twelve and sixteen years standing. It is not dangerous when it is a primary disease; for even when nearly the whole skin is encased by its scaly concretions, the injury of its function seldom involves the system in general disorder. This is a statement of a general rule, to which, of course, exceptions will be found in those whose organization is bound together by a greater sympathy—idiosyncrasies† of constitution, which it is impossible to foresee as it is to explain when developed. The obstinacy with which it adheres when once engrafted on the system, shews itself sometimes by the inefficacy of every means to prevent it spreading over the whole body; and again, in other cases it disappears spontaneously or under the influence of medicine, in one place, and while the patient is congratulating himself on its departure, it sud-

* *MM. Cazenave et Schedel,* Maladies de la Peau d' après M. Biett.

† We owe an apology for the use of this word, which is, indeed, but a confession of ignorance, although cloaked by so learned a term. It really means that the fact which is referred to it cannot be explained by any recognised law in pathology.

denly appears in another part of the body. On the other hand, it has been known, after lasting for months, or even for years, gradually to subside of its own accord under the influence of some of those inexplicable changes to which the human body is liable. It appears to have sometimes gone on to a fatal termination; and the description of its ultimate encroachment on the vital functions, while it suggests phthisis, presents some singular features. "The local disease having reached its highest degree, a remarkable constitutional affection appears. The patient now becomes very languid; asthmatic, particularly at night-time; smothering fits seize him; he coughs violently and spasmodically, and spends the night in perfect sleeplessness, falling into excessive, colliquative, clammy sweats, which give an intolerably fetid odour. His voice becomes weaker and hoarser; the appetite for food and drink is preternaturally increased; and the temper becomes gloomy. Finally, various nervous symptoms arise, faintings, convulsions, paralysis of some parts, and death arrives preceded by the highest degree of exhaustion."*

Treatment.—The history of the treatment which has been from time to time employed presents a picture of the prevailing medical dogmas, and at the same time indicates the obstinate nature of the disease; for where so many various remedies have been lauded for their success, it only proves that experience has not established that any one has been generally successful. It would take up a large space to furnish a mere catalogue of the various substances which the three kingdoms of nature have been ransacked to supply for the cure of this disease in different ages. Empiricism, aided by superstition, was, in the early times, perpetually devising something new from the animal kingdom; from the flesh of the harmless ass, recommended by Hippocrates and mentioned with applause in the writings of T. Bartoline, and the bull-frogs of Myzaldus, to the poisonous viper, which Galen hails as one of those great discoveries which accident has furnished to mankind.† In the vegetable and mineral kingdoms almost every article used as a drug has had, at one time or other, its favourers, from the most innocent herb to arsenic; and each has been extolled as a specific. In describing the treatment, however, we shall only take notice of those remedies of which the efficacy has been proved by the experience of men who have made their therapeutic virtues the subject of investigation since cutaneous diseases have been studied after the modern improvements in pathology.

One great reason why remedies have been extolled beyond measure by some as certain specifics, and denounced unmeritedly by others as quite useless, is, that former writers have mostly neglected to mark the particular features of each case in which their remedy succeeded or failed. Having determined that it was *the leprosy* they had to do with, they appear to have gone to work with their favourite nostrum, without taking into account, or at least without recording, the most important therapeutical indications of the affection.

The first grand consideration in a rational treatment has respect to the cause. Can we trace its dependence on any internal disease? If so, it is vain to expect its cure until the primary disorder be successfully attacked; while it is unpathological to make it the object of *chief* attention: we say chief, because, although only a symptom, yet it is not, even in this case, to be entirely neglected, as its reaction may have a powerful influence on the original focus of the disease, and this in two ways, which it is highly important to distinguish. Its appearance on the skin may afford a salutary natural derivation, and in this case it would of course be injurious to endeavour by treatment to repel it: in another instance the disease of the skin may be only an additional source of morbid action, and react on the primary affection in a prejudicial manner; so that here, although but a secondary phenomenon, it must become an object of treatment. It is only tact and much observation that can discern these different circumstances; they do not often, however, fall under consideration, as lepra is one of the cutaneous inflammations least frequently complicated with organic disease of the viscera.

It needs scarcely to be mentioned that if the skin affection can be traced to any external cause, whether it be mechanical irritants peculiar to any trade or locality, or endemic agents operating through the atmosphere, the patient must be withdrawn from their influence. Thus, if it occurs from the influence of a cold and moist climate, or that it can be imputed to sordes on the skin, (both which circumstances Willan reckoned as common causes,) in the first instance the patient should remove to a dry atmosphere; and in the latter he should change his occupation to some that would not necessarily expose him to the exciting cause; and it is the medical man's duty, if he have ascertained any of these sources, to insist upon the absolute necessity of taking this step, being aware that the comfort which flows from health may be taken from the patient for the remainder of his life if he neglect of it.

The cause being investigated, and the treatment with respect to it having been considered, the age and constitution of the patient, and the extent and duration of the cutaneous affection, are the circumstances upon which we ground our judgment in proceeding to apply remedies for its cure. If the patient be young and strong, (and lepra usually occurs in such patients,) general bleeding must be performed; and if the disease has not become very widely extended, and inveterately chronic, the abstraction of blood by the lancet will frequently be attended with great benefit. The application of leeches in the neighbourhood of the leprous patches is also very effectual; and the disease in some instances yields to a few general bleedings, accompanied by leeching. The local bleeding by leeches is inadmissible

* *Richter*, Specielle Therapie, vol. vi. p. 440.
† De Simpl. Med. Facult. lib. xi.

when the malady has extended over the whole or a great part of the body; but when it is confined to one or both arms or legs, we can speak in the most decided manner of the great benefit derived from their use. In the comparatively recent cases the application of leeches two or three times, preceded by abstraction of blood from the arm, will be generally followed by a great diminution of the central and external redness and of the desquamation; in fact, sometimes by a speedy disappearance of the disease without the use of any other measures of importance.

The circumstances which peculiarly demand the abstraction of blood are, an active irritable state of the patches, and the existence of feverishness or great uneasiness from the prickling sensations; but it has of late years been proved that bloodletting is an excellent adjuvant to other means. In fact, a great improvement in the treatment of skin-diseases generally has taken place since the utility of bloodletting has been recognised in reducing the inflammation from an active to a passive state. It will much facilitate the cure of even the smallest extent of the disease to begin by a good bleeding; but it is in cases where it has spread very generally over the body that the bleeding is to be mainly depended on, at least at the outset of the treatment.

Dr. Duffin, whose large experience of this remedy is very favourable to its use, after pointing out its striking usefulness in the circumstances adverted to above as peculiarly requiring it, adds, "but supposing that there exist no general symptoms, still this mode of treatment is very often proper, were it had recourse to with no other view than to subdue the irritability of the skin or its extreme susceptibility to disease. But it has another good effect—it induces a state of the system that admits of being much sooner affected by the use of arsenic, when the active symptoms have been so far subdued as to allow of the employment of that medicine." Its effect as a preparative is, indeed, the chief improvement we alluded to; and since it has been so employed, many remedies whose efficacy was much debated are now found decidedly useful, their exhibition being preceded by a bloodletting, and recourse being had to it during their use occasionally, if any symptom of the active inflammation re-appear. It would be obviously improper to employ it if the patient be in a debilitated state, the effects of a bad constitution, of the long duration of the disease, or of old age.

Amongst the external remedies the bath is indisputably the most effective, and most generally used. The simple tepid water is very much employed, and is not superseded by the many new methods of bathing or vapourising the surface. The painful stiffness and irritation is almost always relieved by a twenty minutes' immersion in water at 90°: it appears to us to promote cleanliness, and a softening and falling off of the scales, just as well as the vapour-bath; but the latter is preferred by many experienced practitioners. The tepid salt-water bath is still more effectual as a stimulant to the skin; but it is to be used only when the inflammatory state has been entirely removed by the antiphlogistic measures.

Much expectation had been raised as to the efficiency of medicated vapours in this and the other squamous diseases; but their superiority to the ordinary baths has not been demonstrated. The sulphur vapour-bath is the most powerful stimulant amongst them, and it has certainly been used successfully in some obstinate cases; it must, therefore, be kept on the practitioner's list, to be employed where other remedies are inapplicable or have already failed. The vapours of tar and of acetic acid have been much used, but they are not so highly esteemed as those of sulphur; but, indeed, experience has not established for any of those fumigations the virtues which were proclaimed at their first trials. Bathing in the medicinal waters containing sulphur, such as Harrowgate, Lucan, Leak, St. Gervaise, &c. is decidedly a means of great power in scaly diseases, and many extraordinary cures are attributed to their use. When they are recommended, and the patient cannot remove to any sulphureous spring, a useful substitute may be readily made by dissolving six ounces of the sulphuret of potash in ten gallons of tepid water, and adding a small quantity of the sulphate and muriate of soda (eight ounces of each). Bathing, however, whether it be local or general, and medicinal fumigations, are only to be relied on as a secondary remedy; they are not to be used till the active irritation be removed by depletory measures; and it follows from this that they are particularly applicable in the chronic cases, and in patients of a debilitated habit, where the disease is but little energetic: they must be persisted in for some time to produce a beneficial effect, and the vulgar opinion that they weaken the constitution is to be entirely disregarded, for the contrary is the fact, as the patients will be found to derive strength from every means that exerts a salutary influence on the cutaneous disease. In many states of the skin where tepid bathing is advisable, its action will be much aided by gentle friction with a soft flesh-brush, the use of which is deservedly extolled by some writers.

Topical applications in the form of ointments and lotions are very useful in many cases. They are intended either to allay irritability, or, from their stimulating effects, directly to attack the disease by altering the action of the skin. In the former kind is reckoned the Carron liniment, which, spread over the leprous patches, has been found to cool the skin, and keep it soft and comfortable; the addition of two drachms of oil of turpentine to eight ounces of it, renders it a gentle stimulus which can be borne in almost all cases, and adds much to its good effects; it is one of the simplest applications, and can be used over a greater surface than others of a more powerful nature. Dr. Duffin prefers an ointment composed of equal parts of diluted citrine ointment and tar ointment to any

other topical remedy in the chronic cases, and states that it may be applied very extensively over the body without dreading its affecting the mouth, or producing any other of the effects peculiar to mercury. The patient is to be directed to remove the old ointment perfectly previously to laying on a fresh application, and to use for this purpose an alkaline lotion, made of two drachms of liquor potassæ to six ounces of water. The ointment adheres with great tenacity, and he "thus unconsciously submits the parts to a very perfect ablution and considerable friction, two agents of the utility of which no person can doubt in the case of lepra."

M. Biett, who thinks that ointments in general are of but little service, yet places confidence in one composed of the ioduret of sulphur and lard, twelve or fifteen grains of the former to the ounce of the latter. It is a very valuable remedy in recent lepra, occurring in a weakly individual who could not tolerate active internal medicines: it should be applied by a gentle friction to a few patches at a time, after a tepid bath: the skin's activity increases under its use; the circular elevations are reduced to its level, and the scales fall; and when the natural state is nearly restored in one part, new patches are to be attacked, until the resolution becomes complete.

Besides the Carron liniment mentioned before, the smearing of the patches with cream or with fresh butter has been extolled as very efficacious in allaying irritation from the rigidity of the skin; and we can recommend with confidence the use of these emollients as excellent adjuncts to the general means of bleeding and purgatives, (which must be the chief reliance as we have mentioned before,) when the heat, itching, and stiffness give great annoyance.

A lotion that was held in much repute for detaching the scales when they adhere tenaciously, is a decoction of the stalks of dulcamara with some alkali: it is said even to bring the skin to a healthier condition. We should remark that benefit from these external applications, liniments, ointments, &c. is to be looked for chiefly when the disease is confined to the extremities, and shews little disposition to spread.

The most effectual means for combating lepra are, however, to be sought for in the internal medicines; and the experience of able observers has proved a great number of these to possess undeniable power.

The use of different medicated waters, as those of Harrowgate and Leamington in England, and of the different waters on the continent which contain sulphur, has been a long time established as very beneficial; we have of late had occasion to know of several cases that have been cured by drinking the water of Lucan Spa, which resembles the Harrowgate, but is not so strongly impregnated with sulphuretted hydrogen. This is a much better way of administering the sulphur internally than either the simple flores sulphuris, or in combination with antimony, the golden sulphuret of which was once a very favourite remedy in cutaneous diseases. The mineral waters should, if possible, be drunk at the source, or at least be procured from it; as it is a fact that their imitations are not so efficacious as the waters of the springs.

The dulcamara has certainly properties which entitle it to notice. Dr. Crichton's testimony was very strong in its favour, and brought it much into use in the treatment of lepra. He states that out of twenty-three cases in which he employed it, only two resisted its action; two or three ounces of the decoction of the twigs and leaves were used by him thrice a-day; but we cannot help being inclined to attribute his success rather to the other means which he used, as the experience of other physicians who have used it still more extensively does not corroborate its virtues: it is still used, however, as an adjunct, in chronic cases.

Decoctions of the acrid stimulant plants, daphne mezereon, d. enidium, and of guaiacum, have been used with success in different instances. The compound decoction of sarsaparilla has also enjoyed much reputation, and may be recommended for its stimulant effects on the skin: its use should alternate with some of the more powerful remedies to be mentioned.

A remedy which at one time was extolled to an extravagant degree, and has fallen in late times into as undeserved disrepute, is the tar-water; but we are persuaded on the grounds of experience that it does possess real efficacy. A case has been communicated to us, which had been treated by some of the most eminent practitioners with the most powerful remedies; but no effect was produced on the disease till tar-water was tried by a physician whose experience of it led him to place much confidence in it; and under its use the patient got quite well. Half-a-pint of it should be drunk three times a day. In the case alluded to the patient was made to walk rapidly until he began to perspire, and then to sit for a time in a warm room, and much importance was attached to this manner of exhibiting it. Pitch pills are also to be mentioned as a remedy to which experience bears a very satisfactory testimony; six or eight of them, each five grains, should be taken for a dose three times a day, and this will have to be increased by degrees according to circumstances.

Some English writers praise very highly the treatment by mercurial preparations; and in some cases minute doses of corrosive sublimate have proved of unquestionable utility, salivation by mercury being, however, seldom undertaken in the cure of lepra. The naïve relation which that respectable writer, Dr. Turner,* gives of its effects in two cases where he employed it, would answer for its history in most cases; and as a purgative, indeed, calomel will be very beneficial in occasional doses, no matter what plan of treatment be preferred; and in children particularly it is a very useful means.

* A Treatise of Diseases incident to the Skin, by Daniel Turner, of the College of Physicians, London. 3d edit. 1726, p. 30, et seq.

We come now to speak of arsenic, a remedy that has been of late years much investigated as to its effects in squamous diseases. While some have found it to possess uncommon virtues, others have decried it as not only useless but dangerous. It is without doubt a very dangerous remedy in the hands of incautious practitioners, and will never prove useful if it be employed where circumstances contra-indicate it. But we must express our suspicion that where it has failed, it has been for want of discriminating between the states which are favourable to its action, and where its administration is improper. It is superfluous to say that its exhibition requires the most cautious attention on the part of the practitioner; and we are confident that where it is judiciously employed, it is not only a safe but a very valuable remedy. It seems to be peculiarly applicable in those cases which are seldom benefited by other medicines—we mean those instances in which the lepra has lasted for several years, and has invaded nearly the whole skin, so that it has taken on such a diseased habit, that nothing less than the most powerful means will restore its original state. In cases which have not run on to a very chronic state, the other means will prove as effective, and probably should be tried before we should have recourse to the arsenic, although some able practitioners advocate its propriety in almost every case. In the inveterate cases, however, when all other means have failed to produce any salutary effect, its well regulated exhibition has been frequently known to effect the dispersion of the disease.

Having determined on its use, we must watch its effects, and persevere so as to give it a fair trial. Fowler's solution of arsenic is the preparation most approved of. It is best to commence with the small dose of three drops to be taken three times a day in a glass of water; or it may be deemed advisable to use the decoctions of dulcamara, mezereon, or of sarsaparilla as a vehicle, as Dr. Duffin recommends. The dose must not be raised beyond eight drops three times a day, or at the very highest ten. When it first affects the system, the pulse becomes quickened, smaller, and hard; and there arises a prickly soreness about the eyelids, accompanied by some puffy swelling, particularly of the lower one. The gastric symptoms which are the signals for suspending its exhibition, are, sickness of the stomach, griping pains all over the abdomen, headach and whitish tongue, with a peculiar taste in the mouth. When there comes on a pain in the chest, accompanied with anxiety of the præcordia, and a certain consciousness of serious constitutional disturbance, which is indicated by uncommon gravity of the countenance, the medicine has been either given in too large doses or continued too long. When the pain in the chest and any of the latter symptoms occur shortly after its commencement, it is probably a case which will not bear its administration at all, and other means should at once be substituted. It will generally be found that an impression has been made on the disease when its effects are recognized in the constitution, and often before this. At first the patches become less indolent, and a long-unaccustomed sensation of heat and activity is felt; the scales first clear off in the centre, (for in those inveterate cases the whole patch is overgrown with scales); by degrees the circular eminences sink and clean; and thus a disease which had become engrafted on the habit for years, retires under the influence of this powerful medicine.

Some of the favourable symptoms ought to shew themselves by the time that the medicine has affected the pulse, or when the stiffness and puffiness are perceptible under the eyelids. If the skin do not discover its action when these characteristic signs appear, there is no necessity, indeed it would be improper, to continue its use. In others, nausea and loss of appetite, with some epigastric soreness and oppression, are the first signs of its operation; but we should not consider these latter symptoms as unequivocal reasons for laying aside its use altogether; a few days' intermission will often remove this gastric disorder, when a further trial may be made; and it has frequently happened that the good effects have begun to shew themselves soon after its being resumed. But in deciding how far it may be pushed, the discretion and tact of the practitioner must guide him: we only wish to lay down as a principle that the arsenic is not so unsafe a means in judicious hands as it has been vulgarly thought; and that after its use is commenced, ill-grounded fears should not deprive the patient of the steady trial of a remedy which experience has proved to be so valuable. Dr. Duffin states that he has prescribed it in very near four hundred cases, and has never yet seen it do any mischief; and his testimony and that of M. Biett, (two gentlemen who have investigated its effects the most assiduously amongst modern observers,) agree that it is a most important remedy in this intractable disease.

The tincture of cantharides is another very energetic medicine in lepra. It was brought into notice by the eulogy of Mead, although it is nearly certain that it was against the tubercular elephantiasis that he employed it.* However that may be, it has been used ever since in the scaly disease, and it has been found of great effect, particularly of late years. It is applicable in the same inveterate description of cases as the arsenic, and requires quite as much caution in its administration. Four or five drops three times a day should be the utmost dose for the first month of its use, and at the same time the patient should use demulcent drinks of gruel, barley-water, flax-seed tea, &c. When given at an improper stage, or in too large a dose, it is very prone to produce serious disturbances in the alimentary canal and the genito-urinary organs, so that when we perceive painful heat at the epigastrium, vomiting and purging, or strangury and

* Medical Works of Richard Mead, M.D. Dublin, 1767; of the Leprosy, p. 455.

erections to follow its use, it must of course be intermitted; but unless these symptoms shew an unusual degree of violence, it may be often advantageously resumed. By a cautious gradation of the dose (very small at first), and the use of the demulcent drinks, with an occasional dose of purgative medicine, those sinister consequences may in general be avoided.

In some remarks on the use of tincture of cantharides in hooping-cough by Dr. Graves, in the fourth number of the Dublin Journal of Medical and Chemical Science, Dr. G. states that it produces its good effects without causing urinary irritation when given in the formula recommended by Dr. Beatty, which we here subjoin:—R. Tinct. cinchonæ compositæ ℥ v; tinct. cantharidis; tinct. opii camphoræ *aa* ℥ß. M. There is nothing in the other ingredients of this mixture which should preclude its trial in lepra; and it would be very desirable if this combination would allow of its free use, by averting its ill effects on the urinary organs. Bateman's disparaging notice of cantharides kept it out of use for some time; but its value has been confirmed by the experience of the Hôpital St. Louis, where it is esteemed as only second to arsenic in the chronic cases. Where either of these two remedies is found to create constitutional disorder forbidding its continuance, it may advantageously be replaced by the other: but we repeat, to derive good effects from either of them, the greatest care must be taken to use them in the proper stages; for if they be given whilst any activity of inflammatory action remains, instead of benefit we must only expect to aggravate the whole disease.

A course of purgatives is at the present time a favourite practice in the less severe cases of lepra with some French practitioners, who speak with much applause of the good effects of calomel, jalap, sulphate of magnesia and of soda, aloes, &c. in its removal. We rather suspect that this may arise from the novel introduction of catharties into their practice, and the reaction in their favour which naturally follows on the apprehension and horror they had of this valuable class of medicines up to a recent period. It is, doubtless, of the highest importance to keep the bowels free by the occasional use of laxatives; and for this purpose a few grains of calomel will be generally found the most suitable. Much purging, however, as far as our experience goes, is decidedly injurious, excepting probably in children, where we can have recourse to scarcely any other class of remedies, and where purgatives answer very safely and conveniently.

The external and internal means of treatment have been noticed separately for the sake of arrangement, but in practice they are almost always employed together; and, when judiciously combined, they mutually assist each other's action. The tepid bath may be used in almost every plan of treatment, and will be found a useful adjunct. In those cases which have not spread extensively nor lasted long, the treatment should be commenced by an abstraction of blood, which is to be repeated either generally or by leeches, whenever the inflammation shews any signs of having resumed an active state: at the same time the patient should use some one of the internal remedies, and probably daily the bath. With those it will be often judged advisable to apply some of the unguents or lotions already mentioned, so as to conjoin the operation of the different classes of remedies; and it is in such cases that this combination is most effective. In the inveterate cases our reliance must be placed in the steady use of the internal medicines. We can go no farther on these points; each particular case will doubtless present its peculiarities, which must be considered. Having adverted to the most approved principles, and mentioned the remedies whose virtues have been best confirmed by experience, it remains for the judgment of the practitioner to guide him in each particular instance in the application of the former, and the choice and conjunction of the latter.

(J. Houghton.)

LEUCORRHŒA, from λευκὸς, *albus*, and ῥέω, *fluo*. Properly this name ought to be restricted to a *white vaginal discharge*, but every sort of discharge, not sanguineous or menstrual, has been at various times considered as leucorrhœa, whether mucous, serous, purulent, or of a mixed description.

Besides "leucorrhœa" and "vaginal discharge," this complaint has been called "fluor albus," "fluor muliebris," "les fleurs blanches," "sexual weakness," or "a weakness," and vulgarly "the whites." All these are more or less objectionable, and the one chosen for the title of this article as much so as any other; but it is one which is so well known and universal, that it can scarcely lead to error in practice, and is, therefore, the most convenient. It would, no doubt, be very useful in practice to discriminate between the different discharges, because very frequently their character will depend upon, and therefore be a guide to the knowledge of, the nature of the disease which produces them, or the particular part which has become disordered or disorganized. Sir Charles M. Clarke has classed the diseases of the female genital organs by the nature of the vaginal discharges which are peculiar to them; and although there are many serious objections to such a mode of classification, yet it proves how important it is to note their several and distinguishing peculiarities. Of the diseases to which females are liable, there is none more common than vaginal discharge, of one sort or another; it attends most of the uterine diseases, and it is extremely common as the result of either local or constitutional disturbance, or of general debility. It is looked upon by the patients themselves as the cause of ill health, or of the symptoms under which they may happen to labour; whereas, in the majority of instances, the discharge itself can only be considered as a symptom, the effect and result of local or general disorder. By practitioners in general vaginal discharges have been carelessly attended to; there has been one common

routine of treatment without investigation; and it is only when the complaint has been obstinate, that at a later period more minute inquiry has been made, and more rational and scientific plans adopted. So many of the vaginal discharges depend upon uterine disorganization, or some alteration in the position of that organ, that it is advisable in every case, where possible, to make a minute examination *per vaginam*, so as to ascertain the exact condition. It is foreign to this article to enter upon the question of the numerous uterine diseases which give rise to vaginal discharges; we must here only consider idiopathic leucorrhœa, a simple vaginal discharge, unconnected with any alteration of structure.

The simplest form of leucorrhœa is a mere increase of the natural secretion from the mucous membrane of the vagina. As this membrane is continued to the interior of the uterus and the fallopian tubes, it is easy to suppose that now and then the lining of these organs may become affected, and the leucorrhœa have a more extensive seat. Frank has mentioned a case of unusual obstinacy, where, after death, the fallopian tubes were found to be the origin of the disorder; and numerous cases are on record, where, in prolapsus uteri, the leucorrhœal discharge was found to proceed from the os uteri itself. By many of the older writers it was thought to be merely a variety of menstrual discharge, and hence the term "menstrua alba," &c. Hoffmann, Cullen, and others, considered that the discharge issued from the same vessels which secreted the menstrual fluid in their healthy condition. Dr. Jewel, in his recent work on this disease, states his impression to be that it seldom issues from the uterine cavity, and proposes a test to ascertain that point in individual cases. Dr. Jewel assumes that in the night-time, when in bed, the discharge from the interior of the uterus is suspended, which is not the case when it arises only from the vagina or the cervix uteri; and hence he advises that a piece of sponge be introduced into the vagina at bed-time, and if the uterus only is affected, the sponge will be withdrawn *dry* in the morning. The accuracy of this test must depend upon the assumption being correct. That is, however, by far the most common form of the complaint which takes place from the vagina alone, or, perhaps, as this gentleman states, from the cervix uteri. There is an altered action of the mucous lining of the parts, and in what that particularly consists depends the peculiarity of the cases. It has been by far too common to consider all such cases as arising from debility, local as well as constitutional, and hence the remedies have most frequently been merely strengthening. In general we shall find great symptoms of debility accompanying long-continued leucorrhœa, but the debility is nearly always the consequence and not the cause of the disease. It is the acknowledged fact, that whenever the general health has been broken down and much constitutional weakness occasioned, local disorder is often the result, and such disorder may attack the uterine organs or vaginal passage, though it is not debility which affects them, but through debility a diseased action arises. This diseased action is sometimes acute inflammation; in others, and more commonly, sub-acute; whilst, in chronic cases of long standing, a relaxed condition of the secreting apparatus may take place from habit, as we see in the diseased discharges from other sources: this Dr. Dewees has called the "leucorrhœa of habit." Besides inflammatory action, a very large proportion of cases of leucorrhœa depend apparently upon irritation, different from inflammation, and yet easily running on into it—a state easily recognised, but difficult to be described. The irritation which excites leucorrhœa is very often remote from the vaginal membrane itself, so that, upon alleviating or removing the distant irritating cause, the complaint will cease.

The discharge of simple leucorrhœa is mucous—merely an increase of the natural moisture of the part; it becomes more abundant than in health, but retains its character of mucus, being clear, transparent, colourless, and glutinous to the touch. This rarely goes on to a great extent without being altered in its appearance, and much more watery. In general this sort of discharge is accompanied with but moderate symptoms, is more gradual in its progress, and is unattended by pain; there is little or no inflammatory action present. In other cases the discharge is whitish and opaque, becoming creamy when rubbed between the fingers, and rendering water turbid. This sort of discharge has been considered by Sir C. M. Clarke and others to depend chiefly on an inflamed condition of the cervix uteri; it is rarely abundant, but occasions much disorder of health, and local pain. A watery discharge resembling serum is a very common result of more acute inflammatory action in the mucous surface, and in general appears suddenly, as the effect of cold or any active excitement. It occasionally becomes very abundant, is attended with much local heat and soreness, and soon becomes puriform, or mixed with purulent matter, and sometimes with bloody streaks. When it is fetid, brown, or coming away in violent gushes, organic disease of the uterus is to be feared, the nature of which can only be detected by an examination per vaginam. Purulent discharge from inflammatory action may also take place from the vagina, independent of gonorrhœa from impure connection; and this may be said to form one variety of leucorrhœa, as, although it may often arise from organic disease of the uterus, it is not unfrequently met with in a perfectly healthy condition of that organ. Many will hesitate, perhaps, to class either the watery or the purulent discharge under the term leucorrhœa; but it is quite certain that all the above-mentioned discharges arise from the mucous surface of the vagina alone, without organic disease, and solely from a diseased condition of the natural secretion of the part.

Patients in general content themselves with stating the existence of a weakness, and too many medical men are satisfied with such a slight

description, and neglect to inform themselves more accurately of the nature of the discharge.

The symptoms vary, as will be supposed, and there is a marked connection in general between the symptoms and the character of the discharge.

The mildest form of the disease is often of long standing before a practitioner is consulted; it is generally found that it has been preceded by what is called "delicate health." The countenance is pale and sallow, the frame weak, the pulse feeble and easily quickened by the least exertion, the appetite impaired or capricious, the spirits are languid, and exercise is taken with difficulty; menstruation is either scanty or too profuse, the digestion is disordered, and the bowels are irregular; there is pain in the back when the individual is fatigued, or when she remains long in the erect posture; but it is a pain of debility, relieved by rest, and not permanent. The discharge, which has been referred to weakness, is a disordered action of the mucous membrane, and is the effect of a state of indifferent health. The discharge in these cases is mucous only, is never very abundant, and is unattended by local pain, except in the back. It may easily be altered in character, and then the symptoms are also changed, as in such cases a very slight cause will increase the disordered local action.

The most acute form of leucorrhœa is most commonly the effect of cold, of metastasis, or of some local irritating cause, and consists of a profuse watery or purulent discharge, accompanied with local soreness and pain: the vagina is hot, very tender to the touch; there is much fever, heat of skin, quickness of pulse; these symptoms being often preceded by a distinct rigor. When the discharge is more scanty and glairy, like the white of an egg, or creamy and opaque, the cervix uteri is considered to be principally affected, and may be felt by the finger to be hot and tumid, the pulsation of the minute arteries being easily distinguished. In these cases there is much pain of the back, extending round the hips and down the thighs, and, though relieved, not removed by the recumbent posture. This description of leucorrhœa may occur in the most debilitated or in the most healthy frames, and may be considered accidental. All of these forms may end in chronic leucorrhœa, where the discharge is more or less profuse and constant, mucous or purulent, or a mixture of both; it may become green and offensive, and yet be the result only of functional disorder. The quantity poured out is sometimes very abundant, even to the extent of a pint and a half in the twenty-four hours; it will then be expelled in gushes on any change of posture. There is in these cases a very relaxed vagina, often accompanied by prolapsus of the uterus; the mucous surface appears smooth and glossy, and has lost its natural rugæ; there is great emaciation and debility; the eyes are hollow, the face pale or chlorotic, the pulse feeble and rapid, the feet often anasarcous, the respiration short and laboured, to which succeed palpitation of the heart, dragging pain in the back, inability to exertion, profuse nocturnal perspirations. Unless remedial measures be successful, after a protracted scene of much general suffering the patient dies exhausted.

The causes of leucorrhœa are either those which induce inflammation of the parts or irritation, or which weaken the action of the secreting vessels, although by far too much stress was formerly laid upon the latter. Catching cold, as it is commonly termed, is a very frequent cause of the acute leucorrhœa; so also is metastasis of a discharge from some other part, though of a different character. The suppression of the menses, the repelling of milk in the breasts, the sudden checking of catarrh, and perhaps any sudden check to the perspiration, may be considered as causes of acute leucorrhœa; a severe labour, in which the vagina has been kept long upon the stretch, or where it has been injured by officious manual interference or the use of instruments, will often cause the inflammatory leucorrhœa. Violent exercise, particularly dancing or riding on horseback, the excessive use of venery, or pollution, have the same effect. Of the irritating causes, we may mention local displacements of the uterus, especially prolapsus; local tumours of the vagina or uterus, and of the latter polypus in particular; stone in the bladder, disease of the urethra, a loaded state of the rectum, the presence of hard scybala, or of ascarides. A pregnant uterus may act in this manner, and also by the increased local determination of blood which pregnancy produces. The impaction of a pessary, or of a piece of sponge introduced for other purposes into the vagina, has sometimes been the unsuspected cause of a long-standing leucorrhœa. Of the debilitating causes, may be mentioned frequent child-bearing, repeated abortions, profuse menstruation, and in general all the usual tendencies to disordered health, such as hot rooms, luxurious habits, indolence, poverty of living, protracted lactation, over-exertion, &c.

Treatment.—It is in this point that the greatest errors have prevailed, from the disposition to follow carelessly an established routine. Astringent tonics, bark and acid for instance, are prescribed in the majority of cases, and perhaps an astringent injection, which would aggravate many of the forms of leucorrhœa we have been mentioning. The plan of treatment ought to be regulated solely by the character of the complaint. It must be recollected that it is not always safe to check suddenly a long-standing leucorrhœa, if profuse. Many instances are on record of mischief resulting from such a course, and the following case is a striking illustration. We were consulted by a soldier's widow several years ago, for a complete prolapsus of the uterus, produced by violent exertion during the retreat from Corunna, within a few days of her confinement, and which had never been reduced. There was profuse semi-purulent discharge from the inverted vagina. After some difficulty the uterus was replaced within the pelvis, and a pessary worn, consisting of sponge soaked in an astringent lotion. The discharge from the

vagina ceased, and in twenty-four hours a quantity of muco-purulent fluid began to be copiously expectorated from the bronchial membrane, which amounted after a few days to nearly three pints in the twenty-four hours; and in less than a fortnight from the replacement of the uterus, the patient sank from exhaustion.

In the leucorrhœa from constitutional debility or disordered health, of the first class described, the usual remedies for restoring the vigour of the frame are required. Tonics of every description are admissible, according to the circumstances of the case; but those containing or combined with the mineral acids have most efficacy. The vegetable bitters, or the sulphate of quinine or the bark itself, may be given three times a-day, combined with from ten to twenty drops of the diluted sulphuric acid, or double that quantity of the old vitriolic elixir. From one to two grains of the sulphate of zinc, or any of the preparations of iron, will often agree exceedingly well, and as the health improves, the discharge becomes less and less abundant; the diet should be nourishing, the air good and occasionally changed. Besides these remedies, the shower-bath or cold bathing may be used, and especially hip-bathing, or sponging the back and loins freely with cold vinegar and water or salt water. Local remedies are rarely required in these milder cases. In the acute form of the complaint, it is often necessary to apply leeches to the neighbourhood, to the groins, labia, or back; and if the cervix uteri is particularly affected, to the os uteri itself, by means of a proper tube. This is much more easily effected than is supposed, and the liability of the leech remaining at the lower end of the tube instead of crawling up to fasten upon the uterus, may be prevented by inserting a piston to push the leech higher up the tube. Bleeding from the arm is rarely necessary, though in plethoric habits it may now and then be desirable. A low diet, perfect rest, and antiphlogistic general treatment are necessary; the bowels should be kept fairly open with saline purgatives or castor-oil, avoiding aloes, scammony, or others of a drastic character; warm hip-bathing is very useful, and injections into the vagina of warm water, decoction of poppies, or solutions of the superacetate of lead. Dr. Jewel advises, very confidently, weak solutions of the nitrate of silver as injections, in the proportion of one to three grains of the salt to an ounce of distilled water, or even the application of the caustic itself to the cervix uteri. We doubt, however, whether this treatment is applicable to this very acute form of the disease.

When more chronic, when there may be said to be subacute inflammation only present, or perhaps only irritation, the general health must be attended to, according to the nature of the general symptoms; but in such cases the greatest benefit will arise from local treatment, or from remedies more especially directed to the local mischief. It is this form of the disease which is most obstinate, and for which it is advantageous to possess a variety of remedial measures. Of the internal medicines which have been found serviceable, the balsams, particularly the copaiba, have been mentioned; but their efficacy is not nearly so marked as in the gleet or gonorrhœa of the male: the cubebs has also much about the same remedial powers. The cicuta has been found of service by some practitioners. The tincture of cantharides has been perhaps more successful, pushed to as large a dose as can be borne without producing irritation of the bladder. Astringent medicines are also found occasionally serviceable, particularly the mineral acids with the infusion of roses and alum; the latter may be given in doses of from five to twenty grains three times a-day. The acetate of lead has been often successful, catechu, kino, uva ursi, powder of galls, which may be given in large doses. At the Lock Hospital, Mr. R. B. Walker is in the habit of giving ten to twenty grains of the latter in decoction of tormentilla. Dr. Copland recommends small doses of the sulphate of copper. Emetics are said to have been of use, but perhaps in the more acute form of the complaint. The local remedies, however, are most to be depended upon in these cases, and may be applied freely and several times a-day, either by means of the female syringe, or of a piece of sponge or lint introduced carefully into the vagina, and occasionally withdrawn for a fresh supply of lotion. Most of the female syringes are too small, and produce irritation by the frequent necessity for withdrawing the pipe for the purpose of refilling the instrument. The writer has been in the habit of obviating the inconvenience by a gum-elastic tube of three to four inches in length, and about half an inch in diameter, perforated with several holes at the apex, which is rounded off, and the tube made to fit to the stomach or lavement pumps, which are now so common; in this way any quantity of fluid may be injected into the vagina without withdrawing the tube. The applications may be classed into the irritating, the sedative, and the simple astringent; and as a general rule, it may be stated that the first are most applicable to the chronic states of subacute inflammation, rousing the vessels into a more healthy action. These consist of solutions of nitrate of silver (as just mentioned), of the sulphate of copper, of oxymuriate of mercury, &c.; injunctions of mercurial ointment, fumigations of cinnabar, or the local application of copaiba or turpentine. Dr. Jewel limits his lotions to the strength of three grains to an ounce of water, preferring the application of the lunar caustic itself to a stronger solution; but at the Lock Hospital, solutions of the strength of half a drachm, or even two scruples to the ounce, are not unfrequently employed. The sedative injections consist of decoction of poppies, of solutions of opium or belladonna, and of the superacetate of lead, the last being by far the most efficacious. The writer is in the habit of using the common Goulard's extract in the proportion of two or three drachms to the pint of distilled or rain water, warm or cold according to the sensations of

the patient, and he prefers as much as half a pint to a pint to be used at a time, three or four times a day. The sedative lotions are most serviceable where there is an acrid discharge, with heat and excoriation, or where there is much inflammatory action with local pain. In some severe cases he has seen benefit from introducing a piece of lint soaked in a liniment consisting of equal parts of Goulard's extract, Battley's laudanum, and mucilage. The astringent injections are applicable to the cases which appear to be attended by great relaxation of the vagina and its mucous membrane, with chronic discharge of a mucopurulent or simply thin mucous character. All the vegetable astringents are then occasionally serviceable, as well as the mineral. Alum, the sulphates of zinc, iron, or copper; the acetate of zinc; decoctions or infusions of oak-bark, galls, green tea, kino, catechu, rose-leaves, &c. may be alternately used, or some may be combined together; but a great deal depends upon their being used freely and frequently. In using astringent injections, particularly alum, it is advisable to wash out the vagina directly afterwards with cold water, as the discharge will sometimes become coagulated, and, remaining in the vagina, produce irritation and an increase of the symptoms. Leucorrhœa has been said now and then to be owing to want of cleanliness, and no doubt this may cause it, but it would be difficult to prove that no other cause existed. The remedy is obvious.

When there is reason to believe that the leucorrhœa depends upon a loaded state of the rectum or the presence of ascarides, a soap or a turpentine clyster will readily remove both cause and effect. In the leucorrhœa of pregnancy more caution is to be observed. In the early months it is desirable to check it, as an excess of it will be very likely to bring on abortion; but it must be done gradually, and the lead injections are the safest. Where the discharge arises principally from the uterus, conception rarely takes place; and when it has occurred, the ovum is easily separated by the slightest causes, so that extreme quiet is always necessary for the first few weeks. In the latter months of pregnancy, leucorrhœa may be looked upon rather as a relief, unless excessive; the pressure of the gravid uterus and the greater determination of blood to the neighbourhood frequently producing symptoms of heat, weight, and discomfort, which are alleviated by the escape of the discharge. Rest and cooling laxatives, with a spare diet, are generally all that will be required.

Very young children are liable to leucorrhœa. It occasionally occurs in infants shortly after birth; in these cases it is more or less purulent, and attended by a redness and tumefaction of the orifice of the vagina. It is very apt to occur also during dentition, and not only when the first set of teeth are in progress, but at the time of the second set, and even when the dentes sapientiæ are irritating the system at a more mature age. Young girls are also sometimes affected with leucorrhœa, attended with debility, disordered health, and pain in the back. This usually arises from intestinal irritation or from gravel, though probably the latter may be equally the effect of the visceral disorder. It must be borne in mind that the appearances above described are not unfrequently the effects of improper habits. The curative measures are simple; the portion of the vagina affected is usually very limited, generally near the external orifice, so that the Goulard lotion is readily and effectually applied. Alkalis and gentle purgatives, with a mild diet and rest, will in most cases be sufficient to remove the complaint. An epidemic vaginal catarrh has occasionally existed, as mentioned by Professor Capuron to have prevailed in Paris. It has also been observed in this country among children, but attended by much local inflammation and constitutional disturbance of a typhoid character, and which, unless treated very early, has ended in ulceration, sloughing of the pudenda, and death. These cases have been described by Dr. Percival of Manchester, as having occurred there in 1791. Again, in 1815, the attention of the profession was called to them by Mr. Kinder Wood, who had then seen twelve of them, all occurring at Oldham, or the immediate neighbourhood of Manchester. Dr. Mackintosh, of Edinburgh, has described four cases, of which two followed immediately after measles; and it is not uncommon to find a milder sort of leucorrhœa making its appearance after the subsidence of that eruptive disease. Except those mentioned by Dr. Mackintosh, it is curious that nearly all the others have been noticed in the neighbourhood of Manchester; for Dr. Ferriar, who practised there also, states, in his "Medical Histories and Reflections," that he had "met with several instances" of a similar nature. The cases related by Dr. Percival are important on another ground, as the first instance which fell under his notice led to the committal of a youth for a supposed rape, the appearances on the pudenda of the child having led to the suspicion that violence had been committed. The rapid occurrence of several similar cases alone saved the youth from trial and probably execution. The recollection of such facts is of real consequence when an opinion is required upon supposed instances of defloration.

There is one material point connected with cases of leucorrhœa, and especially those where the discharge is purulent or of an acrid character. In such instances it is well known that sexual intercourse will often bring on a train of symptoms very much resembling gonorrhœa in the male. This, when occurring between husband and wife, has often led to much domestic unhappiness, from the supposition of one party or the other having contracted gonorrhœa from impure connection. It is important to be able to distinguish between gonorrhœa and common leucorrhœa to remove or confirm the suspicions, but it is very doubtful whether any very accurate diagnosis can be formed. It has been stated that in a recent gonorrhœa there is ardor urinæ,

which does not accompany leucorrhœa, unless unusually acrid. But how are we to distinguish in a case of this unusually acrid leucorrhœa, or where a gonorrhœa is not recent? The redness and tumefaction of the labia, nymphæ, &c. only can be seen in a recent gonorrhœa, and they may be seen in severe cases of leucorrhœa, particularly in those following local irritation, or possessing more acute inflammatory action. One other test is mentioned by authors, that in leucorrhœa the discharge ceases during menstruation, but does not in gonorrhœa. This, however, is denied by other authors, and, as Dr. Jewel observes, "this is a point which cannot easily be decided, as from the colour of the menstrual secretion, that of the leucorrhœal or gonorrhœal must necessarily be in a great measure obliterated." From what has been stated, it is quite evident that it is extremely difficult to distinguish between the two diseases, and particularly when we recollect how ready the party in fault will be to conceal or distort the facts. In all such cases it becomes the duty of the medical man to give his assistance not only in curing the disease, but in preserving domestic harmony.

(C. Locock.)

LICHEN, λειχήν. The cutaneous affection known formerly under this term was supposed to be, with several others, a mere modification or symptom of the lepra Græcorum (about which disease we have seen what confusion reigned—see LEPRA); and we find that this improper notion was still held by writers at the beginning of the last century. It was also erroneously represented to be synonymous with impetigo. All this originated in its not being quite clear what was intended by the term λειχήν in the Hippocratic writings, and in a misconception of Celsus. The latter describes, under the name of *papulæ*, a form of cutaneous eruption which the best authorities consider to be the same as the λειχήν of Hippocrates, and it is quite evident that he means a perfectly different disease by the term impetigo. Able commentators assert that the λειχῆνες of Hippocrates (Aphorism. sect. iii. aph. 20.) signify what they denominate "pustulæ siccæ," —an expression which accords in sense with the papulæ of Celsus, and the same term (or pimple) which is adopted in modern nomenclature from the Roman author. Since the time of Willan, indeed, his application of lichen has been in universal acceptation, and it now always signifies an eruption of small, solid, reddish papulæ, which terminate with a scurf, and are very liable to recur.

The papulæ of lichen usually occur in adults, and are often connected with internal disorder, but not so exclusively as to be admitted into the definition: they are accompanied always with more or less pruritus, and are situated on the arms, face, or legs, and sometimes are developed all over the body.

But the closer description of the disease and its course requires that we notice its varieties; and here we may remark that we differ from those authors who deny the utility of entering into more minute distinctions than are necessary merely to denote the generic relations of the cutaneous affections. It is true that multiplying terms *uselessly* would only tend to embarrass the student of those diseases; but it is equally certain that classifying phenomena according to the various relations of form, colour, situation, extent, and other conditions, and thereby establishing *real* varieties, not only is highly conducive to the advancement of the pathology of those affections, but very much facilitates the attainment of a practical acquaintance with them. It appears to us to be as indispensable to the study as it is to the description of them, to have specified varieties fixed in the mind by distinctive appellations; and we confidently affirm that students who were really interested in acquiring a knowledge of skin-diseases have ever found material aid from the division into species accomplished by Willan. Their imperfections are, of course, manifold, but it is a proof of their utility to observe that every systematic writer, whatever his sentiments be with regard to them, whether he admire them or call for their abrogation, is obliged to notice them. The fact is, that they burden the memory of those only who make the vain endeavour to learn skin-diseases by books, while they assist in a very efficacious and pleasing manner the labours of the patient observer of nature.

The principal species, or rather varieties, of this affection are the following.

1. *Lichen simplex.*—This is the species most commonly met with. It consists of small red papulæ, more or less elevated and acuminated, which contain no fluid of any kind, and are quite opaque and solid. It mostly commences on the face and the back of the hands, and, when more generally extended, it affects in preference the posterior and exterior parts of the arms and thighs. It may be stated generally, that it occurs most frequently in those parts of the skin which are most delicate and exposed to external influences. The eruption of papulæ is accompanied with a tingling formication, which is very disagreeable, particularly during the night, or when the person becomes heated by exercise or otherwise.

This variety is either acute or chronic in its course and character, but much oftener the latter.

In the *acute* form the papulæ are very red, and the inflammatory action accompanied with much heat and itching. After three or four days their redness diminishes, and having thrown off a minute furfuraceous scurf, they disappear. They are, however, at the same time followed by others. In about a fortnight, after four or five successive eruptions, it genetally subsides altogether. This acute form of the affection mostly occurs on the face and trunk.

The *chronic* form is generally situated on the limbs, and prefers, as before mentioned, the posterior and exterior surface of these. The papulæ have scarcely any inflammatory

character, and the pruritus with which their manifestation is preceded or accompanied gives but trifling annoyance. While some are sufficiently red, it requires that we pass the fingers over the great majority which stud the surface to distinguish them, so little do they differ from the rest of the skin in colour. The papulæ remain from a week to a fortnight, and leave the branny desquamation behind on waning; but the duration of the affection in the chronic form is quite indefinite, as fresh successive crops of pimples protract it often to many months. It manifests its tenacity sometimes by breaking out in a different part of the body after disappearing from its original situation, and it is liable to recur from the slightest cause, when the patient thinks that he is at length clear of it; such as changes of weather, errors in diet, or unusual exercise.

2. *Lichen circumscriptus.*—This variety is distinguished by a marked peculiarity of form. The papulæ, which in the former species are scattered without order, assume in this a circular arrangement. At the first view nothing may be observed beyond a ring of red papulæ, but on closer inspection these are found to enclose areas covered with a minute farinaceous desquamation, which is detached from small papular eminences beneath. The external papulæ alone manifest any inflammatory redness, or if those inside the circles differ from the rest of the skin in colour, it is only by a light pinkish hue. The circumference of these circles, at first so small that the papulæ lie clustered in contact, soon spread by new eruptions, while the old borders fall into the desquamating centres. They seldom enlarge beyond the size of a shilling, and when the eruption is extensive, they mingle their circumferences, yet not so intimately but that it is always easy to recognize their circular form. This variety occurs as frequently on the trunk and face as on the extremities. From its tendency to spread and to propagate by forming new patches, it is not to be speedily eradicated. We have observed it occurring most frequently in early youth: it is called by boys at school *wildfire*.

3. *Lichen pilaris.*—This differs from the *lichen simplex* probably in no pathological character save that the papulæ are developed at the root of the hairs, which perforate their centres. This variety is remarked to be more chronic in its duration, and to be accompanied with greater irritability of the skin, than any of the preceding. Bateman's observation accounts for this: he states that it is often connected with derangement of the digestive organs, produced by ardent spirits.

4. *Lichen lividus.*—This is a kind which almost always occurs in persons with constitutions broken up by misery and privation. It consists in dark violet pimples scattered here and there on the legs and thighs; they are flat and broad, and are generally mixed with specks, which differ in nothing from purpura, to which disease this form of lichen is evidently allied. It is not so rare as some authors assert, but it is of little importance in a medical point of view, as in most cases its cure is to be promoted rather by the charity than the professional services of the physician.

5. *Lichen agrius.*—This is the severest form of this disease, as its name implies.* The papulæ are smaller than in the lichen simplex; they occur in congregated masses, and are very numerous. Their colour is deep red, and the skin where they arise is affected with a vivid erythematous inflammation, which spreads between them and beyond them. The heat or pruritus which accompanies their eruption is of the most violent character, and often deprives the patient, night after night, of rest: he cannot avoid scratching the pimples, and often employs a hard brush for this purpose. This proceeding, although rendered irresistible by the intolerable burning and itching, only tends to make matters worse; it aggravates the inflammation, and encourages the development of new patches. Besides this, where the papulæ become forcibly abraded, small ulcerations ensue, and a liquid oozes from them which forms thin crusts or scaly concretions. In some rare cases the affection appears to be relieved by the discharge, and having soon thrown off the soft incrustation which the latter formed, the cutaneous inflammation and its effects subside. The general course of the disease is, however, very different; painful exacerbations and new eruptions take place for many weeks; and at length it falls into a chronic condition, in which the inflammation nearly ceases, and the pruritus becomes much mitigated. In this condition it remains for an indefinite period, the serous secretion being checked, and the scaly crusts becoming dry, and diminished to a farinaceous exfoliation. After a severe attack of this affection the skin remains for a long time thickened and rough, and retains a morbid sensibility, which persists for a considerable space.

This aggravated form of lichen is sometimes produced from the lichen simplex by causes, general or local, which determine a higher inflammatory action. In such a case the inconsiderable itching which accompanied the pimples of the original species is changed into a burning pruritus; the papulæ become in some places apparently confluent, and surrounded with a deep red inflammatory areola; and thus it proceeds in the course described. It more generally, however, commences as a distinct form, putting on its characteristic severity from the very beginning. In that state where the lymphy fluid which exudes from the abraded and ulcerated papulæ concretes into crusts, it approaches very nearly to the character of eczema. If it persist without shewing any tendency to heal, after some time a purulent secretion forms, and may become, as Celsus remarked, really converted into impetigo.

The situation of this species is uncertain. It occurs with about equal frequency on the face, trunk, and extremities. It is not peculiar to any period of life, as it happens at all times

* Ἀγριὸς, *ferus, agrestis.*

from childhood to old age, but it appears to be more frequently and easily excited in those vitiated habits of body produced by addiction to spirituous liquors. This is more particularly the case among the poor, who, in addition to the injury done by the drinking itself to their organization, deprive themselves of a wholesome nutrition to indulge this miserable propensity. It is always preceded or accompanied by some fever and gastric derangement, sometimes of a serious nature; such as headach, nausea, vomiting, and loss of appetite, also general soreness and pains. Internal disorder is also very apt to occur if the eruption be repelled by the unseasonable application of cold.

6. *Lichen urticatus.*—This is a variety which well deserves to be separately specified. It consists of an eruption of large red papulæ, like the wheals produced by the stinging of nettles. They are found on the neck and arms of young persons, and those of a delicate skin, in spring and summer. It disappears with a slight exfoliation after a short time, and recurs again generally several times before it is finally removed. The pruritus which accompanies it is not of the acrimonious character of the last species, but it gives considerable annoyance, particularly at night, when it also is accompanied by a slight feverish access.

M. Biett describes a variety distinguished from any other by the papulæ displaying a spiral or circularly twisting arrangement. He has given it the name of *lichen gyratus.*[*]

Lichen tropicus is a species which appears to differ in no respect from the other varieties except in the rapidity of its invasion, and the greater intensity of the itching, which are caused by the high activity of the cutaneous action, and the general exaltation of sensibility which the solar heat gives rise to in the torrid zone. It is appropriately called the "prickly heat" in the tropical countries. "The sensations arising from it," says Dr. James Johnson, "are perfectly indescribable, being compounded of pricking, itching, tingling, and many other feelings." It is usually, but not invariably, accompanied by an eruption of vivid red pimples, not larger in general than a pin's head, which spread over the breast, arms, thighs, neck, and occasionally along the forehead, close to the hair. This eruption often disappears in a great measure when the patient is sitting quiet and the skin is cool; but no sooner does he use any exercise that brings out perspiration, or swallow any warm or stimulating fluid, such as tea, soup, or wine, than the pimples become elevated, and but too sensibly felt. As would be anticipated, the new comers are much more liable to this unpleasant affection than natives or long residents, for the susceptibility of the skin is greater while the contrast between the cold and hot climate is still sensibly present; but even natives are not exempt from it. The fears which Hillary and Mosely express about dangers accruing to the patient from repulsion of the eruption by cold bathing are ungrounded; but Dr. Johnson states "that the cold bath rather aggravated than appeased the eruption and tingling, especially during the glow which succeeded the immersion." "The only means," says he, "which I ever saw productive of any good effect till the constitution got assimilated to the climate, were light clothing, temperance in eating and drinking, avoiding all exercise in the heat of the day, open bowels, and, last not least, a determined resolution to resist, with stoical apathy, (the temptation to scratch,) its first attacks." Mr. Plumbe remarks with justice, "that the prickly heat is not confined to the climates from which it derives its name. In fact, the lichen *urticatus* occasionally occurs in these countries with an intensity of itching and tingling that must be quite as tormenting as the tropical affection. The writer knew a person who for several successive nights was obliged to jump out of bed from the sudden supervention of an intolerable heat and itching, produced by an eruption of this nature. The pimples which arose on the head in particular produced such irritation, that the patient felt as if they would make him mad. After remaining in the cool air for a while, and taking a draught of water, they subsided, and allowed him to go to sleep at an advanced period of the night, leaving him quite free till the next night. It is often brought on in spring and autumn, in young persons, by violent exercise, and it is a penalty not unfrequently paid for dancing in these seasons. Mr. Plumbe mentions a case where a public performer was obliged to forego this manner of obtaining a livelihood from the severity of its attacks."[*]

Diagnosis.—To some of the foregoing varieties may be referred every example of lichen; but these papular eruptions are so manifold, and pass so readily into one another, that it may be difficult to assign its proper place to individual cases: this, it will be conceived, is not of essential importance. Although we have adopted this division into species because we are convinced of its convenience and exactness, and think that it tends to forward the study of cutaneous pathology, yet it is not intended to impose a notion on the student that we derive at present much assistance from them in the treatment. Their diversity consists, at least chiefly, in the degree of inflammatory action, and is much influenced by the previous constitution of the person, their circumstances and habits, local relations, &c. The causes which produce them afford, also, a proof of their agreement. They may be comprised under two general heads:—1st. heat, either of the atmosphere or artificial. This is a common source of them, from the slightest summer rash (lichen simplex) to the prickly heat. Blacksmiths and glasshouse-men are very constantly affected by some form of it, from the heat of their furnace and forge. 2d. Derangement of the digestive organs, either from improper diet and spirituous liquors in excess, or defective and unwholesome aliment. To this head are often

[*] *Cazenave et Schedel*, Maladies de la Peau d'après M. Biett, p. 269.

[*] Practical Treatise on Diseases of the Skin, p. 251, third edition, 1832.

to be traced cases of lichen agrius, lichen urticatus, and to the latter cause particularly the lividus.

An accurate diagnosis of lichen is not always easily made. It is of considerable importance in practice, however, to be able to distinguish it, more indeed for the sake of determining what it is not, than for establishing its own identity. We must be particularly cautious not to confound it with any of the exanthematous eruptions, with measles or scarlatina for instance; but it is only necessary to point out here the possibility of this mistake: if the description of the varieties above given be fixed in the mind, it cannot occur.

From scabies, prurigo, and eczema, the lichen simplex is not so easily distinguished. We will observe, in drawing the distinction, that scabies comes out in vesicles which discharge a fluid on breaking, that it occupies the intervals between the fingers, and the flexures of the wrist and finger phalanges; on the other hand the solid red papulæ of lichen are very different from the transparent vesicle of scabies; they are situated, as we have seen, on the exterior parts of the arms and thighs; and if they appear on the hands, where scabies almost universally begins, they occupy the dorsal surface, and do not affect the joints or the intervals of the fingers. The contagion of scabies would settle the question if this were ascertained, but this is never the case where there is a doubt as to the diagnosis. It is, in fact, to procure information as to the contagious nature of the eruption under consideration that diagnostic marks are valuable between scabies and lichen, in order that proper precautions may be taken, in case it be the former, to prevent it spreading. Lorry sums up the difference between them with conciseness and accuracy. "Primo a scabie differunt, quod papulæ illæ (lichenis scil.) vulgo magis confertæ sint et elatiores: 2°. quod rubicundæ magis et minus aridæ sint: 3°. quod sanatis febribus superveniant: 4°. quod latiores sint, et sæpius recidivam patiantur quam vera et legitima scabies; 5°. quod in furfur abeant notabile; 6°. demum quod remediis sanentur a scabiei curatione alienis."*

The papular nature of prurigo comes nearer the external character of lichen simplex, but the pimples of the former are larger, much more separated, and seldom differing in colour from the surrounding skin; they are not acuminated as in lichen, and are covered generally with a speck of dark blood: this is produced by abrasion in scratching, the pruritus being of a peculiarly acrimonious nature; whereas in lichen simplex it is comparatively mild. Lichen may simulate eczema so closely as to require much tact and consideration to decide between them. When the eruption of lichen simplex is very vivid, there often appear, here and there, some vesicles; and when with this occurrence it happens that the patient abrades the summits of the papulæ, the excoriations give out a fluid which concretes and forms soft crusts; in this state many of the features of eczema are present. On inquiry it will be ascertained that at first the eruption was entirely papular, and that the few stray vesicles are merely adventitious. They generally come out after the excoriations have been made, and in their immediate neighbourhood.

The lichen agrius is still more difficult to distinguish from eczema. We must rely on the history of the eruption, and the character of the elevation of the skin, which is vesicular in the latter case, and papular in the former. This can generally be determined by examination after the crust which covers it is removed. Besides this, the irritation which the real eczema causes is strongly contrasted with the burning itching of the papular eruption; but this distinction may fail after a long duration of the latter disease, and the others become so confounded, that it is often impossible to distinguish between them.

It has been already stated that lichen agrius sometimes takes the characters of impetigo, but the reverse never takes place; the latter ought never to be mistaken for the former. The small psydracious pustules of impetigo are manifest from the beginning, and the coarse crusts which form on their breaking are different from the thin layer which the excoriations of lichen furnish.

When lichen agrius subsides into a very chronic state with a tendency towards cure, it is often so much overlaid with furfuraceous exfoliation as to be taken for a scaly disease. Some authors, indeed, assert that it is not uncommon for it and for the lichen simplex to be converted into psoriasis. The writer has lately seen a gentleman who had on the arms and chest an eruption of lichen simplex, which in the axillæ and the folds of the buttock was changed in character so as to resemble pityriasis more than any other cutaneous affection.

Lichen circumscriptus has often been mistaken for herpes circinnatus; we have lately seen a skilful observer make this oversight. It is to be borne in mind that the circular patches of the papular eruption are smaller, and shew no vestiges of vesicles or their remains, which are always discernible on closely inspecting the rings of herpes circinnatus. Moreover the central space of the latter is quite untouched, but in the lichen the papulæ are still recognised, paler than the external circle, and overlaid with the farinaceous scurf. It is proper to remark that the psoriasis guttata has been also mistaken for lichen circumscriptus.

The difference between lichen urticatus and urticaria will be ever easily recognized by any one that has seen both affections. Besides the exanthematous character of the latter, the form is quite distinct. The papulæ in the lichen are large, elevated, distinct, and are more or less permanent. The wheals of nettle-rash are confluent, flat, and scarcely ever remain beyond a few hours at a time. This lichen may also be mistaken for the venereal eruption called by some authors lichen syphiliticus. The latter disease is marked by its coppery hue; besides it is destitute of the pruritus

* Bateman's Synopsis, (note) p. 8.

which accompanies all proper lichens, and it is more steadily persistent than lichen urticatus. Again, it is seldom found alone, almost invariably accompanied by some of the other attendants on secondary syphilis.

Prognosis.—In none of its varieties can lichen be considered as a dangerous disease, and in the less scarce forms almost the only importance that attaches to its presence is the troublesome itching which the pimples occasion. When it arises from merely local or temporary causes, such as the directly irritating action of the spring or summer heat, it is of little consequence and of short duration; but if its origin be more deeply seated in the constitution, if it be liable to frequent recurrence and exacerbation, it leads to more unpleasant consequences. It is in such instances that it gives rise, after a long duration, to a thickened rugous state of the skin, which completely obstructs its function of exhalation. At other times, as we have before stated, under similar circumstances it becomes complicated with eczema and impetigo, and, according to Biett, sometimes degenerates into ecthyma. The lichen agrius, as it is the most severe of all the varieties, so is it also the most difficult of cure; when situated in the face, it more particularly resists with uncommon obstinacy all therapeutic means. It may be stated as a general rule, that this and the other varieties are difficult of removal in proportion as they are of long duration.

Treatment.—In the lighter forms of this eruption the treatment is simple. It demands, indeed, but little interference from the physician. His services here are seldom required further than in making an accurate diagnosis, tracing the eruption to its true cause, and laying down principles of treatment. As they generally occur in warm weather, and depend more or less on it, the individual should keep the house for some time, and thus abstract himself from the direct heat of the sun and from exercise, which last is one of the most common exciting causes of it. It will be useful to employ every day towards evening the tepid bath. Some even prefer the cold bath; the warm bath is too stimulating to the skin. To coincide with these cooling means, it will be requisite to adopt a diet in which the allowance of animal food is diminished. It will rarely be necessary to inhibit it altogether, but the greater proportion that vegetable and farinaceous matters make in the meals, the better. Wine and spirituous drinks should be laid aside, but there is no objection to a moderate quantity of table-beer. As to medicines, it will be sufficient to give a saline laxative occasionally, so as to keep the bowels open: sometimes it will be judicious to use a few grains of calomel or blue pill for this purpose; potions of lemonade are much used in France. Bateman extols the success of dilute sulphuric acid where a grateful tonic is called for. For allaying the itching, various topical applications have been used. Mucilaginous decoctions, as that of marsh-mallows, are said to have a soothing effect. A lotion with two drachms of prussic acid to a pint of water has been also recommended highly. We believe that one of the best applications for this purpose is milk of almonds, in the composition of which a few bitter almonds have been mixed; with this the skin should be gently moistened three times a-day, or whenever the pruritus become troublesome.

In some of the acute cases where a good deal of fever accompanies the eruption, or where much sympathy is evinced in the digestive organs by vomiting, loss of appetite, or pain in the head, it will be highly advisable to take away some blood from the arm, and to pursue a more decidedly antiphlogistic plan. Stimulating applications, such as sulphur fumigations, or ointments with camphor, &c. are not to be used in the acute forms; but when much of the activity of the eruption is subsided, and the harsh chronic state of the skin, mentioned before, supervenes, then baths of the sulphuret of potash or of the sulphureous mineral waters will be very proper. In this state the ointment of the proto-ioduret of mercury, mentioned in the article Lepra, has been used with decided benefit.

In lichen agrius it is advisable to commence the treatment almost always by a venesection. Nothing tends so much to allay the vehemence of the burning pruritus. This practice will be more pointedly indicated if the patient be young and vigorous, but we consider that it is not less useful in an opposite condition. The application of leeches in the neighbourhood of the inflamed papulæ will also prove a very effectual sedative for the painful itching, but in their use it must be carefully observed to place them exterior to the inflammatory area. Every thing said with respect to the necessity of an antiphlogistic diet it is still more indispensable to observe here while any fever remains, or while the inflammation displays any activity. Under these conditions, every local stimulant must be avoided as worse than useless. Emollient poultices, with some Goulard's extract sprinkled in them, will sometimes be found to assuage the irritation, but if used more than barely lukewarm, they will only increase it. The almond-milk embrocation will answer this end probably as well as any other. Dr. Elliotson recommends, as the best means for allaying the tingling and itching, a lotion of chloride of lime or soda, to be used very dilute.

If under depletory means the eruption loses much of its intensity, then the exhibition of tonics will often prove highly serviceable. The decoction of cinchona with sulphuric acid is preferable to any other. This is especially useful in the cases of broken-down, dissipated subjects, and where the constitution has been brought rather low by antiphlogistic measures. It is not to be imagined that there is anything contradictory in this practice of first reducing the system by depletory means, and then administering tonics as it were to restore it; on the contrary, the practice is found not only compatible with theory, but experimentally

good. In fact, where we have to do with impaired constitutions, the abstraction of blood will be useful, as the tonics will act with greater certainty and efficacy after it, than if they be trusted to without it. With respect to the diet in this stage of the affection, it should be still kept of a very light kind; but it is to be borne in mind, that where the disease has supervened in an individual whose digestive organs and system generally have been greatly impaired by habitual drinking, it is expedient to allow him a small portion of his accustomed stimulus. This is another fact confirmed by experience and reconcileable to pathological principles.

Where it has fallen into an inveterately chronic state, lichen is a very intractable malady. Sulphur fumigations, sulphur and alkaline lotions, have in this case been found beneficial. Mercurial preparations have also been recommended. If obliged to have recourse to this mineral, we would prefer trying the proto-ioduret of mercury to any other preparation, from what is known of its effects in some other cases; one grain twice a-day is a sufficient dose for an adult. With its internal use, might be properly joined the local application of the ointment of the same preparation. We believe, however, that Fowler's arsenical solution is the best internal remedy in those inveterate cases; it is to be given in doses of from three to eight drops thrice a-day, and continued for at least a month. The cautions usual in its exhibition are of course to be strictly observed.

(J. Houghton.)

LIVER, INFLAMMATION OF. Hepatitis, from Lat. *hepar*, Gr. ἧπαρ, *the liver*.

The history and symptoms of inflammations of the liver have been peculiarly dwelt on in all works on medicine from the earliest periods. In fact, until very recent times, when the attention of physicians was more especially called to the diseases of the gastro-intestinal mucous membrane, — heretofore a comparatively unexplored field,—this affection and its subsidiary diseases were more studied than any other lesion of the digestive apparatus. (See Gastro-Enteritis.)

Pathology.—The liver may labour under the effects of increased quantity of blood in its parenchyma from several causes. Of these the two most important are, 1. *active congestion*, the result of irritation in its tissue, either primary or the consequence of some other lesion originating in its own substance, or some other organ with which it sympathizes; and, 2. *passive congestion*, induced by mechanical obstruction to the exit of its venous blood. This obstruction may be seated in the hepatic veins, the heart, lungs, or even in the aorta, *(mechanical hyperæmia of Andral.)* In addition to these, two other sources of congestion are mentioned, one a stasis of blood similar to that which occurs in organs attacked with scorbutic disease, and the other the congestion which occurs so remarkably in intermittent fever; a congestion sometimes so intense as to induce hepatic apoplexy.*

The results of inflammatory action on the liver vary according to the intensity, length of duration, and situation of the disease. In general, the first visible effect is the production of increased vascularity of the parenchyma, which may be either general or partial; but we believe that in the majority of cases the latter is most frequent. This is accompanied with tumefaction of the part, and is the first stage of acute inflammation, as far as this can be demonstrated by the knife: under these circumstances the hepatic tissue is extremely red, and blood flows copiously when it is divided by the scalpel.

In a still more advanced stage, in addition to the vascularity, we observe a remarkable softening of the part, sometimes so great that a slight pressure will reduce it to a mere pulp. This state is analogous to the second stage of acute pneumonia, and, like it, may be accompanied by the formation of pus or lymph on the serous surface. In this respect, however, there is a great difference between the liver and lung, as we seldom meet with pneumonia without serous inflammation, while the reverse often obtains in hepatitis. This is a point of great importance in the surgical treatment of the disease, and one to which we shall recur.

On this subject Mr. Annesley makes the following remarks: "When the surfaces are the seat of inflammatory action, the adjoining internal structure of the organ generally participates in it to a greater or less extent, and likewise, when morbid vascular action commences in the parenchymatous structure, it sometimes extends to the external surface; but this more rarely occurs in India than the former mode of extension, the internal structure appearing to us to be more frequently the seat of the inflammatory state than the surfaces, which seldom participate in it till the more advanced stages of the disease. We frequently observe in India the internal structure of the liver inflamed to the greatest possible extent without any effusion of lymph from its surfaces, and the inflammation of structure may go on to the production of several abscesses in both its lobes, or of one very large abscess in the eighth lobe only, without any decided marks of inflammation of the envelop of the organ, except some alterations of colour merely, which are usually occasioned by the states of the parts immediately underneath; nay, even abscesses of the liver may proceed to the utmost extent, and ultimately break into the abdominal cavity, without having induced inflammation of the serous surface where they point, and consequently without forming adhesions to the parts with which they are in immediate and close contact."†

In the report of the Meath Hospital, by

* *Bailly*, Traité anatomico-pathologique des fièvres intermittentes, simples, et pernicieuses, 1825. See also Mackintosh, Cleghorn, &c.

† Annesley's Diseases of India, vol. i. p. 406.

Dr. Graves and the writer of this article,* the important fact of the rarity of adhesions in cases of hepatitis, even after the formation of abscess, is noticed. This is a fact which we had observed long before the appearance of Mr. Annesley's work, and one from which it would appear that both in the warm and temperate climates acute inflammation of the liver is much more seldom complicated with serous inflammation than a similar state of the pulmonary parenchyma. It is not easy to explain this singular but most important difference; but it is obvious that the only mode of arriving at a solution of the difficulty is to compare the physiological relations of the two membranes.

It has been long admitted that the peritoneum is less liable to the adhesive inflammation than the pleura, as, in our examinations after death, we commonly meet with adhesions of the pleura, while those of the peritoneum are comparatively rare. This fact, however, may, to a certain degree, be explained by the greater fatality of abdominal inflammations, a greater portion recovering from pleuritis than from peritonitis. The more frequent affection of the pulmonary serous membrane in cases where the subjacent parenchyma is engaged, may be explained partly by the greater degree of motion which, in consequence of the function of respiration, the two pleural surfaces are exposed to; as in this way the parts are not only predisposed to inflammation, but a slight effusion of lymph may become an exciting cause of disease by its mechanical action over an extensive surface. Again,—if, as there is great reason to believe, the air-cells are in reality white tissues, the propagation of inflammation from them to a similar structure ought more readily to take place than from the glandular acini of the liver to an essentially different tissue.

The next stage of hepatic inflammation which has been described is that of purulent formation or abscess; but we believe that between this condition and the red softening of the liver there is an intermediate stage, in which the hepatic tissue is found of a yellow colour, exceedingly soft, and leaving a puriform exudation on the scalpel. Between this state and the third stage of pneumonia there appears to be a great analogy, as it is an interstitial suppuration immediately preceding the formation of abscess. In several instances we have observed this alteration to extend to some distance around an hepatic abscess, and in cases where numerous small purulent collections existed, the hepatic tissue which separated them had undergone this change. The tissue thus altered varies considerably in consistence, in some instances being almost semifluid, in others possessing a certain degree of firmness. As yet this condition does not appear to have been recognized in the systematic works on pathology.

Lallemand, in his "Lettres sur L'Encéphale," speaks of a softening of the liver, in which, in consequence of severe inflammation, its tissue is reduced into a diffluent sanies of the colour of wine-lees; but this condition is obviously different from that we have just described.

Abscess of the liver, so common in India, is of rare occurrence in these countries. A few isolated cases are to be met with in medical records, but no series of cases was published as occurring in Europe until the appearance of Louis's researches on this subject.* Subsequently, the writer of this article, in conjunction with Dr. Graves, published several examples of this lesion.†

Puriform matter, as the result of inflammation, is met with in the liver under several forms. We may find it, as it were, infiltrated into the hepatic tissue, as described above,—a condition to which the name of yellow softening of the liver may be given; it may occur in numerous minute abscesses; or, lastly, it may form one or more large collections of matter, in some cases encysted, in others bounded only by softened and yellow hepatic substance. These collections of matter are generally isolated, though in a few cases they have been found to communicate by fistulous passages.

As yet we are not fully aware of the circumstances which dispose to the formation of a cyst around these puriform collections. The more chronic the abscess, the greater will be the likelihood of a cyst existing, but it will often be found even in recent cases. We have seen these cysts under very opposite circumstances. Thus, in a case which occurred in the Meath Hospital, where, after acute hepatitis, the patient sank with suppuration of the liver, we found numerous abscesses, some the size of an orange, others that of a hazel-nut, the smaller being encysted, the larger not so. In another case, however, the reverse of this was observed. A patient had laboured under gastro-enteric fever for some time, when attention was directed to his liver, from his complaining of pain in that situation. The organ was then found enlarged, and it soon became evident that matter was forming. The patient died, and on dissection, a vast abscess in the right lobe, capable of containing several pints, was discovered: this was encysted, while in the remainder of the liver were numerous small abscesses, only separated by softened hepatic tissue. In another case, the particulars of which we shall detail hereafter, a very chronic abscess, communicating with the duodenum, existed in the right lobe, while a recent one, which had opened into the peritoneal cavity, was found in the left. In the first abscess, which had existed under our observation for two months, we found the cavity empty, and lined with a strong semi-cartilaginous membrane, of a dark greyish colour; while in the second there was no cyst whatever, its parietes being formed of yellow softened hepatic tissue. The last case which we shall notice on this subject is that of a woman who sank under a very chronic abscess of the liver. Here the cavity was of enormous dimensions, and presented an im-

* Dublin Hospital Reports, vol. v.

* Recherches Anatomico-pathologiques. Paris, 1826.

† Dublin Hospital Reports, vol. 5.

perfectly formed cyst, most developed where the parietes of the abscess were thinnest—that is to say, immediately under the serous covering of the convex surface. In the more deep-seated parts it could hardly be detected.

The appearances of structure of these cysts are various. In some cases we only observe a pseudo-membranous layer, of a line or two in thickness, yellowish white, and resembling semi-concrete pus. In other cases the cyst appears organized, and may strongly resemble a mucous membrane; presenting villosities more or less completely developed, which we can easily demonstrate by immersing the part in water. A third variety presents the lining membrane of a reticulated structure, for which the name of fibro-mucus has been proposed; while in the last species the membrane is semi-cartilaginous, of an iron-grey colour, and very similar to the investment of chronic tuberculous cavities in the lung.

Nothing can be more various than the size of these abscesses. We have seen them so large as to be capable of containing four pints, and, on the other hand, they may be so minute as to represent suppurated tubercles, from which indeed it is sometimes difficult to distinguish them. The surrounding hepatic tissue is generally in a state of red or yellow softening, but cases are on record where it has been found perfectly unaltered; in these the disease was generally chronic. The same variety is observable in the nature of their contents. In all our cases, with but one exception, the matter was healthy, though sometimes mixed with portions of softened hepatic substance. In the case of exception, in which the operation of opening the abscess was performed successfully, the matter was of a dirty green colour, and mixed with sanious fluid. Andral states that in all the cases in which he found puriform matter in the liver, it was white and consistent, like the pus of a phlegmon, and that those who have described it as similar in colour to the lees of wine have confounded other diseases, particularly the occurrence of encephaloid matter, with the inflammatory suppuration. In warm climates, however, great variety is observed in this respect. "The matter," says Mr. Annesley, "contained in an abscess presents various appearances. In some it is a thin, watery pus; in others it is thin, watery, and with thick curd-like clots floating in it; in many cases it is perfectly purulent, and of varying degrees of consistence. As respects colour, there is also considerable difference; most frequently the matter is of the usual yellow colour. Sometimes it presents a yellowish-brown or sanious tinge, and occasionally a greenish-brown or greenish-yellow hue; sometimes it is watery or reddish brown; at other times it is observed of a creamy consistence, and nearly white."*

It is to be regretted that the relations which exist between the vessels of the organ and these collections of matter have not as yet been made the subject of any accurate investigation. We cannot find any instance recorded, where, as in tuberculous and other cavities in the lung, vessels were found traversing the puriform collections. They have been observed, however, forming projections on the internal surface of the cysts; but when we consider the vast size to which hepatic abscesses may attain, the inquiry as to what has become of the vessels becomes a matter of extreme interest, and in the present state of pathological anatomy offers a new field for inquiry.

The abscess once formed may open in a great variety of situations both internally and externally. Of the internal openings we have witnessed the following examples:—1. perforation of the diaphragm and communication with the lung; 2. communication with the duodenum; 3. perforation of the peritoneum, and effusion into the abdominal cavity.

The first of these terminations appears to be a not unfrequent and perhaps the most favourable of the internal openings of the abscess. Many patients have recovered where this lesion undoubtedly occurred, as indicated by the fact of their presenting all the symptoms of hepatic abscess, both constitutional and local, which subsided upon the occurrence of a sudden and copious expectoration of purulent matter, which had not been preceded by any symptoms of pulmonary disease. We have known of cases where pressure exercised on the hepatic region was immediately followed by a free expectoration of pus. The easy exit of the purulent matter, the result of its entrance into the bronchial tubes, is in all probability a principal reason why this termination of the disease should be so often favourable. The abscess may open either into the right or left lung; and though there are some cases where the pulmonary pleura was not perforated, yet the communication with the pulmonary parenchyma and bronchial tubes is much more frequent than the formation of an empyema,—a circumstance explicable by the great tendency to adhesion presented by the pleura.

Dr. Smith, an American writer, details a case where the hepatic abscess opened into the pericardium. The liver, which was almost entirely occupied by an enormous abscess, adhered closely to the upper portion of the diaphragm, through which the opening between the abscess and the pericardium existed; the pericardium was inflamed, and contained about two pints of a purulent liquid similar to that which existed in the liver.

It would appear, then, with respect to the thorax, that the abscess may open into the lung, pleura, or pericardium. Of these, the first is by far the most frequent. With respect to the abdomen, the abscess may communicate with some portion of the gastro-intestinal tube, the peritoneal cavity, the gall-bladder, the vena cava, or kidney. In the cases where the opening has taken place into some portion of the digestive tube, its seat has been in the stomach, duodenum, or colon.

Lastly, the abscess may open externally in a great variety of situations upon the abdomen, and also on various places on the side and in

* Op. cit. p. 533.

the axilla. When the opening takes place externally, it is seldom by a direct, but commonly by a sinuous and fistulous passage. Louis, in his *Recherches Anatomico-Pathologiques*, declares that he has never yet known of the occurrence of a cicatrix in the liver the result of a cured hepatic abscess. We feel satisfied that this is a pathological appearance rarely observed in the dissecting-room,—a circumstance to be explained by the rarity of the disease in this country and its general fatality. In one case, however, we have witnessed this rare appearance. A patient who had been a soldier in the East-India Company's service, and who had, while in India, suffered from an attack of hepatitis, accompanied, as he described, by great tumefaction of the liver, died in the Meath Hospital of a chronic enteritis. On dissection, the right lobe of the liver was found greatly diminished in volume; while in the centre of its convex surface existed a very deep stellated depression, around which the hepatic tissue was puckered, rising in the form of crests with intervening sulci of nearly an inch deep. From the centre, which was occupied by a mass of cartilage nearly the size of a walnut, emanated prolongations of thin plates of cartilage, answering in number to and forming the base of the sulci which appeared on the surface. In this case we were not able to determine by what aperture the contents of the abscess had been evacuated, but in all probability it was through the duodenum. The appearances on dissection in this case were almost identical with those in a case of cicatrices of the liver, of which Mr. Annesley gives a beautiful drawing, (see plate 15 of his book.) This gentleman states that he has met with several cases of these cicatrices in India. There is a form of disease which is very liable to be confounded with hepatic abscess, as it has many symptoms in common with this affection; we allude to a circumscribed inflammation and suppuration in the parietes of the abdomen, immediately over the liver. The disease sets in with fever, pain, tumefaction, and tenderness in the affected part; and, in addition, we have many of the constitutional symptoms of hepatitis. In one case, which occurred in the Meath Hospital, a slight jaundice existed for several days, analogous, in all probability, to that arising from diaphragmatic pleurisy. These cases are generally of little severity as compared with true hepatitis. Matter forms speedily under the integuments, and, on this being evacuated, the patient rapidly recovers. In a case, however, which we have witnessed, the disease proved fatal under very remarkable circumstances; we shall therefore notice it at greater length. A woman aged twenty-three, who had laboured under amenorrhœa for twelve months previously, was attacked with cough and hemoptysis, followed, after some days, by fever, pains in the back and limbs, and prostration of strength. Soon after this she complained of pain in the right side of the chest and hypochondrium, increased by coughing, pressure, or motion. She had a distressing short cough, with yellow tenacious expectoration. The inferior portion of the right side of the chest sounded dull, and the respiration in this situation was almost inaudible, except when she made a forced inspiration. The symptoms having continued for about a fortnight, an uncircumscribed puffy tumour made its appearance over the lateral portion of the liver; the hemoptysis returned, with a hard teazing cough, but the fever disappeared; poultices were diligently applied to the tumour, which rapidly enlarged and presented evidences of extensive suppuration. On the thirteenth day after its appearance it was opened by means of an abscess-lancet, when a great quantity of matter mixed with blood was discharged; at this time the spitting of blood ceased. In about three weeks, however, the abscess again appeared, and rapidly increased to a size much greater than its former dimensions; it was again opened, and a large quantity of purulent matter given exit to. On the next day the abscess presented the appearance of an enormous anthrax, with edges about two inches high, from which a quantity of whitish slough could be detached by pressure; the patient was now emaciated, had diarrhœa, with cough and sanguinolent and puriform expectoration. We endeavoured to trace the extent of the disease by introducing a probe; but although this was found to pass extensively under the muscles and cellular substance, yet it could not be introduced either into the thoracic or abdominal cavity. After some time it was found that when the patient coughed, or took a deep inspiration, air escaped with great violence from the base of the ulcer, towards the upper portion of which a circular fistula, through which a probe could be passed, was observed; through this the probe passed for about three inches, when it met with a solid resisting body. The infra-mammary region sounded clear on percussion. Examined by the stethoscope, the respiration was cavernous, and accompanied during inspiration by a sound like the tick of a watch. When the patient coughed or made a forced inspiration, a loud guggling was audible. There was no metallic tinkling, *bourdonnement*, or pectoriloquism; but the voice resounded strongly from the sixth rib upwards, while anteriorly and posteriorly the respiratory murmur appeared natural. She died on the following day.

Dissection. — Great emaciation. The external sore extended from the sixth to the tenth rib; it was about four inches in breadth. Between the eighth and ninth ribs the fistula was plainly observable. On opening the abdomen, the serous membrane was found healthy, with the exception of that portion which covered the liver laterally and superiorly. Here the liver adhered to the diaphragm.

On the centre of the convex surface of the liver we found the base of the abscess formed by a circular portion of thick false membrane, of about two inches in diameter, *external* to *the hepatic peritoneum*, but producing a depression on its surface. The costal portion of the diaphragm, for an extent corresponding to the base of the abscess, was destroyed, but adhered round its edges. This abscess communicated

with the lung by a perforation through the diaphragm of about the same size as the external fistula, which led into an abscess in the lower lobe of the right lung. This was narrow, elongated upwards, and presented many of the characters of a pneumonic abscess. It had no lining membrane, and communicated with numerous bronchial tubes. Around it the pulmonary tissue was of a greyish-white colour, softened but not granular. The diseased portion did not terminate by any distinct line, and occupied about two-thirds of the lower lobe, which was universally adherent to the diaphragm, and for about three inches to the costal pleura; the remainder of the lung was healthy. The mucous membrane of the stomach was pale and soft, the lower portion of the ileum red, and presenting some aphthous ulcerations; the mucous membrane of the colon was covered with fungous elevations and numerous aphthous ulcerations.*

In this case the diseased action had in all probability a double seat from an early period, namely, the lower portion of the lung and the integuments over the liver; it is remarkable for the double perforation of the diaphragm through its costal and thoracic portions, and for the direct communication made by the latter with the substance of the lung: the pleural and peritoneal adhesions prevented the escape of the matter either into the thoracic or abdominal cavity, a circumstance illustrative of the powers of nature in availing herself of diseased action to promote an ultimate cure.

Some authors have described gangrene as a result of hepatic inflammation; but facts are still wanting for the elucidation of this subject, and there can be but little doubt that, if it ever does occur, it must be a circumstance of extreme rarity. On this subject we shall quote from Mr. Annesley:—

"Gangrene has been remarked by many writers and teachers as one of the terminations of acute inflammation of the liver; but although we have observed this disease, and made post-mortem examinations of it, the number of which certainly has not been exceeded by any other inter-tropical practitioner, we have never seen a single case of gangrene of this viscus. We are inclined to believe that the appearances that have been taken for gangrene have been merely that black congested and softened state of the organ which is sometimes observed in the more acute attacks of the disease, supervening to congestion, or at least this state of the viscus having speedily run into gangrene after the death of the patient; and therefore, if gangrene had actually existed at the time of dissection, it is to be considered as a consequence of death rather than a termination of the disease."†

In the works of the modern pathological anatomists of Europe, the same infrequency of gangrene of the liver is observed; so that we may conclude that both in warm and temperate climates the termination of hepatitis by gangrene is of extreme rarity. Andral relates one decided case of gangrene of the liver, where the disease surrounded an abscess of the left lobe, and states that this is the only instance he has seen of gangrene of the liver. When we reflect on the vast number of dissections which this great pathologist has made, the fact of his having seen the disease but once is a decided proof of its rarity. Here is another circumstance in which the pathological relations of the liver differ remarkably from those of the lung, as, in the latter viscus, gangrene is a not unfrequent occurrence; but when we consider the greater liability to a stasis or effusion of blood in the pulmonary parenchyma as compared with the hepatic, and also that in the lung the diseased portion is exposed to the action of air, we may find in these circumstances an explanation of the fact.

The effects of chronic inflammation on the liver are exceedingly various, and its results greatly influenced by the constitution or habit of the patient. Among them may be enumerated the different forms of hypertrophy, either partial or general, either of the red or white substance, or of both; induration; scirrhous or tuberculous tumours; and hydatids. We are far from believing that these latter lesions are always the result of an inflammatory process; as there is undoubted evidence that these new tissues may be the result of a lesion of secretion and nutrition, not induced by any previous irritation of the part; while, on the other hand, cases are on record where these different diseases appear to have been first brought about by an acute or chronic hepatitis. The following observations by Andral on this subject are highly philosophic:—

"There is scarcely one of the alterations of the liver which have been described which has not been designated by the name of hepatitis. In my opinion there is hardly one of them which may not be the result of an irritation whose first effect was to cause an hyperæmia of the liver. For example, four individuals receive an external injury on the same region of the liver; in one an abscess is developed in the liver; in the second this organ becomes cancerous; in the third it becomes filled with hydatids; and in the fourth it is atrophied. In all these four cases irritation has been manifestly the point of departure: but what has been its mode of action?—it has deranged the normal nutrition of the organ; there its influence is confined: the predisposition of the individual has done the rest. On the other hand, I do not know an alteration of secretion or nutrition of the liver, not even a collection of pus in its parenchyma, that can be considered as necessarily arising from an antecedent process of irritation. I do not know one of which we can say that its formation has been necessarily preceded by a hyperæmia. What, then, does the word hepatitis express? nothing more than the common link by which the different lesions of secretion and nutrition of the liver are often united. But this link is neither constant nor necessary; and if we have seen a case where an hyperæmia of the liver by ex-

* Meath's Hospital Reports.
† Op. cit. vol. i. p. 435.

ternal violence has been followed by the formation of hydatids, I may cite many other cases where nothing has demonstrated a similar point of departure, and where, from analogy, we would arrive at an opposite conclusion, and admit that the development of these entozoares is found connected with a diminished activity of the normal nutrition of the liver."*

Observations are still wanting to establish the exact relative frequency of suppuration as the result of hepatitis in its acute and chronic stage; there can be little doubt, however, that this lesion is much more frequently the result of an acute than of a chronic inflammation.

With respect to the frequency of peritoneal adhesions it may be stated that these, which we have seen to be by no means constant in the acute disease, are commonly met with in chronic hepatitis. In this disease the convex surface of the liver is generally found adherent to the parietal peritoneum by strong and organized adhesions. On its concave surface we may also meet adhesions with several portions of the abdominal viscera, though, as far as we have seen, these are not so frequent nor so general as those of the convex portion.

Symptoms of hepatitis.—Inflammation of the liver has long been described as occurring under two forms, the *acute* and *chronic;* but although numerous cases will be met with where it would be difficult to declare to which of these species the disease belongs, yet in a practical point of view the division is convenient. Let us examine the symptoms, progress, and termination of the first or acute species.

Acute hepatitis.—In the different elementary works on the practice of physic, the symptoms of this disease are described as occurring in a manner much more constant than the state of the science can permit us to believe, and in this way the student is misled, and gets a very false and contracted view of the affection. In fact, there is no one symptom mentioned that may not occasionally be absent; and, on the other hand, all may arise from other causes besides hepatitis. The symptoms may be considered as local and general, the *local* being, principally, pain, tenderness, and tumefaction; the *general*, fever, and lesion of the digestive and in some instances of the nervous and respiratory systems. Of these, the first two, namely, fever and lesion of the digestive function, are by far the most frequent, a circumstance to be expected when we recollect the general complication of hepatitis with gastro-intestinal disease. (See GASTRO-ENTERITIS.)

Acute hepatitis may be generally described as commencing with that group of symptoms indicative of inflammation in the digestive system; in other words, the patient at first appears to be attacked with gastric or bilious fever, to which succeed, sooner or later, symptoms of the hepatic disease. There is often then high fever, the type being generally more inflammatory and less typhoid than that which results from a simple gastro-enteritis. The pulse is more frequently strong and full; there is thirst, a furred and yellowish tongue, and frequently vomiting, sometimes of a bilious, at other times of a dark-coloured matter. The bowels are commonly irregular or costive, and the discharges present a great variety of appearances according as the biliary secretion is more or less affected, and also according to the degree of complication with gastro-intestinal disease. The urinary secretion is also affected, being almost always scanty and very high coloured.

In addition to these symptoms we have the local indications of hepatitis, which are, principally, pain, tenderness, and tumefaction. The pain is felt in various situations, and occurs with various degrees of intensity. In some cases the patients describe it as a stitch in the side, aggravated by respiration or motion; in others the pain occurs about the cartilages of the lower ribs, or it may be felt in the lumbar region. Much has been written about the occurrence of pain in the right shoulder in cases of hepatitis; from our experience we would say that this is an extremely rare symptom, and one by no means pathognomonic of the disease, an opinion borne out also by the experience of Dr. Mackintosh* in these countries, and of Andral in France.† There can be no doubt that practitioners are often misled from attaching an unmerited degree of importance to the presence or absence of this symptom. Generally speaking, the pain is more acute when the inflammation is superficial,—a circumstance illustrative of the general law, that in parenchymatous inflammations the pain is more severe when the disease approaches or involves the surface of the organ.

The symptom which we regard as next in importance to the pain is the tumefied and tender condition of the organ. When the belly is flaccid and the intestines are empty, there is seldom much difficulty in detecting the hepatic enlargement. We then generally observe the right hypochondrium and the epigastric region full, and the edge of the liver can be felt descending more or less below the costal cartilages. Sometimes the ribs appear tilted out, but the intercostal spaces preserve their relative positions with respect to them; a point of great importance in the diagnosis between hepatic and pulmonary diseases. But where the belly is distended by either fœcal matter or air, it becomes extremely difficult to ascertain the enlargement of the liver. In such a case we would always recommend that a dose of opening medicine should be given, followed after some time by a purgative injection, after the operation of which the examination of the hepatic region will be greatly facilitated. We shall also derive important information by the use of mediate percussion by means of the pleximeter, as recommended by M. Piorry, from whose recent work we shall quote.

"In some acute cases of hepatitis, or rather in sanguineous congestions of the liver, it has

* Précis d'Anatomie Pathologique, tom. ii.

* Elements of Pathology and Practice of Physic, vol. i.

† Clinique Médicale, Maladies de l'Abdomen.

been easy to demonstrate, at the Salpêtrière, the Pitié, and at the Hôtel Dieu, that the liver is susceptible of great increase of volume, and that the dimensions of this gland diminish rapidly after a copious bleeding, and sometimes also by strict regimen, which by itself produces a loss of blood. The diminution of the hepatic organ varies from one to three inches, from above downwards, in the twenty-four hours; this is still greater in proportion as the blood drawn is more considerable. Not only has this fact been observed with old men in whom the venous circulation, embarrassed by disease of the heart, and particularly its weakness, explains the tumefaction of the liver, but also in adults, in cases of plethora and acute fevers. I could easily accumulate twenty observations to support this proposition. M. Vidal, one of the house pupils connected with my attendance, has just related to me three most remarkable facts taken most carefully. I shall confine myself to the following:—A young man discharges a loaded pistol direct against the region of the liver; the ball, however, does not penetrate, which singular fact may be attributed to the presence of air between the muzzle of the piece and the ball, the pistol being applied to his clothes so firmly as to stop up the muzzle: his clothes are, however, torn, and the foreign body, after having violently contused the skin, falls at the feet of the wounded man. The first few days no accident of importance occurred; the circumference of the liver was bounded by a black line. The fourth day there was fever, flushed face, and dyspnœa very intense: this was referred to the liver; this organ above and below exceeded by an inch or more the former line of demarcation. A copious bleeding was tried; the next day the liver had resumed its former dimensions, and the severe symptoms disappeared. The cure was rapid."*

In using the pleximeter we should employ it over the epigastrium and hypochondrium, and also over the lower portion of the chest both anteriorly, laterally, and posteriorly. By this means the extent of the hepatic tumefaction can be generally determined with ease. In some instances the tumefaction is more evident in the superior, in others in the inferior portions of the liver; when, however, the belly is much distended, this mode of observation is liable to many difficulties: thus, when the intestines contain much solid and fluid matter, we cannot estimate the extent of dulness inferiorly; and on the other hand, when they are distended by flatus, the liver is pushed upwards, under which circumstances the dulness of the lower part of the chest ceases to be a measure of the hepatic tumefaction.

Jaundice has been described as an attendant on hepatitis, but it is not a constant symptom. The patients have generally a slightly yellowish tinge, particularly in the face, similar to what is observed in gastric or bilious fevers, but very different from true icterus. In none of the cases observed by us at the Meath Hospital was there jaundice; and Andral relates numerous cases of hepatitis where this symptom was absent: it may, however, occur in acute hepatitis; but facts are still wanting to explain its absence in some cases, and its presence in others. Of one fact we are certain, that jaundice, when induced by inflammation, is much more frequently the result of a duodenitis than of an inflammation of the liver. From the known effect of a duodenitis, simple or complicated with gastric inflammation, in the production of icterus,* it becomes an interesting question to determine how far the complication of gastro-intestinal inflammation in hepatitis may act in producing the symptom of jaundice. The following table of cases, taken from the writings of Andral, Louis, and from the report of the Meath Hospital, may assist in throwing some light on the subject. The first column states the condition of the liver, the second that of the gastro-intestinal apparatus and ducts, and the third that of the skin.

State of the liver.	*Digestive tube and ducts.*	*Skin.*
Acute hepatitis	Healthy; ducts free	Jaundice.
Red softening	Healthy; ducts free	Jaundice (slight).
Red induration	Ditto ditto	Jaundice.
Numerous abscesses	Ditto ditto	Jaundice.
Abscess	Ditto ditto	Jaundice.
Ditto	Ditto calculus	Jaundice.
Ditto	Ditto healthy	Jaundice (slight).
Hepatitis with tumefaction	Chronic gastritis	Jaundice.
Hypertrophy	Chronic gastro-duodenitis; ducts free	Jaundice.
Vast abscess	Gastro-enteritis; ducts healthy	Jaundice.
Numerous small abscesses	Slight enteritis; ducts free	Jaundice (slight).
Ditto ditto.	Gastritis; gall-bladder atrophied; calculus in cystic duct	Jaundice (deep).
Numerous abscesses	Colitis; ulcerations of gall-bladder	Jaundice.

* *Piorry*, du Procédé Opératoire, etc. Paris, 1831.

* *Marsh*, on Jaundice, Dublin Hospital Reports. *Broussais*, Commentaires, &c.

State of the liver.	*Digestive tube and ducts.*	*Skin.*
Hypertrophy	Chronic gastro-duodenitis ..	No jaundice.
Numerous abscesses	Chronic gastro-enteritis; duodenum healthy	No jaundice.
Ditto ditto.....	Gastritis	No jaundice.
Vast abscess	Ditto	No jaundice.
Abscess and gangrene.....	.....	No jaundice.
Abscess	Duodenitis	No jaundice.
Chronic abscess in right .... Acute ditto in left lobe	Chronic gastro-duodenitis ..	No jaundice, (slight yellowness at the commencement).
Vast hepatic abscess	Healthy	No jaundice.
Numerous abscesses	Colitis	No jaundice.
Red softening	Gastro-enteritis.....	No jaundice.

It is obvious, from the inspection of this table, that we cannot arrive at any explanation of the presence or absence of jaundice in cases of hepatic inflammation, from the consideration of the circumstance of gastro-intestinal complication. We see here cases of hepatitis with jaundice, in which the digestive tube was free from disease, and the same symptom with gastro-intestinal inflammation; and, in the cases of hepatitis without jaundice, the tube was healthy in some, and diseased in others.

We may remark, while on this subject, that in hepatitis the biliary secretion is variously affected. In some it appears to be suspended, while in others, even after extensive suppuration of the liver, the gall-bladder has been found filled with healthy bile. We have observed these facts repeatedly in the Meath Hospital. Thus, in a case where a great number of abscesses were formed, the gall-bladder contained a perfectly transparent viscid fluid which did not coagulate by heat or the addition of nitric acid; the fluid was perfectly colourless, and in short presented all the characters of pure mucus. Notwithstanding this appearance of the contents of the gall-bladder, it is most remarkable that the intestines contained a quantity of yellow mucous and fœcal matter. In this case the mucous membrane presented indications of inflammation.

In two other cases, where the most extensive destruction of the liver had taken place, the gall-bladder was found to contain a bile healthy to all appearance. In the first of these a chronic abscess existed in the right, and a recent abscess in the left lobe. In the second, the organ was completely burrowed by numerous abscesses. In the different cases of hepatic abscess recorded by Louis, the greatest variety in the contents of the gall-bladder occurred. From these facts we seem justified in concluding that in acute hepatitis, and probably also in the chronic disease, we cannot form any exact diagnosis of the state of the liver from the appearance of the biliary secretions in the stools, inasmuch as in one case it is altered in its quality in a variety of ways, while in another, apparently the same condition of the organ, no perceptible change is observable. The truth is, that neither its presence, absence, nor alterations, give us any data to enable us to conclude as to the stage, extent, progress, or termination of the inflammation; and it is plain that under these circumstances the state of the stools will but little assist our prognosis. It is probable, however, that a very copious secretion of bile is more favourable than the contrary, as the inflammation of secerning organs is generally more inveterate when their secretion is arrested.

When hepatitis is once formed, it may terminate by resolution or by suppuration; or the irritation may continue in a modified manner, so as to be classed among chronic diseases of the liver. The indications of resolution are, in the first instance, the subsidence of the fever, the gastric symptoms, and the pain: this is followed by the disappearance of the tumefaction, which, though generally the last in the order of symptoms, often occurs with great rapidity. The infra-mammary and postero-inferior portions of the chest recover their clearness of sound on percussion; the dilatation of the side is no longer observed; the right hypochondrium and epigastric region lose the tension and fulness which occurred during the acuity of the disease. Although a few cases of suppuration without perceptible tumefaction of the organ have been met with, yet from our own experience we would say that the subsidence of the swelling is one of the most certain indications of the resolution of the disease, certainly more so than the disappearance of the fever and pain.

But when suppuration is to occur, we often find that the tumefaction, so far from diminishing, becomes increased, and this at a time when the fever is frequently changed in character and assumes a hectic type. Shiverings, more or less severe, are observed, with or without perspirations; the pulse becomes small and rapid; the countenance is pale, and a sour smell of the surface is perceptible. In one case we have observed a miliary eruption. There is generally a constant sense of weight and uneasiness in the right hypochondrium, and the pain has in some instances been found as it were to concentrate itself on a particular spot, probably corresponding to the principal collection of pus. After some time a fluctuating tumour may appear generally in the epigastrium or some part of the right hypochondrium, which is followed by discoloration of the integuments; but in other cases no such occurrence takes place, and we must be guided by the history of the case and the constitutional symptoms in forming the diagnosis of suppuration. Should the tumefaction persist,

with a fever either of the continued or remittent type, we may suspect the formation of matter. When, however, the abscess forms so as to be perceptible by manual examination, we may observe the following conditions:— 1. a generally enlarged state of the organ, in which, though no perceptible fluctuation exists, a doughy or boggy feel is communicated over a greater or less portion of the tumour; 2. distinct tumefaction below the margin of the rib; 3. a tumour in the epigastrium; and, 4. a bulging of the false ribs, with more than usual fulness of the intercostal spaces.

But it must be always borne in mind that, although the constitutional symptoms frequently undergo a remarkable change at the moment of suppuration, yet there are abundance of cases in which the change is scarcely if at all perceptible. To this we shall recur in speaking of the difficulties in the diagnosis of this disease.

The constitutional symptoms which are of most value are, the supervention of night perspirations, shiverings, cold sweats, clamminess of the skin, and frequent fainting sensations. If this state has arisen in a case where it has been found impossible to affect the system with mercury, the diagnosis of abscess may be made with a great degree of certainty. In this last and most important statement, the best East-India practitioners agree, and we have heard one gentleman, who occupies a high rank in the service, declare that he never yet knew a case of abscess of the liver in which ptyalism was induced, even although the largest quantities of mercury had been exhibited. Mr. Annesley says, "that there can be no doubt that the system will not be brought under the full operation of mercury, or that ptyalism will not follow on the most energetic employment of this substance, when abscess exists, although a slight tenderness of the gums will be produced by it." As far as our experience in the Meath Hospital has gone, we should say that the same circumstance holds good in the case of hepatic suppuration in these countries; but it is not peculiar to inflammation of the liver, as it is observed in other cases of intense visceral inflammation, in which, when ptyalism is induced, it is obviously the effect and not the cause of the reduction of the visceral disease; and we have no doubt that, from not properly estimating this circumstance, practitioners have erred with respect to the curative powers of mercury, and have done injury by the introduction of enormous quantities of this mineral into the system at a time when the violence of the local action prevents its specific and sanative effects on the economy.

The terminations of these cases of hepatic abscess are various. We have already alluded to the internal openings of the abscess in describing the pathological anatomy of the liver in a state of inflammation. In these cases the diagnosis is to be made on the same principles which Louis has laid down in speaking of peritonitis from perforation of the intestine: there is a sudden appearance of a new train of symptoms, accompanied in almost all cases by subsidence of the hepatic tumour. Thus, when the matter makes its way into the lungs by the mechanism which we have before described, a sudden and copious expectoration of puriform matter has been commonly observed; this is accompanied by a remarkable diminution in the hepatic tumour. Should these symptoms arise in a case where previously there had been no evidence of disease in the pulmonary parenchyma, the diagnosis may be still more certain. We had once an opportunity of making a stethoscopic observation of this most interesting lesion: the patient had recovered from an attack of that violent gastric fever accompanied by yellowness of the skin which we have described in the article Enteritis, when he again came under our care, labouring under symptoms of hectic fever, which proved ultimately to proceed from hepatic suppuration. This patient had a constant dry cough, which led us to make repeated stethoscopic examinations without our being able to detect any disease whatsoever in either lung: in less than twelve hours after the last stethoscopic observation the patient was suddenly seized with a feeling of suffocation, and began to expectorate large quantities of perfectly formed pus, of which in the course of the night he discharged upwards of a pint and a half. On the following morning the left lung, which the day previously had presented no morbid sign whatever either by the stethoscope or percussion, was found completely dull over the whole region of the lower lobe, with complete extinction of the respiratory murmur: there was no bronchial respiration, no resonance of the voice, dilatation of the side, nor displacement of the heart; nor was there any constitutional symptom indicative of either pleuritic or pneumonic inflammation. The patient continued to expectorate copiously for some days, and after the second day the morbid phenomena of the chest began to subside. We had, first, a mucous rattle audible at the root of the lung, which gradually extended over the dull portion, and was followed by a return of the respiratory murmur and resonance of the voice.

This stethoscopic observation, for the accuracy of which we pledge ourselves, is explicable only by the sudden filling of all the bronchial tubes with purulent matter. Let us observe, first, the sudden supervention of dulness and absence of respiration in a patient whose chest a few hours before presented no morbid phenomenon; this is accompanied by a copious expectoration of purulent matter, and there are no constitutional symptoms of pleurisy or of pneumonia. The absence of these symptoms is of great importance, because if the disease had proceeded from either of these lesions, it must have been of extraordinary violence, and would have certainly been accompanied by high constitutional and local symptoms. There was no dilatation of the side, or displacement of the heart, so that the diagnosis lay between hepatization of the lung and the sudden filling of the tubes with pus;

but there was no bronchial respiration nor resonance of the voice, which would have occurred had it been hepatization, but which were absent because the large tubes were completely filled; and further, during the recovery of the patient the phenomena of the voice were exactly the reverse of those in pneumonic resolution. Thus, in the latter the resonance *decreases*, while in this case it *increased*;—in hepatization, because the air-cells recover their permeability, and the morbid subsides into the natural bronchophony;—in the case under consideration, because the emptying of the tubes permitted the return of the natural resonance of the voice. The resolution of pneumonia is accompanied by *decrease* of bronchophony, while in the case before us it was accompanied by *increase*.

In the majority of cases the matter discharged from the chest consists of well-formed pus. In a case, however, recorded by Annesley, the opening of an hepatic abscess was followed by a violent purulent and bloody expectoration; the patient experienced a great sense of suffocation when he lay on his back, and on dissection a vast hepatic abscess was found communicating with the posterior portion of the lung. We have witnessed a case of the same lesion, in which, whenever the patient turned on the left side, a large quantity of purulent matter was discharged from the trachea.

It is hardly possible to confound this accident with any disease of the lung, properly so called, particularly if by stethoscopic observation we have been satisfied of the previously healthy condition of the organ. The only cases which might possibly be confounded with it are the rare instances of the opening of an empyema into the lung, or the sudden secretion of purulent matter in quantity by the bronchial mucous membrane, of which a few instances are recorded.*

We have already spoken of the rarity of hepatic abscess opening into the general cavity of the pleura—a circumstance explicable by the adhesions which are formed between the two surfaces of the pleura, and which have the effect of directing the matter into the substance of the lung. From the rarity of these cases it is difficult to state the symptoms of this lesion; yet in a case where a sudden occurrence of the signs of effusion into the pleura, accompanied by the disappearance of those of the hepatic abscess, were observed, the diagnosis might be made with a great degree of probability.

A not unfrequent termination of hepatic abscess is by the establishment of a communication with some portion of the digestive canal. The stomach, duodenum, and colon, are the parts in which the communication has been most commonly observed; and the circumstances which appear to influence the point of communication are principally the situation of the abscess and the general volume of the hepatic tumour. When the matter makes its way into the stomach, a sudden vomiting of purulent fluid, with subsidence of hepatic tumour, has been observed. When, on the other hand, it opens into the intestine, we have a sudden diarrhœa, followed by the same phenomenon. From instances of recovery under these circumstances, it seems fair to infer that a cure by cicatrization of the opening is not unfrequent; but the opening may become fistulous, and continue until the fatal termination of the case. This occurred remarkably in a case the particulars of which we shall just now detail, and which we before alluded to.

Rupture into the peritoneal sac seems to be more frequent than the opening into the pleura, a circumstance to be expected from the smaller degree of liability of this membrane to form adhesions. When it does occur, we have violent peritonitis supervening; but the full evacuation of the abscess is not a necessary consequence. The following unique case is highly instructive, as illustrating the rupture of hepatic abscesses both into the digestive canal and peritoneum.

A man, aged 39, was admitted into the Meath Hospital in August, 1828, labouring under hectic fever, with cough and nausea. He complained of great soreness from the fourth rib on the right side downwards. The hypochondrium was full and tender, and the side dilated one inch and a half, without distention of the intercostal spaces. Having recognized that the disease was hepatic, and suspecting that an abscess, deep-seated, had formed, we determined on performing the operation, first proposed by Dr. Graves, of dividing the abdominal parietes as far as the peritoneum, and keeping the wound plugged with lint. This was done, yet after six days had elapsed, no matter made its appearance. Soon after this a circumscribed tumour, evidently containing fluid, suddenly appeared between the median line of the epigastrium and the termination of the wound. It is important to remark that this tumour was not preceded by any local induration, but at once presented fluctuation. In consultation, however, it was determined to open it cautiously by means of a lancet, when, in place of matter, there was a gush of dark-coloured bile: the tumour disappeared, but fulness of the side continued. About four hours after this operation the patient expressed a sudden desire to go to stool, and passed two copious discharges of purulent matter, with bilious fæces. This was followed by remarkable improvement, and the tumefaction rapidly diminished, so that in a few days all swelling of the right hypochondrium had disappeared. A diarrhœa, however, continued from the time of the disappearance of the tumour, and resisted every attempt to check it. Twenty-three days after the subsidence of the first tumour, a small hard swelling was observed in the epigastric region, about the size of an egg: this increased daily, and soon became fluctuating. On the thirteenth day after this, sudden and violent peritonitis set in, with subsidence of the epigastric tumour. He lived

* See *Van Swieten*, Comment. vol. iv. p. 60. Les Ephemerides des curieux de la Nature. *Baumes*, Traité de la Phthisie. *Hippocrat.* de morbis vulgaribus. *Andral*, Clinique Médicale.

eight days longer, the diarrhœa continuing until his death.

From considering the various symptoms in this case, we made the following diagnosis publicly, before dissection: viz. 1. that the gall-bladder would be found to have been punctured, but that from peritonitis not having set in on that occasion, it was probable that its fundus was adherent: 2. that a chronic abscess would be found in the right lobe of the liver, which was the cause of the first symptoms, and in all probability of the persistent diarrhœa, from a communication remaining open between it and some portion of the digestive tube: 3. that a recent abscess would be found in the left lobe, which had opened into the peritoneum, and had caused death by peritonitis.

On dissection, the peritoneum was found of a deep-red colour, containing a quantity of serous fluid, in which was a large quantity of flocculi forming masses having the consistence of jelly; the liver was generally adherent to the diaphragm and abdominal parietes, the adhesions of the right lobe being strong and ancient, those of the left soft and recent. In the left lobe an abscess of the size of an orange was discovered a little above its lower edge, and communicating with the peritoneal cavity by a fistulous opening sufficiently large to admit a quill. In the right lobe we found a cavity of the size of an egg, empty, and lined with a semi-cartilaginous membrane of a dark iron-grey colour: this communicated with the duodenum by an opening large enough to admit the finger with ease. The gall-bladder presented superiorly a spot exactly corresponding to the size and form of a lancet puncture, which was covered by a thin transparent membrane.*

But hepatic abscess frequently proves fatal without any rupture internally or externally. In these cases, as Broussais has well observed, the diseased action is seldom confined to the liver, but commonly occurs in some other organ, such as the gastro-intestinal mucous membrane, the lungs, or brain; of these the first is by far the most frequent. The actual state of pathology, however, does not permit us to adopt the opinion of Broussais as to the constancy of this complication, but the fact of its frequency is well established, and becomes of great importance in practical medicine. In all the cases of abscess of the liver recorded by Andral, there is but a single instance where the disease occurred without complication with lesion of other organs.

Suppuration of the liver has occurred without any of the characteristic symptoms of hepatitis. Thus, in the twenty-sixth observation of Andral, numerous abscesses, with redness and softening of the hepatic tissue around them, were found, yet the patient never had pain or tumour in the region of the liver, nor was he jaundiced: in this case there was complication with acute pneumonia and gastritis. In another case, where a scirrhous state of the stomach existed, numerous partial inflammations of the liver and an abscess were discovered; the patient never had either icterus or pain either in the hypochondrium or right side of the chest. The same author details a case where an hepatic abscess with gangrene was discovered after death, and in which all the characteristics of an hepatic affection were absent. This patient laboured under a chronic bronchitis and gastritis. We have known two cases where numerous abscesses were found in the liver, and in which the symptoms were merely those of continued fever, without any indication which could lead to the suspicion of the disease. Other instances might be quoted, but such cases are comparatively rare, and should not discourage the student, or render him too sceptical as to the powers of diagnosis.

In certain cases the gall-bladder becomes distended with bile so as to form a tumour in various situations along the margin of the liver, representing in many particulars the phenomena of an hepatic abscess so completely that the most eminent practitioners have been deceived in their diagnosis. It is extremely difficult to lay down rules by which this affection can be distinguished with absolute certainty. The obstruction of the ducts in most cases has been preceded by more or less of indications of hepatic disturbance, which it is impossible to say did not proceed from disease of the parenchyma of the liver. In the case which we have recorded, there was actually an hepatic abscess at the time when the distention of the gall-bladder occurred, and which was evidently its cause, so that in this case we had the local and constitutional symptoms of hepatic suppuration preceding the tumour caused by the gall-bladder. In this case, then, the previous symptoms could only mislead us as to the nature of the tumour. We are not, however, aware of any other case where the tumefaction of the gall-bladder was preceded by an hepatic abscess.

In the first volume of the Dublin Hospital Reports a most interesting case of enlargement of the biliary duct is recorded by Mr. Todd. The patient, a delicate girl, had been in bad health for some months previous to her death, during which she had had severe fever with several relapses. When she was first seen by Mr. Todd, she was nearly insensible; she moaned incessantly, and frequently screamed, as if seized suddenly with acute pain; the skin was of a deep orange colour, and she was greatly emaciated. On examination, it was found that the abdomen was distended with fluid, and that the epigastric and right hypochondriac regions were occupied by a tense swelling, which could be traced extending even below the umbilicus. A distinct fluctuation was perceptible at the most prominent point, a little below the ensiform cartilage, and a little to the right of the linea alba. This part was extremely sensible, and hence it was thought probable that a large abscess of the liver was here approaching the surface. With this impression, and anxious to afford immediate relief, Mr. Todd made an opening into the most prominent part of the tumour, when a thin fluid coloured with green bile escaped; a

* Dublin Hospital Reports, vol. 5.

canula was then introduced with a view to prevent the escape of the fluid into the peritoneal cavity, when upwards of two quarts of a viscid green bile were discharged. After the operation all the tumefaction of the abdomen had subsided, and no enlargement of the liver nor any other swelling could be detected. In the evening, however, the belly became swollen, painful, and tense, and the patient died on the following day. On dissection, the peritoneum was found inflamed, and containing a serous and bilious fluid; the liver was perfectly healthy, and the gall-bladder was found empty and contracted; but the hepatic and common ducts were found to be enormously distended, forming a sac, which still contained more than a quart of bile, and extending from the porta of the liver to the os sacrum, lying behind the duodenum, pancreas, and root of the mesentery, and stretching in a transverse direction, so as to cover the anterior surface of the right kidney, and the greater part of the left.

Andral relates several cases of distended gall-bladder forming an evident and fluctuating tumour in various portions of the abdomen. He has seen it, 1st, immediately below the cartilaginous portions of the right ribs; 2dly, lower down in the hypochondrium; 3dly, in the iliac fossa; and, 4thly, in the epigastric region. In a case of aneurism of the hepatic artery, which we have lately observed, the gall-bladder formed a fluctuating tumour very near to the right ileum, and the biliary ducts were found in a similar state to that described by Mr. Todd, only distended to a less degree. We believe that in all the cases, with the exception of that which we have recorded, there was jaundice; and it is probable that if the gall-bladder had not been punctured, and that the abscess had continued to press on the ducts, this condition would ultimately have been induced. In this case, also, it is very important to compare the appearance of the two tumours with a view to their diagnosis. That of the gall-bladder appeared suddenly, without being preceded by local pain or induration, but was at once fluctuating: that arising from the abscess of the left lobe was preceded by pain and induration; and fluctuation did not appear until some days after its occurrence. This observation may be of utility in determining the point in future cases.

Chronic hepatitis.—A great number of affections of the liver have been classed under this general term; such as induration, scirrhus, tubercle, hypertrophy, atrophy, &c. &c. In fact, we cannot say with certainty what the condition of the liver will be on dissection in a case where symptoms of chronic irritation have existed. We may, indeed, recognize an enlargement or an induration, but it appears rash to go farther than this. The liver, like other organs, however, being subject to chronic inflammation, we may recognize this condition, although we cannot say what particular alteration it may have induced.

The disease may set in with an attack of acute hepatitis, or may from the commencement preserve a slow insidious character. In some cases there is more or less of fever, while in others the patient is apyrexic. The principal phenomena are various derangements of the digestive function, and it is often next to impossible to pronounce on the actual condition of the gastro-intestinal mucous membrane. In fact, chronic disease of the liver and of this surface are commonly combined. If, in addition to pain, long continued in the region of the liver, increased by excitement, and accompanied by tenderness and tumour, we observe a sallow countenance, a dry skin, foul tongue, scanty and high-coloured urine, with occasional attacks of jaundice, we may safely make the diagnosis of chronic hepatitis.

In the less acute forms of the disease the local symptoms of an hepatic affection are often very indistinct, and the case presents many of the usual phenomena of a chronic gastro-enteritis. In addition to these, the pain about the right shoulder, when it does occur, the distention and oppression in the epigastrium and right hypochondrium, the bitter taste in the mouth, the sallow appearance of the countenance, the elevation of the shoulders, and the wasted state of the body, are the circumstances which in warm climates are relied on as indicative of hepatic disease.

It is stated that, when the surfaces of the liver are the seat of disease, the pain is more decided, and that, as the superior or interior surface is chiefly affected, so in the first case the symptoms will be referred to the chest, and in the second to the stomach and bowels. An eminent writer says, that when the superior and exterior part of the right lobe is the seat of disease, the patient reclines with most ease on the right side, a dragging sensation being felt on turning to the left. From this sensation it is supposed that we may infer the existence of adhesions between the lobe of the liver and the right side.

Nothing can be more various than the terminations of this disease which have been observed. In fact, every one of the known organic changes of the liver has been found in cases where the patient laboured under symptoms of chronic hepatitis. Most of these certainly may be looked on as the results of the inflammatory action, the modifications in their nature being probably connected with the constitutional dispositions of the patient. In fatal cases death is induced by various circumstances. In some cases an acute hepatitis supervenes upon the chronic, but in the majority the patient is cut off in consequence of disease of other organs. He may be attacked by peritonitis, either in consequence of the rupture of an abscess or of the gradual extension of disease to the serous surface: he may be attacked with enteritis or dysentery, which is a common termination in warm climates: pulmonary or cerebral disease may set in; and dropsy, with or without an affection of the heart, is not unfrequent.

The diseases with which chronic hepatitis has been confounded are principally the following: chronic gastro-duodenitis, scirrhus of the stomach, chronic pleurisy of the right side

with empyema, and a neuralgic affection, of which the seat appears to be in the hepatic plexus.

In the articles Enteritis and Gastro-Enteritis we have alluded to the great frequency of the error of confounding the affection of the gastro-intestinal mucous membrane with that of the liver, and have dwelt on the injurious consequences of this mistake. With respect to the diagnosis between this disease and chronic pleurisy with effusion, we would say that there is hardly a case where the tact of the practitioner is more requisite than in this. We will suppose that he is called to see the case for the first time after considerable enlargement of the organ has occurred. He will often find that the history of the case gives him but little assistance, as the two affections are often accompanied by very similar symptoms; neither will he derive decided assistance from the stethoscope and percussion. In both cases we may have extensive dulness of the side, absence of respiration, resonance of the voice, or bronchial respiration. The side will be dilated in both, and the decubitus generally on the affected side. Neither will the existence of a tumour in the abdomen be unequivocal, as in the one case it may occur from hypertrophy of the organ, in the other from displacement.

From our experience we should say that the indication which is the most unequivocal is drawn from the state of the intercostal spaces. When the side is dilated by a fluid, as in empyema, the spaces are raised either to a level with the ribs or even protruded beyond them, and the side has generally a smooth and rounded appearance. On the other hand, when the dilatation is produced by a solid tumour, such as an enlarged liver, the reverse of this occurs; the pressure being exercised on the ribs, these are pushed outwards, but the intercostal spaces preserve their relative positions with them, and the side does not present any thing of the smooth and rounded appearance which we have described.* There are certain cases, however, where even this diagnosis is not applicable, such as where the patient is fat, the integuments œdematous, or the belly distended by fluid. Under such circumstances the difficulty of diagnosis is extreme.

It appears to us that the attention of British practitioners has not been sufficiently called to the frequency of the neuralgic affection of the liver which is commonly seen in hysterical subjects, and has been noticed by Andral in his Clinique Médicale. "We sometimes observe in the region of the liver severe pain, which cannot be accounted for after death by any lesion of the viscus or its excretory ducts. These are cases of hepatalgia or hepatic colic. The circumstance just mentioned, and, moreover, the nature of the pains, their intermission, and the state of good health which often exists in the intervals,—all lead us to believe that these pains have their site in the numerous nervous filaments which are distributed in the liver, and which are derived either from the pneumogastric or the great sympathetic."*

The persons in whom we have witnessed this affection were females. In some of these a decidedly hysterical tendency existed, while in others this disposition was scarcely if at all indicated. In one case the condition of the spine lately denominated "spinal irritation" was present. The principal symptom in these cases was a constant pain in the region of the liver, which lasted for years, and was subject to occasional and violent exacerbations from various causes, such as mental emotion, fatigue, over-excitement, derangement of the bowels, or the occurrence of menstruation. During the exacerbation the pain is excruciating, to all appearance more violent than that in the most intense inflammation, and is generally accompanied with exquisite tenderness of the right hypochondrium. It has been stated to have been sometimes accompanied by a slight jaundice, but of this we never witnessed an instance, as, in the cases which we have observed, none of the usual symptoms of hepatic irritation, with the exception of the pain, existed. There was never fever, nor tumefaction, nor a bilious state of the urine, foulness of the tongue, thirst; nor were the alvine evacuations apparently affected, although the disease had been present for months or even years. Further intervals occurred during which the patient enjoyed a respite from pain, and presented no local nor general symptom of hepatic derangement. The diagnosis of this disease is then to be drawn from the violence of the pain, which is greater than that of inflammation, combined with the absence of fever, tumour, and the other indications of structural disease of the liver. We may also remark, that in several cases which have occurred under our observation the patients were subject to neuralgic affections in other situations, as the face or extremities: in one severe dysmenorrhœa had long existed.

It is now some years since we were consulted in the case of a lady of luxurious habits and highly nervous temperament, who, while in India, had been attacked with pain in the region of the liver, which was supposed to arise from acute hepatitis. For this she was largely bled, both generally and locally, and brought under the influence of mercury, without relief. She was ordered to return to England, and on the passage was several times bled and twice mercurialized with the same intention. Some time after her arrival in this country the pain became again severe, and occurred with violent exacerbations. Each attack had been treated as if it had been one of acute hepatitis, she having been repeatedly bled, leeched, blistered, and mercurialized. Temporary relief used to be afforded by the bleeding, but the disease constantly recurred; her constitution had become shattered, and she was constantly subject to the most violent hysterical paroxysms: the stomach had become so irritable that every

* See Dub. Hosp. Rep. vol. v.

* Maladies de l'Abdomen, t. ii. p. 26.

thing was rejected, and the patient's sufferings were indescribable. Such was the condition of this lady when we were first called to see her; it was plain that the disease had resisted the most rigorous and long-continued antiphlogistic treatment. We found that there never had been any fever, that the right hypochondrium was perfectly supple, the lower part of the chest sounding clear, the tongue clean, the eyes and complexion clear, and the patient subject to neuralgic affections in other parts of the system. Under these circumstances we determined on treating the affection as a neuralgia. Further bleedings were inhibited, contrary to the wish of the patient, who, as before stated, experienced temporary relief from them. She was put on a generous diet, sent to the country, and directed to use free doses of the carbonate of iron. This treatment proved perfectly successful, and in the course of a few weeks the lady was in the enjoyment of a state of health and comfort to which she had been a stranger for more than two years previously. We know of another case of a lady who had been actively treated for supposed hepatitis in the country without success. She was advised to come up to town to place herself under the care of physicians, for the purpose of undergoing a course of mercury. On examination, her medical attendant could find no evidence of hepatic disease except the pain. She was also treated by the carbonate of iron with complete success. Since then we have known several cases where the error of confounding this affection with inflammation has been committed,—an error always full of danger, but in Great Britain peculiarly unfortunate from the empirical and almost universal employment of mercury in all hepatic affections. We have at this moment under our care a most deplorable example of the effects of this error, where the most profound lesions of the nervous system have been induced by the long-continued use of mercury.

Causes of hepatitis.—The exciting causes of hepatitis may be enumerated as follows: residence in a tropical climate, intermittent or continued fever, gastro-intestinal inflammation, suppression of habitual fluxes, abuse of spirituous liquors, injuries of the side, wounds of the head, congestion from venous obstruction, suppression of cutaneous eruptions, exposure to cold, gall-stones, &c.

Treatment.—When a patient has been attacked with symptoms of acute hepatitis, the disease being still in its early stages, and no evidence of suppuration present, the treatment should be commenced by a free bleeding from the arm, which, if the subject be robust and the inflammatory fever high, should be pushed so as to produce some effect on the circulation. It would be always well to see the patient again in the course of from four to six hours, when, if the pain and oppression should have returned, and the inflammatory fever again be lighted up, the bleeding should be repeated without hesitation; a less quantity of blood, however, will generally answer the expected purpose. The bowels should be opened by a free dose of calomel, followed by saline medicine, and assisted by a purgative injection. The patient will thus be brought into the state best adapted for deriving advantage from local bleeding; and we would impress strongly on the mind of the practitioner, that, although the exhibition of mercury is sometimes indispensable, he must place his chief reliance on general and local bleeding, both as the surest means of arresting the disease, and of ensuring the beneficial action of mercury should its exhibition become necessary. In warm climates it has been observed that in some cases the operation of bleeding is followed by faintness before a sufficient quantity is taken, and the blood is dark and grumous. In this case, as has been observed in other violent inflammations,* the bleeding is soon followed by more violent excitement of the circulation, when a second bleeding is indicated, and the patient will bear the loss of a much greater quantity of blood; and this will then be found to present the buffy appearance in a much higher degree. This second bleeding also gives much greater relief to the patient.

From our experience we would say that general bleeding has not the same marked influence over hepatitis that it has over peripneumony, but appears principally useful in preparing the patient for local depletion, which seems to have the most direct influence on the disease. We have seen a case where upwards of a hundred ounces of blood were drawn at different times, and in which no apparent effect was produced on the inflammation until local bleeding was performed. In a robust adult not less than thirty leeches should be applied after the general bleeding, to the most painful part of the side, a measure which will be followed by still greater advantage if the bowels have been previously opened; and to ensure this result, purgative injections should be used to assist the action of the medicine administered by the mouth. When the patient can bear it, the greatest advantage will be derived from the application of a cupping-glass, fitted with an exhausting syringe over the leech-bites, by which means a much greater quantity of blood is obtained, and the subsequent oozing from the leech-bites generally prevented. As the blood flows, the exhaustion should be gently continued until the cup is full, when, if it is thought necessary to obtain more, the cup should be re-applied, and its margin surrounded with a cloth dipped in warm water; this causes a copious flow of blood.

In all cases it will be well to avoid, as far as possible, the oozing hemorrhage of leech-bites, as this exhausts the patient without any corresponding influence on the disease, and keeps him in an uncomfortable state. It is much better to make several applications of leeches successively, and to arrest the hemorrhage after the leeches have fallen off, either by the cupping-glass or the application of stypties, of which the best appear to be the solid nitrate

* See Rush on the Yellow Fever.

of silver, or the muriated tincture of iron. In the Meath Hospital the application of powdered alum has been found very beneficial. After the hemorrhage has been completely arrested, the patient will derive great advantage from the application of warm poultices of linseed-meal or bread and milk over the affected organ; these, however, must be made light, as their weight in some cases proves distressing.

It has been the practice on the continent, and lately in Great Britain, to apply leeches to the anus in cases of hepatic irritation, on the principle of depleting the system of the *porta* through the hemorrhoidal veins. We believe that the only cases in which this practice would be decidedly beneficial are those where the hepatitis is complicated with dysentery, or where it has supervened on the suppression of a hemorrhoidal flux; but in no instance should we be content with this mode of local depletion, as it is decidedly inferior to the application of leeches over the affected organ itself. In the dysenteric complication to which we have alluded, which is frequent in India, Mr. Annesley has found decided benefit from the application of leeches to the os coccygis.

The circumstances which point out that the general and local depletions have exercised a salutary influence on the suffering organ are the following:—the diminution of the inflammatory heat and of the oppression in the epigastrium and hypochondrium; the subsidence of the pain and tenderness; and, lastly, of the tumefaction, which is to be ascertained by the touch and by percussion of the lower part of the thorax and abdomen.* Blisters may be now employed, but their use must never be resorted to while the inflammatory fever continues high, and they must be removed as soon as the patient begins to feel their stimulus. (See Derivation.)

When the disease occurs in persons of a broken-down constitution, and particularly in those who have long indulged in ardent spirits, it is scarcely necessary to observe that we must be much more cautious in the use of the lancet, and trust principally to local bleeding and counter-irritation.

After the employment of general and local bleeding, the production of ptyalism appears to be the most powerful means of subduing the disease; but, as we stated before, the practitioner must consider this treatment as secondary to that which has now been pointed out. There can be no doubt that the establishment of a free salivation is commonly followed by a rapid subsidence of the local disease, but it is also true that the accomplishment of this is commonly difficult, and often impossible. The more severe the disease, the greater will be the difficulty of inducing ptyalism; and the best mode of insuring the kindly action of mercury will be to reduce the inflammatory condition of the organ as far as possible before its exhibition. We have before stated the remarkable fact that in cases of suppuration of the liver it has been found nearly impossible to induce salivation.

It would appear that the safest mode of using mercury in this disease is by the exhibition of large doses of calomel at long intervals of time; as it is stated upon high authority that the remedy is thus much less apt to irritate the bowels, and that a less quantity of mercury, when thus exhibited, will sooner affect the system than a greater quantity given in divided doses. Ten grains of calomel, combined with one or two of opium, may be given twice in the day, or a scruple dose at bed-time, as recommended by the East-India practitioners. It is stated that the combination of the calomel with some antimonial, such as the antimonial powder or James's powder, assists in the speedy production of ptyalism. But of one fact we feel certain, that if after the use of mercury for three or four days free ptyalism be not induced, the remedy should be omitted.

In the acute stage of the disease the patient must be kept on a strict antiphlogistic regimen. Effervescing draughts may be allowed, and will often be found to be of great benefit when they act on the skin or kidneys. Mild saline purges with emollient injections should be employed; and the patient may drink a solution of cream of tartar or tamarind tea; and if there be much restlessness, an anodyne draught or twelve grains of Dover's powder should be exhibited at night.

But if, notwithstanding these means, the tumefaction continues, and the fever assumes a remittent or hectic type, the formation of abscess is to be dreaded. Under these circumstances we can no longer push the strict antiphlogistic treatment. The patient's strength must be supported by farinaceous and gelatinous foods, and the exhibition of wine in moderation, with vegetable tonics, will be advisable; poulticing must be diligently employed over the region of the liver, and we must endeavour to bring forward the abscess towards the surface as much as possible; when, in the event of a perceptible and fluctuating tumour being formed, it will be advisable to give exit to the matter as speedily as possible. This, however, is an operation of the greatest importance, and must never be undertaken without a full knowledge of the pathological relations of this disease.

We have already alluded to the rarity of adhesions between the surfaces of the peritoneum in cases of acute hepatic abscess. It is obvious that for the success or safety of the operation the adhesions of the peritoneum is a necessary condition; for in the event of their not existing, the matter will make its way into the peritoneal cavity, defeat the object of the operation, and almost inevitably destroy life. To obviate these difficulties, Dr. Graves has proposed a mode of proceeding which has been repeatedly acted on with success in the Meath Hospital. It is, without question, a most important addition to the surgery of the abdomen. In the fourth volume of the Dublin Hospital Reports this eminent and scientific physician has published a case of hepatitis, in which, notwith-

* See article Abdomen, Exploration of.

standing the employment of active measures, evidences of suppuration occurred. There was no distinct pointing of abscess, so that it was judged impracticable to perform any operation which could reach the contained matter. Under these circumstances Dr. Graves, reflecting on the fact that certain deep-seated collections of matter may be induced to point towards a situation in which the resistance of the integuments and fascia is removed, proposed that an incision should be made over the most prominent part of the tumour, and carried through the abdominal muscles, so as to reach without dividing the peritoneum. This wound was kept open by plugs of lint, and poultices were applied over it. In a few days after a fit of sneezing by the patient, puriform matter in great quantity broke through the wound. The discharge continued copiously for a number of days, and the patient recovered perfectly.

We have since witnessed two instances where this operation proved successful. It would appear that it not only acts on the principle of removing resistance in a particular point, but also by inducing adhesions immediately below the wound, in all probability the result of its immediate irritation. In a case where numerous abscesses existed, and in which this operation was performed over the most prominent part, we found on dissection that the only point of adhesion of the whole peritoneal surface was that immediately below the wound, and corresponding exactly to its extent. Here recent coagulable lymph was effused, so that there can be no doubt that, had the patient lived longer, the contents of this abscess at least would have been evacuated through the external opening. The operation has every thing to recommend it; it is perfectly safe, productive of no distress to the patient, prevents the chance of effusion into the abdomen, and has been *proved* to be efficacious.

In a case of extensive and chronic hepatic abscess with great attenuation of the integuments, we proposed the performance of this operation; but it was determined by the attending surgeon to try the operation of a caustic issue in place of that proposed by Dr. Graves. After the separation of the slough, the matter did not shew any disposition to escape. A small valvular incision was then made through the ulcer, which gave exit to a few ounces of puriform matter. This operation was immediately followed by excruciating pain in the abdomen and the most violent peritonitis, evidently arising from the escape of matter into the cavity, and proving that in this case the operation of the caustic had failed in producing adhesions.

When the abscess makes its way either externally or into the lungs or digestive tube, the strength of the patient must be carefully supported by light and nutritious diet, wine and tonic medicines, according to the circumstances of the case. The mineral acids may also be exhibited in the different tonic infusions, such as gentian, calumbo, or cinchona. Attention must be paid to the bowels; and it seems not impossible but that a gentle and graduated pressure on the organ might accelerate the cure by inducing a closure of the opening after the matter has been evacuated. The opening of the abscess into the serous cavities appears at first sight a necessarily fatal occurrence; and we believe that it has been so in every recorded case, with a single exception. In the report of the Meath Hospital before alluded to, a case is recorded in which death from the peritonitis was apparently prevented by the opiate and stimulating treatment first proposed by Dr. Graves in certain cases of peritonitis. In the case also of double abscess of the liver which we have recorded in this article, the patient lived for eight days after the rupture of the second abscess into the peritoneum, and it was evident on dissection that the process of cure had commenced, the gelatinous effusion in many places having assumed an appearance of layers, and presenting large bloodvessels in its interior.

In the treatment of *chronic hepatitis* the first great indication is to remove all unnecessary stimulation of the liver or gastro-intestinal surface. Fermented liquors and all kinds of stimulating food must be inhibited, and the diet of the patient must consist of the simplest and most bland articles. The bowels are to be diligently but mildly acted on by gentle laxatives combined with mercurials, such as the hydrargyrum cum creta or the blue pill. In the commencement of the treatment we should apply every third or fourth day a dozen of leeches to the region of the liver, until we remove as far as possible the pain and tenderness of the organ. When this is effected, we should resort to counter-irritation, which must be persevered in for a considerable length of time. The best mode of proceeding is by the repeated applications of blisters over different parts of the organ, and by keeping up an eruption with a mild tartar emetic ointment. If these means do not succeed, and if there is no contra-indication, it will be advisable to affect the system gently with mercury, which may be done either by the exhibition of a small dose of calomel and blue pill combined with Dover's powder, at night, or by mercurial inunctions practised over the region of the liver.

Where it is thought unadvisable to use mercury, from the constitution of the patient, the nitro-muriatic acid and the nitrous acid have been strongly recommended. It would appear that the best mode of using these remedies, particularly the first, is by the external application, either by sponging the surface, or by the foot-bath. The following is the mode in which this remedy is recommended to be used by Mr. Annesley. A mixture is made of eight ounces of pure water with four ounces of the nitric and four of the muriatic acid, of the strength of the London Pharmacopœia. Of this solution from two to five ounces are to be mixed with about three gallons of water at the temperature of 96°, in a high and narrow vessel, and the feet kept immersed in it for about half an hour every night before retiring to rest. If the bath does not cause a pricking sensation in the parts, the next is to be increased in

strength. Advantage has also been obtained from sponging the trunk with a similar solution every night. The dilute nitrous acid drink has also been strongly recommended in cases of chronic hepatic affections. It possesses the property of producing a slight salivation, but is much slower in its operation than mercury. Taraxacum is a favourite remedy with many practitioners in these cases, but we are sceptical as to its efficacy.

After the disease has been subdued, vegetable tonics may be given to restore the digestive powers. The patient should wear warm clothing, and carefully avoid any error of regimen that may cause a return of the hepatic disease. In some obstinate cases we have known decided benefit from the use of the seton; and it is scarcely necessary to observe, that where the disease has supervened in a warm climate, removal to a more temperate region will be always advisable.

(William Stokes.)

LUMBAGO.—See Rheumatism.

LUMBRICI.—See Worms.

MALARIA AND MIASMA. The first of these words, and that which is now generally employed to designate a certain effluvium or emanation from marshy ground, we have adopted from the Italian. It is framed from the coalescence of the words *mala* and *aria (bad air.)* Miasma is a Greek word (μίασμα, from μιαίνω, *inquino, polluo,)* signifying originally contagion or pollution, but now with the occasional adjunct, marshy, not unfrequently applied to the same effluvium or emanation.

We infer the existence of the matter designated by one or other of these terms, as we do that of contagion in cases of disease which do not furnish a material transferable by inoculation, from certain effects on the animal economy; and we trace its origin to marshes from its having been observed, for a series of ages, that such effects are produced only in the vicinity of marshes, or at least are more abundant where vegetable matter and water are so situated with respect to each other, that a chemical reaction between them is possible. The observation of centuries having rendered us well acquainted with certain effects of malaria, we now reason conversely; and when we perceive the more familiar of them, particularly intermittent and remittent fevers, we infer its existence, and endeavour to discover its sources, which may not be very manifest.

The chemical and physical properties of malaria are unknown to us; the experiments which have been hitherto performed to illustrate its nature, or even to discover its presence, having furnished very unsatisfactory results. The air collected above the marshes of fort Fuentes was found by Gattoni as pure as that at the summit of Mount Leguone, if not more so; and M. Deseye obtained in the most confined marshes as on the most exposed hills, 78 parts of azote, 21 of oxygen, and one of carbonic acid, from an analysis of the air. It is true that MM. Thénard and Dupuytren found that the carburetted hydrogen gas disengaged from marshes left in the water through which it was passed a peculiar and very putrescible matter; and M. Julia discovered that dew gathered in the neighbourhood of marshes contains, likewise, a matter capable of fermentation; but there is no evidence that these substances are malaria; nor, were they proved to be so, do we know any thing of their chemical properties but their capacity of undergoing the putrefactive process. Even the very obvious question, whether malaria is always one and the same, or a multiplicity of marsh-poisons exist, is one which the present state of our knowledge does not enable us to answer decidedly. It has been argued, that as the existence of such a poison is known only by its effects on the constitution, a variety in these effects should be deemed evidence of a difference in the poison. But it may be remarked that the diseases which are reputed to originate from malaria pass in the same subject into each other,—intermittents, for instance, into remittents, and inversely; and that, of a certain number of individuals residing in or merely visiting the same place at the same time, and consequently exposed to the same morbific cause, some are attacked with one form of fever, others with another. And we know that diseases certainly derived from one and the same poison, such as small-pox, exhibit great diversity of character in different persons. These circumstances favour the opinion that there are no differences in the effect of this poison which may not be explained by a difference in the dose, or of the constitution on which it acts, or by the influence of certain agents, such as temperature, which modify its operation. The fact most in favour of a multiplicity of poisons is the occasional prevalence of one form of malarious disease, yellow fever for example, in the same situation for months, to the exclusion of all others. But as this occurs only under high temperatures, which at once promote the evolution of the poison, and modify the individual habits on which it operates, we would not consider it to furnish conclusive evidence, that the poison acting in this case is specifically different from the malaria which produces other forms of marsh-fever.

From what we have said on this obscure branch of our subject, it will be tolerably manifest that on the questions of the nature and simplicity or variety of malaria we possess no satisfactory information whatsoever; and that the legitimate objects of our present investigation are its sources, the laws of its propagation, the extrinsic circumstances which modify its influence, its effects on the animal economy, and the measures to be adopted to guard against these effects.

Though marshes, whether salt or fresh, are prolific sources of malaria, especially in a certain stage of the drying process under a hot sun, this poison is the product besides of various sorts of soil, to which the term marsh is by no means applicable. In the warmer regions of the earth those collections of low and dense brushwood, or of reeds and grass, which are

called *jungles*, are so familiarly known to be productive of malaria, that jungle-fever is as common a name for malarious disease in southern latitudes as marsh-fever is in Europe; and in the warmer regions of Asia, Africa, and America, even the larger and more open woods generate the poison under certain circumstances. Grounds which are alternately inundated and drained for the cultivation of rice, whether in India or Europe, are found so injurious to the health of the cultivators and the neighbouring inhabitants, that by some governments, that of Russia for example, this species of cultivation has been prohibited. Wet meadow lands, especially in warm climates, and in temperate ones during seasons of unusual heat, have been proved to be sources of malaria; at least agues have been observed to prevail in districts in which no assignable cause for them existed but lands of this description. That the half-wet ditches of fortifications may produce malaria was shewn by the result of filling up those of Bourg-en-Bresse, by which process those fevers ceased which had previously so affected the inhabitants, that one-half of them were incapacitated from any occupation for a third of the year. The mud which is left by the drying of extensive ponds or marshes by the summer's heat, though invested at the time with no growing vegetation, but probably containing vegetable and likewise animal recrements, is capable of furnishing this poison. Lakes, especially if situated in flat countries, are indirectly sources of it, not by the moisture of their immediate margins only, but likewise by imparting a degree of the same quality to the adjacent country. Considerable portions of Hungary and tracts of land in France are rendered insalubrious from this cause. The mud left by the retiring tide in sea-ports and estuaries is productive of malaria in hot climates, as is evinced by the fevers with which the crews of boats are attacked in such situations; and we have seen reason to think that in certain seasons they are not perfectly salubrious in our own. The felling of woods, by which process land previously shielded from the sun's rays (and consequently damp) is exposed to their influence, is often followed by the prevalence of malarious disease in the district in which it is performed. Turning up lands which have long lain in pasture for the purpose of cultivating them is mentioned both by Volney and Rush as productive of malaria and its consequences. In the West Indies this has been found to be a very dangerous operation, Cassan describing it as sometimes producing fevers which resemble an absolute plague, the labourers even dying on the spot if they attempt to remain at night on the ground which they have broken up during the day.*

The decomposition of vegetable matter in other circumstances than in connexion with soil has frequently proved a prolific source of malaria. This is often exemplified by the very pernicious effects of steeping flax and hemp; and Rush and others mention examples of fevers originating from the decomposition of coffee, potatoes, pepper, and other vegetables. The sickliness of ships from the leakage of sugar in a damp hold, and the occurrence of a fever which committed fearful ravages on the crew of the Priamus frigate from the action of bilge-water on chips and shavings left in the hold from the repairs of the magazine, as mentioned by Burnett, may be referred to the same class. Neglected sewers and drains have proved under a high temperature to be productive of fever by generating this poison.

If the preceding enumeration of circumstances under which the production of malaria takes place be examined, it will be found that vegetable matter and moisture are present in all the examples, and that animal matter is so occasionally. It is a proper subject of enquiry, and one which has given rise to some controversy, which of these elements are essential to the generation of the poison, and under what conditions those which are essential should exist to possess the power of producing it.

With regard to water, it seems ascertained that its presence is necessary, if not at the surface, certainly below it; but that the quantity in the former situation should not be large. Many circumstances tend to prove that for the production of malaria only a small proportion of water should exist in any situation. It is remarked by African travellers, that in that country the evolution of malaria commences immediately on the falling of rain, and that of this the inhabitants are so conscious that they then retire to their houses, and endeavour to exclude even the least access of air. As the rains continue and the ground becomes thoroughly wetted, the sickness abates, to be renewed with greater violence on the retiring of the rains, and the ground becoming dry. In the case of inundations, it is at their subsidence that sickness prevails, as was exemplified by the mortality among our troops under such circumstances during the Burmese war. In temperate climates, a marsh, the whole surface of which is thoroughly wet, is comparatively innocuous; but if partially or entirely dried by the summer's heat, it becomes extremely pestilential in autumn. Dr. Ferguson, a writer whose extensive opportunities have been aided by great power of observation, has furnished us with many instances, we cannot so justly say, of the small degree of moisture as of the excessive dryness which produces malaria in its most intense degree. "The army," says this writer, "advanced to Talavera through a very dry country, and in the hottest weather fought that celebrated battle, which was followed by a retreat into the plains of Estremadura, along the course of the Guadiana river, at a time when the country was so arid and dry for want of rain, that the Guadiana itself and all the smaller streams had in fact ceased to be streams, and were no more than lines of detached pools in the courses which had formerly been rivers; and there they suffered from remittent fevers of such destructive malignity, that the enemy and all Europe believed that the British army

* Macculloch on Malaria, p. 112.

was extirpated. The aggravated cases of the disease differed little or nothing from the worst yellow fevers of the West Indies; and in all the subsequent campaigns of the peninsula, the same results uniformly followed, whenever, during the hot season, any portion of the army was obliged to occupy the arid encampments of the level country, which at all other times were healthy, or at least unproductive of endemic fever."* The writer can vouch from personal observation for the accuracy of this description; and he has repeatedly observed that cases of fever and ague abounded in parts of Estremadura so remote from the Guadiana or any stream, that no influence from visible water or dampness could be supposed to have a share in their production.

The following example taken from Dr. Ferguson's paper is strongly illustrative of the same facts, the effects of concealed water in producing the poison. The approach to the town of Ciudad Rodrigo is through a bare, open, hollow country, that has been likened to the dried-up bed of an extensive lake. Upon more than one occasion, when this low land, after having been flooded in the rainy season, had become as dry as a brick ground, with the vegetation utterly burnt up, there arose fevers among our troops, which, for malignity of type, could only be matched by those before mentioned on the Guadiana.

It will be readily understood, that though the surface of the soil which produces fever may appear dry or even burnt, yet as its occurrence takes place after rains, there is no proof that the presence of moisture is not necessary, but evidence of the very reverse, though it is shewn that the dampness need not exist on the surface. The nature of the subsoil,—its being, for instance, a dense clay, which by preventing percolation may detain the water within a short distance from the ground,—has probably some influence in engendering sickness; but there are many facts which prove that an impermeable subsoil is by no means essential to the production of the poison. The leeward shore of Guadaloupe, Dr. Ferguson informs us, so far from being impermeable, is a remarkably open and pure one, being mostly sand and gravel, altogether without marsh in the most dangerous places; yet it is inconceivably pestiferous throughout the whole tract. The soil of Walcheren, too, of the pestilential nature of which we have had such melancholy experience, is sandy, or a mixture of clay and sand.

These examples tend to confirm, so far as the water is concerned, the law of Dr. Ferguson, that the only condition indispensable to the production of the marsh poison on all surfaces capable of absorption is the paucity of water where it had previously recently abounded; a rule, to which he assures us there is no exception in climates of high temperature. It ought at the same time to be remarked, that though the formation of malaria is perfectly compatible, as the writer can testify from personal observation, with the degree of superficial dryness described by Dr. Ferguson, it may likewise consist with a degree of manifest moisture.

The necessity of the presence of vegetable matter has hitherto constituted an important part of the creed regarding malaria, but this necessity is questioned in the paper in the Edinburgh Philosophical Transactions, to which we have so often adverted. We have already mentioned Dr. Ferguson's opinion, that the only essential requisite for the formation of the poison is, that water should be absorbed by soil and then exposed to speedy evaporation; and the following example is given of the apparent absence of vegetable matter from a situation abundantly productive of malaria. "In Spain, during the month of May 1809, which was cold and wet, the army remained healthy; but in June, which was remarkably hot and dry, marching through a singularly dry rocky country of considerable elevation, several of the regiments bivouacking in hilly ravines which had lately been water-courses, contrary to the advice of officers who had served in the Mediterranean, several of the men were seized with violent remittent fever, (the first that had shewn itself in the march,) before they could move from the bivouac the next morning; and this portion of the troops exclusively were affected with this disorder for some time. In this instance, the half-dried ravine having been the stony bed of a torrent, in which soil never could be, the very existence of vegetables, and consequently of their humid decay or putrefaction, was impossible, and the stagnant pools of water still left among the rocks by the watercourse, and near which these men encamped, were perfectly pure. Yet this situation proved as pestiferous as the bed of a fen." Even in this situation, which furnishes the strongest argument that could be adduced for the author's departure from the established creed, it would perhaps be difficult to prove the total absence of vegetable matter, not only from the surface of the ravines, but beneath the rocky surface; and certainly there exist many facts which prove that vegetable matter is in the highest degree favourable to the production of malaria, if not essential to it. These are, the universal presence of such matter where the poison is generated, the cases adduced by Dr. Ferguson and similar ones excepted, if they are to be regarded as exceptions; the pernicious effects of the steeping of hemp and flax, for we presume it will not be argued that in this case the mere evaporation of the water, independently of the vegetable matter, would produce the poison; a similar result from the leakage of sugar and the decomposition of coffee, potatoes, pepper, &c., and the fever which committed such ravages on board the Priamus frigate from the action of bilge water on the chips and shavings left in the hold. A similar argument may be deduced from the wholesomeness of peat-bogs, which seem as well calculated as any marsh to produce malaria, excepting that the vegetable

* On the Nature and History of Marsh Poison, by William Ferguson, M.D., &c. (from the Transactions of the Royal Society of Edinburgh), Edinburgh, 1821.

matter they contained being in a subcarbonized state, is not susceptible of decomposition. Since there is no reason to think that the evaporation of mere water will produce the poison, we are compelled to conclude that, if there was no vegetable matter present in the cases mentioned by Dr. Ferguson, some influence from mere terrestrial soil gave rise to the effects which are usually owing to the presence of such matter.

The necessity of the putrefaction of the vegetable matter present when malaria is produced, is a different question from that which we have just considered. In by far the greater number of cases in which this poison is generated, there is no offensive smell whatever; it is true that a marsh or other source of malaria may be at once noisome to sense and pestilential, but it is frequently the latter without being the former. Although it has been shewn that vegetable decomposition is instrumental in the production of the poison, if not strictly essential to it, yet the circumstance of its being generated in abundance without there being any perceptible smell, and in situations so dry that vegetable putrefaction in the ordinary sense of the term seems impossible, appears to prove that this decomposition is either in degree or kind different from putrefaction, though the two may coexist.

Malaria is generated in so many instances in which animal matter does not exist, that we must conclude that the presence of such matter is not essential to the formation of the poison; whether, when present, it increases the quantity or modifies the nature of the miasma, does not appear to be ascertained.

Heat is the extrinsic agent most influential in favouring the production of malaria in soils and situations capable of engendering it—an influence attributable probably to the effect of a high temperature in favouring the chemical action between organized recrements and humidity, and likewise to its accelerating the formation of the aqueous vapour which appears to be the vehicle of the diffusion of the poison. Hence even the milder forms of malarious disease are observed only in seasons of a certain degree of warmth, rarely, for instance, arising in this country before the vernal or after the autumnal equinox; whilst the more intense degrees occur only in the higher latitudes, or, if seen in climates ordinarily temperate, it is during seasons of unwonted heat; and wheresoever they exist, their prevalence is terminated by the cold of winter. It has often been observed that a summer of unusual warmth, especially if occurring after a wet spring, causes intermittent and remittent fevers to reappear in districts whence they had long been banished by the improvement of agriculture,—an occurrence, of the possibility of which medical men should be aware; for when the malarious disease has made its visitation in the form of remittent, it has not always been discriminated from typhus, and confusion and controversies have hence arisen not very creditable to all parties concerned.

The branch of our subject now to be considered, the propagation of the poison, is one regarding which we possess a considerable degree of irregular knowledge, consisting rather of detached facts presenting various unexplained anomalies, than of groups of corresponding facts from which the medical reasoner can deduce fixed and determinate laws. As might be supposed, the effect of the poison is in general more intense in proportion to the proximity to its source. This is probably owing to the more condensed state in which malaria exists near to the spot where it is generated; and it is remarked that circumstances which favour its condensation add to the intensity of its effects. It appears to be on this principle that the vicinity of swamps is so much more pernicious in the evening or night than during the day. The influence of a high temperature in favouring the production of the poison has already been pointed out; but it appears that during the portion of the day when the temperature is at its highest, the mobility of the atmosphere is so great, and favours so much the diffusion of the poison, that it is comparatively innocuous near the spot where it is generated; but in the more quiescent state of the air in the evening, though it is less abundantly formed, it is infinitely more pernicious. Its effect at these times is aided probably by its finding a powerful vehicle in the mists which at night are observed to rest over low and marshy grounds. The more pernicious effect of the night-air in a pestilential country and season, however it is to be explained, is familiarly known, and is often exemplified by the fatality to soldiers of certain night-guards.

But to this general law, that malaria is more pernicious in proportion to the proximity to its source, there are important exceptions. In some instances it is found to affect places at some distance, especially if they are situated on an eminence, with the same if not greater intensity than those in the vicinity; thus the neighbourhood of Versailles is powerfully influenced by the marshes of St. Cyr; and at Neuville-des-Dames, above Chatillon on the Indre, fevers are more prevalent than close to the marshes where the malaria is produced. The stagnant water of Lake Aguano, we learn from M. Monfalcon, exhales deleterious effluvia, which are carried backwards to the north-east to two or three villages, and even to the convent of Comaldules, a league distant, and situated on a high mountain. But the most extraordinary instance of this kind is mentioned by Dr. Macculloch, as occurring in Malta; the malaria which is produced on the beach beneath a cliff producing no effect on the spot itself, while it affects, even to occasional abandonment, the village situated above.

In explanation of circumstances of this nature, of which it were easy to multiply examples, M. Monfalcon supposes that the aqueous vapours in which the marsh poison is dissolved are raised during the day by the heat and consequent expansion of the air, and are condensed and precipitated on the adjacent hills during the evening; whilst Dr. Ferguson conceives that so far from rising into the atmosphere, malaria has a peculiar attraction for the earth's

surface, along which it creeps so as to concentrate and collect on the sides of the adjacent hills. We doubt whether either of these explanations is very satisfactory, and think it probable that the explanation of these facts is to be found simply in currents of air which sweep the surface of the marsh so as to prevent the accumulation of the emanations there, and convey them in a state of condensation to the more elevated spots situated in the line of the atmospheric movements. The situation of certain elevated places, which have been powerfully influenced by marsh emanations, has frequently been observed to correspond with the direction of a manifest current of air which passed over the surface of a swamp. Chains of hills in Corsica and Italy, very far from morasses, but placed in their line, and in the face of a wind which carried to them their emanations, were entirely depopulated and rendered uninhabitable. Orlandi cites an analogous example:—the south winds passed over stagnant waters before arriving at some hills, the air of which they infected: these heights became salubrious only when Pope Paul V. had caused the marshes to be drained.

The distance to which marshy emanations may extend by gradual diffusion has been calculated by Monfalcon to be 1,400 or 1,600 English feet of elevation, and from 600 to 1000 in a horizontal direction. In Europe these limits, he supposes, cannot be exceeded; but in equatorial regions the activity of the poison is much more extended; and in the West Indies, vessels at the distance of 9,000 feet from the marshy coast have felt their baneful effects. But when winds are in operation, their influence may extend to much greater distances than those mentioned. The case of the convent of Comaldules, which was infected at the distance of three miles, has already been quoted: but we know not any facts which teach us the extreme limits to which the poison may be transported. The distance will probably be influenced if the ground be such as to preserve the poison in a state of condensation instead of allowing it to be diffused; thus, a current of air sweeping up a valley, at the mouth of which the surface is swampy, will convey the poison to a greater distance than it could reach in a more open situation. An instance of this kind occurs in Ceylon, where the poison is conveyed many miles inland up a valley, whenever the sea-breeze blows in such a direction as to cross the swamps on the shore and enter its mouth.

We should take but an imperfect view of malaria did we consider intermittent and remittent fevers its sole results. Besides these its more familiar effects, organic affections of the spleen, liver, and mesenteric glands; similar affections of the stomach and intestines; dropsy, apoplexy, palsy, and idiocy, as manifested in the marshy districts of Tuscany, and in the cretinism of the valleys of Switzerland, are the effects of its long-continued application. Cholera, dysentery, and diarrhœa are by many writers referred to its more brief agency, and there is reason to think occasionally with justice; intermittent neuralgia, there seems little doubt, is one of its effects, and to this formidable list some are disposed to add rheumatism, but the propriety of this seems doubtful. It is observed that the natives of marshy districts, who permanently reside in them, lose their whole bodily and mental constitution, contaminated by the poison they inhale. Their aspect is sallow and prematurely senile, so that children are often wrinkled, their muscles flaccid, the hair lank, and frequently pale, the abdomen tumid, the stature stunted, and the intellectual and moral character low and degraded. They rarely attain what in more wholesome regions would be considered old age. In the marshy districts of certain countries, for example Egypt, Georgia, and Virginia, the extreme term of life is stated to be forty; whilst we learn from Dr. Jackson, that at Petersburgh, in the latter country, a native and permanent inhabitant rarely reaches the age of twenty-eight. In the portions of Brittany which adjoin the Loire, the extreme duration of life is fifty, at which age the inhabitant wears the aspect of one of eighty in a healthier district. It is remarked that the inferior animals and even vegetables partake of the general depravation; they are stunted and short-lived.

By the progress of civilization, and consequently of agriculture, the domain of malaria is diminishing throughout the more enlightened portions of the earth. This is manifest in our own country, from many parts of which, where they formerly prevailed, agues have been banished. The draining of swampy lands; preventing in ponds or other damp situations the accumulation of putrid or putrescible vegetable or animal matter; and, in marshes situated near the sea, preventing by embankments the mixture of salt water with fresh, from which combination most pestilential emanations have always been observed to proceed, are the most efficient means of reclaiming malarious tracts, and consequently of preventing the production of the poison. But some lands are of so incorrigible a nature, the Pontine marshes for example, that the hand of man has hitherto been employed upon them in vain; and it is desirable to know, since we cannot prevent such districts from generating the poison, how its diffusion and pernicious influence may be in some degree checked. It is remarked that malaria has a peculiar attraction for certain surfaces, and that it is not disengaged from those to which it adheres, at least not in a noxious form; in other words, they do not constitute fomites. The attraction of the poison for trees is great; and it has repeatedly been observed that not merely a few individuals, but the population of whole cities, situated in the most swampy districts in the world, have owed their security to a screen of woods interposed between them and the marshes. Facts of this nature suggest very obviously the propriety of planting trees in the vicinity of irreclaimable swamps. The floors of dwellings are supposed to have a similar attractive power over the poison; and hence, in malarious districts, the second stories of houses are found to be more salubrious than the first; and if from circum-

stances the first floor must be occupied, some security is afforded by having the bed a few feet elevated from it.

Nutritious diet, and that kind of general regimen which is most conducive to good health, should be observed by individuals exposed to the operation of malaria; and they should be especially careful to avoid, if possible, the vicinity of swamps in the evening.

(Joseph Brown.)

MALFORMATIONS OF THE HEART.—Under this head we comprehend all those deviations from the natural mechanism or form of the heart which are developed in its original conformation, or in the progress of its early growth. They arise, for the most part, from an arrest or interruption in those successive changes which the heart undergoes from its first formation until it is adapted to support the double circulation of post-natal life; but, as in the case of other monstrosities, they sometimes consist of an irregular, and sometimes of a superfluous, development of parts.

1. *Defective malformations.*—As there is a period in fœtal life in which the heart does not exist, so there have been instances in which the constructive process has been at this period interrupted with respect to this organ; so that, whilst other parts of the body were more or less perfectly developed, the heart was entirely deficient; its place being sometimes occupied by a mere sac or a net-work of vessels, as in the zoophytes, and in other cases the communication between the arterial and venous system being direct. In nearly all the cases of *acardia* on record, the brain and spinal marrow were also wanting; but Andral* quotes an instance from the second volume of the *Répertoire d'Anatomie*, in which the nervous centres were nearly entire, but there was neither heart, nor lungs, nor large vessels. As these are cases more of physiological than of practical interest, we need not dwell longer upon them.

It has not been distinctly ascertained by observation that the heart of the embryo is ever quite of the simple structure of the heart of fishes: in the early stages of its existence, however, it differs only in having the rudiments of a septum at the apex of the ventricle, and probably at a more remote period it is quite simple, consisting of a single auricle and ventricle; and this condition remaining stationary until birth, constitutes a variety of malformation of the lowest order. Of this description we find the record of eight instances.† In these cases the aorta gives off one or more pulmonary arteries, and the pulmonary veins terminate either in the auricle or in the vena cava. Some of these infants lived for several days without any *apparent* irregularity or defect in the performance of their functions, except some dyspnœa and blue discoloration of the skin, which varied considerably in different instances and at different times. In Dr. Farre's case the skin was very pale, and with but slight lividity, while the action of the heart and diaphragm was excessive; and these symptoms are explained by the fact that the orifice of the aorta was much contracted, so that, while the system was ill supplied with blood, the heart and lungs were kept constantly engaged. Of the two cases related in the Philosophical Transactions, one lived ten days with no other uncommon sign than a purple skin; in the other this only occurred shortly after birth and again just before death, which happened on the eighth day.

The next gradation of malformation is that in which there are two auricles with one ventricle. Of this we have found only two examples recorded, the subject of one of which, quoted by Laennec from Kreysig,* attained the age of twenty-two years. This fact proves that, great as the anomaly in this case was, the body can better adapt itself to this sort of reptile-like circulation than to those malformations which greatly obstruct the course of the blood.

Nearly allied in effect to the preceding, although their more perfect structure would entitle them to a step higher in the class, are the cases of imperfections or perforations of the septa between the ventricle, and between the auricles.† Many of this kind have been described, in a considerable variety of combination. There is commonly a contraction of the orifice of the pulmonary artery, and in the fœtus born with this malformation the ductus arteriosus is either totally wanting, or imperforate. Some subjects of this malformation have survived for several years, (one reached twenty-seven,) but always in a state of great disorder, being affected with blueness of skin, faintings, &c. The foramen in the septum of the ventricle is always nearest to the base of the heart, and it is often so near the origin of the aorta or of the pulmonary artery, that the vessel communicates freely with both ventricles. These all appear to be instances of arrest of development, corresponding with the state of the fœtal heart in the early stages of its existence; and the disorder which they occasion in post-natal life is generally in proportion to the extent of the imperfection, but it is always greatly augmented wherever there is a contraction of the arterial orifices.

The last order of malformations from simple interrupted development or adaptation are those in which the heart retains, after birth, one or both of the peculiarities naturally destined

* Pathological Anatomy, translated by Drs. Townsend and West, vol. ii.

† 1. Phil. Trans. 1798, p. 2; 2. ibid, 1805, p. 2; 3. *Dr. Farre*, Patholog. Researches; 4. Ephem. Nat. Cur., Dec. 1, Obs. 40; 5. *Ibid.* Dec. 2, Obs. 44; 6. *Fleischmann*, Leichenoffnungen, 1815; 7. *J. F. Meckel*, de Monstrosa Duplicitate, 1815; 8. *Burns*, on Diseases of the Heart, p. 27.

* Vol. iii. p. 100.

† *Farre*, op. cit. p. 30, 27, 28; *Meckel*, Tab. Anat. Path. Fasc. 1. Fig. 1 and 2; *Senac*, Traité sur la Structure du Cœur, t. ii. p. 404; *Dr. Hunter*, Medical Obs. and Inq., vol. vi. p. 291-9; *Corvisart*, sur les Mal. du Cœur, pp. 276, 293, 298; *Bartholinus*, acta Hofniens. t. i. p. 100; *Abernethy*, Surg. and Phys. Essays; *Dr. Crampton*, Trans. Coll. Phys. Dublin, vol. i; *Dr. Hope*, on Diseases of the Heart, p. 468.

only for the fœtal state, the open state of the foramen ovale and of the ductus arteriosus. As the occlusion of these channels of auxiliary circulation is essential to the well-being of the perfect breathing animal, nature admirably contrives that the first respiratory act shall in normal cases effect this change, and the means by which it fulfils this end are worthy of attention. According to Meckel, there is little difference in thickness between the two ventricles of the heart at the time of birth, the left scarcely presenting any of that superiority which is so evident in after-life. In fact, it appears that before birth the right ventricle, through the ductus arteriosus, assists the left in the systemic circulation; and when the post-natal change takes place, there must be not only an additional outlet given to the blood from the right ventricle, but also an increase of power to the left ventricle, to maintain the aortic circulation, which now depends solely on it. A full and perfect respiratory act fulfils both these objects; by expanding the lungs it gives a free outlet to the blood from the right ventricle, and, by arterializing the blood which returns to the left ventricle, it stimulates it to such an increased energy of contraction as enables it, unaided, to supply blood through the system. This increased energy is soon followed by an increased thickness of the muscular walls of the ventricle, which gives a permanency to the greater power required in its important function. The ductus arteriosus, thus freed from the current of blood through it, contracts, as in the case of all obstructed or empty arteries, into an impervious cord. The progress of this contraction has been minutely described by Bernt as a test applicable to the investigation of cases of supposed infanticide.*

The obliteration of the foramen ovale is probably a much slower process, and one of less consequence, for its ordinary state at the time of birth is such that, unless there be considerable inequality of pressure between the auricles, it is sufficiently closed by its valves to prevent the passage of blood through it.

From these circumstances we are inclined to consider patescence after birth of the foramen ovale in most cases, and of the ductus arteriosus in every case of its occurrence, to be the result of loss of balance between the effective forces of the two sides of the heart at the time of birth. The ductus arteriosus stands in the same relation to both ventricles, that is, it communicates with the great artery proceeding from each: as long as these two arteries are filled with equal force, there will be no current in the duct; and such is the state under which, in natural cases, it contracts into an impervious tube. But if there be greater pressure on one end, whether from the pulmonary artery or from the aorta, a current must then pass from the stronger to the weaker side. Now the causes of such an inequality of pressure are various; and it will be worth while to point out a few of them, as we shall thereby gain a clearer understanding of the complicated pathology of several kinds of malformation. In several cases on record the open state of the ductus arteriosus has been found in conjunction with a manifestly contracted state of the orifice of the pulmonary artery, and in some with its total obliteration. Dr. William Hunter relates the case of a child born in the eighth month of gestation, which, after exhibiting a livid skin, dyspnœa, and violent palpitations, died of convulsions on the twenty-third day from its birth. On dissection, the pulmonary artery was found reduced to an impervious cord, whilst the foramen ovale and ductus arteriosus were both open. Dr. Farre gives the history of two similar cases, one of which died in a week, the other lived six months. In all these the muscular power of the right ventricle had become useless; in Dr. Hunter's case its cavity was nearly obliterated, and in both of Dr. Farre's a perforation of the inter-ventricular septum made the right a mere appendix to the left ventricle. The part which the ductus arteriosus bore here was important, for, open to pressure only at its aortic end, it must have supplied the place of the pulmonary artery, by conveying the blood in a retrograde course from the aorta to the lungs. The same thing occurs in a minor degree when the pulmonary artery is merely contracted at its orifice. If, on the other hand, the aortic orifice is contracted, so that the artery does not receive the due influence of the systole of the left ventricle, the pressure on the right end of the ductus arteriosus will be greatest, and a current will flow from the pulmonary artery to the aorta. Any obstruction to the circulation through the lungs would have a similar effect, and for the reasons which we have already observed to obtain in fœtal life.

Openings in the septum of the ventricle, when combined with decided contractions of either of the arterial tubes, we cannot but view as in most instances the effects of the latter; for it is a simpler idea, and one more consistent with the laws of development, to suppose that an obstruction, which, pathologically speaking, is of frequent occurrence, retains the current of blood in the course which it held in the early period of its formation, than to ascribe a perforated septum to some specific and inexplicable arrest in its natural development.

The most common combination of an open ductus arteriosus is, however, with considerable patescence of the foramen ovale; and we would still view this latter in the light of a cause. Any considerable direct communication between the auricles must, to some extent, frustrate the longer intercourse through the lungs; and from the blood passing thus directly in a venous state to the left side of the heart, two things affecting the balance of the circulation must result: 1. the left ventricle, not receiving its proper stimulus of pure arterial blood, does not contract with increased energy, as at the moment of birth it ought to do; 2. this defective force in the left ventricle occasions some stasis of blood in the pulmonary vessels; whence the pressure of the aortic extremity of the ductus arteriosus continuing to be less than at the

* Handbuck der Gerichtlich. Arzneikunde.

right end, the blood persists to flow through it as before birth, and its canal is kept permanently open.

2. *Irregular malformations.*—The next description of malformations are those which consist of a misplaced or erroneous position or attachment of parts in the heart, constituting the *qualitative* malformations of Meckel. Examples of transposition of the aorta and pulmonary artery are described by Farre,* Langstaff,† and Baillie.‡ The subject of one lived five months and died of small-pox; the surface was cold and extremely susceptible, and the skin blue, with incessant cough in any posture but on the right side. During the eruptive fever there was increased heat only in the head, the limbs and body remaining cold. The valve of the foramen ovale was found perforated with five holes; the aorta sprung from the right, and the pulmonary artery from the left ventricle. In Mr. Langstaff's case the child lived ten weeks with similar symptoms, and here both the foramen ovale and ductus arteriosus were open. In two cases related by Sir Astley Cooper, the pulmonary artery communicated with both ventricles, and gave off the descending aorta; the ascending aorta rose from the left and divided into the innominata, and the left carotid and subclavian; the foramen ovale was also open.

A remarkable instance of malformation is described by Dr. Holmes in the first volume of the Transactions of the Medico-Chirurgical Society of Edinburgh. The subject was a young man aged 21, who had from childhood been affected with palpitation, dyspnœa, blueness of skin, pain about the heart, and frequent faintings, with cold limbs. The foramen ovale was found open, and the right auricle, instead of opening into the right ventricle, communicated with the left by a large aperture, which was furnished with a tricuspid valve. The auricle was enlarged to the capacity of a pint. The right ventricle gave off the pulmonary artery as usual, and must have received blood only through an opening in the left ventricle, immediately beneath the aortic valves.

The valves of the heart have been found in an unnatural state, which many pathologists have considered to be congenital. Laennec describes a union of the laminæ of the tricuspid and of the mitral valves at points near their extremities, but leaving apertures through which a finger might be passed. In the same case the semilunar valves of the aorta and of the pulmonary artery were also adherent to one another. Small, smooth, round, or oval openings are occasionally met with in the different valves, which may be regarded as congenital; and Laennec met with a case in which holes of this kind had converted the tricuspid valve into a mere net-work. There have been noticed other irregularities in the valves, such as an inequality in their size, and a superfluity in their number.

3. *Superfluous malformations.*—The last order of malformations to be noticed are those consisting of excessive development. Well described examples of these are not numerous, nor do they bear any remarkable feature. The heart has been found with supernumerary auricles and ventricles, and even double the natural number. Meckel describes instances of these double hearts, all having occurred in double monsters.* Winslow met with one in a fœtus which was defective in the œsophagus and trachea. Andral has seen a heart with three auricles, and another with four ventricles. An appendicular auricle or ventricle is not uncommon: we have met with an instance of the latter. Supernumerary septa, partially or entirely separating portions of the different cavities, have likewise been described. The foramen ovale has been found closed in the fœtus;† and in one case of this kind there existed an unusual communication between the vena cava and pulmonary veins. Bertin quotes a case of a double arch of the aorta.

The pathological effects of malformations of the heart depend on two physical causes, an obstruction to the circulation, and an intermixture of venous with arterial blood. The first of these is probably the most important; for the latter, although decidedly injurious, does not appear to encroach so seriously on the functions of a body accustomed to its effects, as to prove fatal, unless when conjoined with material obstruction to the circulation. These two, moreover, produce and react on each other in a manner sufficiently interesting to merit a little consideration.

Some cases of single heart already noticed, prove that the free admixture of venous blood in the arteries is not incompatible with life, as the subjects lived for several days. There was in these cases, besides, some obstruction to the circulation, in the aorta, or in the pulmonary artery; the one being characterized by pallor, and the other by a blue discoloration of the skin: and it is a question whether, but for these impediments, life would not have been considerably prolonged; for the simplicity of the moving power would prevent any of that loss of balance which is so frequent a cause of obstructed circulation in the double heart. This loss of balance, or undue action of one compartment of the heart, is an almost inevitable consequence of any malformation which causes a mixture of venous with arterial blood; and if it be great, it will generally aggravate the evil effects of the malformation; whence, in such cases, the obvious tendency to progressive disorder. In the greater number of instances the right side of the heart suffers more especially. Naturally its task may be said to be lighter in post-natal life than that of the left side, but the various congenital irregularities of mechanism fall heavy upon it; whence, according to the observations of Louis, it is almost always affected with dilatation or hypertrophy. Thus in perforation of the septum of the ventricles, as well as in the open state of the ductus arteriosus with a free pulmonary artery, the

* Op. cit. p. 29.
† Lond. Med. Rev. p. 88.
‡ Morbid Anatomy, p. 36.

* De Monstrosa Dupl.
† Vieussens sur la Structure du Cœur.

right ventricle has to contribute to the aortic circulation as well as to maintain the pulmonary, whence it gradually assumes a more muscular structure than the left ventricle. The right auricle may suffer in a similar way from an open foramen ovale; but as the contractile power of the aurieles is but trivial in force, this malformation will scarcely produce great disorder without the addition of another cause, Such a cause is any obstruction to the circulation through the lungs; for example, a contraction of the pulmonary artery. Where this exists, the blood will not proceed so fast as it arrives; there is consequently an accumulation in the auricle, with an unequal pressure and a flow through the foramen ovale. But in the history of cases described, we find the worst complication of this malformation is with an imperfection in the tricuspid valve. This is illustrated in Corvisart's case of the postilion.* The man, aged 57, said to have been previously healthy, was attacked with blueness of skin, palpitation, dyspnœa, &c. after injuries from a carriage passing over him, and a violent blow on the epigastrium. From this time he suffered in various degrees, and in four years sank under the usual symptoms of valvular disease of the heart, accompanied by discoloration of skin. The right auricle and ventricle were found greatly dilated and thickened; the left auricle was also dilated, but the left ventricle was both thinner and smaller than natural. The foramen ovale was more than an inch in diameter, and the right auriculo-ventricular opening so much dilated as to admit four fingers, whilst that on the left side only admitted one; the mouth of the aorta was likewise contracted. Laennec ascribed the open state of the foramen ovale to this accident; but we think it more probable that this was congenital, and, as is often known to be the case, harmless in its effects until the period of the accident. The violence may have occasioned a rupture or dilatation of some portion of the tricuspid valve, so that it ceased to close the auriculo-ventricular orifice, whence regurgitation into the right auricle, and such pressure as to drive the blood through, and in time greatly to dilate the foramen ovale. We have said that an imperfect state of the tricuspid valve is the worst disorder of the mechanism that can complicate itself with an open foramen ovale; and the reason is, in addition to what we have just remarked, that the impulse of the right ventricle is propagated through the foramen ovale to the left auricle, and there opposes the course of the blood, which, during the systole of the ventricle, ought to flow into it from the lungs. It may be thus seen why in the above and in all similar cases on record, there has been an excessive oppression of the respiratory function. The contraction of the left ventricle and aorta was obviously the effect both of the small quantity of blood which the disordered mechanism of the right ventricle could propel into it, and also of the unstimulating quality of that blood.

We may remark, in conclusion, that every kind of malformation which leads to a mixture of venous with arterial blood, must, as we have before explained, occasion an obstructed circulation through the lungs, and consequently add to the labour of the right ventricle. Bertin ascribes the frequent occurrence of hypertrophy in the right cavities of the heart, in cases of malformation, to the more stimulating influence which arterial blood, obtaining entrance through the unnatural opening, exercises upon them.* Laennec thinks, however, that the pathological change results from the necessity imposed on the right cavities (naturally the weakest) of a more energetic action, in order to resist the impulse of blood flowing from the left side.† This opinion is more clearly supported by Dr. Hope, in his valuable work on Diseases of the Heart,‡ who remarks on the opinion of Bertin, that the obstructions in the pulmonary artery which so frequently prevail, would throw the current too much in the opposite direction, from right to left, to permit the entrance of arterial blood into the right cavities; and he considers that the greater labour thrown on the right ventricle in supporting the weight of the aortic circulation, is a sufficient cause for the changes in question. The dilatation in the same cavities is the generally acknowledged effect of over-distention; and Dr. Hope considers that this always depends on some obstruction to its course on the left.

M. Louis gives the following numerical comparison of the pathological changes in nineteen cases of congenital malformations.§

Contraction of the orifice of the pulmonary artery in ten; of the aorta in only one. Dilatation of the right auricle in eighteen, five of which were with hypertrophy, and two with attenuated parietes. Right ventricle simply dilated in five; simply hypertrophied in six; dilated and hypertrophied in four. Left auricle dilated in eight; hypertrophied in three. Left ventricle dilated in four; hypertrophied in two. Tricuspid valve more frequently diseased than the mitral, but neither often.

Symptoms. — Malformations of the heart sometimes give rise to very prominent and well-marked symptoms, whilst in other instances they have only been discovered by the scrutiny of the anatomist after death. When the disease is extensive, and particularly when combined with hypertrophy of one of the cavities or obstruction in some of the orifices, some or other of the following signs are always present:—discoloration of the skin, varying from a slight reddish purple tinge to a deep purple or livid colour, especially affecting those parts which are naturally red, as the lips, tongue, fauces, and nails, which are sometimes almost black;—considerable diminution of the superficial heat, with great sensibility to cold;—palpitation of the heart coming on in paroxysms, especially after exertion or mental emotion;—the pulse very variable, but generally irregular;—occasional syncope;—in children con-

* Op. cit. p. 279.

* Traité des Mal. du Cœur, p. 436.
† Dr. Forbes's Translation, p. 630.
‡ Op. cit. p. 463.
§ Archives de Méd. tome iii. Nov. and Dec.

vulsions;—respiration habitually short and difficult, with fits of severe dyspnœa, which sometimes occur periodically, and after tormenting the patient for a variable period, are terminated with sighs and yawning;—torpidity of bodily habit, with irritability of temper;—severe pain of the head, vertigo, and defective vision;—atrophy, and a disposition to hemorrhage.

It was, until lately, a general opinion that the blue discoloration of the skin, or *cyanosis*, as in its greater degrees it is termed, is a characteristic sign of malformations of the heart which occasion the mixture of venous with arterial blood. This has been called in question in consequence of some cases described by Fouquier, Meckel, and Breschet, in which there existed malformations of this description without cyanosis; and on the other hand an example of cyanosis reported to the Academy of Medicine by Dr. Marc, where no organic disease of the heart, congenital or otherwise, was discovered on dissection. Another opposing argument has been urged by Fouquier, founded on the alleged fact that the blood in the arteries of the fœtus is dark without there being any blueness of the skin. Bertin* and Ferrus† have accordingly taken up the idea that the mixture of venous with arterial blood has no necessary connection with cyanosis, but that a stagnation of blood in the capillaries, generally dependent on an obstruction to the circulation in the heart, is the universal cause of the blue discoloration in question; and that the presence of this sign in malformations arises only from the impeded state of the circulation which generally attends them. This view appears to us at least quite as inconclusive as the former one; for we know that the circulation is impeded in almost every considerable disease of the heart or lungs, often without any cyanosis, and never (except, according to Laennec, in emphysema of the lungs) with that degree which is seen in congenital malformations. Moreover, the cases before quoted (from Farre, Langstaff, and Baillie) prove that in some most remarkable examples of constant discoloration of the skin, there were no apparent obstructions to the course of the blood.

We confess that we are still inclined to prefer the old opinion, modified in some degree according to the objections which the foregoing facts bear against it. With respect to Fouquier's argument, it may be stated that the fact of the blood in the fœtal arteries being dark is denied by later writers;‡ and it is familiar to accoucheurs that a newly-born infant is often livid or purple till it cries; crying is a proof of complete respiration, and then this colour gives place to a general redness. The absence of cyanosis in the cases of malformations before named was conjoined with a general pallidity of the surface; and it would seem, therefore, that defect of blood in the capillaries was the reason of the absence of a dark colour. It must be remembered that in many cases we often see the countenance and surface so pale that the colour of the blood obviously does not affect them; and it is not to be expected that blueness of the skin should be apparent in a greater proportional number of cases of malformation with free communication between the cavities than is the redness of the same parts visible in other subjects. Dr. Paget well observes that, "as the colour of any organ is partly derived from the blood it contains, a change of the colour of the blood must affect the colour of the organ;" and we can conceive no cause of this change more efficient than one which throws black blood into vessels which naturally contain it of a visible red. To assert that malformations are the only source of cyanosis would be to take an occasional for a proximate cause: in the collapsed stage of cholera, in asphyxia, and in emphysema of the lungs, we find a similar discoloration of the skin; and in these the same proximate cause must be recognized, the presence of black blood in vessels which ordinarily convey red. In these cases, as in the former, and as also in the healthy state, an additional obstruction, the effect of posture, exposure, or exertion, will be followed by a still further injection of the capillaries, and where an ordinary subject would become florid and flushed, these assume a deeper and more livid hue.

In most of the cases accurately described, a diminished temperature with chilliness of the surface has been remarked in those malformations that are attended with blueness of the skin. Dr. Farre submitted some of these to the test of the thermometer, and found the internal heat to be as usual, but that of the surface depressed in various degrees according to the exposure of the part. In some instances, when a limb has been exposed, it has been observed to become quite cold and livid. The patients commonly like to approach the fire at all seasons, and require an unusual quantity of clothing; when exposed to cold, especially if accompanied with wind, they sometimes become quite torpid and incapable of exertion. This is well instanced in a case described in Dr. Hope's work.*

The palpitation, syncope, and dyspnœa may generally be said to be more frequent than in any ordinary disease of the heart; but the paroxysms are not often so severe as in the advanced and aggravated forms of valvular disease: nevertheless, when verging towards a fatal termination, they scarcely differ in symptoms from valvular disease, with which in fact they are frequently complicated. The greater blueness of skin, when present, is the most decisive distinction. It would appear that the intermittent form of the dyspnœa depends here, as in other diseases of the heart, in some measure on a sympathetic spasm, excited in the bronchial tubes by the engorgement of the right cavities of the heart. The relief of these exacerbations by deep sighing and yawn-

* Mal. du Cœur, p. 437.

† Dict. de Méd. art. *Cyanose*.

‡ Bostock's Physiology, vol. ii. p. 109. Holland on the Physiology of the Fœtus, &c. p. 154. See, also, an excellent inaugural dissertation on Malformations of the Heart, by Dr. Paget, Edinburgh, 1831.

* Op. cit. p. 470.

ing, which favour the oxygenation of the blood and its transmission through the lungs, is more remarkable than in other asthmatic diseases. The torpidity of habit, as well as the vertigo, acute headach, and defective vision frequently present, must be ascribed to the influence of the venous blood circulating through the brain; and the same circumstance renders the nutritive process inactive, whence the subjects are commonly thin and slender.

We have no reason to think that malformations of the heart are characterized by any distinctive physical signs; but the accompanying organic changes may be recognized by their usual signs, which are ably stated elsewhere. (See Auscultation, Hypertrophy, Dilatation, and Diseases of the Valves of the Heart.) Contractions of the arterial orifices would be attended with a hissing, grating, or bellows murmur during the first sound; and a similar sound, more profound or remote, would probably accompany regurgitation into either auricle. In a case related by Dr. Hope, in which there was a perforation through the septum of the ventricles with a contraction of the pulmonary artery and open foramen ovale, there was a loud, superficial, hissing, bellows murmur accompanying the first sound. Dr. Hope considered the superficial character of this sound to indicate an obstacle in the passage of blood from the right ventricle. It is probable that a free communication between the ventricles might occasion a murmur with the first sound; but an open foramen ovale can scarcely be expected to have any such effect, as the flow of blood through it, if there be any, would scarcely be forcible enough to become sonorous. Corvisart* perceived, in one instance, a peculiar *bruissement* in the region of the heart, sensible to the hand. One of the aortic valves was absent.

Treatment.—Although it is obvious that the cure of malformations is beyond the reach of art, yet, as we have seen that their fatal tendency depends greatly on their complication with other pathological conditions, the treatment which is adapted to retard the progress of these will generally delay the fatal subversion of the functions to which both, when united, inevitably proceed. Anything which causes an additional embarrassment to the breathing, or in any way injures the balance of the circulation, will not only produce a temporary disorder in fits of palpitation or asthma, but will permanently aggravate the organic mischief by increasing the attendant dilatation or hypertrophy, and by favouring the habitual passage of blood through all devious and unnatural channels. Hence it becomes of the utmost consequence to watch those patients who are supposed to labour under congenital disease of the heart, and to keep their functions as near as possible on a balance; forbidding every sudden or violent exertion or mental excitement; enjoining a moderately nutritive but light diet of the most easily digestible kind; carefully excluding from cold a frame so susceptible to its effects; and, if necessary, aiding the excretory functions by the occasional cautious administration of appropriate medicines. The defect of the proper arterial quality of the blood is probably more or less felt by all the organic functions; in none, perhaps, more than in the secretion of urine, which is generally turbid and scanty. Hence the artificial aid of diuretics, especially colchicum, with nitre and other salts, may prove serviceable. Dr. Farre supposes that the skin may be made in some measure to compensate for the defective action of the lungs in the process of arterialization; and although the experiments of Majendie and others scarcely permit us to believe that the process of oxygenation goes on at this surface, it is probable that, by keeping it in a more perspirable state, more relief may be afforded to the pulmonary and cardiac congestion than by any other measure. The warm bath, partial or general, has been found of great effect in relieving the paroxysms of palpitation and dyspnœa occurring in these complaints; and the application of warmth by gentle frictions with hot flannels is a measure of some utility, and one which may very often be resorted to. In individual cases relief may often be procured during the paroxysms by particular postures; it is important to try to discover these in each case, but no general rule can be laid down.

From what we have before remarked, it may be deduced that malformations may occasionally take their origin at the time of birth from a defective state of the respiration; and we do not deem it quite useless to suggest the expediency of watching this function in the newborn infant, and of exciting it, if any lividity of the skin should show it to be imperfect, through the various channels of sympathy that are familiar to physiologists, such as by sprinkling the face and neck with cold water, or tickling the nostrils with a feather; or, if these fail, by artificial inflation of the lungs.

(C. J. B. Williams.)

MANIA.—See Insanity.

MEASLES.—See Rubeola.

MEDICINE, PRACTICAL, PRINCIPLES OF.—In the article Disease was necessarily presented to the reader a long catalogue of evils, which, however, man has not been left unprovided with the means of meeting or of combating; some of them he has been enabled to mitigate, and others have quite disappeared before his increasing knowledge and skill. In the same manner as beasts of prey and venomous and offensive reptiles lose their ferocity, or recede in all parts of the earth, and finally disappear, before the advancing civilization of mankind, so, also, it would seem, do the diseases which prey upon health and life become modified by the resources of man's ingenuity, or disappear before his discoveries and growing wisdom; and when philosophers perplex themselves concerning the origin of evil, they little suspect how many of the physical as well as moral ills of humanity are destined to disappear before the sagacity, the research, and the enlarged virtue of the species. The great king-

* Op. cit. p. 276.

doms of nature have each already and amply contributed to reward human industry by remedies for the maladies of men; placing within man's power various substances which, taken in certain quantities, or externally applied, produce beneficial effects on the frame when it is labouring under disease; that is to say, when its functions are disordered, or the structure of its parts is changed or impaired. Experiencing the effects, also, man has learned how to avoid many of the causes of disease. His reason to a great extent protects him; and would do so more effectually but for the force of habits formed before his reason acquires strength. By regulating the impressions made on the body and mind by some of the actual agents of disease, he has even converted them into occasional remedies; and, the practice of medicine becoming more comprehensive in its scope, and no longer confined to the administration of drugs or to the mere *cure* of maladies, has so far advanced as to include the means of preserving health unbroken in a great variety of circumstances, by which the mind and body are liable to be temporarily affected in the course of life.

These agents of disease have already been spoken of, as being external to the body or inherent in it: the air which surrounds it; the food which supports it; the exercise which promotes all its actions; the sleep which, after labour, refreshes it; the mind which governs and directs its voluntary actions and ennobles it; and all the inherited or congenital peculiarities to which it is liable, as well as all the accidents to which it is exposed in its progress from the helplessness of infancy to the second helplessness of old age.

When by the undue impression of any of these agents their morbid effects are produced, such effects consist of disorder in some of the corporeal actions, of which the secondary results have been pointed out as very various. If there is, first, some increase or some decrease of the energy of the nervous or of the vascular system, exhibited in one function, in more than one, or in all, there follow changes in the structural condition of the parts affected; whilst new formations seem produced by peculiar modifications of action, distinct from mere depression or augmentation of vital power. Certain laws of sympathy, of relation, and of conversion, have also been detected, which were comprehended in our general notice of disease; and by reasoning from the evident object of some morbid actions, an attempt was made (professing, certainly, little novelty) to establish the probable final cause of all.

If any endeavour to attain to general principles in medicine be thought worthy of encouragement, they must be sought, it appears to us, by pursuing the route thus marked out; by a review of the causes of disease, and of the forms which it assumes; of the results to which it leads, and of the general objects to which it tends. It is agreeable to believe that medicine is now cultivated by many labourers in a spirit so philosophical, that the young student who falls into the vulgar error of considering such a general view superfluous, may confidently be told that he will live long enough to see and to regret his mistake.

Before the forms and products of disease had been so minutely investigated as to admit of being detailed with any approach to exactness, the ancients were led, by the simple observation of the *causes* of disease, to adopt natural measures for restoring the equilibrium of a function disturbed. If a man became ill from exposure to a hot sun, he was cured by a cool regimen; and if from exposure to cold, a return to health was promoted by warmth, and sometimes by mere insolation. If too much food disordered him, he was relieved by abstinence; if too much exercise or labour had exhausted him, he was renovated by rest. Thus *contraria contrariis medentur* became one of the first maxims, or one of the first general *principles* in medicine. As knowledge advances, the general principles of treatment acquire a wider and a firmer basis; but this first principle, to which the ancients in their regulation both of treatment and regimen paid especial regard, has in some periods of medical history been departed from with disadvantage, and sometimes, and even recently, been utterly denied. The wise physicians of Greece saw nothing unreasonable in the belief that when the system was disturbed by a burning fever, the body was struggling to produce coolness; and when they beheld the frame shaken with a chilling ague, they concluded that an effort was making for that restoration of bodily warmth which they found to follow the cold fit: nor, probably, was their conclusion incorrect. Without neglecting these observations, the modern physician has much more to do. He endeavours to ascertain in what consist the first movements of nervous or vascular disorder, and, in any disease presented to him, what actual change is already produced, and what further is threatened; so that his measures may be properly directed, and with a promptness proportioned to the occasion; for he has not only to remove effects obviously induced and existing, but to check, suspend, and stop the less palpable actions out of which the structural mischief grows.

He knows that there is in many or in all functional disorders, and even in some which have gone on to the production of structural change, a tendency to salutary terminations. In the paroxysm of an intermittent, he can admit that the successive stages seem intended to effect the quiescence in which they terminate. Deep-seated abscesses, for instance in so large and important a viscus as the liver, shew in their progress a tendency to seek or form communications by which the purulent collection may be carried away with safety. Almost all, perhaps all, the irritations of phthisis are the concomitants of an effort, always going on, for the riddance of the lungs from them; and the most deplorable changes in the course of scirrhous affections appear to be but the attempts of nature to break up or to separate from the body a portion so peculiarly diseased that its continued attachment to the system is inconsistent with

the continuance of life. Admitting that these are the best means of relief which the laws of disease allow, and seeing, in too many melancholy examples, the inefficiency of the laws to the salutary end proposed, he cannot but draw the conclusion that *art* was intended to step in and supply what is wanting; and that it may often direct the actions thus originated, and sometimes most beneficially counteract them by others artificially excited. To know when to do this is an essential part of the wisdom of practical medicine, and a knowledge of the means of doing it is another of equal importance.

As a general rule it may be stated, (and the highest authorities might, if necessary, be quoted for it in every age of medicine,*) that wherever it can be safely done, the natural tendency to cure, supposing it to be evident, is to be followed. In very slight disorders no benefit arises from interference. A slight cold, or a slight diarrhœa, for example, will cure itself by the discharge which constitutes one of the first of the effects of the disorder. A slight hemorrhage, or a slight external inflammation, may also be left to itself; but for a more violent or continued hemorrhage, although its object be apparent and salutary, we must substitute means which are capable of giving equal relief, and are at the same time more under our control. A more severe inflammation, also, or even the slightest if seated in a part not exposed to sight, can seldom or never be permitted to proceed uncontrolled; because inflammation seldom terminates without some product which may excite secondary inconvenience,—in other words, seldom terminates simply in what is called resolution, but either, when continuing, or when it attains a certain vehemence, ends, by a necessity arising from the laws of disease, in copious effusion, or in suppuration, or in the thickening or other alteration of parts, or the agglutination of opposite surfaces, or in ulceration, or mortification; the inconvenience or the danger of which effects in the head, the chest, the abdomen, or the articulations and extremities, are such that art must be vigorously employed to arrest the progress of the first functional disorder, and prevent the advance to those new formations or structural changes which, albeit they are natural methods of cure, are methods inconvenient and ineligible, or unsafe.

But it often happens that the functional disorder, the disordered action, is too violent, and will not be altogether suppressed: in these cases our efforts are limited to its moderation, and to conducting it to the least dangerous or least inconvenient termination that circumstances will permit. If effusions or suppuration cannot be prevented, their extent may be limited, or their escape facilitated; and if structural change cannot be altogether prevented, means may be found of saving a considerable portion of the suffering organ, so that its natural function may remain but slightly impaired.

When medical aid is sought for at a period too late to secure these advantages, and morbid actions have passed, unrestrained, into their ordinary effects on structure, medicine yet has its principles and resources. Circumstances have changed, and measures must be adapted to them. If effusion has taken place, as in various forms of dropsy, its absorption or its removal may be effected; if suppuration, its discharge, and sometimes its absorption; if structural change, its gradual repair or its removal. The resources are not always efficacious, but they always deserve a trial. Even when promising to be most successful, the frame is irritated by the presence and persistence of the disease, the strength of the body is reduced, and life is endangered. This irritation must, if possible, be allayed, the debility guarded against or removed, the danger to life averted. Whilst these indications are pursued, some new disease may be excited, or some of the *conversions* of which we have spoken (see Disease) may take place. The supervention of a new disease, for instance of pleuritis or phthisis, always demands prompt attention; the conversion of the original disease into another is occasionally salutary; that is to say, when the new disease is less dangerous than the old, and entirely takes the place of it, as in the case of an affection of the skin supervening on disease of some internal organ. It is a very common object of art to produce this kind of conversion. Even a febrile disorder of the constitution has sometimes been considered capable of producing curative effects: Celsus enumerates among the accidental circumstances which cure the sacer ignis, *a day's fever*; "medicamentum ejus fortuitum est, uno die febris, quæ humorem noxium absumat;"* thus adding the theory of the cure also. The authority of Hippocrates may be quoted to support a similar fact concerning convulsions dispersed by fever; and even epilepsy removed by the supervention of an intermittent; and Bartholinus and Salmuth are quoted by Hoffmann to the same effect. Hoffmann adds that he has often observed the convulsions produced by worms put an end to when a febrile action had destroyed the worms; considering the attendant fever as a salutary process set up to rid the body of the worms, effecting its purpose either by heat or by producing acrid bile.† Even chronic glandular disorders, which are perhaps generally exasperated by any febrile disorder, sometimes have disappeared, and old enlargements of the glands have seemed to be removed by an absorption induced by the fever attendant on measles.‡

In all these instances, if we admit the facts

* Medicinæ leges naturæ legibus debent esse consentaneæ. Felix medicatio cui adjutrix natura succurrit, irrita vero quæ repugnante natura tentatur. *Fernelius*, in præfat. lib. i. See also *Hoffmann*, vol. iii. s. 2.

* Lib. v. cap. 28, s. 4.

† Ipse quoque compluries observavi, motus convulsivos ex vermibus, accedente febre vermibusque per æstum vel bilem acrem enectis, sponte cessasse. Opera omnia, vol. iii. sect. 2, cap. 1. *De optima naturæ morbis medendi methodo*, sect. xxv.

‡ Dr. Forbes has communicated to us a striking fact of this kind.

without cavil, and in any other instances in which it may be thought salutary to excite any degree of fever, it can only be understood that certain circumstances accompanying the febrile state, certain conditions of the extreme vessels and nerves, are the causes of any benefit that is obtained. It must generally be more desirable to induce the same condition, if practicable, by other means,—by medicines which can affect the capillaries or the ultimate nervous actions without producing a concomitant fever; and this, we shall see, is another principle of practical medicine. By some of the older physicians, as by Van Helmont and Campanella, the disposition to regard fever as always a curative effort led to the mischievous doctrine that by all means the fever should be increased by calefaciants and tonics.* This is one among many instances in which a correct principle has been hurtfully perverted; and the remains of this prejudice only disappeared in the memory of practitioners yet living.

If medicine could be so directed as to reach the first link in the chain of diseased effects, deep-seated and often hardly discernible, in the nervous and vascular systems, and to which the term *proximate cause* has often been applied, the treatment of mere symptoms would become but a small part of our duty. It is to this point that the efforts of enlightened medicine constantly tend. Whilst we try to relieve pain, we carefully seek for the diseased action of which it is a symptom; and, not content to allay the pain by destroying acuteness of sensation, seek to remove the diseased action, that a permanent cure may be effected. If we desire to suppress the immoderate evacuations of diarrhœa, we carefully consider what particular state of the intestinal canal occasions the disorder; and in such a case inconsiderate and empirical practice, never successful except by chance, may even be fatal. To attempt to remove the effusions attendant on chronic pleuritis or peritonitis without regarding the continuance of the inflammatory disease, or to attempt to counteract the prostration of strength in a fever by other means than removing the febrile state, would be so exclusively to attend to mere symptoms, as to follow methods of treatment most inefficient and unsuccessful.

Yet it arises from the defective state of our pathology, combined with our anxiety, and even with our duty to relieve the afflictions of the sick, that we are often glad to treat symptoms only; and sometimes it would appear that when prominent symptoms are removed, the disease is at an end. As we can generally see and act upon the symptoms, although we are oftentimes unable to penetrate to the primary disordered actions, it happily follows that the limitation of our knowledge concerning the causes of disease does not determine the limits of our practical power, or always produce uncertainty or inconvenience. To the philosophical inquirer, however, it will always be unsatisfactory to be unable to account for some of the principal achievements of medicine; as the cure of an intermittent by bark, of syphilis by mercury, and of scabies by sulphur. In each of these cases the curative means are employed with singular confidence, and with general success; in each we see the grounds of hope that there are, even now, undiscovered remedies of equal efficacy in other maladies; yet, in each case, to speak candidly, it would be presumption to attempt an explanation of the mode in which the methods employed produce their marked and salutary effects.

To meet the complications of disease, the principles of treatment must often be equally complicated: two or more simple principles being not only simultaneously acted upon, but respectively modified by the existing circumstances of morbid complication. Chronic inflammation may exist with effusion, and both with debility; and although the principal indication or principle to be followed is in such a case to put an end to the inflammation, respect must be had to the existing debility, and relief from the mere effusion must neither always be postponed until the difficulty of acting on first indications is overcome, nor attempted without regard to the original cause or to the actual strength of the patient. There may be unequal growth, redundancy, or hypertrophy, in one or more portions of the frame, deficiency in others. General plethora may be combined with general debility. In these and numerous other complications, the principles of cure, being two-fold or three-fold, demand more from the practitioner than lectures or books can inculcate; a discriminating wisdom which must partly depend on his organization, and partly on his attention to the instructive examples afforded by daily practice.

Structural change is always preceded by disordered function, and the principles of treatment which are the ordinary guides of practice have reference to the means of restoring functional regularity. Disordered function consists, we have said, (Art. Disease,) of, 1. vascular disturbance or irregularity, producing local or general excess or defect of sanguineous supply; 2. nervous disturbance or irregularity, producing local or general excess or defect of nervous energy; 3. of combinations of these disturbances, producing various affections of nutrition, secretion, absorption, evacuation, muscular motion, or the sensorial offices, or the intelligence and will.

The modes in which we attempt to control these morbid states, and re-establish natural actions, would seem then, very obviously, to be such as tend to equalize the vascular and nervous actions, simply or conjointly, and in every degree of their functional combination; in other words, to excite or depress, to stimulate or to allay, in every case, as each case may require. In the practice of surgery, or rather in the medicinal means employed in external affections, we can generally recognise these simple principles; and when to stimulate and when to lower is acknowledged to be so compendious a surgical principle as nearly to include every other. In the treatment of

* See *Baglivi*, De Praxi Medica, lib. i. cap. xii. sect. 2.

such cases as fall under the physician's care, the principles are, we apprehend, equally applicable, although their simplicity is in some degree hidden by the variety of the phenomena, the frequent obscurity of their origin, and the number of the constitutional and local means employed. If this be so, the Brunonian doctrine erred less in its principle of dividing diseases into two great classes, than in the application of the principle to the actual arrangement of diseases, and in not admitting the simultaneous existence of states compounded of and exemplifying both the divisions.

Admitting the great difficulty of determining in what precise manner medicines produce their least doubtful effects, we plainly observe how both vascular and nervous excitement are sometimes lessened by *evacuants*, general or partial; by general or local bleeding, by purgatives, diuretics, and diaphoretics; and how the evacuant plan is supported by the auxiliary one of diminishing the supplies introduced into the system. It is equally clear that we try to rouse both the vascular and nervous systems by *stimulants*, including various agents exerting a more or less durable tonic power on the contractile forces, or on the digestive function, or directly on the nervous system, or on the vascular extremities on the internal or external surfaces. Several of the agents employed in certain circumstances as general evacuants are local stimulants, which in other circumstances are used simply as such; those, for instance, which excite the bowels, the kidneys, the uterus, or the skin. In some instances even venesection, the most direct evacuant, has the effect of a stimulus, by removing some oppression, as in apoplexy; in other cases, as of nervous excitement connected with vascular disturbance, it is a direct sedative; and in certain states of fever a brisk purgative, by its effects on the intestinal surfaces, acts as a stimulant to the whole system. We are also possessed of means of allaying inordinate actions by medicines which do not act as evacuants, by *sedative* applications. Opium and other medicines of this class are daily employed as auxiliaries to bleeding, and as means of restraining violent muscular actions, or irregular and profuse secretions, or sensations too acute, or mental excitement so great as to be incompatible with repose or with reasonable mental acts. The same substances, in smaller doses, are sometimes used as stimulants; and as irritation is often connected with debility, all stimulants may sometimes be said to act as sedatives. All that belongs to a knowledge of the ordinary properties of medicines of different kinds or in different doses may soon be known; but the great art of medicine (expressed in a well-known and often quoted saying of Boerhaave,) is the application of the proper medicine in the proper dose at the proper time.

Both in cases requiring evacuants or stimulants, and also in cases of long-continued disorder of any function or organ, leading to structural changes and new formations, the employment of evacuants, of stimulants, or of sedatives, may be so regulated as to produce gradual alterations of action, to suspend actions which are morbid, or to restore, or excite, or regulate actions which are only disturbed. When thus employed, the medicinal means are called alterative, and they have already been spoken of under the head of ALTERATIVES.

There can be no doubt that the operation of medicines prescribed with these intentions is contemporaneously exerted both on the nervous and the vascular system, and generally by a primary influence on the functions of digestion and assimilation.

Besides the general effect of medicines as stimulants, evacuants, or sedatives, they commonly possess, as we have seen, a power of acting locally, from which, in many instances, even their general operation is obtained: the various purgatives act with greater or less energy on particular portions of the intestinal canal, some on the duodenum, some on the colon and rectum, and yet all may be employed as evacuants. But there are a few medicinal substances which seem to exert a still more especial influence on particular parts of the body: it may, perhaps, be said that iodine especially stimulates the absorbent and glandular system; there can be no doubt that the secale cornutum singularly stimulates the muscles of the uterus, and that the strychnine exerts the same power over the whole system of voluntary muscles. We are content therefore to employ these agents empirically.

In a great variety of cases, and for a great variety of purposes, external irritants are employed; to aid in checking acute diseases, and to suspend those which are chronic; to relieve local internal plethora; to free internal parts from painful disorder; to disembarrass, as it were, in some cases, the constitution from superfluous or morbid humours, and prevent their specific irritations of glandular or other tissues. In the familiar instance of cynanche tonsillaris it may often be noted how the scarlet colour of the fauces, with the swelling and other appearances of inflammation, disappear as soon as a blister has been applied with effect to the throat; the relief being plainly attributable here to a simple transference of action. The cough and some of the other symptoms of phthisis are generally, although but temporarily, relieved whenever a pustular eruption is produced on the chest by the antimonium tartarizatum applied in the form of ointment; and this suspension of symptoms is the result, perhaps, of a transference of irritation from the bronchial mucous surface to the skin, rather than of any suspension of the disease itself; although it is often sought to suspend the actions of diseases themselves by similar means, or by setons and issues. When the new actions induced by counter-irritation produce relief from pain, the effect may either be ascribed to a transference of irritation, inducing an altered condition of the nerves, or to the discharge of humours from the circulation, which in such cases were productive of nervous irritation, as in others they seem to be of all the disordered actions of the scrofulous constitution.

As the advantage obtained from alterative medicines appears to be derived through their influence on the functions of digestion and assimilation, and by their general operation on the nervous and vascular system; so, on the other hand, it may sometimes be observed that medicines of great power are singularly modified in their effects by the state of the body at the period of their administration. In the latter case all the operation of the medicines seems happily directed to a specific movement or alteration in the part of the system particularly affected, and their usual effects on the system at large are placed in a state of abeyance. Calomel, and opium, and wine, have been given to an enormous extent in tetanus, and sometimes in other affections, without salivation, or mental elevation, or oppression. In certain states of nervous irritation, very young children have taken, with advantage, opiates in doses which would have been destructive to them in a state of health. The same observation has been made in the case of adults affected with calculus; the quantity of opium given in such cases having sometimes been governed solely by the relief afforded, and yet producing no effect on the system in general.* In hydrocephalus the power of sustaining immense quantities of calomel has been ascribed to the peculiarly insensible state of the nervous system; but the same power is occasionally seen in cases of croup, although certainly in the latter affection the debility produced by large quantities of mercury sometimes becomes a serious consideration on the decline of the original malady. To these illustrations may be added that afforded by the tolerance of large bleedings, of calomel, and of opium, in inflammatory disorders in general, and of the tartar-emetic in pneumonia especially.

The best approach to the general principles of practical medicine, and the most convincing illustrations of their authenticity, are to be gained by reflecting on the intentions of all the usual parts of practice in the most common examples of disease.

Taking the example of *fever*, the most general morbid affection of the frame, we may perceive that the intentions acted upon are sometimes to check the first depression by direct stimulants and tonics, which is chiefly if not solely practicable in fevers of an intermittent type. When excitement supervenes on the first depression, we seek to allay it by evacuants, acting either on the mucous and cutaneous surfaces, in the shape of purgatives and diaphoretics, or on the whole system, by venesection. We lessen the quantity and stimulating quality of the food. When inflammatory actions arise, to these means are added local depletion, or local evacuation, and sometimes sedatives, as the application of cold, or the combination of opium with calomel; and very frequently we resort to some of the forms of counter-irritation; all these means being varied according to the seat of the inflammation. After a certain period the febrile actions decline, the different organs are left in a state of weakness; even the inflammatory affections which still linger behind seem connected with debility: and now we resort more freely to tonics and stimulants, medicinal and regiminal. Throughout the whole course of a disease, various in its forms, severe in its symptoms, and uncertain in its results, there are certain plain rules for our guidance, few in number, drawn from the existence of certain states of increased, or diminished, or irregular actions at the time. The principles are not obscure, but it is still their wise and timely application which constitutes a good practitioner. In following, for instance, that apparently plain indication of giving tonics or stimulants in the stage of debility consequent on fevers or other maladies, not only is it necessary to commence their administration with exact attention to the proper time for so doing, but delicately to apportion our attempts to the existing strength; according to the ancient and sage maxim, that *debilibus debilia, valentibus valentiora conducunt*; a rule which was supported by John Hunter, when he maintained the principle of not "increasing the action without giving real strength," and that we should always have regard to "the balance which ought to subsist between the power and action of every part."*

In the course of a fever we find the most remarkable exemplifications of the effect of mental derangement; certain states of the mind seeming to increase or moderate the symptoms of a disease to which they also increase or lessen the predisposition.

There is a very important *sedative* appliance, the effect of which is never so universally observable in fever; although it is not to be overlooked in any affection; namely, *repose* of the affected or disturbed organ. With as much care as the surgeon takes directly to impede the undue use of maimed or diseased extremities or parts of the body, should the physician forbid or obviate the undue exercise of the whole muscular system in a fever; and not only of the muscular system, but of the system of circulation and the nervous system. It is, indeed, in some degree with this view that he inhibits a full or stimulating diet; but he must also prevent, as much as possible, the access of all external circumstances which excite the senses, the mind, the volition, and the locomotive forces. The benefit of this kind of repose in a fever is always in proportion to its extent. In slighter maladies its use needs no illustration.

In the treatment of *inflammations*, not originating in the state of fever, the same principles are followed; active evacuations during their active stage, combined with various sedative means, sometimes opium, sometimes the tartar emetic, which, although an evacuant when employed, after the old method, in small doses, is a sedative when given to the extent common in modern practice, and particularly, as has been mentioned, in pneumonia. The chronic forms of inflammation, like those in

* Parr's London Medical Dictionary, article *Calculus*.

* Treatise on the Blood, &c. Introduction.

the latter period of fevers, are sometimes combated by stimulants, external or internal, and these may be simultaneously employed with some local forms of evacuation, and also with sedative agents; the emptying of distended and disordered vessels, the excitement of the vessels themselves, the strengthening of the body, and the expulsion of morbid humours, all requiring to be attended to.

The importance of local applications, both internal and external, is seen to be very great. Even in acute inflammations they are highly serviceable auxiliaries, and in chronic affections they are often alone equal to effecting a cure. Whilst by general bloodletting and other evacuants we seek to lessen the quantity of circulating fluid, and to lower the energy of the heart, by local means we still endeavour to alter the state of the capillaries; and in cases in which neither general evacuants nor general stimulants are required, local means applied to the internal or external surfaces may perhaps effect all that the case requires. Such is the result of daily experience; and the fact is consistent with the physiological character of the capillaries, the powers of which are to a certain extent independent of the heart; insomuch that they are even exerted for a time after all communication between the capillaries and the heart is cut off. The application of leeches, of blisters, of friction, and of cold and warmth to the body, amply illustrate the action and the utility of local measures in inflammations, in fevers, and in various local affections: and in other cases, diuretics, purgatives, expectorants, emmenagogues, are used with a design of obtaining specific local actions, which are often excited with equal certainty and advantage.

External applications include the various forms of bathing, which may be so ordered as to answer in different cases the purposes of a stimulant, of a sedative, or of transferring vascular and nervous excitement to external from internal parts. (See Bathing.) The use of fomentations is equally applied to all these purposes, to stimulate inactive parts, or to allay pain and inflammation.

When it is the object of our practice to relieve a patient from the inconveniences or threatened dangers of *plethora*, the reduction of the quantity of circulating fluid is in ordinary cases the plain indication or principle which we keep in view; and this we attempt to pursue by direct evacuants, bloodletting, and purgatives which stimulate the capillary extremities in the intestines to the evacuation of fluid; perhaps, also, by diuretics and diaphoretics, which act in a similar manner on the kidneys and skin. These indications may become combined with that of giving tone to the containing vessels; or, more commonly, with that of guarding some particular organ from the effects of determination or congestion; and we fulfil the latter indication by local depletion, by the sedative action of cold, by establishing artificial discharges, and by warning the patient against hurtful exercises or postures. Whilst we try by these means to diminish the quantity of fluid already existing in the body, and to avert its, evil consequences, we are careful to cut off the supplies, by a proper regulation of the quantity and of the quality of aliment; and we debar the patient from solid or fluid stimulants which would counteract our evacuating plan. In some cases of congestion, as of the skin, or of the abdominal viscera, the admission of medicinal or dietetical stimulants, and of external stimulating applications, may constitute a part of the indications.

In all the approaches to *anæmia* and to *atrophy*, our principles of proceeding are totally different. To supply proper food, and by cautious attempts to rouse or stimulate the powers on which the digestion and assimilation of that food depend, not only demands every resource of medicine, but the judicious application of the air as a means of renovation, and the careful avoidance of evacuants which would destroy the feeble remains of vitality.

In combating the *profluviæ*, we have to counteract the increased discharge by stimulants which act on the too much relaxed extremities of the capillaries, or we have to lessen the determination to them by new modes of evacuation, or we have to remove their state of congestion by local depletion instead of permitting the evacuating discharge to proceed uncontrouled; and external means are sometimes employed to assist one of these kinds of indication and sometimes another: the direct removal, also, or allaying of the irritation of the capillaries, whether directly or sympathetically excited, is often had recourse to, and by the use of sedatives.

In the case of *suppressed secretions*, whatever may be the cause of the suppression, our means of relieving and removing the disorder are still either vicarious evacuants, or stimulants, or sedatives. Take the periodical uterine discharge as an example. Its suppression is sometimes cured by bloodletting or by leeches; sometimes by purgatives; sometimes by local, sometimes by specific, sometimes by general stimulants, as tonics, exercise, change of air, and diet; and sometimes by sedatives, which remove irritations of the affected organ incompatible with functional regularity.

In violent *nervous disorders*, where at first sight it might appear that our principles of treatment were more numerous, it is found on examination that they are only more complicated than in common cases. In epilepsy, in hysteria, in mental disorders, whether the cause is in the brain itself, or in its bloodvessels, or in some other organ, the means of cure are but the means of evacuation or of stimulation, or of allaying morbid movements, general or local, immediate or remote, occasional or habitual.

In the case of *morbid formations*, and in that of *scrofula*, we attempt to controul evident disordered actions in the nerves and bloodvessels, actions not easy to be defined, by diminishing or by increasing the supply of blood or of nervous energy sent to them, by allaying irritations, and by setting up new and controllable actions to oppose and suspend the old.

Hereafter, in these instances of morbid for-

mations, as in those of calculi and of poisoning, very material chemical principles may enlarge our views of practice and add to our means. These are at present extremely limited, and chemical medicine, of which Paracelsus may be said to have been the founder, is yet in its infancy; indeed it is yet very doubtful if any instances of the successful application of chemistry to medicine can be cited; the chemical medicines, so called, which are employed in cases of calculus, or of simple gastric acidity, not appearing to act as direct chemical agents, but by their influence on the organs of digestion. Yet the detection of some fluid ingesta in the blood, and in the urine, as well as the direct influence of atmospheric air on the blood, are facts sufficient to defend chemical therapeutics from the imputation of extravagance; and we cannot but be of opinion that the improvement of medicine will, during the next century, proceed much in that direction. More accurate investigation of the fluids in a state of health will lead to a fuller acquaintance with the changes effected in them by disease, and it is not forbidden to us to hope that more direct means may eventually be discovered of checking several diseases than we have yet ventured to suppose the existence of. This probability, however, has been recently disputed; the chemists, on the one hand, being accused of expecting too much from their science, and the physiologists, on the other, reproached with a neglect of chemistry. Dr. Thomas Thomson of Glasgow, a chemist of the first reputation, and a man of great knowledge and great wisdom, expressed himself on this subject in the following terms, in a work published a few years ago:—

"I need not observe to those gentlemen who have paid attention to the subject, that by far the most likely means of improving physiology is a cautious application of chemistry to the investigation of the different constituents of the human body. An accurate knowledge of the chemical composition of every organ, and of the alterations produced on that organ by disease, would probably throw new and unexpected light upon the nature and treatment of many diseases. Physiology hitherto has been handled almost exclusively by the anatomists. These gentlemen have acted with a zeal and industry that cannot be too much admired. * * * * * A new and more subtile species of anatomy remains still to be applied. Where the labours of the anatomist terminate, those of the chemist should begin. This chemical investigation of the animal body may be just said to be commencing at present; for it was not till the atomic theory was brought to considerable simplicity and perfection, that such an investigation was possible. It is easy to see that it must contribute prodigiously to the advancement of physiological knowledge."*

More recently, Dr. Prout has expressed himself in terms more sanguine; and to the controversy which ensued between this distinguished pathologist and Dr. Wilson Philip, a physician who stands peculiarly characterized by the philosophical spirit with which he has cultivated physiology, pathology, and the practice of medicine, the reader might with less hesitation be referred, if the discussion had not provoked more discourtesy than should ever be shewn by great improvers of science, to whom truth alone should be of any real consequence.* All parties and all authorities will, we believe, at least concede that chemistry may and will prove a valuable auxiliary to physiology and to pathology; and that its subsequent application to the treatment of diseases may not unreasonably be expected. No one will be found, we imagine, to contend that chemistry will ever explain every thing in physiology, or that the practice of medicine will ever rest on chemical principles alone.

There is much reason to believe that the advantage derived from medicines in some states of disease arises from the changes they effect in the intimate elaborations carried on within the bloodvessels, and of which the products are the various healthy and morbid secretions. Such would seem to be particularly the case in the instance of specific inflammations; and the same is very probably true as respects several or all of the morbid formations. The disposition of a scrofulous constitution towards the formation of tubercles is probably connected with as definite a change in the character of the blood as that which more palpably, and by general acknowledgment, exists in chlorosis and in scorbutus, in some fevers, and in the Asiatic cholera. In many of these cases, as well in colica pictonum, and in the tremors produced by exposure to mercurial fumes, it cannot at present be decided how far the supposed sanguineous detriment exists, or, if existing, to what extent it is combined with, or even dependent on, injury of the nervous system.

In several disorders which the pathologist unhesitatingly admits to be nervous in their character—in tic douloureux for example—the cure by specific modes of treatment seems to depend on some change wrought in the condition of the nerves or nervous system itself, different from mere sanguineous excitement or congestion, and different from deficient supply of blood. The whole subject of nervous pathology is in great obscurity. It is possible that the minute ramifications of the several nerves may possess various properties as distinct from and to as great a degree independent of those of the larger nervous masses as are some of the functions of the capillaries from those of the heart; and a knowledge of such properties, if existent, must be preliminary to any near approach to correct principles of treatment in nervous disorders.

A few medicinal applications require to be separately alluded to, as being employed on mere mechanical principles;—demulcents in

* An Attempt to establish the First Principles of Chemistry by Experiment. By Thomas Thomson, M.D. Regius Professor of Chemistry in the University of Glasgow, &c. &c. Lond. 1825. Introduction.

* See the Report of Dr. Prout's Gulstonian lectures, and the whole controversy in the Medical Gazette for 1831: also a paper in the same volume by Dr. Stevens, on the Treatment of Malignant Diseases.

irritations of mucous passages; some of the anthelmintics, as the filings of tin; and various emplastra, when the intention is to give support to subjacent or neighbouring parts. None of these require further observation.

The principle of treatment sometimes recommended in chronic and obstinate diseases, and spoken of in the article DISEASE, that, namely, of producing some strong impression or commotion of the system, in the hope that the system may, in such an artificial and general disturbance, rectify or *right* itself, might, in different cases, produce its advantages by acting on the nervous or on the vascular system, or on both. As views of treatment become more and more understood, such treatment, however, will be less and less resorted to; and if sudden and violent measures should be thought desirable in lingering states of disorder, the principles of their application and use will be better comprehended. It may be observed, that much of the success of irregular practitioners seems no less to depend upon this principle than that part of the benefit often ascribed to the use of various mineral waters arises from the general change of diet, regimen, and habits of life, with which a temporary residence at watering places is almost in all cases accompanied. The principle by which these circumstances effect favourable changes in the health seems especially deserving of consideration, both in such cases of chronic disorder as are connected with morbid conditions of the nervous system, including those which especially and in various degrees affect the mind; and in all diseases which depend upon, or which have induced, an altered condition of the blood.

Careful consideration will generally shew, even in chronic, and obstinate, and anomalous maladies, some clear indications to be followed for the relief of the patient; and in the cases in which any expectation of a perfect cure is to be indulged, the means of effecting it can hardly ever be wanting to those who can reasonably entertain the expectation. The very principle on which relief seems sometimes to be obtained by changing the habits of the patient in many particulars, may perhaps be found, if inquired into, to be resolvable into that of removing some unexpected cause of irritation, which removed, digestion and assimilation, and the proper distribution of venous and sanguineous energy are restored, and the balance of health is regained. The *means* of relief will still be found to have been something which has imparted power or stimulus to overcome the morbid obstacle, or something which has directly allayed some morbid irritation; or, lastly, something which has produced a delayed or much required evacuation of some morbid material, or something which has improved the state of the blood. The principle of relieving long-continued ailments by attention to the digestive organs is spoken of by Dr. Heberden in his Commentaries.* It has of late years gained much attention in this country, and still more on the continent, insomuch that practitioners have not been wanting who have ascribed every possible disorder to primary digestive derangement. A direct improvement of the blood is a very probable consequence of such a plan, and various amelioratious of nervous and vascular actions may follow, or may only accompany this change.

The first *principles* of practical medicine, then, are few and simple. In a work every article of which is an illustration of those principles, we need not dwell longer on the principles themselves. It may almost be said, employing the words of Hoffmann, that there is no other method of cure, and that there should be no other intention in the physician, than to reduce to order the actions and excretions when not in a natural state; and that all kinds of medicines do but this, to allay actions which are excessive, and excite or promote and equalize those which are depressed and obstructed.* But the *means* of fulfilling these indications are very various; and if the judgment of the practitioner is exercised in their application, so their increase and diversified combination afford equal scope for his ingenuity and invention. Departing from all rational principles, physiological or pathological, the physicians of the middle ages vainly sought some universal medicine which should accomplish every varied indication at once. Such dreams have long ceased to be indulged in, although some base pretenders yet insult the public sense by professing them; and the only hope of attaining to principles of universal application depends on the gradual improvement of our knowledge of all the actions of the body in health and disease. The principles of medicine, not dependent solely on a doctrine of solidism or of the humours, lead, therefore, to no extreme and exclusive practice; and the influence of the moving powers is admitted without excluding just views of their solid and fluid results. The mutual dependencies of the nervous and vascular energies, and the properties of and changes effected in the blood, being all taken into consideration, we admit nothing but what is known, and wait for further explanations from the constant progress of all the sciences connected with medicine.

From early infancy even to extreme old age, the few principles now enumerated seem at present to be the constant guide of our art in its attempts to rouse, to regulate, or to appease, actions insufficient, or too disorderly, or too energetic, to be consistent with comfort, with freedom from uneasiness and pain, or with the maintenance of health and strength of body or of mind. In all the varieties of their application, the object is to restore healthy actions as soon, and with as little waste of strength, and

* De Ratione Medendi. See also *Baglivi*. In chronicis pauca remedia requiruntur ——————— semper tamen in morborum diuturnitate consulendum est digestionibus. Animadv. Pract. Nov.

* Neque aliam dari medendi viam, vel etiam medentum debere esse intentionem, arbitramur, quam ut motus et excretiones, a naturali statu desciscentes, in ordinem reducant. Omnia enim remediorum genera id tantum præstant, ut vel nimis auctos motus sedent ac moderentur, vel depressos et impeditos excitent, promoveant et rursus æquales reddant. *Opera omnia*, Præfat.

with as little suffering, as possible: or, as a fashionable physician of ancient Rome was in the habit of professing to do, *cito, tuto, et jucunde*: and where a cure is out of the power of our art, the same principles lead to means of relief by which life is made comfortable for a long period, during which the patient, if left to nature, would be consigned to misery. The time *may* come when, guided by yet undiscovered knowledge, and new and more direct principles, the tendency to tubercular and other morbid formations may be surely checked; chronic inflammations readily cured; and fever suspended in its first movements. But the day of these triumphs is yet distant.

Hoffmann mentions it as the first criterion of a man skilled in medical art to know "*cur et quare* hoc vel illud alimentum ad valetudinem conservandam morbosque sanandos salutare vel minus tale sit dicendum;" and he quotes with deserved praise the eulogium of Thuanus on Hollerius, a famous physician of Paris, who by constant meditation had so improved his judgment that he often cured those ill of such deplorable maladies as the other physicians of the time, "riding rapidly through the streets," (per vicos vaga cursitatione mulos fatigantibus,) knew little or nothing about. We may confidently recommend to the student the diligent perusal of the works of the admirable physician whom we have here and already more than once quoted in this article. His learning and admirable good sense, the liberal spirit in which he viewed all parts of medicine, his discrimination as regards the innumerable controversies existing in his time, his wise direction of the medical practitioner's mind to things concerning which the senses could give information, things useful and about which men could speak reasonably,—"quæ in sensus incurrunt, quæ usum habent, et de quibus evidens ratio constat et dare potest,"—rather than to subtile disquisitions relating to things more obscure;—these and many other merits have not only endeared his name to learned physicians, but to liberal scholars, from the time when his writings appeared to the present day. Notwithstanding the subsequent undoubted advancement of medicine, there are few pages of his voluminous works to which the practical physician may not yet refer with advantage.

The number of writers in whose publications any specific notice of the abstract principles of medicine is to be found is not very great. We do not mention writers professedly on the practice of medicine, whose works are, like the separate articles of this work, *illustrations* of principles. Many valuable observations occur in Baglivi,* and many ingenious ones in Cabanis;† the works of M. Broussais, amidst much false and much doubtful theory, contain views and principles both original and important. In Dr. Heberden's Commentaries will be found a sensible chapter De Ratione Medendi, and another in Dr. Gregory's Conspectus Medicinæ Theoreticæ, with the same title. Dr. Burne made it the subject of an excellent oration delivered to the Medical Society of London a few years ago, and since published. And we may mention, that in the Outlines of Pathology just published by Dr. Alison, the English reader is for the first time presented with so clear, condensed, and comprehensive a view of the whole subject of *disease*, as can hardly fail to lead those who read it with care and reflection to a knowledge of the principles by which their practice should be regulated in all diseases.

At the same time, no reading nor reflection can make a good practitioner. Like an able orator, he must add to all the rules of his art daily habit and practice. His mind must be continually presented even with *numerous* examples and illustrations to guide and assist his judgment, and to correct the errors of reasoning on a practical subject. The symptoms of disease may be well understood and remembered, and the general principles of practice; but the treatment of diseases comprehends a multiplicity of details, essential or indispensable to the cure, and yet which easily, or almost inevitably, escape the memory of him who, although thoroughly grounded in the principles of medicine, is not continually exercised in prescribing for the sick.

The great utility of teaching by examples, selected at the bed-side, or by what is called clinical teaching, so long neglected in this country, and for the introduction of which we owe so large a debt of gratitude to Rutherford and Cullen, begins to be universally acknowledged. The full benefit of this admirable method will be the inheritance of another generation. A long existing defect in this respect has doubtless obscured the principles of practice, and in many instances quite shut them out of the practitioner's view during his whole life.*

But, if so engaged and so prepared,—by the principles already mentioned, and by others hereafter to be discovered, or by additional means of fulfilling the indications of medicine, the practitioner of the medical art has the privilege of feeling assured that he is useful; and the art itself, thus guided, and in every stage of its imperfection even to its final advancement, will continue to be of most singular service to mankind; relieving the sick, to use the expressions of Hippocrates, from the greatest of evils, from diseases, from pains, from sadness of mind, and from death.

By no one circumstance, we would add, will the practitioner find himself more assisted in his practical efforts, more enriched in practical

* Opera Omnia, Lugd. 1733.

† Du Degré de Certitude de la Médecine.

* For an account of Dr. Cullen's clinical teaching in Edinburgh, the reader is referred to Dr. John Thomson's recently published life of Cullen. Every pupil of the great school of Edinburgh must rejoice to see the reputation of one of its greatest founders, and one to whom practical medicine is so immensely indebted, placed in its true light by a man of learning and science, and rescued from the superficial criticism in which it has of late years been too much the habit of a certain class of writers and lecturers to indulge when mentioning Dr. Cullen's practical works.

resources, and better able to command them in all emergencies, than by the cultivation of a sincere and anxious desire to relieve his patients from whatever physical evils oppress them:—in all the varieties of his practice no other feeling will so surely and so happily stimulate his mind.

(J. Conolly.)

MELÆNA.—This name (*μέλαινα νοῦσος*, the *black disease*) was adopted by Sauvages from the writings ascribed to Hippocrates, to designate a genus of disease which he defines, "Alvifluxus materiæ nigricantis, atro-rubræ, dejectione aut vomitione frequenti notatus;" and this is the sense in which it is generally employed by modern nosologists and practical writers. We mean, therefore, by melæna, the occurrence, *as a symptom* in any disease, of very dark-coloured, grumous, pitchy, often highly-fetid evacuations by stool, commonly joined with sanguineous vomiting; or we use the word *as the name of a disease* in which such evacuations, with or without vomiting of blood, constitute the characteristic symptom. In these two senses authors speak of *symptomatic* and *idiopathic* melæna; but even where the latter phrase is with most propriety employed, the hemorrhage may generally be traced to some constitutional disorder or local organic disease as its primary cause. It has been mentioned in the article Hematemesis, that there is so close an affinity between that disease and melæna, that often they are not easily to be discriminated. Hematemesis is properly a hemorrhage from the mucous membrane of the stomach, and is *chiefly* characterised by vomiting of blood: melæna properly consists in hemorrhage from the mucous membrane of the small intestines, and is *chiefly* characterized by the dark evacuations by stool which have just been described. But as these two symptoms very frequently concur in the same case,—as blood poured out by the stomach is often carried downward into the intestines, and blood effused in the duodenum may pass upwards through the pylorus into the stomach; and as, moreover, these two hemorrhages are so much akin to each other in their seats, their causes, pathology, and treatment, a distinction between them is not always easy, and is seldom practically important. There exist, however, sufficient distinctions between them in all these respects to make it proper to treat of them separately in a system or a dictionary of medicine.

Synonymes. Μέλαινα νοῦσος? *(Hippoc. de Morbis,* lib. ii.) Morbus niger; Fluxus splenicus; Melæna splenetica *(Sauvages)*; Secessus niger *(Hoffmann)*.

The description of the *μέλαινα νοῦσος* by the author of the treatise "On Diseases" ascribed to Hippocrates, is rather a matter of literary curiosity than of any practical importance. It is in the following words, translated as literally as the English idiom will permit:—

"The patient vomits black bile (*μέλαιναν*), resembling lees of wine; at other times a matter resembling blood. Sometimes the matter vomited resembles the *second* wine (*οἶνον τὸν δεύτερον*, that obtained by putting the grapes into the wine-press:) sometimes it is like the ink of the cuttle-fish; sometimes it is acid, like vinegar; sometimes it consists of saliva and thin phlegm; sometimes of greenish bile. When the black blood-like matter is vomited, it smells like putrid or sanious blood (*δοκεεῖ οἷον φόνου ὀζεῖν*). The fauces and mouth are scalded by the acrimony of the vomit; it sets the teeth on edge, and effervesces with the earth in which it falls; (this is probably the meaning of *τὴν γῆν αἴρει*.) When the vomiting is over, temporary relief ensues; but the patient cannot bear either emptiness or fulness of the stomach, the first causing flatulence and acid eructations, the latter a sense of weight at the præcordia, and a feeling as if the breast and back were pricked with sharp instruments. There are aching pains of the sides; a slight fever; the sight grows dim; and the patient is unable to stand. His complexion turns dark-coloured, and he becomes emaciated." Such is the description of the disease: the treatment it is unnecessary to give at length, even were it possible to render it faithfully. As far as we can understand it, it consisted in purgatives given frequently, (*φάρμακον πιπίσκειν θαμὰ*,) emeties, (*φαρμακοπόσιας τὰς ἄνω*,) and afterwards venesection, if not forbidden by debility; a diet of whey, milk in the proper season, and whatever is cooling and laxative, excluding sweet, oily, and rancid articles; emollient clysters, if required on account of costiveness; great quietude, and regularity of regimen. "If these things be done," adds our author, "the disease, as age advances, is removed, even if it remains in the habit till old age. But if the skin assumes a dark hue, it (quere the colour or the disease?) will continue till death."*

It is remarkable that the above description contains not a word respecting the black discharges by stool, which, with Sauvages and the moderns, characterize melæna, though this symptom (*ὑποχωρήματα μέλανα, ὀκοῖον αἷμα*) is often mentioned in other parts of the Hippocratic writings.

Hoffmann treats at considerable length of hematemesis and melæna, the latter of which (vomitus cruentus *cum secessu nigro*) he considers by far the more dangerous form of the disease, and identical with the morbus niger of Hippocrates.†

Sauvages introduced the name of melæna to denote this particular disease. He makes it a distinct genus, and assigns to it several species,

* *Hippocrat. περὶ νοῦσων*, lib. ii. ad finem. Opera, p. 486, edit. Foesii, Genevæ, fol. 1567. The writer of this article has had the kind assistance of a friend distinguished by his philological attainments in revising the above translation. The last passage is scarcely intelligible, but seems to indicate that the disease in question is one of a very chronic nature and slow of removal; *ταῦτα ποιεῖν· καὶ ἅμα τῇ ἡλικίῃ ἀποφεύγεται καὶ ἡ νοῦσος, εἰ καὶ καταγήρασκει σὺν τῷ σώματι· ἢν δὲ μελανθῇ συναποθνήσκει*. The two other diseases, called *ἄλλη μέλαινα νοῦσος*, and *σφακελῶδης* (*νοῦσος*) have nothing to do with our present subject.

† Opera Omnia, tom. ii. p. 214.

some of which appear to be founded on observation, if not on correct pathology; others are hypothetical and fanciful.

Although Cullen has omitted melæna in his catalogue of diseases, he gives some account of it in his "First Lines," principally with reference to its pathology.

Morgagni, Haller, Lieutaud, Tissot,* but especially Portal,† have, among continental writers, mainly contributed to advance our knowledge of the history, pathology, and treatment of this disease. The series of cases and dissections recorded by Portal are particularly worthy of diligent perusal.

In the publications of our own country, Dr. Francis Home,‡ Dr. Marcard,§ and more recently Dr. Brooke‖ and Dr. Cheyne¶ of Dublin, Dr. Ayre,** and Dr. Belcombe,†† have recorded instructive cases and dissections of this disease. But there are few subjects in pathology which stand more in need of fuller and more careful investigation.

General history and symptoms.—Melæna, as well as hematemesis, so generally occurs as a symptomatic affection, that a description can hardly be framed which shall embrace all the various symptoms by which it is accompanied, according to the various causes which produce it. A much better notion of these will be gathered from a perusal of the cases above referred to, especially those so admirably detailed by Portal, than from any general description. The following may, however, be taken as a comprehensive view of the usual course of what has been termed idiopathic melæna.

The patient has for a considerable time shown symptoms of progressive constitutional disorder: the functions of the stomach have become debilitated; those of the liver and the bowels are imperfectly and sluggishly performed. The countenance has assumed a sallow, dusky, or "leaden" hue; the adnatæ of the eyes have become dull or greenish; the tongue is furred and clammy, or more or less dry; the breath often tainted. The pulse is habitually frequent, or is periodically accelerated towards evening; in other cases it is intermitting and irregular; and there are palpitations of the heart, or a pulsation at the epigastrium. The symptoms altogether are those of aggravated dyspepsia, to which are often superadded those of visceral congestion. On examination of the abdomen, there is to be felt a circumscribed enlargement or general tension and fulness in one or more of the abdominal regions; sometimes also tenderness to the touch. Upon the occurrence of any exciting cause of hemorrhage, an attack of melæna is induced, which is most commonly, but not always, accompanied by hematemesis, and at any rate with the same or very analogous symptoms. After complaining of much præcordial oppression and anxiety, tensive pain of the hypochondria, or dull pain at the scrobiculus cordis, with nausea, general uneasiness of the abdomen, and more or less tormina,—together with the common hemorrhagic symptoms of giddiness, coldness of the extremities, a tendency to faint, &c.—the patient is suddenly seized with vomiting of dark-coloured blood, together with a discharge, by stool, of blood of the same appearance, or more frequently of a very dark and often extremely fetid semifluid mass, of the consistence and colour of tar. Sometimes this discharge by stool occurs without any vomiting: it is invariably accompanied by great faintness and exhaustion. Occasionally the black matter discharged by stool is mixed with blood of more unequivocal appearance, or with dark-coloured bile, which may be distinguished from the former by dilution with water, which brings out a yellowish or greenish tinge. In some comparatively rare cases, the matter discharged by stool and vomiting is of a sooty blackness, (οἷον πόλυπου θήλου, Hippoc.) has no smell, and assumes neither a bilious nor sanguineous tinge on dilution with water: this appears to be the true *melanosis* of the ancients. For some time after the cessation of the hemorrhage the patient remains in a very weak and precarious state, extremely liable to its recurrence, and requires to be carefully watched. Even after the attack appears to be entirely over, a predisposition to its return remains, and unless this be overcome by medical treatment, or by the resources of the constitution, it will in most cases ultimately prove fatal.

Appearances on dissection.—Although a considerable number of dissections of patients who have died of this disease have been recorded, the subject is one which stands in need of much further investigation with a view to a satisfactory pathology of the several varieties of melæna and hematemesis. It is sufficiently established, by the researches of Portal, Andral, and other morbid anatomists, that no lesion of the mucous membrane of the stomach and intestines, except in some very rare cases, is to be met with in cases of gastric and intestinal hemorrhage. (See Hematemesis.)

In a few cases partial reddening, softening, and oozing of dark-coloured fluid (similar to that discharged during the disease) is stated by Portal to have been observed in the villous membrane of the bowels. Morgagni records a case where the whole tract of the intestines was found "horribly inflamed." But much more frequently no trace of disease is discovered in the stomach and intestines; these organs have on the contrary been found remarkably pale and exanguious,* while marks of congestion appeared in the turgescence of the mesenteric and gastric veins, loaded with dark-coloured blood.† Chronic enlargement or structural disease of the liver and spleen has been found in cases where the symptoms had led to suspect them to exist during

* Epist. ad Zimmermann. Epistolæ Medico-Practicæ, 12mo. Lausannæ, 1782.

† Mémoires sur plusieurs Maladies, tom. ii. pp. 129, seq.

‡ Clinical Exper. and Hist. p. 127.

§ Edin. Med. Commentaries, vol. iv. p. 203.

‖ Irish College Transactions, vol. i. p. 124.

¶ Dublin Hosp. Reports, vol. i. p. 259.

** On Marasmus, pp. 113, 117, first edit. 1818.

†† Med. Gazette, vol. iv. p. 109.

* *Morgagni.* † *Portal.*

life. It is highly desirable that in future investigations not only the state of these viscera be most carefully examined, but also the condition of the circulating system, and especially of the heart and great vessels, morbid alterations in which have only of late begun to attract a proper degree of attention, as causes of venous congestion and of *passive* hemorrhage.

Causes.—The predisposing and exciting causes of gastro-intestinal hemorrhage have been pretty fully considered in the article Hematemesis, and therefore it is not necessary to prolong the present article by recurring at any length to this part of the subject. Organic disease, a cachectic or greatly debilitated state of the constitution, sedentary employment, intense anxiety and close application to business, and a full and stimulating diet, with neglect of air and exercise, are the most usual predisposing causes, to which must be added fretfulness and irascibility of temper. These causes are most apt to induce a predisposition to melæna in males about the age of forty-five or fifty, in females about the time of the cessation of the menstrual periods. The exciting causes are those which occasion hemorrhage in general, as intemperance or any kind of excess, but especially any violent mental emotion or struggle, and none so frequently as a burst of passion. This has often induced not only a first attack of melæna or hematemesis, but the same cause has given rise to its recurrence at several times, when the patient seemed to be going on favourably, and to the final catastrophe by bringing on a last and fatal attack. This is well illustrated in Portal's first case, (that of the botanist Aublet,) and furnishes a most important caution as to the *moral* management of patients who are predisposed to, and especially who have already suffered from this disease. Irritating and drastic purgatives are well known to occasion bloody stools, when injudiciously employed, and sometimes when given with every proper precaution; but they can hardly be supposed to induce a true attack of melæna, unless where a great predisposition exists.

Varieties of melæna.—It is important in melæna, as in hematemesis, to distinguish with as much accuracy as possible the varieties which exist in the disease, or the *species* into which it may be distinguished, according to the nature of its causes, the kind of constitution in which it occurs, and the series of symptoms which precede or accompany it. It is evident that on such discrimination alone, a rational pathology or judicious therapeutical system can be founded. The fullest and most accurate enumeration of these varieties which has yet been made, is that of Portal.* His species are the following: 1. melæna supervening in *acute* (continued) fevers; 2. preceding, accompanying, or following intermittent fevers; 3. supervening on strong mental emotion, cases of which are so common; 4. following suppression of hemorrhoids or other habitual evacuations, and especially supervening on the cessation of the menses; 5. depending on the effect of gout upon those organs in whose substance the vena portæ is ramified; 6. that arising from scurvy, whether from this disease occasioning, as it often does, congestion of the spleen and liver, or from an alteration in the quality of the blood; 7. occurring in dropsy, either from the compression produced by the fluid effused in the abdomen, or from the accompanying organic disease of the liver, spleen, and other viscera. This division is evidently not strictly pathological, but it is much preferable to that of Sauvages, and may be useful to those who have leisure and opportunity for a further investigation of this very important subject. Portal illustrates each of his proposed species by reference to his own cases, and to some instances furnished by other authors. Pinel's division into species, of hematemesis* (under which he comprehends melæna,) may also be consulted with advantage, but not implicitly adopted. Dr. Mason Good's division of melæna into two species, (melæna *cholæa* and melæna *cruenta*,) appears captivating by its simplicity; but he is evidently mistaken when he professes to derive it from Hippocrates; and moreover he starts with a generic definition totally at variance with the usual acceptation of the term melæna, and which seems to rest wholly on the dark hue of the skin, the only circumstance common to melæna, (the melæna *cruenta* of Good,) and the green jaundice described by Dr. Baillie, (his melæna *cholæa*.)

Pathology.—This branch of the subject has been in a great measure anticipated in the article Hematemesis. It may, however, be useful to take a brief review of the opinions which have been adopted respecting the nature of melæna by pathologists. The notion universally entertained before the time of Hoffmann and Morgagni, was that melæna depended on a flow of *black bile*, or of dark venous blood, (for these terms seem to have been almost convertible, *bilis atra*, *melancholicus humor*, *fæx sanguinis*, &c.) from the spleen, which was supposed to be its great reservoir into the stomach and intestines, through the veins called vasa brevia. The latest supporter of this opinion was Van Swieten; but it is not very easy to understand what he means by *atrabilis*.

According to Hoffmann, melæna consists of a true hemorrhage from some of the viscera of the abdomen, most commonly from the small intestines; but in conformity to the notions of his time, he conceived that this could only take place by the *rupture* of a vessel. He therefore supposes that the branches of the meseraic veins ramified on the inner surface of the ileum are ruptured in consequence of impediments to the return of the blood through these veins, in hypochondriacal and hemorrhoidal subjects, in whom this disease, he says, chiefly occurs; from which impediments follow "distentions,

* Op. citat. p. 211.

* Dict. des Sciences Médicales, art. Hématemèse, tom. xx.

spasms, and congestion in those vessels, and finally effusion."* Cullen adopts Hoffmann's view of this disease: he considers it to be a *venous* hemorrhage, from obstructed circulation in the vena portæ and its branches; he thinks that its causes are of the same nature with those which give rise to the hemorrhoidal flux; but does not deny that in some cases there may be a true *atrabilis*, producing the symptoms of melæna.† Portal chiefly differs from Hoffmann and Cullen in referring hematemesis and melæna to *arterial* hemorrhage from the stomach and intestines, occasioned by the afflux of blood by the arterial branches being greater than the corresponding veins can take up; maintaining that this is mostly owing to the compression of the trunk or branches of the vena portæ, occasioned by obstructions not merely of the spleen, as was formerly thought, but also of the liver, pancreas, mesentery, and other viscera of the abdomen. The opinions of Portal, modified by the doctrines of Bichat and his school respecting arterial exhalation from mucous membranes, constitute the now generally adopted pathology of melæna and hematemesis. (See HEMATEMESIS.) The dark colour of the blood, as has been observed by Portal, (and the observation is as old as Aretæus,) does not prove that the blood is derived from the veins, for the fluid and gaseous contents of the alimentary canal will act upon it after it is poured out, and deprive it of its bright colour. Perhaps this explanation of the intense blackness and pitchy appearance of the stools in melæna is not quite satisfactory. Dr. Ayre has ingeniously contended, that as no trace of lesion is generally found in the mucous membrane on dissection, the hemorrhage which constitutes melæna and hematemesis does not take place from the capillary exhalents of the mucous membrane, but from the extreme minute ramifications of the vena portæ in the glandular texture of the liver. He argues that a certain degree of congestion of that important viscus will occasion an excessive and vitiated secretion of bile, constituting the common autumnal cholera, and the various modifications of bilious disorder; but that when this congestion occurs in a still greater degree, the extreme branches of the vena portæ are so distended that they cease to secrete bile, and pour out the dark and highly-carbonized blood which oppresses them, unchanged; that this is taken up by the biliary pores and conveyed by the gall-ducts to the duodenum, whence it either regurgitates into the stomach, or is carried down the course of the intestines. Dr. Ayre conceives, therefore, that melæna and hematemesis scarcely differ, but in degree, as to the pathological condition which occasions their symptoms, from cholera and other bilious disorders: and he accordingly proposes the same treatment for both.‡ These views are certainly ingenious, and, if established, would be highly important. But the arguments adduced by Dr. Ayre in his work are not conclusive; and his theory must still be considered as an hypothesis which may not impossibly afford the true explanation of *some* cases of hematemesis and mælena, where there is evidence of hepatic congestion existing in a great degree.

The pathology of melæna is still an obscure and very interesting object of inquiry. It is highly probable that in certain cases it depends not so much on mechanical obstruction and congestion of the blood in the veins of the abdominal organs, as on a change in the physical and perhaps vital qualities of the blood itself,* which gives it a tendency to escape every where from its vessels. Such a state seems manifestly to exist in certain cases of purpura and of scurvy, in fevers of the typhoid type, and in some malignant varieties of small-pox, in all of which melæna, as an occasional symptom, occurs. Fully to develope this as yet mysterious condition of the blood, its dependence on the state of the nervous system, its connexion with the nature of fevers and other diseases, is a problem of the greatest importance and difficulty in pathological science.

Though we have considered melæna as altogether a hemorrhagic disease, yet it may be proper to notice two cases in which the symptoms may closely resemble those of hemorrhage, yet not be truly such. The first is a discharge from the intestines of very dark and putrescent bile secreted in abundance from some irritation or congestion of the liver; the second, a truly *melanotic* discharge, proceeding (as supposed by Dr. Marcard in the case related by him,) from the breaking down of what he calls an atheromatous encysted tumour, in fact a mass of melanosis, either connected with the liver or alimentary canal, or else perhaps from a secretion of matter of the same kind from the mucous membrane of the stomach and intestines. The production of melanosis is not well understood. Does it consist of blood very little altered? Is the black matter vomited in cases of scirrhous pylorus for a considerable time before death, of the nature of melanosis?

Melanotic matter is distinguished from the sanguineous dejections of melæna by the absence of smell, and by the effect of dilution with water. The latter circumstance distinguishes it also from bile.

Diagnosis.—Except the two cases just mentioned, and that of hematemesis, the discrimination of which from melæna (as they may jointly occur, and at any rate require similar treatment,) is not practically important, melæna cannot require to be distinguished from any other affections, except hemorrhage arising from ulcerations, wounds, and injuries of the intestines, (which are not properly to be referred to melæna,) and the hemorrhoidal discharge. From the latter, where any necessity arises for discrimination, a better diagnosis cannot be laid down than that of Hoffmann, who says that

* *Hoffmann*, op. citat. p. 214.
† First Lines.
‡ Ayre on Marasmus, (First Edit. 1818.)

* *Andral*, Pathol. Anat.

melæna is to be distinguished by the tormina and spasmodic pain by which it is accompanied, and the imminent danger of death in which it places the patient; whereas the hemorrhoidal discharge is free from spasmodic pain of the bowels, and brings relief to any uneasiness which previously existed. Ulceration of the bowels is known by peculiar symptoms, which will be pointed out in treating of that affection.

Prognosis.—Melæna is almost always a symptom portending considerable danger. The only exceptions to this are where it occurs as a truly *critical* hemorrhage in fevers, or where it is attendant on hematemesis in young and plethoric females of unbroken constitution, and with vicarious or suppressed menstruation. The profuse discharge of blood, the debilitated state of the system in which it often occurs, and the organic diseases with which it is apt to be complicated, are the circumstances which constitute the danger by which its degree is to be estimated. The putrescent blood effused into the intestines and stagnating there, acting as a poison upon the nervous system, or re-absorbed into the circulating mass, was thought by Hoffmann to be the chief source of danger in this disease; and hence the great stress which he and others of the continental writers laid on clearing out the bowels by laxative clysters.

Treatment.—In the treatment of melæna, we have to deal with an intractable and too often an incurable disease, and almost always with an enfeebled and exhausted habit. Organic disease is always to be suspected in chronic cases, and where the disease occurs in advanced life, or in persons much exhausted by sedentary labour and anxiety, or weakened by intemperate habits, it is commonly a symptom of what is popularly but expressively termed "a breaking-up of the constitution." There is, therefore, little scope for active, much less for *heroic* remedies. Both during the hemorrhage and in the intervals, or after its cessation, the greatest quiet is to be enjoined; all disturbance of mind or body is to be sedulously avoided. The strength must be supported by the mildest nourishment, in such regulated quantities as not to disturb the stomach. The bowels must be kept open by the gentlest means, as castor-oil and mucilaginous clysters; nervous irritation is to be allayed by camphor and hyoscyamus. Opium and stimulating antispasmodics are to be avoided. Refreshing and antiseptic beverages, as lemonade, whey, &c. may be allowed in moderation; wine only where the debility is such as to require it, and where there is no febrile movement in the pulse; regard being also had to the constitution and previous habits of the patient.

Respecting astringents, we may refer to what has been said in the article on HEMATEMESIS; observing only that they must in the case of melæna be employed with still greater caution. This applies especially to the more powerful remedies of this class. The mineral acids are useful rather as refrigerants and gentle tonics than as astringents. Where more of a styptic effect is required, the diluted sulphuric acid should be preferred; where a tonic or alterative effect is wished, the nitric. Dr. Mason Good recommends in preference the vegetable acids, and particularly the acetic. The remedy which has acquired the highest reputation as a styptic in melæna, is the oil of turpentine. It appears to have been first recommended by Mr. Adair, in the fourth volume of "Medical Facts, &c." Dr. Brooke of Dublin, and Dr. Cheyne have since published cases illustrative of its employment, which have been already referred to, and Dr. Elliotson, in his published lectures, has borne testimony to its usefulness. Dr. Brooke gives three cases, in all of which the hemorrhage was effectually and promptly arrested by the remedy when other treatment had failed. One of his patients died shortly afterwards, but the case was one of long standing, and probably connected with organic disease of the stomach; but this could not be ascertained, as inspection of the body was not allowed. The other two cases were doing well at the date of the paper, but only a short period had elapsed. It is evident that the oleum terebinthinæ, however successful in arresting the hemorrhage, has no influence on the primary cause of the disease, and therefore can be esteemed only a valuable palliative remedy. The formula employed by Dr. Brooke was the following:

℞. Olei terebinthinæ, guttas xxv.
Aquæ cinnamomi, ℥i.
Syrupi aurantii, ℥i. M. fiat haustus ter die sumendus.

In Dr. Cheyne's case the result was less favourable, but the circumstances of it are not the less instructive, especially as it illustrates a caution given by Hoffmann, that astringents given in melæna are, in cachectic habits, likely to produce "a sudden transition to dropsy." A profuse melæna had continued two days. The patient (a tailor, aged twenty-four, and of cachectic habit,) was growing weaker and weaker, when a "small dose" of ol. terebinth. was ordered to be taken every second hour. Dr. Cheyne does not state how many doses were taken; but it stopped the hemorrhage, but at the same time "seemed to lock up the bowels, so that for nearly three days he was without a stool, his abdomen all the while increasing in bulk. On the 16th, (the ol. terebinth. had been prescribed on the 11th,) there was evident fluctuation, and the stools, when at length obtained, consisted of hardened colourless faeces." First, crystals of tartar, then blue pill with squills, were given, which last affected his mouth in two days, and were discontinued. On the 28th, having taken a purgative, the hematemesis and melæna recurred; it continued two days, and the tension of the abdomen diminishing, he grew very weak and faint, and died on the 30th. The dissection is given at length, but need not be inserted here. Dr. Cheyne candidly owns that the treatment in this case was too energetic; that with more of *expectancy* the patient might have lived longer. This is an instructive point of the case: another important one is, the alternate morbid excess of action in the serous and the mucous exhalents,

—a fact often to be noticed in practice, and in the present instance affording a valuable caution against the too free use of astringents in certain hemorrhages.

When the hemorrhage is arrested, without any such unfavourable concomitant events, we must endeavour to support the strength of the patient by moderate restoratives, according to the circumstances of the case, and do what we can to obviate the recurrence of hemorrhage by proper regimen, and medicinal treatment directed to the primary disease. This must necessarily vary according to the nature of the case, and it is unnecessary here to enter into the details of the various treatment which may be required in particular cases. The histories related by Portal may furnish some valuable hints if read with due discrimination, and allowance for national peculiarities of opinion and practice. His favourite remedies appear to have been leeches to the anus, and a course of very gentle alteratives, such as lime-water with infusion of camomile, of taraxacum, and other cichoraceæ, pills composed of soap and bitter extracts, clysters, tepid bathing; and in cases where a more tonic treatment was indicated, he prescribed the waters of Vichi, (a saline chalybeate highly impregnated with carbonic-acid gas,) cinchona, and the moderate use of sound wine. In old and feeble persons especially, he found the best effects to result from the employment of the two last-mentioned articles.

(George Goldie.)

MELANCHOLIA.—See Insanity.

MELANOSIS, from μελας, *black*, and νόσος, *disease*.—Syn. Melanoma; tumeurs mélaniques; dégénérescence noire; cancer noire; cancer mélané.

The term melanosis is employed to designate a morbid product, the distinctive character of which consists in a dark brown or black colour, of various degrees of intensity.

Although there can be no doubt that many of the ancient physicians were aware of the existence of the disease—at least in some of its forms, which we are about to describe—there is no such description of it in their writings as would lead us to believe that they regarded it either as a distinct disease, or in any other point of view than as one of the many local or general morbid states, which they supposed to originate in the predominance of one of the four elements—the *atrabilis*—of their humoral pathology.

The first account of this disease (the discovery of which is claimed by Dupuytren) was given by Laennec, in the Bulletins de la Faculté de Médecine de Paris, in 1806, and it was then named by him mélanose.

This distinguished pathologist describes melanosis as an accidental product, possessing a degree of consistence equal to that of the lymphatic glands, a deep black colour, a homogenous tissue, somewhat humid, opaque, and presenting an appearance similar to that of the tissue of the bronchial glands of the adult. He says that it afterwards becomes soft, when there oozes out from it, on pressure, a yellowish red, thin fluid, mixed with small black particles, which are sometimes firm, at others friable, but still presenting a certain degree of flaccidity to the touch. At a more advanced period of this softening process, the particles, and soon afterwards the remainder of the mass of which they form a part, becomes quite friable, and is converted into a kind of liquid pulp.

The same author regards melanosis as occurring under the four following forms: viz., 1. that of masses enclosed in cysts *(mélanoses enkystées)*; 2. that of masses without cysts *(mélanoses non enkystées)*; 3. that of infiltration in the tissue of organs; 4. that of deposition on the surface of organs.

A *liquid* form of melanosis (which is, in fact, the fourth kind of Laennec) has since been admitted by pathologists. Laennec not only knew of the existence of the disease under this form, but has even described it, although he has not given it a place among what he conceived to be the essential forms of the disease. This circumstance, which some may consider as an oversight on the part of Laennec, is obviously to be referred to a fundamental error in the pathological doctrines which he maintained regarding the mode of formation, development, and termination of accidental or new products; for he believed that all these products possessed at first a greater or less degree of density, to which state he gave the name of *crudity*; and that they afterwards undergo, at some period or other of their existence, by means of some change taking place within themselves, a process of solution, which he describes as the period or state of *softening*. The idea, therefore, of melanosis existing *primarily* in a *fluid* form was repugnant to such doctrines; consequently this form of the disease could not be admitted by him into the class of accidental tissues, to which he conceived melanosis to belong.

The division of melanosis, as to its forms, established by Laennec, has been adopted, with some slight modifications, by almost every author of note who has treated of this subject. The results of more recent researches, however, on melanosis and other morbid states and products which present the same distinctive physical character as the former, seem to us to suggest the necessity of a different arrangement of melanotic formations, and to warrant us in proposing one, which, we think, will comprehend all the forms and conditions under which these formations have been observed to occur.

Melanotic formations may take place in various and different parts of the body; may present considerable variety in the forms which they assume; and may owe their production to the operation of very different agents.

These circumstances do not appear to have been well understood, or their importance sufficiently appreciated, as Laennec has confined his description of melanosis to one kind only of

black deposit; whilst Breschet,* Heusinger,† Noack,‡ Andral,§ and many others, have included under the same general denomination various and very different morbid states and products, because of their presenting, as their most remarkable character, a greater or less degree of blackness. To reject every black discoloration or product which does not agree in all its characters with those assigned to melanosis by Laennec, or to collect them indiscriminately into one entire group under the same appellation, as has been done by others, would obviously render the pathology of melanotic formations equally incomplete and inaccurate.

In order to conciliate these differences, and at the same time to facilitate the study of melanotic formations, we shall consider the latter as susceptible of being grouped under two heads, each presenting a certain number of forms, the distinctive or pathognomonic characters of which are derived from some peculiarity of seat, origin, or nature.

In accordance with this plan, we shall comprehend all anormal black substances, fluid or solid, found in the body, under the general title of *melanotic formations*. When these formations depend (as is the case with several of them) on some change taking place in the economy, or the important function of secretion, independently of at least the direct influence of any external cause; or, in other words, when they constitute what is called an idiopathic disease, we shall consider them as belonging to the first head, and as deserving the name of *true melanosis*.

Other melanotic formations have quite another origin, being the consequence of the accumulation of a black material introduced into the body from without; the action of chemical agents; and the stagnation of the blood. These we propose to include under the title of *spurious melanosis*.

We are perfectly aware that these terms are inaccurate, and that to avoid the ambiguity which the use of them may create, we might have arranged all black products or deposits under the general head of melanotic formations, distinguishing each kind in reference to some peculiarity in its external form, origin, or mode of production. By doing so, however, we should not have drawn a sufficiently marked line of separation between these anormal products, which, as we have already said, differ in their nature, and offer only one common external character by means of which they can be recognized by the practical pathologist.

The following tabular view will show at once the nature of the arrangement which we have adopted.

Classification of melanotic formations.

I. TRUE MELANOSIS.

Origin.	A modification of secretion.
Locality.	1. Tissues, systems, and organs.
	a, in the substance and on the surface of organs.
	b, in the cavities of hollow organs.
	2. New formations.
Form.	1. Punctiform.
	2. Tuberiform.
	3. Stratiform.
	4. Liquiform.
Seat.	1. Molecular structure of organs.
	2. The blood.

II. SPURIOUS MELANOSIS.

Origin.	A. Introduction of carbonaceous matter.
	B. Action of chemical agents.
	C. Stagnation of the blood.
Locality.	Of first kind: the lungs.
	Of second kind: the digestive organs; the surface of serous and mucous membranes; the cavities of hollow organs; new formations.
	Of third kind: the blood.
Form.	Of first kind: uniform.
	Of second kind: 1. punctiform; 2. ramiform; 3. stratiform; 4. liquiform.
	Of third kind: punctiform and ramiform.
Seat.	1. The blood, contained in its proper vessels, or effused.
	2. Pulmonary tissue: cellular and membraneous.

From a very cursory view of the several circumstances included in the above arrangement, it will readily be perceived that melanotic formations must differ very materially from each other both in their composition and conformation.

I.—TRUE MELANOSIS.

Locality of the disease.—The cellular and adipose tissues are much more frequently found to present the true melanotic deposit than any other tissue of the body. Here, also, the quantity of the deposit is infinitely greater than in any other texture, and is always in proportion either to the quantity of this tissue, considered as a simple element, or as a component part of organs; or to the facility with which it admits, from its situation, of mechanical distention. Hence the reason why the largest masses of melanotic deposit have been found in the retro-peritoneal cellular and adipose tissues.

It is also of importance to know that melanosis may occur in either of these tissues separately. Marked examples of it, confined to the *cellular* tissue, are common in various parts of the body; and the most striking example of its circumscribed existence in *adipose* tissue is

* Considérations sur une Altération Organique appelée dégénérescence noire, mélanose, &c., Paris, 1821; Journal de Phys. Expér., vol. i. No. 4.

† Untersuchungen über die anomale Kohlen; und Pigmentbildung. Eisenbach, 1823; Archives Gén. de Médecine, t. v.

‡ Précis d'Anatomie Pathologique, t. i; Dictionnaire de Médecine, t. xviii. art. Mélanose.

§ Comment. de Melan. cum in Homin. tum in equis obveniente, &c. 4to., c. trib. tab. æn. Lips. 1826.

observed in the appendiculæ epiploicæ, or the fatty appendiees of the colon, these bodies being sometimes converted into a homogeneous solid mass of melanotic matter.

Occurring, besides, as a primary affection of these tissues, the melanotie matter frequently extends to those situated in the immediate vicinity of the former, which it penetrates, or in which it forms excavations of various sizes, on account of the compression and subsequent absorption to which they have been subjected during the progressive development of this morbid product.

It is also by means of the eellular tissue that melanotic tumours spread to a great extent along the course of the bloodvessels and nerves, between the folds of the mesentery, and in the eavity of the pelvis, and where, on aecount of the size which they attain, they sometimes give rise to very serious eonsequences, to which we shall more particularly allude hereafter.

Mucous membranes.—The melanotic deposit, notwithstanding what has been said to the contrary, has very rarely been observed in mucous tissue. We ourselves have only met with one example of it in this tissue, and it was even doubtful whether the deposit had its origin in the mucous or submucous tissue, both of them being simultaneously and contiguously affected.

Skin.—An opposite opinion has been entertained regarding the production of melanosis in this tissue, viz. that when found in the skin, it was to be regarded as the extension of that which existed at the same time in the subjacent cellular or adipose tissues. Sueh is frequently the source of melanosis of the skin; but we have found it to exist as a primary affeetion of this tissue, particularly in the horse. In this animal the melanotic matter may be seen occupying the very centre of the *cutis vera* in the form of black points, or varying from the size of a hemp-seed to that of a large pea, whether the subjacent textures eontain any of the blaek deposit or not.

Muscular, arterial, and venous tissues; serous and synovial membranes; aponeurosis, tendon, and cartilage.—These have not, so far as we are aware, been found to contain any trace of the melanotie deposit as a primary disease. All of them may present the dark brown or black colour of melanosis, but this arises from contiguity, the imbibition or infiltration of the black matter when in a state of fluidity, or from other causes of a very opposite kind, to which we shall particularly direct the attention of the reader in a subsequent part of this article.

Bone.—The bones are not often affected with melanosis; the spongy bones, as the sternum, more frequently than others.

Liver.—Of all the *compound tissues* or organs the liver is by far the most frequently affected with melanosis: in this respect it is inferior only to the cellular and adipose tissues. The frequent occurrence of the disease, as well as the extent to which it proceeds in this organ, are no doubt in great measure to be attributed to the predominanee of the cellulo-vascular element which enters into its composition. We shall, however, endeavour to show that the melanotie deposit is not confined to this element, but that it invades, as a primary formation, the molecular structure of this organ.

Lungs.—Notwithstanding the supposed frequency of melanosis in the lungs, it is by no means so often observed in this organ as in the liver; nor, perhaps, does it ever acquire the same extent as in the latter, although we are aware that eases have been recorded of the whole of both lungs being filled with it. This form of the disease will be considered under *spurious melanosis*, to whieh division of our subject we conceive it ought to be referred.

Brain.—Few cases of true melanosis of this organ are recorded by pathologists. We have only met with one ease, the particulars of which will be related when we come to consider the physical and other eharaeters of melanotic formations. Dr. Hooper* has represented a ease of true melanosis of the brain.

Melanosis of the *kidney* has been occasionally met with. It is also found in the *testes* and *ovaries;* and Andral says that it occurs in the *uterus.* It has also been seen in the *breast.*

The *pancreas* and *lymphatic glands* in several parts of the body, and the *thyroid* and *parotid glands*, have presented the disease in various forms.

Melanosis of the *eye* has been frequently observed by surgeons, either alone, or combined with other morbid products.

Examples of melanosis occurring in the eavities of serous and mucous membranes are given by various authors; and Breschet, Cruveilhier, and Andral, have described it as existing within the veins. We have also had occasion to observe it in these eavities; but it is the spurious melanosis whieh has, in general, been observed in these situations, and has been described as examples of the true kind.

Blood.—The presenee of true melanotie matter in the blood is an important fact, and one which, under favourable circumstances, may be easily ascertained.

It has chiefly been in the minute veins of the liver that we have observed melanosis as a primary formation in the blood. The vessels which, in this organ, contain the melanotic matter, appear like blaek lines, striæ, or dots, and sometimes in a pencillated form, all of whieh appearances may be recognized as originating in the ultimate extremities of the veins of the liver, most probably the hepatic.

We are not disposed to believe that the blaek ramiform appearance so frequently seen in the lungs is owing to the presence of true melanotie matter in the extreme branches of the veins. Such may sometimes be the case, although we have not been able to satisfy ourselves that it really is so. The blaek colour of the contents of these vessels we rather attribute to the simple stagnation of the blood, and to the subsequent removal of *that*, the produetion of the red colour. A similar vascular arrangement of black

* The Morbid Anatomy of the Human Brain, pl. xii. fig. 2 and 3.

matter has also been seen in the vessels of the stomach, and described as melanosis by several pathologists. But in this case error is conspicuous. The writer of this article has shown in another publication* that the black colour of the blood, not unfrequently seen in the vessels of the stomach, in the cavity of this organ, and in that of the intestines, is the result of a chemical process, and is always observed when the blood in these parts is either directly or indirectly brought in contact with the acid products which they contain: melanotic formations of this kind naturally take their place among those of spurious melanosis.

The existence of the matter of melanosis in the blood accounts satisfactorily for its being sometimes met with in the cavities of some secreting organs. It is also said to have been found in the saliva and bile, and likewise in the sweat and urine, in which last fluid a dark colouring matter was found by Dr. Marcet, which has received the name of *melanic acid*. The presence of melanotic matter in these secretions does not, however, appear to us to have been proved, except in the serous and mucous. It has, however, been observed in the medulla of bones, and in the humours of the eye.

Melanotic fluid may be found in cavities, either natural or accidental, without its being the product of their secretion. This happens when melanotic tumours perforate the walls of these cavities, and pour their fluid contents into them. This we have observed in the thorax and abdomen; and in one case a melanotic tumour had perforated the right lateral ventricle of the brain, in which was found a considerable quantity of black fluid, which afterwards passed into the third and fourth ventricles, and thence into the theca vertebralis. Such also is, in general, the source of the melanotic fluid found in accidental cavities.

The production of melanosis, scirrhus, carcinoma, and encephaloid formations in the same organ, and even in the same diseased mass, is occasionally met with.

The simultaneous existence of melanosis with these diseases, and the real or supposed analogy which the former presents in regard to its mode of development, progress, and termination, when compared with the latter, have induced some pathologists to consider melanosis as a species of cancer: how far this opinion is founded in truth we shall not at present stop to enquire.

Such is, we believe, a correct, though general statement of the topography of melanosis. We shall now endeavour to describe the various forms which it assumes in the different tissues, systems, and organs of the body.

Of the forms of true melanosis.

1. *Punctiform melanosis.*—Of the four forms under which we have included the true melanotic deposit, the first is that in which the black colouring matter appears in minute points or dots, grouped together in a small space, or scattered irregularly over a considerable extent of surface, and which we have termed *punctiform*. These appearances are most frequently met with in the liver. The cut surface of this organ appears as if it had been dusted over with soot or charcoal powder. When examined by the aid of a lens, the black points sometimes present a stellated or pencillated arrangement, which in some cases can be distinctly seen to originate in the ramiform expansion of a minute vein filled with black matter. At other times the melanotic matter appears to be deposited in the molecular structure of the organ in a manner similar to that of the organizable part of the blood. In such cases it consists of the most minute points disseminated throughout the acini or little lobules of the liver, and which then assume a uniform grey aspect. The various shades of grey and black which the liver presents when thus affected, depend on the greater or less quantity of the black punctiform injection; and we are inclined to believe that the melanotic tumour in this organ has, sometimes, a similar origin. We have always found the two forms, the punctiform and tuberiform, combined in the liver, lungs, and also the kidney. The "*infiltration des organes par la matière des mélanoses*" of Laennec is, in many instances, owing to the punctiform dissemination of the melanotic matter. In others it is obviously produced, as Laennec believed, by the simple diffusion of the liquid black matter throughout the tissues of an organ more or less remote from the part where it was formed. It is likewise to be attributed to general venous capillary congestion, or the effusion of blood, and the subsequent changes which this fluid undergoes, to be mentioned hereafter.

Punctiform melanosis is not observed in the brain, cellular, adipose, serous, and fibrous tissues. It may take place in mucous membranes; but its occurrence must be rare, as we have already said that we have only seen one case of melanosis of this tissue, in which the submucous tissue was affected at the same time.

2. *Tuberiform melanosis.* This is by far the most common of all the forms of melanosis. The bulk of the melanotic tumour varies greatly, and, as we have already said, always acquires its maximum in loose cellular and adipose tissues. Sometimes not larger than a pin's head, at others it equals in bulk the head of a child, or even that of an adult. It is, however, only in the horse that it acquires such an extraordinary size; in man it is seldom larger than an orange.

The great size of melanotic tumours depends on the agglomeration of smaller ones, the number of which varies with the size of the aggregated mass, or with that of the individual tumours of which it is composed.

The melanotic tumour, when single, is always of a spheroidal or ovoid form; and when aggregated, presents a lobulated appearance. In compound tissues or organs it is more frequently found single; in the cellular and adipose tissues, aggregated.

In both of these forms it has been described

* Recherches sur la Dissolution Chimique ou Digestion des parois de l'Estomac après la mort, &c. Journal Hebdomadaire de Médecine, 1830. No. 87, p. 351. No. 91, p. 517.

as encysted and non-encysted. It is said to be encysted when contained in a membraneous capsule, and non-encysted when it lies in immediate contact with the tissue of the organ in which it is seated.

The encysted melanotic tumour does not, so far as our observation extends, occur, unless in a very imperfect state, in any of the compound tissues. It is chiefly found in the cellular and adipose tissues, a circumstance which the nature of the tissues sufficiently explains. The cyst of the tumour consists of cellular membrane—not of new formation—stretched out in the form of a thin transparent covering, from the gradual accumulation of the black melanotic matter contained within it. Hence melanotic tumours of the latter tissues are always provided with an external covering, which, as it not only adheres closely to them, but generally forms a constituent part of their internal arrangement, is separated from the loose surrounding cellular tissue when these tumours are removed, and which are therefore said to be contained in a cyst.

The tuberiform arrangement of the melanotic matter contained within a cyst is not confined to the cellular tissue as a simple element, or to those organs in which this tissue is more or less abundant. We have found it on the surface of the pleura and peritoneum in man,* and also in the horse. In this situation the melanotic tumours frequently assume a pedunculated appearance, being suspended by a slender neck, like some polypi, and are covered by a thin transparent serous membrane. Under such circumstances it is often difficult to determine whether the serous covering of these tumours is a new product, or merely an extension of pleura or peritoneum produced by the gradual accumulation of the melanotic matter in the cellular tissue beneath these membranes; and the difficulty of the case is increased if there exist at the same time, and in the same organ, tumours of a similar nature either in the sub-serous cellular tissue or in the parenchyma which it covers. Instances, however, have occurred which have afforded us the means of determining the seat of these extra-pleural and extra-peritoneal melanotic tumours. Thus we have seen these tumours co-existing with the more simple forms of the melanotic deposit, such as striæ or patches, consisting of a fluid or semi-concrete black matter lying on the free surface of the pleura or peritoneum, and enclosed in a fine, loose, spongy tissue, or serous covering of considerable tenacity, although almost equal in tenuity to a spider's web. The pleura and peritoneum beneath the melanotic deposit were perfectly entire, and therefore the solid material, whether cellular or serous tissue, in which it was enclosed, must be regarded as a new formation. The inference which we would draw from this is, that the melanotic tumour may, in some instances, have a similar origin, viz. in the deposition of melanotic matter on the surface of the serous membranes, and the subsequent or simultaneous formation of a tissue, which afterwards acquires the solidity and characters of a general serous envelope.

Melanotic tumours of the pleura pulmonalis and costalis are found either solitary or aggregated in considerable number, and vary in bulk from the size of a pea or less, to that of a cherry. When they are found in the peritoneum, it is generally where this membrane receives the name of epiploon.

3. *Stratiform melanosis.*—This form of the melanotic deposit occurs only in serous surfaces: it presents two degrees or stages. In the first the black matter is so sparing in quantity that the serous membrane on which it is deposited presents an appearance as if it had been painted with ink, or stained with a deep brown or black colour. In the second the black deposit is more copious, forms a distinct layer on the surface of the serous membrane, above which it is seen to project. The consistence of the matter thus deposited resembles, in general, that of firm jelly, and is enclosed, as we have already said when speaking of the preceding form of melanosis, either in a soft spongy tissue, or fine transparent serous membrane of new formation; so that, when pressed, it feels pulpy, but is not removed by a scalpel being passed over it, unless some force is employed.

This form of melanosis is described by Andral and others as occurring frequently on the peritoneum in chronic peritonitis. Such, however, is not the case. The "*mélanoses déposées sous forme de couches solides à la surface des membranes,*" described by this author, is of a diametrically opposite nature to that which we are now discussing under the appellation of the *stratiform*. It is the result of the chemical action of certain fluids and gases, formed in general in the digestive organs, on the blood contained in the vessels of the pseudo-membranes of the peritoneum, or effused into the substance of the one, or on the surface of the other, as we shall endeavour to demonstrate when we come to treat of this mode of production of melanotic formations.

The stratiform melanosis of serous membranes has not been observed to any extent in man. In the horse it is sometimes considerable in degree and extent, and is chiefly found on the peritoneum, pleuræ, and pericardium.

4. *Liquiform melanosis.*—The appearance of melanosis in a liquid form has in general been confined to natural or accidental cavities, into which it has been supposed to be poured by a process somewhat analogous to that of secretion. This is certainly one of the modes to which its presence in these situations is to be attributed; but it is also owing, as we have already remarked, to the effusion of the same substance during the softening process of melanotic tumours; and it may also be observed that some of these tumours, when encysted, are found to be composed entirely of the black fluid or semi-fluid matter of melanosis. We shall, however, confine our description of the liquid form of melanosis as it occurs in natural or accidental cavities.

* Transactions of the Medico-Chirurgical Society of Edin. vol. i. p. 279, and Edin. Med. and Surg. Journal, vol. xxvii. p. 151.

Among the former, the cavities of the pleura and peritoneum furnish almost the only examples in which liquid melanosis has been observed, and that, too, in very small quantity. We have never seen it in man, and rarely in the horse.

The mucous cavities, particularly of the stomach and intestines, are mentioned by several pathologists as furnishing, not unfrequently, examples of the presence of melanosis under this form. But in this instance, as in those to which we have already more than once alluded, in which other forms of melanosis are supposed to have their seat in the mucous tissue itself, the same mistake has been committed: the blood, either effused into these cavities or contained in the vessels of their proper tissue, and having been submitted to the influence of an external chemical agent, being in general the *material* thus improperly denominated.

As an example of accidental cavities in which fluid melanosis has been found, we may mention the serous cysts which form in the ovaries, and the capsules of the ova which have escaped from these bodies.

Whatever form the melanotic deposit may assume, it is never, so far as we know, confined to one tissue or organ only; on the contrary, it is found to pervade a greater or less number of these simultaneously or successively; being, in some cases, equally extensive every where; in others, small in quantity in one organ, while in another it is so abundant, that hardly any of the natural texture is to be perceived. The tuberiform deposit is the most conspicuous and prevalent of all the forms which this morbid product assumes.

General characters of melanosis.

1. *Physical characters.*—These comprehend chiefly the colour, bulk, and consistence of the several forms of melanosis which we have described.

The *colour* of melanosis, whether in the solid or fluid state, although always tending to black, frequently presents various shades of brown, such as that of bister or China ink, having either the dull aspect of soot, or the glossiness of pitch. The deep black colour and glossy aspect is more frequently met with in inferior animals than in man; and in both, these appearances are most marked when the melanotic deposit exists in the form of a firm tumour. It is hardly necessary to observe that the quantity of cellular tissue intermixed with the melanotic matter, as well as the presence of a certain quantity of blood, give rise to a greater variety in the shade and depth of colour than this substance would otherwise present.

The *bulk* which the melanotic deposit may acquire is sometimes very considerable even in the human species. It may form irregular or lobulated masses in the cellular tissue as large or larger than the fist; and in parenchymatous organs, such as the liver, it acquires the bulk of a hen's egg, or even that of a small orange. In the cellular tissue, the larger masses are almost always produced by the union of smaller ones, although in one instance we found in this situation a single tumour as large as a hen's egg. In the liver, single tumors of a large size are more common than in any other of the compound tissues, or even the cellular tissue, for the reasons which we have already stated. In the horse, the aggregated melanotic tumor has sometimes been found to weigh from twenty to thirty and even forty pounds.

The *consistence* of melanosis, as we have already seen, presents great variety: there are two circumstances which seem to determine the degree of consistence which it is found to present when examined *in situ*: these are the *texture* and the *form* of the part in which the deposit takes place. Thus it is never found solid in large cavities, such as the abdominal and thoracic, for the plain reason that its diffusion is not limited by dense unyielding tissues. Even in tumours attached to the serous covering of these cavities, it is found for the same reason either perfectly fluid or not more dense than animal jelly. In loose cellular tissue too, one, two, or a limited number of cells, more or less distended into the form of small tumours, are occasionally found to contain the black matter in a fluid state. In the dense texture of the cutis, on the contrary, even the smallest tumours may be nearly as hard as cartilage, and are generally as firm as the pancreas. In the lymphatic glands, and in the brain, the melanotic tumour acquires only a medium degree of consistence, although it is generally firmer in the former than in the latter, on account of the capsule of the glands acting as a compressing cause. In the liver and lungs we perceive the same relation between the structure of these organs and the consistence of the melanotic tumours formed in them. In both they are pretty firm; much about the consistence of a lymphatic gland; from the black matter being contained either in the capillaries, molecular structure, or cellular texture of these organs.

It is an important fact that the conditions of texture and form, or of composition and conformation of the tissue or organ in which the melanotic deposit takes place, determine almost exclusively the degree of consistence which this morbid product, and indeed every other, presents when examined *in situ*. That absorption and imbibition exercise a certain influence in modifying, under certain circumstances, the consistence of this matter, cannot be doubted, inasmuch as they are known to give rise to very marked changes in the consistence of some other morbid products. We have, however, already shown that the operation of either of these modifying causes, as regards the consistence of melanosis, must be very limited, since there is always a direct relation between the consistence of this morbid product and the conditions of the tissues which we have named, in which it is received and retained. It is indeed from a knowledge of this pathological fact that we are led to believe that the *primary* condition of melanosis is that of a fluid, formed or collected in the capillaries and minute cellular areolæ, or combined with the solid or fluid elements of the body. If this fact is not admitted to be demonstrated by the

evidence which we have adduced, we should then be compelled to adopt, at least in part, the opinion of Laennec, namely, that melanosis is, *ab origine*, a solid accidental product: as to its being a *tissue*, as it was believed or said to be by the same author, we shall inquire by-and-by, when speaking of its anatomical characters. And to show that this mode of origin is not peculiar to melanosis, we may mention that tubercle, cancer, and every other morbid product can be traced to this their primary and fluid state of formation. In this respect, therefore, there is no difference between morbid and natural products. The law is the same in both: the hardest texture in the latter, namely, bone, being in its primitive state a mere jelly, as scirrhus and accidental bony formations are in the former. Even calculi do not form an exception to this law, the bile, urine, and other fluids, in a morbid state, constituting the primary forms of these bodies, before their respective elements become tangible to our senses by means of chemical agency; and as the last link in this chain of analogy, the blood—the *fons et origo vitæ*—may be regarded as the representative of the primary condition of organization in general.

Like all colouring matters in a fluid state, that of melanosis, when placed in contact with a white surface, communicates to it its peculiar tint, but the stain thus produced is readily removed by ablution. In its natural state, or when mixed with water, exposed to the air it becomes dry, brittle, and pulverisable, and does not emit the odour of putrefaction until after a long period. When burnt, it swells, gives out a great deal of smoke, a marked empyreumatic odour, and is converted into a carbonaceous substance. It is quite opaque, and has no marked odour or taste.

2. *Anatomical characters of melanosis.*—Several of the anatomical characters of melanosis have already been enumerated in the description which we have given of the different forms of this disease. When speaking of what is called the *encysted* melanosis, we explained the reason why this appellation had been employed, namely, that the single or aggregated masses of melanotic matter found in the cellular tissue are enclosed in and united together by a capsule of the same tissue stretched out by the gradual accumulation of this matter. This membranous covering (for it is not a cyst) is generally so thin and transparent that the black colour of the melanotic matter is hardly if at all obscured by it. If the tumour be simple, and a quantity of the black deposit has been washed out of it, a multitude of fine filaments and lamellæ are seen connected with the membranous covering of the tumour, traversing the substance of the latter in every direction, and presenting an appearance resembling cellular tissue when distended with serosity. When a number of tumours are united into one mass, they are included in a common capsule, and separated from one another by their respective coverings and portions of cellular tissue contained in the angular spaces sometimes left between them.

It is in these filamentous and cellular tissues alone, which are obviously not of new formation, that bloodvessels or nerves are to be seen. Minute arteries and veins can be seen ramifying in both, although they are rarely numerous, and we have never seen them pass beyond the limits of these tissues. Large branches and even trunks of arteries, veins, and nerves are sometimes found passing over the surface, or included in the aggregated masses of melanotic tumours.

There is a considerable difference as to the relative quantity of cellular tissue and melanotic deposit which constitute these tumours, when examined in man and in inferior animals. We have never found the melanotic tumour in the horse to contain much cellular tissue: indeed, it is sometimes impossible to detect its presence until after the tumour has been macerated and the black matter squeezed out, when there is found to remain a small quantity of extremely fine, soft, cellular tissue. In man, on the contrary, we have seen it at least equal in quantity to the black matter in tumours nearly as large as a goose's egg, formed in the subcutaneous cellular tissue. An example of this kind of melanotic tumour, which we had an opportunity of examining in the recent state, is now preserved in the Museum of the Royal College of Surgeons of Edinburgh, and a drawing of it is in the possession of Dr. Thomson, the distinguished Professor of Pathology in the university of that city. The cellular tissue was remarkably conspicuous, in some points almost as dense as fibrous tissue, formed bundles which intersected one another in various directions, and thus formed irregular cells of various dimensions, in which the melanotic deposit, of the consistence of fluid pitch, but without tenacity, was contained.

We have stated that the bloodvessels are confined in their distribution to the cellular tissue, which enters into the composition of melanotic tumours, and that they are never seen to penetrate the black deposit. There is, however, one kind of tumour, already alluded to, which is almost entirely formed of bloodvessels and a black or deep brown fluid. We formerly expressed a doubt whether this tumour should be regarded as one of the true melanotic kind, by reason of its anatomical composition being an exception to that observed in all others. This kind of tumour we have only met with once, and so far as we know there is only one other example of a similar kind on record. The subject of our case was an old man, between seventy and eighty years of age, brought to the Hôtel Dieu of Paris in a state of incomplete paralysis, and incapable of giving any account of himself. He lived several days; had little or no fever or excitement of any kind. The paralysis soon became complete and general, and he died in a state of collapse and profound stupor. On examining the body after death, black or deep brown-coloured tumours, two of which were as large as a hen's egg, occupied both hemispheres of the brain. One of them had made its way through the walls of the right lateral ventricle,

poured a quantity of the black fluid with which it was impregnated into this cavity, which had passed from thence into the opposite ventricle, the third and fourth, and along the spinal cord to its inferior extremity. Although these tumours were almost entirely surrounded by the medullary substance, they must have been seated originally on the external surface of the brain between the convolutions; for they were intimately connected with the pia mater, the bloodvessels of which constituted by far the greater part of their bulk. The bloodvessels were crowded together in parallel bundles at their exit from the pia mater, became tortuous in the substance of the tumours, some of them having nearly a line in diameter; were reflected backwards at their extremities in the form of irregular interlaced groups, towards which two or three small arteries coming from the pia mater were seen to distribute themselves. The black colouring matter of these tumours was very abundant, nearly as fluid as ink, and was contained not only in the loose cellular tissue which separated the bloodvessels from one another, but likewise in the vessels themselves. The veins (or large tortuous vessels described above) were completely filled with it, whilst the arteries, minute as they were, were distinctly seen to carry red blood. The medullary substance was slightly reddened and somewhat soft where it was in contact with one of the large tumours only. The cortical substance of the convolutions contained three or four melanotic tumours rather larger than hemp-seed. They were quite unconnected with the pia mater, were not composed of bloodvessels like the others, presented the usual consistence of melanosis, and contained but a minute quantity of cellular tissue.

Besides these black tumours—vascular and non-vascular—there was one of another kind, about the size of a small cherry, situated in the brown substance of the corpus striatum of the right hemisphere. Instead of being black, it was of a reddish grey colour, and was traversed by a great many minute vessels filled with red blood. It was nearly of the same consistence as the others, but, when pressed, discharged a small quantity of a milky or creamy looking fluid. After having been submitted for some time to ablution and gentle pressure, it assumed an appearance somewhat similar to that observed in the black vascular tumours: its tissue was of a spongy reticulated character, of a dull red colour, and vascular. There was no tumour of a similar kind in any other organ of the body; but as it participated in the characters of erectile and carcinomatous formations, we may mention at present that there existed a somewhat analogous disease of the right parotid gland. This body formed a large oblong tumour, composed of a substance partly of a scirrhous and partly of a mammary aspect and consistence, grouped into irregular masses of various sizes, surrounded by a considerable degree of ecchymosis. At its upper extremity and on a level with the ear there was a melanotic tumour of a firm consistence and homogeneous aspect, as large as a Spanish nut. This tumour had perforated the external auditory canal, and projected into its interior.

Black tumours, similar to those of the brain, were also found in the abdominal viscera. The duodenum contained one, the ileum five, and the epiploon one. In the intestines they appeared to be seated in the submucous cellular tissue, and formed the bottoms of black ragged ulcers occupying the mucous membrane. They were of a round or oval shape, flat, the largest of them about an inch in diameter. The one found in the epiploon was nearly as large as a walnut. It was attached to one of the prolongations of this covering, between which and the tumour there existed the same kind of vascular connexion as between the pia mater and some of the tumours in the brain: it presented likewise the same internal structure as the latter. Those which were found in the submucous cellular tissue did not present any peculiarity of structure.

The above description contains the most of the anatomical facts of any importance connected with this interesting case, which occurred under the care of Dr. Menière, while *interne* in the Hôtel Dieu, and to whom we feel much indebted for the opportunity he afforded us of examining and delineating the appearances we have described. When shewn to Baron Dupuytren, he pronounced the case to be one of melanosis, or, in his own language, *cancer noire;* his opinion being obviously founded on the *colour* of the tumours, without any regard to their *structure*.

Dr. Menière, on the contrary, who has had extensive opportunities of examining diseased structures, considered it to be a case of fungus hæmatodes, the vascular organization of the tumours constituting, according to him, the essential character of the disease; whilst the black colour was merely an accidental circumstance of very inferior importance. We ourselves are of opinion that neither of these notions is borne out by the anatomical facts of the case, as above related; and had we not already extended this part of our article beyond the limits usually assigned to descriptive details in a work of a practical nature, we should have furnished collateral evidence sufficient to shew that both opinions are exclusive, incomplete, and inaccurate. We shall, therefore, only make a few remarks with a view to our being justified in placing for the present this case in the division of *true melanosis*. And first, we have two or three melanotic tumours of the ordinary kind in the cortical substance of the brain; one in the parotid, or in a carcinomatous tumour found in that gland; to which we may add those of the intestines: we have here, therefore, as far as regards these tumours, a case of true melanosis. Secondly, there existed a large tumour behind the ear and in the parotid, presenting the most marked characters of scirrhus and cancer. Here, then, we have a case of cancer, but not of fungus hæmatodes. Thirdly, we have the black vascular tumours of the brain. The question is—did they present the anatomical characters of scirrhus, cancer, or fungus hæmatodes?

Certainly not. They were no doubt vascular, but must not on that account be identified with carcinoma or fungus hæmatodes, for the essential character of both of these was wanting, viz. a fluid resembling milk or cream, or a substance of the colour and consistence of brain; and, besides, carcinoma and fungus hæmatodes do not necessarily possess a high degree of vascular organization.

The production of the black vascular tumours of the brain may be accounted for as follows. The original state of these tumours we believe to have been the same as that of the small tumour situated in the corpus striatum, and which, we said, was of a compound nature, from its structure resembling that of erectile tumours, and the fluid it contained being similar to that which is found in carcinomatous tissue. The melanotic fluid, which we found deposited in the usual way, that is to say, in the form of small, dense, homogeneous tumours, in several points of the brain and elsewhere, appears also to have been deposited in these erecto-carcinomatous tumours, after they had acquired considerable bulk. Thus the black fluid which they contained, (which we have no reason for believing differed in any respect from that contained in those that were not vascular,) instead of being deposited in the form of a homogeneous mass, assumed the form and arrangement of the anatomical elements of these tumours, that is to say, was collected in the veins and cellular tissue of which they were composed. From these remarks on the origin and mode of production of the black vascular tumours of the brain, we do not hesitate to say that, in the strict sense of the term, they do not merit the appellation of true melanotic tumours, but that they ought to be considered as examples of melanosis taking place in a tissue of new formation, just as it is found to do in other tissues, whether healthy or diseased.

The other case of vascular melanosis to which we alluded is mentioned by Lobstein.* The patient was an emaciated old woman between eighty-five and ninety years of age. The inspection of the body was made by M. Alex. Lauth, and also delineations of the melanotic tumours. Besides melanosis of the spongy substance of the inferior third of the femur, there were several black tumours on the anterior region of the neck, and a large one in the inferior lobe of the right lung. The former appeared to be encysted; they were of a round form and lobulated; the most of them moveable under the skin, and were formed of a plexus of veins coming from the neighbouring veins, which became dilated as they approached the tumours. All these vessels, not only those which penetrated, but also those which formed the tumours, were filled with a deep brown substance, having, from the presence of an irregular filamentous tissue, an appearance of organization. In some of the veins, the substance which filled them adhered firmly to their internal surface, and seemed continuous with their tissue, although the latter differed from the former, from its being firmer and of a whitish colour.

The matter contained in the tumour in the lung was fluid, and as black as ink; it was infiltrated into the pulmonary parenchyma, which was reduced to a filamentous tissue. However, when minutely examined, this tissue was found to be composed of arteries and veins swimming in the melanotic fluid, and containing a quantity of it in their interior.

Although the author of this observation does not speak of any other morbid product having been found in the body, except a small horny excrescence on the left side of the thorax, we feel satisfied that the vascular tumours which he has described were precisely of the same kind as those of which we have just given a description. The most important circumstance in both cases was the presence of the melanotic matter within the bloodvessels of the tumours. In Lobstein's case it appears to have been contained in the arteries as well as veins, whilst in ours it was observed only in the latter. In either case the presence of melanosis in the blood is clearly demonstrated. Venous absorption might be considered by some sufficient to explain its presence in the veins; but it was also found in the arteries; and besides, we have already shewn that its existence in the veins of the hepatic tissue is prior to, and independent of, its presence in the cellular tissue, or its combination with the molecular structure of this organ.

3. *Chemical composition.*—The melanotic deposit in the fluid and solid state has been submitted to very minute chemical analysis in this country and on the continent; the uniform result of which shews that melanosis bears a strong analogy in its composition to that of the blood. The most complete analyses of melanosis that have been published are those of Lassaigne and Barruel* in France, and of Dr. Henry of Manchester.† We shall not enter into the details of the analysis of the melanotic deposit furnished by each of these able chemists, but shall content ourselves by giving the facts thus elicited, which seem to prove that the composition of this morbid product is very similar to that of the blood; referring the reader for further information to the works mentioned below.

Mons. Lassaigne found the melanotic tumour of the horse composed of—1st. coloured fibrine; 2d. a black colouring matter soluble in weak sulphuric acid, and in a solution of the subcarbonate of soda, each of which becoming at the same time of a red colour; 3d. a small quantity of albumen; 4th. muriate of soda, subcarbonate of soda, phosphate of lime, and oxide of iron. According to Mons. Barruel, melanosis of the human subject is essentially composed of the colouring matter of the

* Traité d'Anatomie Pathologique, tome premier, p. 461.

* Considérations sur une altération organique appelée dégénérescence noire, &c. Par G. Breschet, Chef des travaux anatomiques à la Faculté de Médecine de Paris, &c. &c.

† A case of melanosis, &c. by Thos. Fawdington.

blood, united with fibrine, both of them "*se trouvant dans un état particulier*," and three distinct kinds of fatty matter. The first of these is soluble in alcohol at a moderate temperature, crystallizable; the second soluble in alcohol at a boiling heat only, soft, and not crystallizable; the third fluid at the ordinary temperature of the air, and of a reddish-brown colour. This chemist found also a considerable quantity of the phosphate of lime and iron.

The following is the result of the analysis obtained by Dr. Henry from a portion of a softened melanotic tumour taken from Mr. Fawdington's patient, and after it had been kept some time in spirit:—

1st. By filtering through paper, much of the colouring matter remained on the paper, and the colour of that which passed through was much less intense.

2d. Boiling does not destroy the colour, nor even when a little caustic potash has been added.

3d. It is not changed by acids even when heated, except by nitric acid, which deprives it of its black colour, and turns it yellow.

4th. A stream of chlorine passed through the liquid destroys the colour, and throws down light fawn-coloured flocculi.

5th. A few grains of corrosive sublimate stirred up with the fluid precipitates the whole of the colouring matter, and leaves the supernatant liquid quite clear.

6th and 7th. Nitrate of mercury and muriate of tin produce the same effect, but more slowly. We may also mention that M. Foy* found in the melanotic tumour of the horse,

Albumen	15,00
Fibrine	6,25
A highly carbonized principle, probably altered cruor	31,40
Water	18,75
Oxide of iron	1,75
Sub-phosphate of lime	8,75
Muriate of potash	5,00
Ditto soda	3,75
Carbonate of soda	2,50
Ditto lime	3,75
Ditto magnesia	1,75
Tartrate of potash	1,75

From the results of all these analyses it is sufficiently obvious that melanosis is essentially composed of the constituent elements of the blood. The colouring material of its composition appears, also, to bear considerable analogy to that of the blood, and is, according to Foy, a highly carbonized principle. Andral puts it as a query, whether the fatty substances found by Barruel belonged to the melanotic tumours analysed by this chemist, or to the tissues of the organ in which the tumours were formed! That these fatty substances may have become incorporated with the melanotic matter during its deposition is possible; but it must also be admitted that they may have been deposited along with it as constituents of the blood, inasmuch as it has been shewn by Lecanu* and by Dr. B. Babington, that this fluid always contains in the healthy state a certain quantity of fatty crystalline and oily matter.

Seat, nature, and origin of melanosis.—We must refer the reader to the preceding section for proofs that the material of which melanosis is composed is formed in the blood, and afterwards deposited in the various parts in which it is found. It is not only because this material is seen in the blood that we have fixed its *seat* in this fluid, but because our anatomical researches shew that it is there formed. The chemical analysis which we have given of this substance confirms the accuracy of this opinion, by shewing that it is essentially composed of the colouring matter of the blood. The separation of this colouring matter, as well as its deposition, in the form of melanosis, must be regarded as the result of a process similar to that of secretion. Several pathologists in France and Germany regard the carbonaceous material of melanosis as having its origin in a modification of the secretion of the natural pigments of the body, and more especially of that on which the colour of the hair and skin depends. This opinion was first entertained by Gohier,† who states that melanosis probably depends on the increase or diminution of some of the elements which enter into the composition of the body of the white and grey horse, or in some remarkable change in the nature of the secreted fluids. The carbon, says this author, which is found in melanosis, is too easily separated by calcination, to permit us to ascribe the colour of this disease to any other substance. Breschet afterwards pointed out the analogy which exists between the black matter of melanosis and that which colours the choroid, the uvea, the rete mucosum of Malpighi in the negro, and the placenta of certain carnivorous animals. He regarded, also, the colouring matter of several morbid secretions as of a similar nature, such as melæna, the black coating of the tongue in fevers, the fluids rejected by vomiting in yellow fever, &c.—an opinion which we consider to be by no means correct. A similar opinion is, however, entertained by Heusinger in his researches on the accidental production of pigments and carbon in the human body. The following are the deductions which this author gives as the result of his investigations:—1. that all the pigments secreted in the body in the healthy state are rich in carbon; 2. that the accidental pigments resemble the natural; 3. that the anomalous pigments are a modification of the colouring matter of the blood; 4. that their secretion is intimately connected with that of the fat; 5. that they announce the predominance of the venous system, the want of oxidation, and particularly the decarbonization of the blood. Some of these deductions, viz. that the secretion of the colouring matter of melanosis is intimately connected with that of the fat and

* Archives de Médecine, Juin 1828.

* An. de Chim. et Phar. xlviii. 308.

† Mémoires et Observations sur la Chirurgie et la Méd. Vétérinaire, Lyon 1813, tom. i.

the predominance of the venous system, do not appear to us to be supported either by the evidence brought forward by the author, or by such facts as have fallen under our own observation; for in the many cases of melanosis which we have seen in man and various kinds of animals, there did not appear to be any visible connexion between this disease, either with regard to its locality, degree, and extent, and the secretion of fat, or any state of the venous system in particular. The much greater frequency of melanosis in the grey and white, than in the bay, brown, or black horse, is a circumstance of some importanee, and which may he regarded as favourable to the theory which ascribes the origin of melanosis to the accumulation in the blood of the carbon which is naturally employed to colour different parts of the body, and more particularly the hair. This theory we are disposed to adopt, not only as regards the formation of the disease under these eircumstances of colour, but also when it occurs in animals of a dark colour, and in man indiscriminately, whatever may be the peculiar tint of the skin or colour of the hair. In the first instance, the colouring matter formed is not deposited in the regular physiological order; in the second it is formed in too great quantity. In both cases its presence and accumulation in the blood is accounted for. Its deposition as an anomalous product in various parts of the body follows, as we have already said, as a consequence of its separation from that fluid by a process of secretion.

Causes.—The above remarks anticipate the necessity of any further notice on what is called the *proximate causes* of melanosis. With regard to the *remote causes* of this disease, particularly the influence of external agents, it does not appear to us that our knowledge amounts to anything more than conjecture. We know that the development of colour in general is favoured by exposure to light, heat, and that combination of physical agents which constitutes the climate of warm countries; and that it is retarded by obseurity, eold, imperfect sourees of nutrition, &c. None of these facts, however, seem capable of affording us any explanation respecting the remote origin of melanosis, still less of its affecting one kind of animal rather than another. We should have observed before, that melanosis occurs most frequently towards the decline of life.

Progress of melanosis.—Under this head it is our intention to describe, 1st, the changes which take place in the melanotic deposit itself; 2nd, the changes induced by this deposit in the tissues and organs in which it is contained, or with which it is more or less immediately connected.

1st. *Changes produced in the melanotic deposit.*—Only two changes are observed to take place in the melanotic matter after its deposition. The first consists in the inspissation or solidification; the second in the softening or liquefaction of the melanotic matter. What we have already said on the various forms, the physical and anatomical characters of melanosis, will in a great measure enable the reader to trace these changes to their respective causes, and to explain the manner in which they are produced. We have, we hope, satisfactorily shewn that the material of which melanosis is composed exists primarily in a fluid form, and that every increase of eonsistence which it afterwards acquires, is owing ehiefly either to its combination with the moleeular structure, or the dense unyielding nature of the tissues or organs in which it is deposited. In the first instance, (examples of which were pointed out in the liver,) its consistence becomes eonsiderable; in the second, it acquires its maximum of density, of which its development in the eutis vera furnished us with the most striking examples. When retained in the vessels in which it is formed, it either remains in its primitive state of fluidity, (see our case of melanosis of the brain;) or it acquires a eertain degree of consistence, (Lobstein's ease of melanosis of the neck, &e. l. c.) We also found that when it is effused on the surfaee of the serous membrane, the degree of consistence which it afterwards acquires depends entirely on the development of an accidental serous or cellular tissue within which it is included. Its various degrees of consistence in eavities, viz. those formed in the cellular tissue by its gradual accumulation, are referahle to the same causes: the mechanical resistance offered to its diffusion by the tissues and organs we have named. These facts regarding the manner in which the solidification of the melanotic matter is effected, as well as the causes to which it is to be referred, appear to us so conclusive, that it would serve no good purpose were we to call in the evidence of analogy furnished us by the mode of development of other products of a similar and dissimilar kind, as farther proof of the accuracy of the opinion which we have just expressed.

From these facts it follows as a consequenee that the process of softening cannot take place until that of solidification has been at least earried to a eertain extent: perhaps it never does take place until it has been carried to its maximum. For the softening of the melanotic deposit is observed only when it has acquired the form of a tumour, or occupies an irregular portion of an organ. Under these eirenmstances, the softening of the hardened melanotic mass is effected in the two following ways: first, by the destruction of the tissues ineluded within it and around it; second, by the effusion of serosity caused by its stimulating power as a foreign body. The liver and lungs furnish the best examples of softening of melanotic tumours, from the destruction of the tissues in which they are formed. When a portion of either of these organs is occupied by the melanotie deposit which has so accumulated as to compress or obliterate the vessels contained within it, that pass through it, or ramify in its immediate vicinity, congestion or death of the parts to which these vessels are distributed, follows as a necessary consequence. Besides this cause of effusion, (congestion,) the stimulus of the melanotic tumour is now more partieularly felt, and the serous part of the blood

is poured out in abundance, which, mixing with the melanotic matter, converts it into a soft pulp, or a thin dark-brown or black liquid.

It were needless to insist farther on these changes, or to combat the opinion which Laennec entertained in regard to the manner in which he imagined the last process was accomplished: that melanosis is not a tissue, but an unorganizable fluid, capable only of a certain degree of solidification, must appear obvious to every impartial pathologist who has had an opportunity of observing it in the different tissues and organs in which it is deposited, and under the various forms which it assumes.

2. *Changes induced by the melanotic deposit in the tissues and organs in which it is contained, or with which it is more or less immediately connected.*—These changes are few in number, viz., *irritation*, *compression*, and *ulceration*.

We have just alluded to irritation as a consequence of the presence of masses of the melanotic deposit, and the subsequent afflux of blood to the surrounding parts. It is seldom carried to the extent of inflammation and ulceration; and when either of these occurs, it is almost always confined to the tissues in immediate contact with the melanotic masses.

Compression, we have also said, may be carried to such a degree by the gradual accumulation of the melanotic deposit, that circulation ceases in the cellular tissue in which this deposit is contained. The same thing also occurs in the cellular covering of melanotic tumours, and more particularly in the skin and mucous membrane of the intestines, when, from the bulk of the tumours, these tissues become more or less stretched. Hollow organs, such as veins, the rectum, and colon, are occasionally much compressed, nearly or entirely obliterated. These effects, however, are only observed when the melanotic tumours have acquired a great bulk, and are, therefore, much more frequently met with in the horse than in man.

Ulceration is not common as a consequence of melanosis, and in the cases in which we have observed it, it was obviously to be referred to the combined operation of the two causes mentioned above; compression, perhaps, having a greater share in its production than irritation. Thus we have only observed it in the skin and mucous membrane when greatly stretched by melanotic tumours situated beneath them. We have a very good example of ulceration of the mucous membrane of the intestines in our case of melanosis of the brain, &c.; and Breschet gives a case of ulceration of the skin of the groin produced by a large melanotic tumour situated immediately beneath it.* Ulceration of the skin, notwithstanding its great thickness, is more frequently seen in the horse. The writer of this article has related a case in which the ulceration was accompanied with suppuration, and which may be regarded as an example of ulceration from irritation rather than from compression and subsequent obliteration of the capillaries.* With regard to the melanotic ulcer, its form is sometimes regular, at other times very irregular; its edges thin, soft, beveled from within outwards, pale, or more or less red, or tinged with black, and a black fluid oozes from its surface. But if chronic inflammation supervenes in the tissues surrounding it, these tissues acquire a considerable degree of thickness from their being infiltrated with serosity and coagulable lymph. They thus become hard, and project around the orifice of the ulcer in the form of a broad everted border, or form on its internal surface a number of irregular projections or excrescences. When cut through, a grating sound is produced, and the cut surface presents a pale grey colour, such as is observed in scirrhus.

Ulceration from melanosis of other tissues and organs of the body has very rarely been met with. Bayle relates two cases of what he conceives to be ulceration of the lungs as a consequence of the softening of melanosis,† and which are considered in the same point of view by Laennec.‡ But we agree with Andral in thinking that they were cases of tubercular excavations or dilatations of the bronchi, the pulmonary tissue around them being the seat of chronic inflammation, and infiltrated with what is called black pulmonary matter.

Symptoms and diagnosis of melanosis.—Among the various modifications of function to which melanosis gives rise, we do not believe that the most careful examination will enable the physician to perceive in any one of them a sign of the existence of this disease in internal organs. It is only when melanosis makes its appearance externally, that he can hazard an opinion that any derangement of function is owing to its presence in one or more internal organs; that oppression and difficulty of the respiration are produced by a similar disease of the lungs, when, by means of auscultation and percussion, he finds that certain portions of the lungs are impervious to the air, without having become so by any other disease with the characters of which he is acquainted; and that ascites and œdema of the inferior extremities are in all probability the consequence of compression of the portal system of the liver, from the presence of melanotic tumours in that organ. The presence of black sputa in the first case may, under certain circumstances, afford him some assistance in establishing his diagnosis; as its quantity, and its appearance at the time that one or more of the supposed tumours in the lung have been observed to soften.

Vomiting and dejections of black matter do not afford any evidence of the existence of melanosis either in the stomach or intestines,

* Loc. cit. p. 10.

* Transactions of the Medico-Chirurgical Society of Edinburgh, vol. i. p. 267.

† Recherches sur la Phthisie Pulmonaire, obs. xx. and xxi.

‡ Traité d'auscult. médiate, &c. tom. ii. p. 31.

or any other organ. The same may be said of the state of the pulse, temperature, and nutrition in general. In some cases the pulse and temperature have assumed a febrile character, and the patients become lean, pale, or sallow; changes which may be attributed to the mere mechanical presence of a great quantity of the melanotic deposit in important organs, thus operating on the one hand as a morbid stimulus, and on the other preventing the blood from undergoing various important changes. Melanosis does not appear to give rise to pain except where nerves have been impacted within, or compressed by it in some unyielding cavity. It is for this reason that the eye is generally the seat of pain in melanosis.

Prognosis.—Under whatever circumstances this disease may present itself, it ultimately proceeds to a fatal termination. It is sometimes developed with considerable rapidity, and when it occupies important organs, such as the brain or lungs, the life of the patient is seldom prolonged beyond a few weeks or months. The fatal effects of the disease are also retarded or accelerated by its extent; being greatly accelerated if it occupies the greater part or the whole of an organ, or a great number of organs at the same time, which is frequently the case, and retarded if limited to one organ or tissue. But we must again repeat that, however favourable the circumstances may be under which it first announces its existence, its tendency is to increase and ultimately to prove fatal.

Treatment.—From what we have said of this disease, it is but too obvious that any mode of treatment that can be adopted must be only palliative in its effects. To have pointed out, so minutely as we have done, the physical, anatomical, and chemical characters of melanosis, in order to show that it originates in a modification of secretion of a carbonaceous pigment analogous to the colouring matter of the blood, may, therefore, appear to the reader to be a waste of labour and of time; but we must remind him that there are a host of diseases the treatment of which is founded on no surer grounds, and respecting the history of which we know much less than we do of that of melanosis. In this respect, therefore, the scientific practitioner will at least have the advantage of being able to give a satisfactory reason for the mode of practice which he may think proper to adopt in the treatment of this very remarkable disease.

II.—Spurious melanosis.

A. *From the introduction of carbonaceous matter.*— Although certain forms of black discoloration of the pulmonary tissue were supposed by Laennec to originate in the inhalation of the carbonaceous product of ordinary combustion, an opinion which was previously entertained by Mr. Pearson,* there was no recorded fact that could be regarded as furnishing undeniable evidence of the accuracy of this opinion till lately, when a case of this kind occurred in a patient admitted into the infirmary of Edinburgh. The medical public are indebted to the late Dr. J. C. Gregory, who had charge of the patient, for the history of the case, the description of the post-mortem appearances observed in the body, and particularly in the lungs, together with the results of the chemical examination of the black matter found in this organ.* The following are the morbid appearances which were found in the lungs of this patient after death: "Both lungs presented one uniform black carbonaceous colour, pervading every part of their substance. The right lung was much disorganized, and exhibited in its upper and middle lobes several large irregular cavities, communicating with one another, and traversed by numerous bands of pulmonary substance and vessels. These cavities contained a good deal of fluid, which, as well as the walls of the cavities, partook of the same black colour. A considerable portion of the pulmonary substance surrounding them was dense, hepatized, and friable. The rest of the lung was also somewhat condensed, and very œdematous. The serum, when expressed, was of the same black colour as the substance of the lung. The left lung did not appear to contain any cavities, but was condensed, and loaded with black serum. Some minute hard points could be felt in various parts of both lungs, but they did not differ at all in colour from the surrounding substance; and no distinct tubercular deposition or infiltration could be detected in those portions of the lungs which were most hepatized, even with the aid of the microscope. The texture in these parts appeared quite uniform, and the minute hard points felt in other parts rather conveyed the impression of their being merely the ends of small bronchial branches divided in making the section. The bronchial glands did not appear enlarged, but partook of the same black colour as the substance of the lungs." No other organ of the body presented any trace of this black discoloration. As a minute analysis of the black matter contained in the serum which was expressed from the substance of the lungs was made by Dr. Christison, we shall offer no apology to the reader for giving, in his own words, the results which he obtained.

"1. Concentrated nitric acid boiled on it did not alter the colour.

"2. Immersion in a strong solution of chlorine had also no effect.

"3. A strong solution of caustic potass boiled on it took up some animal matter, and filtrated very slowly. The first part which passed through was opaque and black; but the last portions were of a pale yellowish-brown colour, and transparent; so that none of the black matter was dissolved. The black matter remained in the filter, and this, well washed and dried, burned like charcoal powder, without swelling up, and with scarcely any animal empyreuma, leaving a considerable pale-grey ash.

* Philos. Trans., 1813, part ii.

* Case of peculiar black infiltration of the whole lungs, resembling melanosis, by J. C. Gregory, M.D. &c. Edin. Med. and Surg. Journal, No. 109.

"4. A small portion of black powder, left after the action of boiling nitric acid, was well washed, dried, and introduced into a minute glass ball, with a tube attached, which was subsequently drawn out, by means of the spirit-lamp flame, to a fine bore. On the application of a low red heat to the ball, there was disengaged, at the open end of the tube, a considerable quantity of gas, which had the odour of coal-gas, and on the approach of a light, took fire and burned with a dense white flame. In the tube a dark yellow fluid likewise condensed, which had very exactly the odour of impure coal-tar naphtha, and became a soft mass on cooling, of the consistence of lard. This, when compressed between layers of filtering paper, yielded an oily stain to the paper, and left a white matter, which dissolved in boiling alcohol, and separated again on cooling, in the form of minute obscure crystals."

"In the product of this experiment," says Dr. Christison, "it is scarcely possible not to recognise the ordinary products of the distillation of coal. A gas of the same quality was procured, and likewise a naphthous fluid, holding in solution a crystalline principle, analogous to, if not identified with, naphthaline."

The history of this case, the morbid appearances found in the lungs, and the results of the chemical analysis of the black matter in particular, do not permit of a doubt as to the origin and nature of the black discoloration of the lungs in this interesting case. The profession of the patient, which exposed him to the habitual inhalation of the coal-dust always contained in the atmosphere of a mine, and the black matter found in the lungs consisting essentially of this substance, are circumstances which demonstrate clearly the origin of the black matter, and its identity with the carbonaceous powder inhaled with the air in breathing. Besides these circumstances, the non-existence of any kind of black discoloration in any other organ of the body would furnish a strong reason for our not regarding this case as one of true melanosis. We have, indeed, never seen, nor do we know of, a case of melanosis occupying the greater part of an organ, without other organs being simultaneously affected to a greater or less extent with the same disease. Aware of this fact, we have always entertained doubts regarding the real nature of a case of black discoloration of the lungs which we had an opportunity of examining several years ago, which occurred in a middle-aged man, who was an out-patient of the Old Town Dispensary of Edinburgh. He was attended by Dr. Probart of Bury St. Edmunds, who was then in Edinburgh, along with whom the writer of this article examined the body after death. The morbid appearances observed in the lungs were in almost every respect the same as those that have been detailed in the preceding case. The whole of both lungs was perfectly black; in many parts indurated and œdematous; in others softened and excavated. There were no tubercles, nor was there any similar discoloration in any other part of the body.

Dr. Allen Thomson has informed us that he has likewise seen a similar case of black discoloration of both lungs. No analysis of the black matter in either of these cases was made; and besides, not having been able to ascertain the profession of either of the patients, our opinion with regard to the origin and nature of the black discoloration of the lungs in both cases must be founded entirely on the anatomical facts to which we have alluded, viz. the universal black discoloration of both lungs, and the non-existence of any similar discoloration of any other organ or tissue of the body.

It is surprising that no case of universal black discoloration of the lungs produced by the inhalation of carbonaceous matter is to be found on record previous to that of Dr. Gregory, when we reflect that so many individuals are daily exposed in this country to the cause by which it is produced. We can hardly attribute this silence, on the existence of such a conspicuous morbid state, to the paucity of post-mortem examinations. Is it not more probable that the accumulation of the carbonaceous matter in the lungs is determined by a morbid state of these organs? — that, although carried into the lungs with the air, it is removed by expectoration or absorption, and its accumulation in these viscera thereby prevented? We are, indeed, much disposed to believe that these circumstances must tend to favour or prevent the occurrence of this diseased state of the lungs. In the cases referred to we have not been able to ascertain that there existed any particular morbid state of the lungs which could have prevented or favoured the accumulation of the inspired carbonaceous matter. We, however, consider it a subject worthy the attention of the medical practitioner who has the opportunity of studying the diseases of persons employed in coal-mines, whether the black discoloration of the lungs is observed to occur in those only who have suffered from pulmonary complaints; although it may be often difficult to discriminate between cause and effect, between the original disease, and the changes which must take place in the structure and functions of the lungs from the presence of the inspired carbonaceous substance.

Symptoms.—The symptoms presented by Dr. Gregory's patient as well as our own, were referable to the presence of the inspired carbonaceous matter, acting, 1st, mechanically, and giving rise to atrophy of the pulmonary tissue, compression and obliteration of the air-cells, bronchi, and bloodvessels; and, 2d, as a foreign body, producing a greater or less degree of irritation. To these modifications of the pulmonary organs are to be ascribed the local symptoms, such as the dyspnœa, cough, the mucous and cavernous *râles*, and the increased secretion and expectoration of mucus. The presence of black matter in the expectorated fluids was no doubt to be attributed to the existence of a direct communication between some of the bronchi and the excavations formed in the substance of the lung.

Although there were also softening and excavation of the lungs in the case which we examined, it does not appear from the account which we have received of the history of the case, that the sputa were discoloured by the admixture of black matter; and as it is stated that the mucous *râles* heard in this case were remarkably strong, but not *cavernous*, it may be presumed that the absence of the black matter was owing to there being no communication between the bronchi and the softened or excavated portions of the lung, or that the solidification of this organ was so great from the presence of the carbonaceous matter, that the former did not admit of being sufficiently compressed to expel any of this substance with the mucous secretion of the bronchi.

The general symptoms produced by the accumulation of the carbonaceous matter in the lungs were chiefly the general cachectic condition of the body, and anasarca, both of them depending on the state of the pulmonary circulation. The great diminution in the quantity of the blood admitted into the lungs, which must necessarily have followed the presence of such a quantity of foreign matter in this organ, as well as the imperfect change which must have been effected in that which was allowed to pass through the pulmonary vessels, will sufficiently explain the cachectic state of the patient. The anasarca must also be attributed to the same cause, viz. the presence of the accumulated carbonaceous matter, and its mechanical effects on the pulmonary veins, thereby giving rise to general venous congestion and effusion of serosity into the cellular tissue.

Diagnosis.—Being in possession of such a limited number of facts in regard to this singular, if not rare, affection of the lungs, we should not feel justified were we to assign to it characters by means of which it may be distinguished from certain organic affections to which the same organs are subject. We, indeed, know of no modification of function, local or general, by means of which this form of spurious melanosis is to be distinguished from true melanosis of the lungs. We may, however, suggest that, as the former pervades the whole of both lungs, dyspnœa may be greater than in the latter, which always leaves a portion, and often a considerable extent of lung in the healthy state;—that respiration will be found to be natural, or nearly so, in several portions of the lung affected with true melanosis; whilst in the spurious form of the disease, depending on the universal deposition and accumulation of inhaled carbonaceous matter, the respiratory sound, or at least the respiratory *murmur*, that which takes place in the air-cells, will either be greatly obscured or inaudible, and will be replaced by *bronchial* respiration, the *ronflement* and *sonorous râles* which accompany the solidification or condensation of the pulmonary tissue. We need hardly mention that the presence of black matter in the sputa cannot be regarded as a *pathognomonic* sign, unless its real nature has been determined by chemical analysis.

The only other disease with which this spurious form of melanosis is likely to be confounded, is chronic catarrh. We are, however, disposed to believe that the presence of anasarca, as well as the dull sound of the chest on percussion, will be sufficient to enable us to distinguish the former disease from the latter, in which the sound of the chest is not materially affected, and which is not accompanied with anasarca, unless it be complicated with disease of the heart. The emaciation, diarrhœa, and hectic, which accompany phthisis, will prevent the physician from confounding this disease with spurious melanosis of the lungs, even when the latter has given rise to softening and excavation of the pulmonary tissue.

Treatment.—Imperfect as the description may be which we have given of the changes produced in the structure and functions of the lungs, originating in the inhalation of carbonaceous matter, and in its accumulation in these organs, it is sufficiently obvious that neither the local effects to which the presence of this foreign substance gives rise, nor the general disturbance of nutrition and circulation which follows as a consequence of the former, can be remedied so long as the offending cause remains. How far the removal of this can be accomplished by means of remedies which act chiefly on the absorbent system, is a point which remains to be determined by future observation and experiment.

If the disease has proceeded to such an extent as to produce general atrophy of the pulmonary tissue, softening and excavations in various portions of the lungs, its fatal termination must be inevitable. We cannot, therefore, too strongly impress on the mind of the physician who has the opportunity of doing so, the importance of ascertaining the early signs of this affection, as well as the influence which other diseases may have in favouring its production, as a knowledge of both circumstances will suggest the means to be employed either for its cure or the prevention of its occurrence.

B. *From the action of chemical agents.*—The next kind of melanotic formation which we have to describe is that which is produced by the action of certain chemical agents on the blood.

Our attention was for the first time drawn to this subject nearly three years ago, while making a series of experiments on the chemical dissolution or digestion of the walls of the stomach after death. With regard to the subject of these experiments, it is necessary to observe that the partial or complete dissolution of one or all of the coats of the stomach was found to take place after death, and to be the invariable consequence of the chemical action of an acid fluid contained in the cavity of that organ. A peculiar change in the colour of the blood contained in the veins of the stomach was also observed to accompany the chemical dissolution of the walls of that organ, and which, though less frequent in its occurrence than the latter, was not the less obviously the effect of the same

chemical cause; for, firstly, there was no discoloration of the blood when there was no softening or chemical dissolution of the coats of the stomach: secondly, the discoloration of the blood was observed only in the vessels distributed, or near, to those parts of the stomach which were softened: and thirdly, that both changes were, *cæteris paribus*, nearly in the same ratio as to degree and extent. Although these circumstances might have been regarded by us as affording sufficient evidence that the discoloration of the blood was produced by the direct operation of the same chemical agent by means of which the dissolution of the walls of the stomach was affected, we made several experiments on this interesting and important subject, the results of which leave no doubt as to the accuracy of our former conclusion,—viz. that the discoloration of the blood which accompanies the chemical dissolution of the walls of the stomach is a direct effect of an acid fluid contained in the cavity of that organ, or, as we shall afterwards call it, the gastric acid.* If we kill an animal, a rabbit for example, or open it while alive, and during the process of digestion, the fundus of the stomach is always found to contain a quantity of this acid, mixed with the food in this the depending part of the organ. When the stomach is laid open, a sour smell is immediately perceived to arise from its contents; and if a portion of litmus paper is placed in contact with the latter, it acquires, almost instantaneously, a beautiful red colour. If arterial or venous blood is allowed to flow into the stomach from some of the neighbouring vessels, so soon as it comes in contact with the digested portion of the food, or that in which the gastric acid is most abundant, its natural colour is almost immediately changed to deep brown or black. The rapidity with which this change takes place in the colour of the blood, as well as the degree and extent to which it proceeds, varies with the strength of the gastric acid and the quantity of the blood on which it is made to act. When the digested acid food, or the gastric acid alone, is removed from the stomach in which it was found, and is put into another stomach, or other organ, the vessels of which are conspicuous and filled with blood, this fluid very soon undergoes the same change of colour which we have said takes place when it is poured upon the digested food, and, consequently, when in immediate contact with the chemical agent by which this change is effected.

These facts shew clearly that healthy blood contained in the cavity of the stomach, or in the vessels of that organ, in a dead animal, is changed to a dark brown or black fluid. But the influence of the gastric acid in producing this change in the blood is not limited by the conditions to which we have just alluded. Not only is the blood that has been poured into the cavity of the stomach, or is contained in the vessels of the mucous and submucous tissues, changed from red to brown or black, but likewise that of the sub-peritoneal vessels of the same organ is similarly altered. We have also seen the same black discoloration of the blood in the sub-peritoneal vessels of a neighbouring organ, such as the liver, spleen, intestine, or diaphragm, in contact with that portion of the stomach which contained half-digested food or gastric acid. Hence we can readily conceive that if blood is effused into the cavity of the peritoneum, and in the vicinity of the stomach, it will undergo the same change of colour as that which we have said takes place in this fluid when contained in its proper vessels beneath this membrane. We have produced effusion of blood into the cavity of the peritoneum around the stomach, in several animals, and have thus been able to witness its conversion from red to brown or the deepest black.

The discoloration of the blood in these situations external to the stomach, and depending on the influence of the gastric acid, is an interesting fact, with the nature and origin of which we were entirely ignorant until we observed the effects of this chemical agent on the blood contained in the vessels of the stomach. It is perfectly obvious, from what we have said, that we have, in both cases, the same efficient cause. We have taken a portion of stomach containing gastric juice, placed it on a coagulum of blood, or kept it in close contact with a portion of intestine on which there was a greater or less number of vessels filled with red blood. In both cases the blood assumed a brown or black colour, no doubt from the acid having been carried from the interior of the stomach by imbibition.

There is still another mode in which the black discoloration of the blood may be produced by the gastric acid, viz., when this fluid is effused into the cavity of the peritoneum through an opening which it has made, generally in the fundus of the stomach. It occupies the most depending parts, dissolves the tissues with which it comes in contact, perforates the diaphragm, and passes into the cavity of the thorax. Along with these remarkable effects of the gastric acid, the black discoloration of the blood is no less conspicuous in all the parts on which its chemical influence has been exerted.

Such is a very general sketch of the several modes in which the black discoloration of the blood is produced, when this fluid is exposed to the mediate or immediate influence of the gastric acid. We have already stated that this condition of the blood was not produced till after the death of the animals submitted to our experiments; that these animals were in the enjoyment of the most perfect state of health when killed; and that the gastric juice possessed that property—acidity—by which it is always distinguished during the act of digestion. These facts are the more important when we consider that they establish the formation of a series of changes in the blood after death,

* We employ the term *gastric acid*, because it indicates the seat, and, particularly, the *property* of the chemical agent by means of which the dissolution of the walls of the stomach, and the black discoloration of the blood in that organ, are produced.

which are entirely independent of any morbid condition, local or general, of the animal in which these changes are observed. It is necessary, however, to state that there are two conditions in which the blood may be placed during life, which render it susceptible of being acted upon by the gastric acid: first, when it has ceased, during an uncertain period of time, to circulate; secondly, when it is effused into the cavity of an organ. In both circumstances it is deprived of those properties by means of which it is enabled to resist, to a certain degree, the destructive influence of external agents; and, therefore, undergoes the same changes when submitted to the action of the gastric acid as it does after death.

Locality and order of frequency of the black discoloration of the blood, from the operation of an acid chemical agent.—As the black discoloration of the blood of which we are now treating is produced by the operation of an acid chemical agent, it is consequently met with only in those organs in which this agent exists as a healthy or morbid product, or to which its influence extends in the manner which we have already stated. Hence, as the stomach is the only organ of the body in which an acid fluid is formed, and is at the same time a healthy product, the black discoloration of the blood is no where so frequently observed, so conspicuous, and so extensive as in this organ. The same discoloration of the blood, as to locality and order of frequency, occurs in the intestines, from the anormal formation of a fluid and gaseous acid product. It is owing to the proximity of the peritoneum to these normal and anormal acid products, that blood situated beneath this membrane on its free surface or in its cavity undergoes so often the change of colour in question; and it is to the same circumstance of situation that portions of the liver and spleen are so frequently found to present the same dark colour. The dark discoloration of the blood in the intestines and in the other situations just named, depends, perhaps, more frequently on the presence of sulphuretted hydrogen gas than an acid fluid in the former, owing, no doubt, to this gas possessing the properties of an acid.

Natural and accidental tissues, remote from the stomach and intestines, are also observed to present various kinds of discoloration; but we allude to those which chiefly depend on the presence of various shades of blue, brown, and black. The blue discoloration, which is sometimes very deep, approaching to black, is most frequently observed to occupy the walls of chronic abscesses in various parts of the body. It is not the consequence of putrefaction, but is produced by the presence of a chemical agent, the nature of which we have not been able to ascertain. The brown and black discolorations are observed to accompany the death of parts, preceded or followed by a local accumulation of blood. It is probable that they also sometimes originate in the formation of an acid product, which afterwards acts upon the blood; although they are certainly owing, in general, to changes which take place in the blood itself of the dead part, for which reason we shall refer them to the fourth division of our subject, which contains the description of the black discoloration of the blood from stagnation of this fluid, and the subsequent changes which it undergoes.

Form, situation, and extent of the black discoloration of the blood.

1. *In the vessels of the stomach.*—The blood which undergoes this change of colour derives the peculiarity of the forms which it assumes from its being contained in its proper vessels. The three following forms are the most conspicuous: the punctiform, uniform, and ramiform. All these forms of black discoloration of the blood are met with either separately or combined, and may occupy a portion or the whole surface of the stomach. They are most frequently observed in the fundus of the stomach, for the reasons already assigned; but they may exist in other parts of this organ, as the pyloric portion, small and great curvatures, to which external causes, such as tumours, distention of the colon, enlargement of the spleen, &c. have given a more depending position than that of the fundus, consequently favouring the accumulation of the gastric acid in these parts after death. The situation of these forms of black discoloration of the blood is also modified by the quantity and quality of the contents of the stomach. Thus, if the stomach is nearly empty, the discoloration of the blood is confined to the surface of the rugæ formed by the mucous membrane; and if it is distended by a quantity of gas, the discoloration is limited to the depending part of the organ, and terminates in a defined margin, the course and extent of which are determined by the superposed gas, which has prevented the gastric acid from acting beyond the limits within which it was thus confined. And, lastly, if the stomach is filled with gastric acid, as sometimes happens in stricture of the pylorus, the whole surface of the mucous membrane may present a uniform dark brown or black tint.

With regard to these three forms of the black discoloration of the blood in the vessels of the stomach, it is only further necessary to observe, that although the punctiform and uniform are more frequently produced than the ramiform, on account of the small veins being more often filled with blood than the large ones, the ramiform is most frequently seen; a circumstance which is owing to the mucous membrane and the minute veins within it and beneath it being sooner dissolved by the gastric acid than the large veins. In the punctiform discoloration of the blood, the mucous membrane presents an appearance as if it were dusted over with a quantity of fine charcoal powder; and when the discoloration is uniform, it appears as if painted with bistre or china ink, in the form of patches or streaks of various forms and dimensions. The ramiform discoloration is generally the most conspicuous and striking of the three, because of the black blood being contained in veins of considerable size. They appear as if they had been injected

with chocolate or a mixture of soot and water. The dark blood presents a *curdled* appearance. It does not fill the veins, but is separated and agglomerated into small masses, which become gradually less towards the minute branches, and there appear in the form of black points, having still a ramiform distribution, but are no longer contained within the walls of the veins, the former having been dissolved by the gastric acid. This is the form of the black discoloration of the blood which we have said has been described as examples of melanosis of this fluid,—an opinion which we hope the preceding details have shewn to be erroneous.

2. *Black discoloration of the blood in the vessels of the intestines.* From what we have already said of this change of the blood in the vessels of the stomach, we have only to add that it is less frequently observed in those of the intestines, is seldom so conspicuous, and that it assumes in general the punctiform arrangement. This character of the black discoloration in the intestines is owing to the change of colour taking place in the blood contained in the vessels of the villosities or isolated follicles. The black punctiform discoloration is sometimes observed to occupy the mucous membrane of the greater part of the intestines, both large and small; but we believe it is most frequently seen in the inferior portion of the ileon and in the duodenum.

A similar discoloration of the blood in the vessels of the villosities and isolated follicles is met with in various portions of the intestines in particular, and which is not produced by the action of an acid on the blood. It is the consequence of stagnation, and is not to be distinguished from the former otherwise than by ascertaining the nature of the contents of the intestine in which it is observed.

3. *Black discoloration of the blood effused into the cavity of the stomach and intestines.*—The fact of the black discoloration of the blood effused into the cavity of the stomach and intestines being produced by the chemical action of an acid fluid or gas contained in these situations, does not appear to us to have been even suspected till after the results of our experiments on this subject were made known. If we consult the works that have been published on melæna, (a disease characterized by the presence of black matter in the fluids ejected from the stomach and bowels,) we shall find that the opinions therein expressed, in regard to the black discoloration of the blood in this disease, were founded on mere conjecture.

By some pathologists the black discoloration of the blood was believed to take place in the venous system; by others, that it was not effected till after the blood was effused into the cavity of the stomach or intestines, and that the red colour of the blood was then converted into black by the fluid or gaseous contents of these organs. The latter opinion was, however, entirely conjectural, such conversion of the blood never having been *seen* to take place. Notwithstanding the importance of the subject, it was never submitted to the test of experiment. The matter of black vomit and dejections was *believed* to be blood *altered* in the stomach and intestines, but whether by a chemical or vital agent was quite undetermined. From the results which we have given of our experiments on this particular point at the commencement of this article, it must appear obvious that blood effused into the cavity of the stomach is almost immediately converted into a deep brown or black colour, and, moreover, that this change of colour is owing to the presence of a chemical agent; that this agent is an acid, similar in all its properties to that by means of which the dissolution of the food during digestion is accomplished. We have also stated that, if this acid fluid is not present, as is frequently the case, no such change of the blood introduced into the cavity of the stomach takes place—it preserves its natural colour: and, again, that if the quantity of the blood be so considerable as not to be acted upon uniformly by the acid, only a portion of it is black, whilst the rest is of its natural colour. These circumstances relative to the presence or absence of the gastric acid, and the quantity of blood submitted to its action, appear to us to furnish the most satisfactory explanation of the essential phenomena of melæna. They further shew that there is, properly speaking, no difference between this disease and hematemesis. Both of them originate in the effusion of blood, no matter how produced, whether by exhalation or a solution of continuity. In the latter the blood preserves its natural colour; in the former it is black, because of the reasons just stated—the presence of an acid in the one case, and its absence in the other. On these circumstances alone can the pathologist be justified in making a distinction between hematemesis and melæna.

As this part of our subject is, as we have seen, intimately connected with the latter disease, we shall only further add, that the black discoloration of the blood in the stomach is found to accompany cancer of this organ much more frequently than any other disease. Black vomit almost always accompanies the last stage of this disease,—that is to say, the stage of softening, because of the hemorrhage which then takes place. Next in the order of frequency is follicular ulceration of this organ. In the intestines follicular ulceration is by far the most frequent change which is observed to accompany black dejections. In both organs the ulceration of the follicles is sometimes so extremely limited that it is not perceived until after the mucous membrane has been well washed and exposed to a strong light, when it is seen to occupy the central portion or orifices of the follicles in the form of a red point, with an irregular circumference, probably the ulcerated border of the orifices of these follicles. Next in the order of succession are the numerous diseases of the heart and its orifices, and several of those of the liver and vena portæ, which obstruct mechanically the return of the venous blood, and thus determine its effusion from the digestive mucous membrane. And, lastly, we have met with the same dis-

coloration of the blood in individuals the most feeble and emaciated, in whom this fluid appeared to have almost entirely lost that plastic property on which its coagulation depends, and by means of which its effusion is prevented when accumulated in the capillary system.

The black discoloration of the blood in the vessels of the stomach, produced by the gastric acid after death, is a subject of the greatest importance to the toxicologist, particularly when considered in connexion with the effects which result from the operations of all poisons possessing acid properties on the blood. Although we have directed our attention to this subject, and have been able to ascertain that several of the changes produced in the blood under these opposite circumstances are so characteristic as to afford us the means of determining their nature and origin, we are prevented from making any further allusion to them, because of the minute descriptive details into which we should be obliged to enter, were we to attempt to put the reader in possession of the means whereby he might distinguish post-mortem from pathological black discoloration of the blood in the digestive organs. We must therefore refer him for further information on this subject to the article PSEUDOMORBID APPEARANCES.

4. *Black discoloration of the blood on the surface or in the cavity of the peritoneum.*—As we have already alluded to the manner in which the black discoloration of the blood takes place in these situations, we shall only notice a few circumstances of importance with regard to its seat, and the lesions which it most frequently accompanies.

We have already said that it is met with in the vessels which ramify under the peritoneum; but it is more frequently seen in those which exist in the false membranes of chronic peritonitis. When the blood is effused into the sub-peritoneal tissue, on the surface of the peritoneum, into its cavity, or into false membranes, the black discoloration which it undergoes is remarkably conspicuous, and frequently occupies a great extent of surface. It is only when the discoloured blood is contained within its vessels that it presents, in the situations just named, a ramiform distribution. There is, however, a peculiar modification of this form which requires to be noticed. It occurs in chronic tubercular peritonitis. The tubercles, scattered over a greater or less extent of the peritoneum, are surrounded by a dark ring, or a multitude of minute vessels filled with black blood, having a stellated arrangement. If the tubercles are very minute, they are obscured by these appearances, and the peritoneum seems as if spotted with a deep brown or black pigment, which has been described as melanosis of the peritoneum.

The black discoloration of the blood when effused on the surface of the peritoneum or into false membranes, has still more frequently been taken for melanosis, and described as such. It then assumes the appearance of black patches, striæ, or layers of various extent, occupying either the visceral or abdominal portions of the peritoneum, or both at the same time. If the effused blood has collected in the cavity of the peritoneum, it undergoes the same change of colour which we have seen takes place in the blood effused into the cavity of the stomach and intestines. The external portion of the blood, or that which is in contact with the peritoneal surface of the intestines, is always deepest in colour, being sometimes as black as pitch; whilst that which is more remotely situated is either of its natural colour, or but slightly darkened. From these circumstances, and from what we have already said on the effects of the acid fluid and gaseous contents of the stomach and intestines, there can be no doubt that the black discoloration of the blood contained in the cavity of the peritoneum is owing to the chemical operation of these products. In confirmation of the accuracy of our opinion on this point, we may mention that we have had several opportunities of seeing the blood effused into the cavity of the peritoneum undergo the change in question, in individuals who died from hæmorrhage in consequence of wounds of the abdominal viscera. Although the description which we have given of the forms, situation, and extent of the dark discoloration of the blood in the digestive organs and in those situated in their immediate vicinity, will in general enable the practical pathologist to recognise them in his post-mortem examinations, we would recommend him in all doubtful cases to *test* the contents of the former organs. A sour smell may not be always sufficiently strong to be perceived; and besides, his having determined (by means of litmus paper for example, some of which he should always have in his case of instruments,) chemically, the presence of an acid, every doubt will be removed as to the nature of the black discoloration of the blood in the parts which we have named.

C. *From the stagnation of the blood.*—Black discoloration of the blood has been long known to follow as a consequence of retarded or interrupted circulation. This change in the colour of the blood is never so conspicuous as when it takes place in the extreme venous circulation, or in the capillaries; and it is only when it occurs in the latter situations that it has been described as a form of melanosis. We shall, therefore, confine our remarks to the black discoloration of the blood, which follows in consequence of the stagnation of this fluid in the capillary circulation. It is worthy of remark, that the black discoloration of the blood originating in this cause is much more frequently observed in some organs than in others, and is never so conspicuous or extensive in young as it is in old persons. The circulation of the capillaries being influenced by that of the heart and great bloodvessels, it is also frequently observed to accompany diseases of the latter organs, which impede the circulation of the blood in general, and give rise to a state of venous congestion. Among the local causes of its production, acute and chronic inflammation are the most frequent. This

change in the colour of the blood has not, however, been regarded as a matter of much importance in acute inflammation; whilst in chronic inflammation, on the contrary, it has received much attention, as its presence has been considered as one of the least equivocal characters of this disease. To these causes of the stagnation of the blood and its subsequent black discoloration, we may also add debility, which gives rise to similar states of the blood in depending parts of the body, but more particularly the inferior extremities.

Under the influence of these causes, the blood accumulates in the capillaries, and ultimately ceases to circulate. After a certain length of time it coagulates, and the serum is forced out along with the salts, which are absorbed. That which remains is an almost black substance, of the consistence of firm fibrine, and is probably composed in great part of this animal principle and hematosine. The black colour thus produced appears to us to receive a satisfactory explanation from the circumstance that it follows the stagnation and coagulation of the blood, and consequently the separation and removal of the serous and saline ingredients of this fluid, to the latter of which, as has been clearly demonstrated by Dr. Stevens, its red colour is to be attributed.

The degree and extent of the black discoloration of the blood from stagnation of this fluid will no doubt vary in different individuals, in different organs, and under the influence of different diseases. Thus it is, generally speaking, most frequently observed in persons whose circulation is low; frequently, as we have already said, in the old and infirm, and seldom in the young and healthy; and in those diseases which mechanically or otherwise impede or interrupt the capillary circulation. As we have already extended this article far beyond the limits which we had originally prescribed to it, we shall confine the few remarks which we have yet to make on this part of our subject, to the presence of the black discoloration of the blood in particular organs and diseases, and some of its forms.

There are, strictly speaking, only two organs, the respiratory and digestive, in which this change of the blood bears any resemblance to true melanosis.

1. *Black discoloration of the blood from stagnation in the lungs.*—This change of the blood in the lungs occurs most frequently at an advanced period of life; in phthisis pulmonalis; in chronic catarrh; in emphysema; in dilatation of the bronchi; in induration of the pulmonary tissue; in disease of the heart; in one word, in whatever diseases impede the pulmonary circulation, and render the function of respiration imperfect. The black discoloration of the blood in the lungs is general, if the diseased condition in which it originates has exercised its influence on the venous circulation of these organs in general, as in disease of the heart; and it is confined to a limited extent, although it may occupy a greater or less number of separate points, when produced by local causes, such as tubercles. In the former case, the black discoloration of the blood is seen most conspicuously in the vessels of the inter and intra-lobular tissue. In the former tissue it has a ramiform disposition, in the latter it is capilliform and punctiform; appearances which are best seen on the serous surface of the lung. In the latter case, the vessels containing the black matter occupy the circumference of the tubercles, and have a stellated arrangement. In emphysema, dilatation of the bronchi, induration of the pulmonary tissue around tubercular excavations, the black discoloration is often very extensive, on account of the great obstacle which these morbid states oppose to the return of the venous blood, and the length of time which they have continued to operate.

Chronic inflammation of the pulmonary tissue gives rise to the same form of black discoloration of the blood which we have just said accompanies induration, because of induration being, in general, the consequence of this state of inflammation. Chronic inflammation of the lungs may, however, produce the same change in the blood without being accompanied by induration.

The mucous membrane of the bronchi seldom presents the grey or slate colour so common in the mucous membrane of the digestive organs,—a circumstance that would seem to indicate that these membranes are not exposed to the influence of the same agents to which we ascribe the black discoloration of the blood in question, in the respective organs to which they belong. Be this as it may, the black discoloration of the blood in the mucous membrane of the bronchi is seldom considerable, and is rarely observed, unless in old persons whose lungs are at the same time extensively affected with it. It is also best seen in the bronchi which communicate with tubercular excavations, and in the vicinity of ulcers of the mucous membrane itself.

Black discoloration of the bronchial glands, with regard both to frequency and degree, has appeared to us to occur under the influence of the same causes which give rise to the black discoloration of the blood in the lungs. It is most frequently seen and most marked in the bronchial glands of old persons, and it may occur even in children with tubercular phthisis.

2. *Black discoloration of the blood from stagnation in the digestive organs.*—This change in the colour of the blood is almost exclusively confined to the mucous membrane of the stomach and intestines, and follows as a consequence either of chronic inflammation of that membrane, or of diseases of the heart or liver which impede the return of the venous blood. It is limited to a portion of the mucous membrane when produced by irritation, and if it accompanies chronic ulceration of this membrane or of its follicles, it is often very conspicuous. When produced by an obstacle to the return of the venous blood, particularly if the obstacle is situated in the vena portæ, it may occupy the mucous membrane of the stomach and of the greater part of the intestines. In both cases the mucous membrane presents

a grey, greyish-brown, or slate colour, which is either punctiform or uniform; and which, when examined with a lens, is seen to depend on the presence of a similar coloured fluid contained in the capillaries. The mucous membrane is at the same time thicker than natural, and the follicles and villosities are in some cases hypertrophied.

The appearances produced by the black discoloration of the blood from stagnation in the stomach and intestines, are very similar to those which are the effect of the chemical action of acid fluid and gaseous products contained in these organs. In order, therefore, to distinguish the former kind of discoloration from the latter, it is often necessary to ascertain that no acid chemical agent is present. From the result of our own observations, we are led to believe that the grey slate colour of the mucous membrane is too exclusively received as a physical character of chronic inflammation. That it does take place as a consequence of this pathological state there can be no doubt, inasmuch as we see it produced, for example, in the mucous membrane of the vagina and in the skin from this cause; but, as we have already observed, it is of comparatively rare occurrence in the bronchial mucous membrane, which is perhaps as often the seat of chronic inflammation as the mucous membrane of the digestive organs. It is on account of this circumstance, as well as from actual observation and experiment, that we are led to believe that this character of chronic inflammation of the digestive organs has frequently been mistaken for the discoloration of the blood produced by chemical action of the acid contents of these organs.

(R. Carswell.)

MENINGITIS.—See Brain, Inflammation of.

MENORRHAGIA. This term (derived from μήν, *mensis*, and ῥήγνυμι, *rumpo*) implies morbidly profuse menstruation. Some authors have attempted a distinction between those cases where the menstrual discharge is simply over-abundant, and those where, along with the peculiar menstrual secretion, pure blood is expelled. Dr. Mackintosh of Edinburgh, and Mr. Burns of Glasgow, have restricted the name of menorrhagia to the latter description of cases, calling the former only immoderate flow of the menses. Others, again, have chosen to class those instances where a mixture of pure blood is passed, under the head of uterine hemorrhage. The great object ought to be, not to mislead by too nice and critical refinement in nomenclature. The term uterine hemorrhage is so constantly limited in practice to cases unconnected with menstruation, and occasioned by organic disease, accidental injury, or the consequences of pregnancy or parturition, that it is much more convenient to include under the title at the head of this article all those instances of discharge of real blood from the uterus which occur in connection with the menstrual functions. The cases, indeed, are very rare in which any strikingly profuse menstruation exists, without more or less of real blood escaping at the same time. Dr. Dewees states that, in a very extensive practice of many years' duration, he has scarcely ever known a case of genuine menorrhagia without the admixture of pure blood.*

Menorrhagia is a disease occasionally of great obstinacy, sometimes of alarming severity; and as much of the success of the treatment depends upon a proper discrimination of the different conditions which give rise to it, it becomes necessary to point out somewhat at length in what this difference consists. At the same time it must be acknowledged that it will be impossible to go minutely into every variety of case which may occur in practice.

Menorrhagia not only includes the immoderate quantity of discharge at each monthly period, the time remaining regular; but it is also understood to comprehend the too great frequency of the recurrence of menstruation, even when the quantity lost is not unusually abundant: still the definition of "morbidly profuse menstruation" ought to be remembered, because to constitute the disease the quantity lost must be relative. Many women remain in perfect health who are accustomed to a very considerable discharge regularly, thus menstruating every two or three weeks habitually; and yet, as long as the health continues unimpaired, or nothing more than has always been usual takes place, it would scarcely ever happen that medical advice would be applied for to abate the symptoms. In healthy menstruation the discharge takes place every twenty-eight days, lasts from three to four days, and the quantity lost upon an average is about five or six ounces. But this is merely a general rule: the exceptions are numerous; and it is only when it becomes an exception to the individual's ordinary habits, that disease should be considered to exist. The effect of climate in these cases is very remarkable; and what would be considered a very scanty menstruation in the warmer climates of the east, would be deemed menorrhagia in Lapland. A curious blunder was committed in this respect by Dr. Freind, who stated that the quantity of menstrual discharge in this country averaged about twenty ounces—a menorrhagic excess by no means common; the mistake arising from his having quoted Hippocrates without reflecting that the δύο κότυλαι Ἀττικαὶ applied only to the females of Greece.

Menorrhagia may occur in very opposite states of the system, and has therefore been divided into active and passive; the former arising from too great activity in the vessels of the uterus, the latter from a want of tone in their secreting orifices. Either of these states may exist in a plethoric habit of body, or in one of great debility; but in general the local condition is of the same character with the constitutional in the same individual. After a long continuance of the disorder, the strongest and most plethoric frames are brought down to the state of weakness, and the active menorrhagia may thus become passive. In

* System of Midwifery, p. 147.

active menorrhagia, for a short time, sometimes for two or three days before the expected period, there is a sensation of unusual fulness about the pelvis, with throbbing referred to the situation of the uterus itself, along with sense of heat and weight; the external parts of generation are often slightly swollen, and the mammæ become hot, tumid, and painful. The circulation is quickened, the mouth hot, the tongue dry with thirst, and there is a general feeling of oppression, with headach and giddiness. After these symptoms have lasted for a certain time, the function of menstruation begins; but the discharge comes on with violence, in gushes, and usually accompanied with pure blood, as proved by the presence of coagula. The progress is then variable; sometimes after the first few hours the patient feels relieved, lighter, and cooler, and the rest of the period passes over more quietly and naturally; but in more aggravated cases the flow still proceeds in equal or increased quantity, and lasts for several days, occasionally subdued, but again breaking forth upon the slightest exertion, till at the end of the period the patient is left weak and languid, with a feeble pulse and a pale countenance. By the time of the recurrence of the monthly period the individual is perhaps restored to the previous state of health; but the same train of circumstances is again renewed with perhaps increased severity; and the complaint rarely lasts long without the number of days intervening between the periods being rapidly diminished, till at last scarcely one period is over before the next approaches. The condition then quickly becomes one of passive menorrhagia, both local and general, the symptoms of which are more formidable, and the treatment more difficult.

The patient in passive menorrhagia is habitually languid and with feeble powers, or may have become so from previous long-continued loss of blood in the more active form of the disease. She is subject, perhaps, to palpitations of the heart, and violent headachs with throbbing and beating in the temples, singing in the ears, and giddiness—all arising, not from plethora or absolute determination of blood to the head, but from exhaustion and relative determination. This is a very important distinction, and one which has been too frequently and often fatally overlooked. For a further investigation of this interesting subject the reader is referred to the experiments of Dr. Kellie of Leith, and the practical observations of Dr. Marshall Hall; and also to the article Bloodletting in the present work. For the difference in the pathology of active and passive menorrhagia, we may also refer to the able article Hemorrhage, in which is comprehended much that will apply to the morbidly profuse menstruation, the circumstances being but very slightly modified by the periodical nature of the discharge, and the fact of its being merely an excess of a natural one.

In passive menorrhagia there are rarely any precursory symptoms; if the periods are still regular as to time, they are irregular and unnatural as to duration and the quantity lost. In general the return is also much too frequent, so that at last one period is followed nearly immediately by another, or there will be one continued discharge, varying from time to time in profuseness, from a mere oozing of a thin, half serous discharge, to the full gushes of coagulating blood. When apparently the discharge is safely over, the least excitement of body or mind, the slightest exertion or disturbance, will reproduce it, and the difficulties are again as great as ever. The usual effects of morbid loss of blood gradually or rapidly present themselves. When the complaint has been of long standing, but not very suddenly violent, the complexion becomes sallow and cadaverous; the countenance either pinched and emaciated, or bloated and anasarcous; the pulse rapid and feeble; the legs and feet, and often the whole of the cellular membrane distended with fluid; the respiration short and difficult; and, in fact, all the symptoms of confirmed and extreme cachexia are observed. But the most dangerous character of the complaint is manifested in the sometimes suddenly profuse menorrhagic discharge, the absolute danger being much influenced by the previous resisting power of the individual. In these instances alarming syncope has occasionally been brought on, and the most active measures become imperatively necessary, to rescue the patient and prevent a fatal termination. Instances of death would no doubt be much more frequent, did we not possess very efficient means in general to arrest the discharge. Besides the exhaustion from the menorrhagia itself, it is nearly always the case that patients are afflicted in the intervals with profuse leucorrhœa; and if they are exposed to become pregnant, abortion will be very apt to follow. We have also frequently remarked that those who have suffered much from menorrhagia, are peculiarly liable to uterine hemorrhage after abortion or parturition at the full time.

There is one species of menorrhagia which is not uncommonly met with in practice, and yet has not, we believe, been noticed in books,—where, instead of the periods being regular to the month, or much more frequent than ordinary, the interval is protracted considerably, even to six, seven, or eight weeks. In these instances, whenever the menstruation is regular to the usual time, the discharge is not excessive; but upon any disturbance to the general health, there is more or less of delay, and the discharge is then morbidly profuse. This is common both with married and unmarried women; but when it takes place with the former, it is very frequently mistaken for abortion, being often accompanied by pain and the expulsion of solid masses of coagulated blood with flakes of albumen, not very unlike an early ovum. These women are said in common language to become *obstructed*, but it is under very different circumstances from amenorrhœa, as the protracted period is always followed by profuse hemorrhage. The patients complain for several days, even for two or three weeks, previous to the appearance of the discharge, of the symptoms mentioned as usually preceding active

menorrhagia, and particularly of a more than ordinary sensation of pulse or throbbing in the situation of the uterus.

The causes of menorrhagia may be divided into the constitutional and the accidental; but it often seems to require a combination of both to excite the disease. The active menorrhagia is found to occur in plethoric habits, often apparently as a natural relief to the overloaded system, but aggravated or excited by luxurious living, a sedentary and indolent life, hot rooms, and also by very violent exercise or any other fatiguing exertion. The passive menorrhagia, on the other hand, is caused by all those circumstances which lower the bodily powers, and weaken the action of the heart and arteries. But in both of these cases there are local causes which peculiarly tend to direct the mischief to the uterus, and increase the circulation in the vessels of that organ, leading to the increased discharge, whether that be the immediate effect of excess of activity, or diminished power of retention: such are blows and falls, or any other local violence; frequent and recent abortions, leucorrhœa, over-indulgence in sexual intercourse, irritation in the bladder, diarrhœa, tenesmus, piles, ascarides or scybala in the rectum, or even habitual or accidental costiveness.

In all severe or protracted cases, resisting the usual means of relief, it would be right to make an examination as to the actual state of the uterus itself, as symptoms closely resembling menorrhagia may be owing to organic mischief, particularly ulceration, polypus, and inversion of the womb. These causes are not immediately connected with the present article, and therefore can only be alluded to.

There is a frequent cause of menorrhagia not much attended to, and not mentioned in systematic works on the subject, but the knowledge of which is highly necessary. It has often been observed that the most obstinate forms of chronic menorrhagia occur in those persons who have an impeded or disordered circulation through the abdominal veins, particularly where there is organic or functional disorder of liver. The same cause will very frequently produce hemorrhoidal disturbances; and it is very easy to understand that the uterus in such cases will be a ready outlet for the relief of the over-distended blood-vessels of the lower part of the trunk. We have no doubt that this is not at all an uncommon cause of obstinate menorrhagia, and we are still more convinced of the truth of the opinion by the success which has often attended the adoption of a peculiar plan of treatment presently to be noticed, and which is only adapted to that condition.

Treatment.—In the treatment of menorrhagia it is especially important that we should inform ourselves as much and as accurately as possible of the actual state of the disease, and of the peculiar cause or combination of causes to which its origin may be attributed. It is too often the case that medical men in such instances, as a matter of course, order medicines containing infusion of roses and the mineral acids, and such-like. This is the every-day routine; and in more obstinate cases the astringent gums or metallic salts are added. But however proper such medicines may be in many, they are by no means applicable to all the cases, and much valuable time is lost by this careless mode of prescription.

In discussing the management of menorrhagia, we must bear in mind that sometimes we are called upon to arrest the violence of the discharge from the uterus at the moment, and which is occasionally so excessive as to hazard the life of the patient, unless readily restrained. We shall therefore, in the first instance, treat of this highly necessary part of the subject, and afterwards of the mode of restoring the patient's health in the more chronic forms of the disease, and in the intervals of the discharge. In a patient who has been till recently in a robust and plethoric condition of body, and in whom the menorrhagia has been of recent origin, or has arisen from temporary and accidental causes, it will be often advisable, during the actual profuseness of the discharge, to diminish the action of the heart and arteries by abstraction of blood from the arm, exactly on the same principle on which we should be led to similar practice in hemorrhage from the lungs. It is only in recent cases, however, or in very plethoric subjects, with a strong full pulse, that we may safely venture upon this plan; and then the quantity of blood abstracted must entirely depend upon the circumstances of the case, the powers of the patient being a much better guide than the severity of the symptoms. When the discharge is excessive, that alone will reduce the powers of life to so low an ebb that much additional loss of blood would be dangerous. After having abstracted blood from the arm, when the case requires this evacuation, we may proceed to the other measures, which are proper to all cases of urgent and immediate danger from menorrhagia. The free application of cold to the abdomen, pelvis, loins, and back, is one of the most powerful means we possess of restraining menorrhagia: the cold hip-bath, dashing cold water or vinegar and water on the person, injecting cold water into the vagina, and applying ice, both externally, and internally to the os uteri, may be had recourse to with much and often decisive advantage. It is necessary that in these cases the application of cold should not be entrusted to the nurse or attendants without the superintendence of the practitioner, as they are rarely aware of the mode in which alone the applications can be effectual. After placing cloths dipped in cold vinegar and water to the pubes, they often cover up the patient with the bed-clothes, *warm* and *comfortable*, soon converting the wet linen into a hot and reeking fomentation. Besides which, by the want of judgment, the application of cold, when properly applied in the first instance, will often become prejudicial from being continued too long. Cold is a most powerful sedative, and when the powers of life are reduced to an extreme state of exhaustion from loss of blood, it often becomes necessary for a time to reverse our treatment, and, when the hemorrhage has

ceased, to rouse up the sinking pulse and failing powers by the cautious application of stimuli and artificial warmth. We may do this more safely when we have made the state of the patient more secure by another very effectual plan for restraining the hemorrhage—*plugging the vagina*. In the uterine hemorrhage which occurs shortly after parturition, this expedient is not safe; because, when the blood, by the plug in the vagina, is prevented from flowing externally, the uterus itself may again expand to a very considerable extent from the blood being poured into its cavity; and in this way death may take place, although there is no external flooding. This can only happen, however, where the uterus is in a condition to undergo the expansion, and in menorrhagia this is not the case. A dossil of lint, or a fine cambric handkerchief, may be gradually introduced into the vagina up to the os uteri, so as to fill the vagina firmly throughout its whole extent, and be allowed to remain there. Many prefer soaking the material previously in some strong astringent liquid, and this is perhaps still more efficacious. If the plug produce pain, it must be withdrawn; and at all events it should not be allowed to remain more than twenty-four hours, because it is apt to become very offensive and irritating from the putrefaction of the discharge. On withdrawing it, unless it be done very gently and gradually, a fresh discharge of blood is apt to be occasioned; but it can easily be restrained by another plug, or some of the other remedies.

Strong astringent injections into the vagina, consisting of solutions of alum or sulphate of zinc in infusion of galls or decoction of oak-bark, are often of service. They certainly possess great power, and act partly by coagulating the blood at the orifice of the uterus, which acts as a compress upon the mouths of the bleeding vessels. There is a remedy which is perhaps the most certain of any in restraining the discharge; but as it is not always safe, it should, in the writer's opinion, only be employed in cases where other plans less dangerous have failed—it is that of injecting the uterus itself with an astringent injection. A gum elastic male catheter is carefully inserted within the os uteri, and, by means of a syringe, a very small quantity of a solution of alum or of the acetate of lead is to be gently introduced into the cavity of that organ. Two instances have occurred, within the last four or five years, where violent vomiting was the consequence, followed by uterine inflammation and death; and although certainly such unfortunate results of the practice are exceedingly rare, the knowledge of them must render any one cautious in applying it. Of course, where it is possible to ascertain the immediate cause of the hemorrhage, and that cause can be removed, our remedies will have but a poor chance if such a precaution be neglected. A loaded state of the rectum has been often overlooked in cases of menorrhagia, and even when recognized, many have been unwilling to produce any action of the bowels, from fear that the exertion or the disturbance might reproduce or increase the discharge. Accumulations of hard fæces in the rectum should always be removed as speedily as possible, and this may be safely and effectually accomplished by a lavement of cold water. This remedy alone, indeed, has often stopped an obstinate case of menorrhagia.

Of the internal medicines for restraining the discharge in the violent degree we have mentioned, opium and the acetate of lead are the most to be depended upon. Where the patient is much exhausted, opium may be given in large doses. Mr. Burns advises at least as much as two grains at once; and where it cannot be given by the mouth, it is to be introduced into the rectum as an injection or a suppositary. Many practitioners exhibit the acetate of lead in insufficient doses, dreading the deleterious effects which lead is known sometimes to produce in the animal economy.* When combined with opium, these effects are considered as less likely to be occasioned, and the usual practice has been to give one, two, and even three grains of the acetate of lead, with from half a grain to a grain of opium, every one, two, three, or four hours, according to the urgency of the symptoms. Dr. Mackintosh of Edinburgh has related a case† where the effects of the acetate of lead with opium were very strikingly displayed, in doses of five grains every three hours, for several successive times, without any of the signs of the poison of lead ever appearing. As opium will not always agree, and as the harmless effect of lead has been attributed to the opium being combined with it, it is very satisfactory that Dr. A. T. Thomson has lately proved that the addition of acetic acid to the acetate of lead, so as to make an excess of acid, entirely prevents the deleterious property. Other remedies have been given in the acute form of menorrhagia with success, and though not so much to be depended upon as those already mentioned, must not be lost sight of. Emetics have now and then been serviceable, but would only be safe where we wanted rather to depress the activity of the circulation. The same precaution is necessary with respect to digitalis, which has been much praised by several authors. Large doses of the nitrate of potash or of the oil of turpentine have been also highly spoken of. The most common remedies are the astringent ones, viz. kino and catechu in large doses, alum, sulphuric acid, rhatany root. Alum whey may be given as drink, or a very weak solution of sulphuric acid, made palatable with sugar. In all these cases the most perfect quiet and the horizontal posture are indispensable.

In the more chronic form of the disease the above plans are more or less applicable, but much will depend upon the character of the individual case. When the individual is ple-

* Mr. Dewees states, in his "System of Midwifery," page 149, that sugar of lead has been declared a dangerous remedy, but "upon what ground we are at a loss to determine, having used it most freely for more than twenty years, without the slightest inconvenience from it." He relates a case where he gave it, as an injection into the rectum, in scruple doses.

† Elements of Pathology, vol. ii. p. 363.

thoric, bloodletting may be required; and in many cases Dr. Mackintosh has found advantage from the application of a leech or two to the os uteri itself. Cooling saline medicines may be taken, and the bowels kept open by saline purgatives, avoiding, however, any irritation of the canal. The infusion of roses with Epsom salts will be found one of the most useful forms of purgative, and if it irritates the bowels, henbane may be added. Cold hip-bathing, and also cold astringent injections, will be found useful. This plan, with great quiet, will be found to moderate the attack, and may be continued in the intervals; and it is worthy of remark that the next return of the menstruation may often be rendered comparatively trifling by the use of a full purgative about twenty-four hours before the period, where that can be ascertained, avoiding any medicine of a drastic or stimulating quality. In these instances the diet should be very bland and spare: wine must be left off, although the common remedy in families for every sort of menorrhagia is to drink rather freely of port wine.

In the more feeble constitutions, already, perhaps, reduced by a long continuance of so debilitating a malady, besides the remedies above mentioned to abate the immediate violence of the discharge, we must endeavour in the intervals to strengthen the general frame, and restore tone to the uterus itself. But in these instances we often find it extremely difficult to restrain the discharge itself, however trifling it may be in amount. The least exertion or excitement will reproduce it, and in spite of all our remedies it continues day after day, exhausting the strength. Dr. Mason Good* is of opinion that in these cases there exists a relaxed state of the solids and an attenuated state of the fluids; and certainly the discharge in nearly every such instance appears very thin, and to contain an unusual proportion of serum. Small and repeated doses of the acetate of lead are more serviceable, perhaps, than any other internal medicine, and it may be combined with opium or an additional quantity of acetic acid. The other astringents mentioned before are preferred by some authors, given in more moderate but more frequent doses. The ergot of rye, with the idea of its promoting contraction of the uterus, has been tried in menorrhagia in small and often repeated doses, and by some, it is said, with success; but others have had no reason to speak favourably of it.

In the intervals, every remedy which can give general and local power must be employed. Cold bathing, cold hip-bathing especially, will be found of great use; and the efficacy of the water may be increased by the addition of salt or vinegar. This should be used from two to five minutes every night and morning, and a cold astringent injection should also be thrown up to the uterus. All violent exertions should be avoided, and especially shaking in an uneasy carriage, or horse-exercise. The free use of the flesh-brush will give steadiness to the circulation, and answer nearly all the salutary purposes of exercise, without the risk of mischief from too much fatigue or exertion. The diet should be nourishing, but not stimulating: fluids and the watery vegetables should be taken but sparingly, and only a small quantity of wine, of which claret or port is perhaps the best. Of medicines, the vegetable tonics are scarcely so serviceable as the mineral; but they may often be combined with advantage. The salts of iron require to be carefully administered; but in spite of their well known effects of increasing or producing the menstrual discharge when deficient, their general tonic and astringent effect upon the bloodvessels is often exerted with marked benefit in cases of menorrhagia of the atonic character. The sulphate of zinc may be more easily managed than steel medicines, and in many instances has been more useful; from one to two grains being taken in the form of pill three times a day.

In a case of complication of obstinate skin-affection with menorrhagia, arsenic was found serviceable to the eruption, and during the exhibition of this remedy the menorrhagia ceased. This was quite accidental; but the writer was afterwards induced to try its effect in menorrhagia of the atonic character, where that was the only complaint; and the success of it has occasionally been very considerable. It has been given in doses of five to ten drops of the liquor arsenicalis, gradually increased to twenty-five or thirty, three times a day, carefully watching the effect of the medicine, and diminishing the dose, or discontinuing it altogether, when the peculiar deleterious qualities have been evinced.

Perhaps no artificial medicines are so powerful in their action in chronic cases of menorrhagia as the natural medicinal springs, which contain minute portions of iron in solution; though some of the benefit may be fairly attributed to the change of scene and the purity of atmosphere.

In that congested form of menorrhagia which has been mentioned, accompanied by protracted intervals between the menstrual periods, much advantage is derived by abstracting blood from the uterus or from the neighbouring parts, whenever the proper day has passed over without the appearance of any discharge, and directly the sense of fulness and throbbing in the pulse is perceptible. The bowels also should be freely purged, and the feet put into hot water: in short, the treatment should be partly made up of that appropriate to cases of amenorrhœa, modified by circumstances; whilst in the intervals horse-exercise and active exertion will be not at all improper, but highly salutary. At the time of the actual existence of the profuse discharge, the most perfect quiet is essential, and those remedies which have been directed to alleviate the immediate symptoms.

In obstinate cases of menorrhagia where we have reason to suspect the existence of

* Study of Medicine, vol. v. p. 66.

a congested state of the liver, or an obstructed or rather a retarded circulation through the abdominal veins, before mentioned as a very common though seldom noticed cause of this disease, nearly all the usual remedies for menorrhagia will fail, and the great number of them will do absolute mischief. Although during the immediate flow of the discharge, if violent, the remedies for checking it formerly mentioned become necessary, yet in the intervals we must direct our attention chiefly to the condition of the abdominal viscera. Small doses of alterative mercurial medicines, particularly the Plummer's pill, will be found very useful, and the decoction or extract of dandelion should be given in full doses. A pill of rhubarb, soap, and ipecacuanha, is a very advantageous combination to keep the bowels open, and this may be assisted, if necessary, by domestic enemata; it being of great consequence especially to prevent the collection of any hard or lumpy faeces in the large intestines. In addition to all this, the writer particularly recommends in such cases the frequent application of a few leeches to the anus. Even in very debilitated and exhausted constitutions, this remedy, when carefully watched, may be safely administered, and relief will often be very rapidly manifested.

(C. Locock.)

MENSTRUATION, PATHOLOGY OF. —It is not intended in the present article to discuss the various theories of this important function of the human uterus, which have at various times prevailed. It will be sufficient to state generally that we consider the menstrual discharge to be the consequence of a peculiar periodical condition of the blood-vessels of the uterus, fitting it for impregnation, which condition is analogous to that of "heat" in the inferior animals. In Dr. Hooper's work "On the Morbid Anatomy of the Human Uterus," there is an exact representation of the uterus of a woman who was instantaneously killed by an accident during menstruation; and every one must be struck with the resemblance which it bears to the description given by Mr. Cruikshank in the Philosophical Transactions (1797), of the appearances observed by him in rabbits killed during the state of genital excitement usually called the time of heat. The actual presence of the discharge is the *resolution*, if we may so term it, of the previous condition of the vessels which separate it; for the uterus is fitted for the purposes of impregnation before the menses begin to flow. An instance in proof of this may be given from the Philosophical Transactions (1817), of a young woman who bore two children successively without any previous menstruation; which function, in fact, did not shew itself externally till after the third pregnancy, which ended in a miscarriage.

The function of menstruation lasts, upon the average, for about thirty years of the life of woman, beginning at puberty, and ending somewhere between forty and fifty years of age, unless interrupted by disease, by pregnancy, or by suckling. During this large proportion of female life, there is a great liability to derangements, of one form or another, in the menstrual process; and to which much importance is attributed, though from some remains of the old doctrine that the menses were the outlets of "peccant humours," more anxiety is generally expressed in cases of diminished or suspended discharge than in those where it is unnaturally profuse. Women have also been always in the habit of considering the time of the first appearance of the catamenia, and of their final cessation, as requiring particular caution and management, and as tending to the development of a healthy or diseased condition for a long period of life. The actual flow of the menstrual discharge itself is also looked upon as a time of great delicacy, and as demanding peculiar attention; so that very few diseases can exist, and very few plans of treatment be recommended, without the presence of the menses in some way influencing the nature of the symptoms or the remedies to be applied. It is in this especially that the character of the female constitution in disease is manifested; for before puberty, and after the cessation of menstruation, the female differs but little from the male in the character of disease, unless in those points which may be considered as accidental, such as organic diseases of the sexual organs.

In the present article we propose to consider the medical management of the female at the first appearance of the menstrual discharge, during the continuance of it, and at the final cessation.

Instances of precocious menstruation are by no means uncommon;* but occasional discharges of blood from the vagina of young children cannot be considered in this light, unless accompanied by the usual signs of puberty. Precocity must always be considered relatively as to climate, for the difference in hot and cold countries is very great. Dr. Denman has quoted an opinion of Hume (the historian), which is scarcely borne out by facts; the difference in the time of life when the menses appear being assigned as the reason why women in hot climates are almost universally treated as slaves, and why their influence is so powerful and extensive in cold countries, where personal beauty is in less estimation. "In hot climates women are in the prime of their beauty when they are children in understanding; and when this is matured, they are no longer objects of love. In temperate climates their persons and their minds acquire perfection at or nearly at the same time, and the united power of their beauty and faculties is supposed to be irresistible."† The influence of civilization seems to have been entirely overlooked in this theory; as otherwise the

* We refer in particular to a case by Dr. Wall of Oxford, in the second volume of Medical and Chirurgical Transactions.

† Introduction to the Practice of Midwifery, p. 83.

most chivalrous devotion to the fair sex would be found in the savage inhabitants of the countries of perpetual snow. Precocious menstruation can scarcely be considered as a disease, but it certainly is not desirable, for many obvious reasons; and as artificial circumstances may hasten it, avoiding such causes or counteracting them may not only prevent, but may even supersede it. For example, cases have been related in which girls have menstruated, with all the signs of puberty, at nine or ten years of age, in the East Indies; and having been removed to Europe, the function has ceased, without disorder of the health, and has not appeared again till the age of fourteen or fifteen, at which it usually comes on in this country. Hot and crowded rooms, luxurious habits, early excited passions, and improper indulgences, are well known to promote an early development of sexual power, and should be carefully counteracted in those cases which seem to call for interference. An opposite condition to precocity is also very commonly met with; but however late the period may be at which menstruation first comes on, it is not a disease in itself, so long as the symptoms of puberty are not manifested. The parents of a young woman are often anxious upon this point, and request medical aid to bring on the menstruation; but, unless by attending to the general health, the practitioner is not justified in interfering. In some unfortunate instances the signs of puberty never come on, from some organic deficiency in the genital organs, particularly the ovaria; and all attempts to excite a menstrual discharge would be pernicious.

For a very considerable period before puberty, often two or three years, symptoms of the approaching important change in the system may be detected. It is not at all uncommon to meet at this age with very obstinate disorders, such as headachs, epileptic fits, or cutaneous affections; and upon finding the usual plans of treatment fail, medical men are in the habit of prophesying a cure when menstruation is established: this arises from long experience of the frequent truth of such a result. As the time draws near, the system becomes more irritable; there is a general uneasiness and an alteration of the moral character; there is also very commonly much languor, flushing, sensation of fulness, headach, livid marks round the eyes, disordered appetite, impaired digestion, and disturbed or unnaturally heavy sleep. These symptoms continue for a longer or shorter period; and immediately preceding the first appearance of the discharge, there is much pain and weight, with fulness in the head and pelvis, and throbbings and swelling of the mammæ. Although the actual discharge is rarely quite regular to the month for the first half year or so, passing over a month or two, yet the usual constitutional symptoms just enumerated as directly preceding the discharge are found to observe the lunar intervals, and to be aggravated monthly, even for some time before the flow of the menstrual evacuation itself. With many, the symptoms above mentioned are either so slight or so temporary, that no great attention is paid to them. Where medical aid is required, the plan of treatment must depend a great deal upon circumstances: as a general rule it is best to temporise, knowing that a little patience will carry the patient to the termination of the discomfort. Should there be any very great disturbance, with a full pulse and much headach, the abstraction of a small quantity of blood will be prudent. The diet should be carefully regulated, and abstinence from meat or wine strictly enjoined. The bowels should be kept rather more open than usual, but not with any of the more irritating and drastic purgatives, under the idea of exciting the uterus to action, as is too commonly recommended; the object being to lead the patient through the struggle without any force or disturbance. We should watch excess of action of every description, and restrain it, but not attempt to stimulate any apparent deficiency, unless actual disorder of health be manifested. Circumstances may arise, however, to call for more decisive measures; and the menstruation may be so protracted as to constitute one of the forms of *amenorrhœa*, the nature and treatment of which have been detailed elsewhere. (See Amenorrhœa.)

During the menstrual period, when quite regularly and properly performed, no medical treatment is required; but it should never be lost sight of either by the patient herself or by her medical attendant, in case of any accidental illness, or any general plan of management of the health. Women expect this carefulness, from the great importance they habitually attach to the proper performance of the function; and therefore, in prescribing for females, it is always right to enquire as to the expected time, as well as the regularity of the periods, to guide us as to the propriety of continuing or remitting any part of the remedial measures. There are many things to be guarded against on these occasions, which might be safely followed at any other time; and while much depends on the patient's own prudence, yet the physician is constantly blamed if he lose sight of the necessary precautions. It is necessary to avoid any very active purgative medicines during menstruation, particularly those which irritate the lower part of the rectum, as they are apt to produce a morbid increase of the discharge. Medicines containing the preparations of iron, strong diuretics, emetics, myrrh, or mercury, are usually ordered to be suspended during the periods, although it is very doubtful whether the milder mercurial medicines in gentle doses can be productive of mischief. Cold bathing ought also to be discontinued, particularly the hip and foot baths; and yet it is a well-known fact that the dippers attached to the bathing-machines at the sea-side are in the habit of being for several hours in and out of the sea during the catamenial flow without detriment. Wetting the feet or exposure to

rain under these circumstances has now and then suddenly suppressed the menstruation, and brought on illness of an alarming nature. Dr. Dewees states that in America it is not at all uncommon for young girls, bent upon a party of pleasure, to put the feet in cold water to stop the discharge. It need scarcely be stated that all vaginal injections to restrain leucorrhœa must be left off at these times. Any very violent exercise is to be carefully avoided during menstruation; partly because it is very apt to produce too profuse a discharge, and partly because, on account of the increased weight of the uterus and relaxation of the vagina, a serious degree of prolapsus uteri has been often occasioned by it. Some aggravated instances of this distressing complaint, even in unmarried women, have occurred in the writer's own practice, which have been brought on by dancing, by horse-exercise, and by over-fatigue in walking, during the menstrual period.

The Jews, and even more modern nations, believed that there was something deleterious and contaminating in the menstrual discharge itself; and hence various directions and regulations as to seclusion and cleanliness of person. It is not necessary now to controvert these doctrines; but it were well, perhaps, if more strict attention were to be paid to some part of the regulations even in the present times. Either by accident or by criminal impatience, sexual intercourse has sometimes been permitted during the period of menstruation; and, although not constantly, yet such conduct has been frequently followed by the most serious effects—generally by profuse hemorrhage; at other times by a sudden suppression of the discharge; to which have succeeded fever, delirium, obstinate hysteria, confirmed mania, and even catalepsy. (See Amenorrhœa.)

When the function of menstruation has been once fairly established, it may become disordered in several ways, each forming distinct classes of diseases. Menstruation may be faulty in respect to the quantity of the discharge, the quality of the discharge, the regularity of its appearance, the time of its duration, and the degree of pain with which the process is accompanied. When the discharge has been in any way suppressed in a peculiar condition of health, what has been called *vicarious menstruation* has sometimes periodically occurred from other parts of the body, the stomach, the lungs, the bowels, &c. although Dr. Dewees evidently doubts the existence of such anomalies. For a minute account of these several forms of disordered menstruation, the reader is referred to the articles Amenorrhœa, Dysmenorrhœa, and Menorrhagia.

During pregnancy and suckling, menstruation ceases. This is undeniably the general rule. Under the head of Lactation, the exceptions to this law of nature, as regards *suckling*, have been noticed, and no one perhaps will deny their occasional occurrence. But many practitioners of extensive experience in midwifery have denied the possibility of menstruation going on during pregnancy, and declare the supposed cases to be either false altogether, or that the discharges which do sometimes occur during pregnancy are not menstrual, but are irregular in time, sparing in quantity, and sanguineous in character. They rest their arguments upon the fact, that at a very early period of pregnancy the os uteri is closed by the thick glutinous secretion which is poured out by the glands at the cervix; and also, that from the interior of the uterus being coated with the decidua vera, there is no surface from which the menstrual fluid could be secreted. Many experienced medical men, and women themselves in general, believe not only in the possibility, but in the comparative frequency of menstruation during the first three or four months of pregnancy; and Dr. Dewees mentions a case in which he was firmly convinced that it went on regularly to the *seventh* month, lasting three or four days, exactly as usual, not sanguineous, at least not containing perceptible coagula, and only differing from common periods in being less and less abundant as the pregnancy proceeded, after the fourth period. The first argument, as to the impossibility, is scarcely tenable, when we recollect how readily slight hemorrhages find their way through the os uteri in spite of its closure, from some accidental disturbances of the ovum at any period of pregnancy, without being followed by miscarriage; and if such discharges can escape, why not the menstrual? In reply to the second, Dr. Dewees asserts, that as menstruation occurs from the cervix uteri in the unimpregnated uterus, as well as from the body and fundus, there is sufficient space for some menstrual fluid to be secreted in that part of the cervix which remains uncovered by the deciduous membrane, and, as is well known, is not taken up into the body of the uterus till an advanced period of pregnancy. He states that a very small space will be sufficient for the purpose, as was proved by discovering in a post-mortem examination that the uterus of a young woman who had menstruated quite regularly and properly to the time of her death, retained only a surface healthy enough to perform the menstrual function, of the size of the finger nail, all the rest of the interior being in a state of disease. In stating the opinions on both sides it will be scarcely necessary to advert to our own; but, although firmly convinced that a perfectly regular discharge as to period is not uncommonly found to continue for the first two, three, or four months of actual pregnancy, yet we do not therefore conclude that such discharge necessarily comes from the uterus, or is exactly menstrual. In what the difference consists between the menstrual fluid and blood is not accurately known; that it does not coagulate is not saying much, as the blood of persons affected with scurvy, or of those killed by lightning or by some of the powerful narcotic poisons, does not coagulate; and menstruation is rarely very profuse without coagula being also expelled, no other secretion ever contain-

ing pure blood mixed with it, unless from organic lesion.

From habit, there is a tendency of the circulation towards the uterus every month, even during pregnancy; and few women are found who do not experience the symptoms occasioned by it, for the first month or two: hence it is that miscarriages are so apt to occur at those periods at which menstruation would have appeared, had not the process been interrupted by pregnancy; and hence, also, a periodical relief resembling menstruation may occur for the first few months, the bloodvessels at the cervix uteri, or the upper part of the vagina, giving way for the purpose. When this occurs, as it is unnatural, and might lead to abortion, great care is required; and when patients have shewn a tendency to it, they should be kept in the horizontal posture for a few days, and a few ounces of blood be abstracted from the arm, or, by means of leeches or cupping, from the neighbourhood of the uterus. Although it is not pretended that these cases are common, and they can only be regarded as exceptions to a general rule, yet it is important that no one should blindly deny their possibility, since it might lead to a neglect of those precautions which pregnancy requires.

The important period of the cessation of the menses is liable to the same varieties as that occasionally observed on the first appearance, and is also accompanied with many very striking changes in the animal economy. It is an age which is always looked upon by the female sex with a certain degree of apprehension, as one in which the foundation is often laid of many a painful and dangerous malady; and yet those who previously are suffering from long-continued general illness or any obstinate chronic disease, are accustomed to look forward to the time when the constitution shall become *settled*, as it is termed, for a relief to their sufferings and a restoration to more perfect health. When the uterus is no longer in a condition to perform the function of menstruation, the power of conception also ceases; and it has been considered by some authors that this was a wise ordination to prevent women from becoming mothers at so advanced an age that they would be incapable of properly attending to their offspring while still too tender to provide for themselves. As it has been generally acknowledged that the uterus is most fitted for impregnation directly before or after each menstrual period; so it also happens, that for a short time before that process ceases for ever, there appears to be an unusual degree of stimulus in the generative faculty; and many women who have ceased to bear children for years, or who have been hitherto barren through the whole of their married existence, at this time, to the surprise of their friends and of themselves, become pregnant. Still more commonly, however, does it happen that women mistake their condition under these circumstances, and so obstinately believe themselves pregnant, that it becomes exceedingly difficult to convince them of their error. It is easy to suppose that at this particular age such mistakes are likely to arise, for the symptoms that naturally accompany the cessation of the function much resemble those of pregnancy. Women are unwilling to be thought beyond the age of bearing children, and are perhaps on that account misled by their wishes; but they not unreasonably are struck with the first sign which generally occurs, —namely, the passing over of the menstrual period; and their attention is ready to seize hold of every flattering explanation of the circumstance. Other symptoms are soon manifested; the size increases, the breasts even become swollen and painful, the stomach disordered, and the appetite capricious, so that a pregnancy sickness is not uncommon; flatulence collects in the intestines, and whilst on this account the size still increases, the sudden motions and rolling about of the confined air are mistaken, even by women who have previously borne many children, for the plunging of a fœtus. It is only by time, or by an examination per vaginam, that the mistake is detected, much to the annoyance of the patient and her friends; but the symptoms are easily removed by the free exhibition of carminatives and purgatives, the use of active exercise, and bandaging the distended abdomen, which has probably been allowed more room to expand than formerly, from a fear of tight lacing in pregnancy.

In this country the average age at which women cease to menstruate, or "*the time of life*," as it has been called, is forty-five. Where they have begun early, it generally ceases early; and, on the other hand, where they have begun late in life, it often lasts much later than common. Some women have ceased entirely before the age of thirty; others have gone on to nearly sixty, or even beyond this period. Many of the cases, however, which have been related of women who have continued to menstruate till seventy, eighty, or upwards, or who have begun again ten or fifteen years after having apparently left off for ever, were not genuine cases of menstruation, but sanguineous discharges, generally irregular, and arising from some disease of the uterus.

Menstruation ceases sometimes at once, when the female has arrived at the usual age; but this rarely happens, unless accidentally as it may be termed. For instance, something or other takes place to check the expected discharge, which would have had the same effect at a much earlier age, such as cold, fright, some acute illness, or any other fortuitous occurrence. At any earlier period the menstruation would return on the cessation of the illness; but now it seems to take the opportunity of departing without further trouble, and never again appears. Much more frequently the change is gradual, and accompanied with such irregularities that it has not inaptly been called "*the dodging time of life.*" The quantity varies much as well as the regularity of the return; sometimes for two or three successive periods it is extremely scanty, and then suddenly is so profuse as to partake of the character of uterine hemorrhage, and even

to create alarm as to the immediate result. The discharge sometimes returns every two or three weeks, and then ceases for several weeks or even months, and afterwards perhaps for a time recurs as regularly as usual. In females in whom it has been always previously the most regular, and when the person has been uniformly healthy and of temperate habits, the cessation of the function goes off the most quietly, and with the least subsequent derangement of the system. Many, however, who have not been so fortunate in their state of health, by being carefully conducted through this critical period, have apparently renewed their existence, have lost their previous delicacy of constitution, and become more healthy than ever; so that it has been remarked that their lives are likely to be prolonged to a more advanced age than men of equal standing and at the time of equal health.

But this is the most favourable termination of the period; for with many it is only the beginning of a train of great suffering and of constant illness, ending in an early death.

Whenever there is any tendency to organic disease, or any weak point in the frame, this is the time when the mischief becomes manifest, and the symptoms are first detected. It is not, as Dr. Dewees has very properly remarked, that the particular diseases are caused by cessation of the menses, but the seeds of such affections already existing are roused into activity by the changes which take place in the system at that period. For perhaps thirty years of the woman's life there may have been an habitual monthly discharge of from four to six ounces, more or less, of a secretion which is nearly allied to pure blood, from the uterus; and it is not surprising that, on this being stopped, the long habit should produce a tendency to the same relief every month; which not taking place, the excess is thrown back upon the circulation, and local congestions are the consequence. Even under the most favourable circumstances there are symptoms of congestion, shewn by headach, shortness of breathing, oppression at the præcordia, and a tendency to corpulency. But whenever any organ is in a state of disease, however latent hitherto, the redundancy is thrown especially to that quarter, and the disease is rapidly called into activity.

It is not surprising, from the great alteration which takes place in the organs connected with the function itself, or those which have been particularly affected by it, that they should be the parts most liable to become diseased at this time; and certainly most organic diseases of the uterus and mammæ date their perceptible origin from this period. Besides cancerous tumours, medullary sarcoma, hæmatoma or fungus hæmatodes, attacking the uterus and breast, many serious diseases of other parts often arise. Apoplexy is not an uncommon occurrence, but is not so often fatal at this age as at one more advanced. Organic disease of the liver or of the other abdominal viscera is much more common than of the lungs, the abdominal circulation being perhaps more closely influenced by the want of the uterine secretion. Very obstinate disorders of the skin frequently make their appearance at this age for the first time, producing great distress and disorder of the health. There is sometimes an apparent effort of nature to substitute some other discharge as a compensation for the one which has been suspended; and it is right always to respect these contingencies, as, however disagreeable they may be, the removal or cure of them may be dangerous. Leucorrhœa is a very common instance of this natural relief; and discharges of blood from the hemorrhoidal veins is another, which now and then becomes periodical. Ulcers sometimes form and discharge copiously, on the legs or behind the ears, and should not be carelessly healed, unless other measures are taken to prevent mischief.

The medical management of the important period of cessation of the menses may be easily collected from what has been already remarked. Recollecting the condition of the system, particularly of the circulation, it will be necessary to keep it free from disturbance as much as possible, to relieve any organ or part of the body which may appear oppressed or in a state of congestion, and to watch carefully the first threatenings of any local disease. Should the pulse be full and hard, and should there be any general plethora, frequent small bloodlettings will be advisable. Every local pain, heat, or sensation of fulness, should be relieved by leeches or cupping. The bowels should be kept carefully and freely open by purgatives which do not irritate, but which produce watery motions, such as the neutral salts or castor oil. If the pulse is habitually quick and hard, small but repeated doses of mercurial medicines may often be of service, and remove any obscure inflammatory action which may insidiously be going on. The diet should be mild, and moderate as to quantity, meat and wine either omitted or but sparingly allowed. Exercise must be regulated by the circumstances of the case; it is very desirable where no local mischief appears to exist, as it promotes regularity of action and general health; but otherwise great quietude should be observed. The production of artificial discharges by means of issues, setons, or perpetual blisters, so much in vogue formerly, is now no longer fashionable, from the dislike patients have to such remedies; but viewing what is often effected naturally, we cannot doubt but that their more frequent employment would be highly advantageous.

In some peculiar constitutions most of the disturbance consequent upon cessation of the uterine functions seems to attack the nervous system, and hysteria, epilepsy, or mania sometimes take place. The management of such cases requires some modification in the treatment above recommended: conium has been found of great service by some; and now and then even mild tonics are required to steady the irritable condition of the frame. When such diseases arise for the first time at this period of life, they generally prove obstinate,

and often incurable. Some have proposed to attempt to reproduce the menstruation, as a means of relief when any of the formidable disorders above mentioned come on, by the employment of violent remedies of the emmenagogue class; but this practice might be highly dangerous, and probably excite uterine diseases of the most fatal description.

(C. Locock.)

MESENTERIC DISEASE.—See Tabes Mesenterica.

MILIARIA.—This term, derived from *milium*, a millet seed, is applied to a minute vesicular eruption which occasionally appears in the progress of various acute disorders, the vesicles resembling in size and colour the seeds of the millet plant.

It has been regarded by some authors as an idiopathic eruptive fever, to which the name *miliary fever* has been given: by many of the older writers it has been confounded with scarlatina and rubeola; and from its having been occasionally observed to co-exist with purpura, the idea probably first originated that it was only a modification of this eruption. We have also on record several accounts of an epidemic miliary fever,* which has at various times prevailed, though it is evident that the eruption was only an accidental or symptomatic affection, and as little entitled to characterize an epidemic as the petechiæ that appear in some epidemic fevers, and from which the disease has been termed *petechial* or *spotted fever*.

The miliary eruption appears in the form of small round vesicles about the size of a millet-seed, surrounded by slight inflammation. It is most abundant on the neck, breast, and back, but is less copious on the face and extremities, and sometimes comes out in irregular patches, frequently appearing and again disappearing without evident cause. The vesicles are at first so exceedingly small that they can hardly be distinguished except by their roughness: when examined through a lens, the round vesicular form of the eruption, each vesicle containing transparent lymph, is distinctly visible, though from the red colour of their under-surface being transmitted through the transparent pellicle, they are of a red colour; the lymph, however, becomes in the course of twenty-four or thirty hours opaque, and thus gives a pearly white appearance to the eruption. From this evidently originated the two varieties mentioned by the older writers; the *red* and the *white* miliaria, *(rothen friesel* and *weisse friesel* of the Germans,)—a distinction not only unnecessary but unfounded, as it is apparent that both these supposed varieties are only different stages of the same eruption.

Miliaria is sometimes rapid in its progress, and the eruption copious and generally diffused: in other instances it is partial and slow, and though the vesicles are usually distinct, they sometimes cohere and become confluent, and thus assume the form of phlyctenæ or small bullæ.

Its duration is various: it sometimes passes off in a day or two; the vesicles either breaking, or the lymph being absorbed, slight desquamation of the cuticle terminates the disorder. According to Bateman, it frequently lasts from seven to ten days, and sometimes much longer: indeed, under the treatment formerly pursued, when the sick, according to the expression of Blackmore, lay "drowning in sweats," it was not uncommon for crops of vesicles to be renewed a second, third, or even a fourth time, and the whole disease to be protracted to nearly fifty days.

The only disease with which miliaria can possibly be confounded is *eczema*. From this it may be distinguished by its being invariably symptomatic of some acute febrile disorder, and by its rapid progress and short duration. Besides, in *eczema* the vesicles are usually confluent, and confined to a circumscribed or limited space, whilst in *miliaria* they are generally distinct, and much more numerous.

With regard to the diseases in the progress of which miliaria occasionally appears, we may observe that since the introduction of the cooling regimen which now forms an essential part of the treatment of every variety of febrile disorder, it is comparatively rarely met with. In common continued fever, even in the worst forms of it, when judiciously managed, its appearance is almost unknown. We cannot bring to our recollection a single instance out of the numerous cases which we have had under our care in the Fever Hospital, though we have had repeated occasion to observe it in the crowded ill-ventilated apartments of the lower orders, when ventilation has been unattended to, and a stimulating regimen adopted.

Miliaria is more apt to appear among women after delivery than in any other circumstances; so frequent, indeed, was its occurrence half a century ago, that it was described by some writers as an epidemic among lying-in women. From the accounts given of the management after delivery, by those who witnessed it at the period referred to, there can be no question that the eruption was induced by the injudicious mode of treatment adopted. In later times, since the adoption of a more cooling plan of management after delivery, not only are febrile disorders less frequent and violent, but the miliary eruption is seldom observed; and when it does occasionally appear, its origin may be always traced to an over-heated atmosphere, over-loading the patient with bed-clothes, and the stimulating regimen adopted by the poorer classes, under the mistaken notion that the parturient female may be thus prevented from *catching cold*. Miliaria is also a frequent accompaniment of the milk-fever, and of ephemera or weed, when the perspiration is injudiciously encouraged. Dr. Burns thinks that this is by far the most frequent form under which the miliary rash appears, but he states that it is sometimes observed in women who

* *Pujol*, Mém. sur la fièvre miliare qui régna en Languedoc et dans les provinces limitrophes, durant le printemps de 1782. *Rayer*, Histoire de l'épidemic de suette miliare qui a régné, en 1821, dans le département de l'Oise.

have been much reduced, but who are free from fever.

With other fevers, Bateman remarks, in which a similar method of treatment was pursued, though in a less degree, and the patient was confined to bed, the miliary eruption, with its attendant languor and exhaustion, was frequently conjoined, especially with catarrhal and rheumatic, and also with typhoid, remittent, and intermittent fevers. Whence the writers who have described the miliary fever, speak of it as being disguised under, or counterfeiting the character of these fevers respectively. In the summer, indeed, when ventilation and coolness are not sufficiently attained or attended to, a slight miliary eruption is even now occasionally seen: a miliaria *clinica*, in fact, may be thus induced by any circumstance that confines a person to bed; as an accident, or a surgical operation, an attack of hysteria, a state of asthenia, &c. From the increase of cutaneous heat, connected with the exanthematous fevers of the nosologists, some degree of miliaria is liable to occur in them all, but more especially in scarlatina; and a few larger pearl-coloured vesicles also occasionally appear.*

The miliary eruption does not afford any relief to the symptoms of the disease on which it supervenes: it is generally preceded by an increase of the fever, and a sensation of heat, pricking, or tingling of the skin. A peculiar acid smell of the perspiration is also perceptible, though we apprehend, from this fetor of the perspiration being frequently noticed in various forms of fever in which there is no cutaneous efflorescence, its connexion with the eruption is not satisfactorily established.

Though there be no proof of miliaria being contagious, several attempts to induce the disease by inoculation having failed, it is affirmed by Frank † and other writers to be often epidemic, and in some localities endemic. Rayer has given an excellent description of an epidemic miliaria, attended with symptoms of a malignant character, which proved in many instances rapidly fatal. From the account given by this writer, it seems to have prevailed epidemically, chiefly in Picardy, Languedoc, and Normandy; but it is so little known at Paris, that many physicians have expressed their doubts of the reality of such a disease. From observations made during epidemic visitations, it appears that no age is exempt from it, though the greater proportion of cases occur in adults, and that females are more frequently the subjects of it than males.

In the epidemic which prevailed in the autumn of 1821, in the departments of the Seine and Oise in France, and which was very fatal, we are told by Rayer that the eruption was preceded by feverish indisposition accompanied by copious perspiration, which continued throughout the progress of the disease.

The eruption appeared generally about three or four days afterwards, first on the neck or around the ears, and spread to the chest and back, and thence over the abdomen to the inferior extremities. The rash was sometimes generally diffused; in other cases it was only partial; the vesicles being distinct, small, and diaphanous, though sometimes large and confluent, so that on some parts of the body large bullæ appeared. The odour of the perspiration was often extremely fetid, which continued in general during the progress of the disease.

The disorder was in many instances mild, but in the more severe cases inflammation of the mucous membrane of the intestines, or of the lungs, or of the brain or its membranes supervened, and rendered the disease more dangerous.

Its duration was various. The more severe cases often terminated fatally within twenty-four or forty-eight hours. In the milder cases, it sometimes disappeared in eight days; more generally, however, it was protracted to the end of the second week, and sometimes lasted three weeks.

Treatment.—From what has been stated of the nature of miliaria, it is evident that it is to be regarded only as a symptomatic affection. Free ventilation and a cooling regimen constitute not only the best means of preventing, but of removing the rash; therefore when it supervenes on acute diseases the cooling antiphlogistic treatment is to be pursued. For this purpose the chamber is to be duly ventilated; the linen of the patient changed as often as circumstances permit; the thirst abated by cooling subacid drinks; the bowels regulated; and the diet should be of the mildest kind. Tonics have been often found beneficial, and none are better than the mineral acids—as the diluted sulphuric or oxymuriatic, which may be taken at intervals. When miliaria occurs as an epidemic, the same treatment has been successfully pursued; and when complications arise in the progress of the disorder, the particular local affection must be treated on the principles already fully detailed in the article Fever.

(A. Tweedie.)

MINERAL WATERS.—See Waters, Mineral.

MORTIFICATION.—The term mortification is generally employed in this country to express that state which has been induced in a part of the body by the complete and permanent extinction of its vital properties. On the continent, however, the term *gangrene* is employed to signify the same state; whilst in England it is more commonly used to denote the incipient stage of mortification; a state of a part in which there is a diminution, but not a total extinction of the vital properties; in which the blood is still supposed to circulate in the larger blood-vessels, and the nerves to retain a part of their sensibility: the complete cessation of

* Practical Synopsis of Cutaneous diseases, p. 245.

† De Cur. Hom. Morb. Epit. tom. iii. Sect. 322.

circulation and an entire want of sensibility characterize the second or last stage of mortification, which is called *sphacelus*, whether the dead part has or has not become putrid, whether it has been separated or not from the living parts. Again, some pathologists confine the term gangrene to the death of the *superficial* textures of parts, and particularly of the soft parts; and sphacelus, to the death of the *whole substance* of an organ, as of the soft parts and bones at the same time.

Other denominations have been given to this pathological state, founded on particular conditions of the affected part, which have been observed to precede or accompany mortification. Thus, we have what is called *hot gangrene*, or that which is preceded or accompanied by inflammation; and *cold gangrene*, or gangrene without inflammation. We have also *humid gangrene*, from the affected part containing a greater or less quantity of decomposed or other fluids; and *dry gangrene*, when these fluids are not present, or only in very small quantity, and which being frequently the case in gangrene affecting the external parts of old people, has, on that account, also been named *gangræna senilis*.

Although some of these distinctions are, no doubt, of considerable importance, some of them are extremely vague and improper, and much less deserving of our attention than the conditions of the part affected with mortification, and the causes by which this state is induced.

Before entering upon the general considerations which present themselves on the several kinds of mortification which occur, it may be well to remark that we shall employ the terms *gangrene* and *sphacelus* as they are generally employed in this country; that of *mortification* constituting the generic sign of the disease of which they indicate particular stages. Although, however, the adoption of these two terms is founded on the differences which exist between the morbid conditions to which they are applied, and their use is necessary to distinguish a state of a part yet susceptible of recovery from one that is not, we shall find that it is by no means easy to determine—even when external parts are the seat of mortification, and, consequently, when many of the phenomena of this disease are capable of being submitted to actual observation—whether the vitality of the affected part be partially or wholly destroyed. It is, perhaps, on this account, and as expressing also a favourable doubt, that the term gangrene is much more frequently employed than that of mortification or sphacelus.

As the descriptive characters of mortification were originally drawn from the appearances which this disease presents when it attacks the external parts of the body, they have ever since been employed by the pathologist as the means of enabling him to detect it in internal organs after death. It may, however, be fairly questioned whether the application of the term mortification has not been too restricted; and whether parts deprived of their vitality and separated from the living tissues should not be designated by the same appellation as those which, similarly situated, differ from them only in point of colour, and perhaps smell. Softening of the cerebral substance, of the mucous and frequently of the serous membranes, constitutes a state of positive death; but the softened substance, in these instances, presenting neither the peculiar colour nor odour of external parts when mortified, it has been considered necessary to distinguish softening from mortification, by a term expressive of its principal character—that of softness. We shall, therefore, treat in this article only of those states which are usually comprehended under the term mortification.

Considered in a general point of view, and in relation to the causes by which it is produced, or the morbid conditions of the part in which it occurs, we find that mortification takes place in a variety of ways, and under very different circumstances. A knowledge of these facts suggests the propriety of arranging the several kinds of mortification under the three following heads:—

1. Mortification from cessation of the circulation.
2. Mortification from the violent operation of mechanical, chemical, and physical agents.
3. Mortification from the deleterious influence of certain poisons.

Cessation of the circulation in a part of the body may be produced in the three following ways:—by inflammation; by mechanical causes which obstruct the passage of the blood; by local or general debility.

I. Mortification from inflammation.

There is no tissue or organ of the body which may not become affected with mortification as the immediate or mediate effect of inflammation. Mortification is, however, much more frequently observed in those organs in which the vascular system predominates, or in which an inordinate accumulation of blood is readily produced, on account of their great sensibility and their direct exposure to the influence of those causes which give rise to inflammation. Hence the reason why gangrene and sphacelus occur more frequently in the skin and cellular tissue, mucous membranes and lungs, than in the other tissues and organs of the body, as immediate effects of inflammation; and why they are so rarely observed in serous and fibrous tissues, which contain few or no bloodvessels.

Not only is mortification rarely observed in these latter tissues, but it may also be said never to occur in them as an immediate effect of inflammation, for they are never found in a state of gangrene or sphacelus, unless the cellular membrane with which they are in contact, and from whose vascular system their nutrition is derived, has previously been diseased. Such also is the case in caries, (death of bone,) as a consequence of inflammation of the periosteum and medullary membrane.

These circumstances enable us to explain why, in certain cases, mortification takes place in one tissue and not in another, although the inflammation by which it is preceded is the

same in kind, degree, and duration. There are, however, many other circumstances of perhaps still greater importance, the single or conjoint operation of which favours in a most remarkable manner the termination of inflammation in gangrene and sphacelus.

1. Certain diseased states of an organ or tissue—of the solids in general, or of the blood in particular—are circumstances which, while they predispose to inflammation, give at the same time to this pathological state a peculiar tendency to terminate in gangrene or sphacelus of the parts which it affects. Thus, chronic inflammation of a portion of an organ, particularly when accompanied by induration and obstructed circulation of the affected part, is not unfrequently followed by gangrene and sphacelus; and still more frequently is this the consequence of an acute attack of the same disease, either in that portion of the organ previously modified, or in a contiguous portion of it, through the medium of which the nutrition of the former was derived.

2. In like manner, when inflammation occurs in an organ in a state of congestion, depending on the presence of an obstacle to the return of the venous blood, the danger of its terminating in mortification is increased in proportion to the extent of the obstacle or the degree of congestion to which that obstacle has given rise.

3. The state of general debility which prevails at the termination of protracted fevers, or during the first period of convalescence, is well known not only to favour the development of inflammation, but to give to this disease a great tendency to terminate in mortification.

4. The influence which a diseased state of the blood exercises in the production of mortification is well exemplified in scorbutus; local inflammation in this disease, even when it has only arrived at the congestive stage, frequently terminating with great rapidity in gangrene and sphacelus.

The termination of inflammation in either of these states is likewise regarded by many to depend much on the nature of the cause by which the inflammation has been induced. It would, however, be more correct to say that the termination of inflammation in gangrene or sphacelus depends on the nature of the change which follows the immediate operation of such a cause on the organ in which inflammation afterwards takes place.

It is true that, independently of any peculiarity of constitution, a mechanical stimulus will produce inflammation very different in its external characters, intensity, extent, duration, and mode of termination, from that which follows the operation of a chemical agent or certain poisons. But, were we to attribute these differences solely to something peculiar in the nature of the exciting cause, we should find it impossible to account for the various phenomena by which they are accompanied. For, in one case, the inflammation may be intense, and the gangrene by which it is followed comparatively slight in degree and limited in extent; in another, it may be mild or imperfectly developed, and yet gangrene and sphacelus succeed each other to a great extent; and in a third, whether severe or mild, its termination in mortification may take place slowly, or proceed with frightful rapidity. All these varieties, also, are observed, without a corresponding change in the causes by which they are produced; the same cause producing at one time only inflammation, at another gangrene or sphacelus.

Instead, therefore, of seeking in the nature of the exciting cause itself an explanation of these remarkable differences, we must have recourse either to the peculiar change which it has induced in the part which afterwards becomes the seat of inflammation, or to some previous modification of the kind to which we have already alluded; such as a morbid state of an organ, of the body in general, or of the blood in particular.

The above are some of the more remarkable of the circumstances which favour the development of gangrene or sphacelus as a consequence of inflammation: the following are some of those which exercise an opposite influence.

1. The first of these in importance is a perfect state of health, whereby inflammation, instead of terminating in gangrene or sphacelus, as it would have done in an individual less favourably circumstanced, is limited to one or other of its more simple forms,—as the adhesive, suppurative, or ulcerative.

2. The structure and situation of an organ, whereby the increase in quantity of the fluids of nutrition and secretion, which takes place during inflammation, is either entirely prevented, or very limited in degree and extent. All secreting organs or surfaces which possess a free exit to their superabundant fluids, natural or morbid, furnish examples of this kind; as the serous and mucous membranes, which, compared with the testes or breasts, in which the circulating and effused fluids are retained, are rarely the seat of gangrene or sphacelus as the direct consequences of inflammation.

3. The importance of an organ, whereby death supervenes before mortification can take place as a consequence of inflammation. Mortification of the brain and heart seldom or never occurs, unless when it follows inflammation produced by the direct operation of mechanical causes. When it occurs as an idiopathic affection in the brain and heart, the derangement of function by which it is accompanied becomes so great not only in these organs themselves but throughout the whole body, that general death supervenes, before the inflammation has acquired that degree of severity which gives rise to local death or mortification.

General phenomena of gangrene and sphacelus.—As the more remarkable changes which take place in the circulation, innervation, temperature, colour, and consistence of a part affected with gangrene or sphacelus, as a consequence of inflammation, are seldom ob-

served unless on the external surface of the body, we shall describe them as they occur in the skin and subjacent parts.

When inflammation is about to terminate in gangrene, the inflammatory redness assumes a darker tint; it becomes deep purple, livid, or almost black; the temperature of the part diminishes, but not always its consistence, which, on the contrary, may be increased, from the presence of accumulated fluids; small vesicles appear on its surface, formed by the effusion of serosity, or serosity and blood, under the epidermis; the sensibility of the part, which, as well as the temperature, was previously increased, is now much diminished, and the seat of the pain which accompanies the inflammation is transferred to the deeper-seated tissues in contact with those which have now passed into the state of gangrene.

When these modifications of colour, consistence, temperature, and sensibility, continue to increase, and terminate in sphacelus, the part thus affected assumes a still deeper tint; it becomes of a dirty brown or black colour, sometimes grey, greyish yellow, or greenish. The vesicles or phlyctenæ become more numerous and larger, or the whole of the epidermis covering the sphacelated part may be completely separated and distended with bloody serum, or ruptured from the same cause, and lying in wrinkles in the denuded and discoloured cutis. The skin and cellular tissue beneath the epidermis are swollen and puffy, and crepitate when pressed; or they are soft, and flaccid, and cold, and may be cut, pinched, or otherwise stimulated, without pain or feeling of any kind being induced: and, lastly, the sphacelated surface emits a strong cadaverous odour.

When these latter appearances present themselves, but more particularly when the peculiar odour of gangrene is perceived, they may be regarded as certain signs not only of complete death of the affected part to a certain depth, but also that putrefaction has already taken place. The local emphysema and fetor of putrefaction produced during life, constitute, therefore, signs of great value in mortification. Their absence, however, furnishes no proof that local death may not already have taken place; for putrefaction or chemical decomposition of an organ may not follow as a consequence of the cessation of those powers by means of which it was enabled to resist the injurious influence of external agents, until some time has elapsed, the length of which will depend on various circumstances, but more particularly on the quantity of fluids contained in the affected organ, and the degree of temperature to which it is exposed.

So long as gangrene continues to spread, the dark-red colour by which it is characterised is diffuse, and loses itself insensibly in the surrounding skin. But when it is about to terminate favourably, the dark-red colour becomes more circumscribed, gradually disappears, and is replaced by a brighter red, which extends over the affected surface, accompanied by a diminution of the swelling and pain. By-and-bye the natural temperature returns, and the healthy characters and functions of the part are restored, without any solution of continuity having taken place.

A similar change of colour is observed to precede the cessation of sphacelus. It appears on the limits of the dead parts in the form of a narrow circle, and announces that adhesive inflammation, the means which nature employs to arrest its progress, has commenced. Ulceration then takes place along the internal border of the inflamed skin, and a separation is thus effected between the living and dead parts, the latter falling off in the form of what is called *a slough*. The loss of substance which is thus occasioned is either partially or wholly repaired by means of the coagulable lymph which is thrown out on the denuded surface, and which, becoming organized, assumes a membraneous or granular form, according to the nature of the tissue to be repaired, and constituting ultimately what is called a *cicatrix*.

Such are the general characters of mortification produced by inflammation of the skin and subjacent textures. We say subjacent textures, because inflammation of the former, when such as to produce gangrene and sphacelus, is always complicated with inflammation of the latter.

In other tissues and organs these phenomena are, as we have already observed, more or less modified: the differences which they present depending principally on the degree of vascularity and sensibility of the affected organ. Hence the variety observed in the quantity of blood, and the kind and extent of the effusion by which it is followed in inflammatory gangrene and sphacelus; the change of bulk which organs undergo in either of these stages of mortification; the extent to which their temperature and sensibility may be reduced before they become actually dead; and the length of time that elapses from the commencement to this the ultimate effect of the disease. Examples of these varieties will be found in the following details on mortification of particular tissues and organs.

Mortification of particular tissues from inflammation.

1. *Mortification of the cellular tissue.*—The cellular tissue is not only more frequently the seat of mortification, but is also more extensively and more rapidly destroyed by it, than any other tissue of the body. It presents, likewise, considerable variety in these respects, in different parts of the body; gangrene and sphacelus occurring more frequently in the subcutaneous than in the submucous cellular tissue; in the fingers more frequently than in the toes; in the thigh and arm than in the leg and fore-arm, owing to the one being more exposed than the other to external injury, or other exciting causes of inflammation.

A greater quantity of cellular tissue in one part than in another, whereby the diffusion of the effused fluids is facilitated, and the pre-

sence of fibrous envelopes which afterwards prevent their escape to the external surface, contribute likewise to the greater frequency of the disease, and favour its extension and the rapidity of its progress. The most remarkable example of the influence which these circumstances exercise in the production of gangrene and sphacelus of the cellular tissue, is met with in *erysipelas phlegmonodes*.

a. Subcutaneous cellular tissue.—When erysipelas attacks the subcutaneous cellular tissue of the extremities, and although it may at first be limited to a very small space of the forearm, for example, it sometimes spreads with great rapidity over the whole of that part of the limb, extends upwards to the shoulder and neck, and descends along the back, breast, and side. Throughout the whole of this course the muscles, bloodvessels, nerves, and tendons are laid bare, and float in the putrid cellular tissue, and in the serosity, pus, and blood, that are effused during the violence of the inflammation.

Such is the state of the cellular tissue not only in erysipelas phlegmonodes when it occurs as an idiopathic disease, but also when it succeeds to slight wounds or punctures of the arm in bloodletting, and the fingers in dissection. In such cases the cellular tissue appears to be the primary seat of the inflammation, which may either extend in the manner we have described, or be confined to the cellular sheath of the bloodvessels. In the latter case we have frequently what is called phlebitis; the venous circulation is interrupted; the blood ceases to circulate, coagulates, and nutrition not being maintained by the formation of a collateral circulation, gangrene of the extremity follows as an inevitable consequence.

Besides the *diffuse form* of gangrene and sphacelus of the subcutaneous cellular tissue, there is also a *circumscribed form* which is observed in furunculus, common carbuncle, or anthrax. The great accumulation of blood, and the still greater and rapid effusion of serosity which takes place in these circumscribed acute inflammatory affections, produces a state of extreme induration and compression of the cellular tissue, a greater or less portion of which being thus as if strangulated, dies from want of nutrition, becomes separated from the living parts, and is expelled, in the form of a grey or straw-coloured spongy or pulpy mass, through an opening made in the skin by a similar process, by ulceration, or a surgical operation.

In cynanche parotidea, or mumps, the cellular tissue of the salivary glands is very similarly situated as in carbuncle or anthrax. It is this tissue that is the seat of the inflammation, congestion, and effusion; and being prevented by the unyielding nature of the glandular tissue of the organ from accommodating itself to the increased quantity of the fluids thus poured into it, it soon sloughs, even sometimes before the glandular tissue has undergone any remarkable change of colour or consistence, and before suppuration has commenced.

It may be remarked here that mortification of the adipose tissue always follows that of the skin and cellular tissue, and in fat persons occasions sometimes the most frightful loss of substance.

b. Submucous cellular tissue.—When *diffuse* or *circumscribed* inflammation of the cellular tissue, terminating in gangrene or sphacelus, occurs in internal organs, it presents the same general characters as those we have just now described. In these, however, it never proceeds to the same extent as when it affects the external parts of the body, either on account of the progress of the disease being checked by one or other of the circumstances to which we formerly alluded, or from death taking place at a very early period.

The *diffuse form* of the disease in internal organs is seldom observed except in the pharynx and larynx, either as a primary affection, or in connexion with erysipelas phlegmonodes of the limbs, face, or neck.

In these situations the sloughing of the submucous cellular tissue is very limited, and always accompanied by a corresponding state of the mucous membrane which covers it. The effusions of albuminous and puriform fluids which take place at the same time, occasion a great increase of bulk, and produce dysphagia, great difficulty of breathing, or complete asphyxia. Hence the frequently fatal termination of the disease before it has passed into gangrene or sphacelus, and which has sometimes been described under the name of serous, albuminous, and purulent œdema of these parts.

Circumscribed inflammation of the submucous cellular tissue terminating in gangrene and sphacelus, seldom occurs as a primary affection. It follows, in general, inflammation of the mucous membrane, but may afterwards proceed to a considerable extent, and occasion sloughing of all the other tunics of the organ in which it occurs, but more particularly those of the intestinal tube: such is a frequent cause of intestinal perforation, and the fatal peritonitis by which it is followed.

c. Sub-serous cellular tissue.—Gangrene of this tissue as a consequence of inflammation is more frequently observed than sphacelus. Neither of them occurs to any great extent, even where this cellular tissue is most abundant, and where it might be called *retro*-serous rather than *sub*-serous, as in the mediastinum, iliac and lumbar regions.

Inflammation assumes a gangrenous termination more frequently in the sub-peritoneal than in the sub-pleural cellular tissue. In some forms of peritonitis, for example, this state is very marked, although not to be detected by ocular inspection. It is only after the peritoneal covering of the intestine has been divided circularly, and the intestine itself is stretched or pulled out, that the diseased state of this tissue becomes visible. When thus treated, the intestine may as it were be *unsheathed*, that is to say, drawn out of its peritoneal covering, the muscular coat now constituting its external surface.

The great facility with which the sub-serous cellular tissue is thus torn in some cases of

acute peritonitis, its pulpy softness in some points, and occasionally a certain degree of fœtor, disposes us to believe that these morbid appearances indicate a near approach to, if not an actual state of gangrene.

In the cavity of the pelvis, and in the iliac and lumbar regions, these appearances are more marked and more easily detected. Not only gangrene but sphacelus of the cellular tissue is occasionally found in these regions; the inflammation which precedes it being sometimes confined to the cellular tissue, at others extending to the peritoneum.

Gangrene and sphacelus of the sub-peritoneal cellular tissue occurs more frequently in the cavity of the pelvis than in any of the other regions which we have named, on account of the number and importance of the organs which it contains.

Chronic and acute diseases of the uterus and rectum, as cancer and phlebitis, extend their ravages to this tissue, and excite gangrenous inflammation.

External violence, also, is not an uncommon cause of a similar state of disease in this situation; and we have known more than one case in which a blow or fall has occasioned, from the supervention of inflammation in the cellular tissue, extensive destruction of the contents of the pelvis, such as denudation and necrosis of a part of the sacrum, gangrene and sphacelus of the neck of the uterus, and perforation of the vagina.

d. Lamellated cellular tissue, or that which separates the larger subdivisions of organs. Gangrenous inflammation of the cellular tissue of muscular, glandular, and other organs, is less frequently observed than the former as a primary disease. It is only in certain of these organs, particularly the muscles of voluntary motion and the lungs, that we can detect with certainty its existence as a primary affection. We shall notice its occurrence in the latter only, on account of the peculiar character of the lesion to which it gives rise in this organ. A distinct layer of cellular tissue separates, one from the other, the numerous lobules of which the lung is composed. Either of these—the interlobular cellular tissue, or the lobules themselves—may become the special seat of gangrenous inflammation.

When a portion of lung is examined, in which the interlobular cellular tissue is alone or principally affected, it presents a number of lines of considerable breadth, of a straw-colour, having the peculiar distribution of the lobules, and formed by the effusion of pus into the cellular tissue by which they are separated. In this stage of the inflammation, the cellular tissue is either very soft or easily ruptured, and when sphacelus takes place, is converted into a grey pulp, in which one or several lobules float, attached only by a narrow pedunele composed of their respective bloodvessels and bronchi obliterated.

2. *Mortification of mucous membranes.*—Although inflammation of the mucous membranes is not unfrequently observed to terminate in gangrene and sphacelus, such is by no means so frequently the case as was imagined by the older pathologists. Great congestion, some forms of melanosis, and several other kinds of discoloration of this tissue, produced not only during life but after death, were frequently confounded by them with mortification. The mucous membrane of the throat and intestines is more frequently the seat of this disease than that of any other organ.

In the former it is occasionally met with to a limited extent in cynanche tonsillaris and pharyngea, and constitutes the distinctive anatomical character of cynanche maligna or angina gangrenosa, whether it occurs alone or in connexion with scarlatina.

In the latter it follows as a consequence of certain forms of acute enteritis, either when the inflammation affects the mucous tissue itself, or its follicular structure at the same time.

In either of these situations the mucous and follicular textures are primarily affected, and may be converted into sloughs of considerable extent, without the submucous cellular tissue being destroyed.

Thus deprived of their vitality, the mucous and follicular textures are, at first, of an ash-grey or straw-colour, and may afterwards become brown or black. They are, however, frequently of the colour of the matter with which they are in contact: the fluid part of which is readily imbibed by the soft, spongy tissue of the slough.

The mucous membrane which surrounds the slough is generally gorged with blood, indicating either a state of great congestion, or gangrene. Its colour, particularly in the throat, is livid or deep purple. When, however, the gangrenous inflammation is confined to the follicles, as those of Peyer (glandulæ agminatæ), and when the greater part or the whole of the follicle has sloughed, little congestion or inflammatory redness may remain. And, besides, if these glands have previously been the seat of disease, as in tubercular phthisis or chronic enteritis, a slight attack of acute inflammation may be sufficient to destroy their vitality, without any remarkable increase of vascularity or redness being found in them to indicate the nature of the destructive cause.

In this, as well as in many other cases of the same disease in other parts of the body, the state of sphacelus must be determined by the colour, consistence, and smell of the part, taken in connexion with the other collateral negative evidence, afforded by the absence of any other cause capable of producing such a state.

On the inside of the cheeks, the surface of the velum and amygdala and pharynx, the presence of circumscribed portions of inspissated mucus, or small patches of coagulated albumen or lymph, formed on the surface of the mucous membrane or epithelium, may likewise be confounded with sphacelus. Detached portions of the epithelium may also assume the appearance of sloughs of the mucous membrane.

Gangrenous inflammation of the mucous membrane of the air-passages is by no means common, unless it be accompanied by a similar disease of the pulmonary tissue, in which case

it is generally confined to the smaller bronchi. We have, however, seen it follow perforation of the trachea from malignant disease of the œsophagus, and necrosis of the thyroid cartilage, to which we shall refer more particularly afterwards.

The mucous membrane of the genital and urinary organs is seldom affected with mortification, unless it has been previously injured by mechanical causes, as in some cases of stone of the bladder and kidneys, in lithotomy, stricture of the urethra, and difficult labour, by the improper use of instruments, and also the pressure of the head of the child, to which we shall afterwards refer more particularly, as belonging to another division of our subject.

Of these two systems of organs, the uterus presents the most marked examples of mortification as an immediate consequence of acute inflammation. It attacks the internal surface of this organ either immediately or shortly after delivery; is confined to a small portion of it, particularly to that which gave attachment to the placenta; or occupies its whole extent. The colour of the part affected is of a dirty yellowish grey, brown, black, sometimes greenish or bluish; it feels soft or spongy, is easily torn, and is generally covered with putrilaginous fluid substance of a strong gangrenous odour. When this substance has been removed, the surface is generally found to be rough and irregular, from the presence of the remains of the placenta, and more frequently from an exudation of fibrinous matter, which we have sometimes found to cover the whole surface from the fundus to the os tincæ.

The substance of the uterus is sometimes affected in this manner to a considerable depth, but is more frequently only softened, without having undergone any remarkable change of colour. The presence of pus in the fibrous structure of the uterus is seldom observed beyond the gangrened or sphacelated surface, but is frequently met with in the veins and lymphatics. The appearances which we have described as occurring in gangrenous inflammation of the internal surface of the uterus present considerable variety, owing, apparently, to differences in the seat and extent of the inflammation, and the period at which it proves fatal. But as the investigation of these and other circumstances connected with the pathology of this important subject does not come within the scope of this article, we must refer the reader for further information to the articles Puerperal Fever and Uterine Phlebitis.

3. *Mortification of serous membranes.*—The few general remarks which we have made on gangrene and sphacelus of the sub-serous and retro-serous cellular tissue, shew that the same morbid states must occur in the serous membrane itself. For as the bloodvessels of this membrane are principally, if not entirely, derived from those of the cellular tissue with which it is in immediate contact, any disease capable of arresting the circulation in the vessels of the latter, must be followed by a similar result in those of the former, the portion of which so circumstanced being soon deprived of its vitality. This is, in fact, the mode in which serous membranes become affected with gangrene or sphacelus. It is not from their being loaded with blood, under the stimulus of inflammation, that they die and are separated, but from the supply of their nutritive fluid having been cut off, on account of the morbid condition of the circulation in the cellular tissue to which we have just alluded, or from this tissue having been destroyed by suppuration, ulceration, or sphacelus. Sloughing of the serous membrane occurs from one or all of these morbid states, the immediate or subsequent effects of inflammation, and is often followed by a solution of continuity which establishes a communication between the serous cavity and that of a neighbouring organ; such as between the cavity of the peritoneum and that of the stomach, intestines, uterus, kidneys, and gall-bladder, or between the cavity of the pleura and bronchi. The contents of these organs are effused into the serous cavities, and excite a degree of inflammation which is seldom equalled either in the rapidity of its progress or the certainty with which it destroys life. The inferior portion of the small intestine is the seat and source of these fatal changes of structure much more frequently than any other portion of the digestive tube, or any other organ of the body. And, besides, sloughing of the peritoneum perhaps never occurs under the circumstances we have already mentioned, except in the situation of the glands of Peyer, or occasionally in those of Brunner. Inflammation of these glands is extremely common in various diseases of the digestive organs, and whether acute or chronic, may give rise to the same fatal result, viz. perforation of the intestine and peritonitis. (See Perforation of Organs.)

The colour of the sphacelated serous membrane is generally of an ash-grey, sometimes ochrey from the presence of bile or blood. It is soft and spongy, and frequently does not present any peculiar smell. Before it separates, the subserous cellular tissue around it is frequently seen injected with fine red capillaries; occasionally, also, all the tunics of the intestine are pale, and the accidental opening appears as if it had been made by excision. But the external border of the opening is always smooth, although irregular, whilst on the internal surface of the intestine it is rough or ragged, or presents other marks of being ulcerated.

A dark brown, dark blue, or black colour of the peritoneum, extending over a considerable portion of its surface, has frequently been described by older authors as indicating the presence of mortification of this membrane. These discolorations, however, depend on causes very different from those which give rise to mortification, and the nature of which is particularly noticed in the article Melanosis.

Gangrene and sphacelus of the pleura take place under circumstances very similar to those which produce them in the peritoneum. Sloughing of the pleura is, however, by no means so frequent as that of the peritoneum, as a consequence of inflammation of the sub-serous or pulmonary tissue. This is owing, in the first

place, to the pleura pulmonalis receiving a superior supply of nutritive material from the highly vascular tissue of the lungs, as well as from the interlobular cellular tissue with which it is continuous; and in the second place, from its not being so exposed as the peritoneum, when laid bare, to the operation of highly stimulating fluids.

Gangrenous inflammation of the pulmonary tissue is, next to the presence of tubercle, the most frequent cause of perforation of the pleura pulmonalis from sloughing.

The presence of air and other fluids in pnuemothorax and empyema have been known, either from their stimulating qualities or the mechanical distention which they occasion, to produce gangrene and sphacelus to a considerable extent, of both pleuræ; and the violent inflammation which follows some mechanical injuries is well known to produce a similar effect.

Sloughing of the serous membranes of the brain we have never seen as an immediate consequence of their inflammation; nor do we believe that it ever occurs to any extent, unless it is induced by a mechanical cause, such as wounds and blows on the external surface of the head, or the presence of foreign substances in the brain itself. The same may be said of synovial membranes.

IV. *Mortification of fibrous membranes.*—We have already stated that these membranes become deprived of their vitality, slough, and are separated, only when the cellular tissue with which they are in contact has previously been destroyed. The death of cartilage and bone, as fibrous tissues, takes place in a similar manner,—that is to say, from previous disease of the perichondrium or other contiguous tissue, and of the periosteum. It is, however, worthy of remark that the vascular system of the medullary membrane, particularly of long bones, may be the primary and chief seat of the disease, which afterwards gives rise to necrosis and sphacelus of the periosteum. We allude here to phlebitis of the medullary membrane, which succeeds to amputation and some external injuries; and, although belonging in this case to the province of surgery, it is more immediately connected with medicine and the duties of the physician than might at first sight be believed. For it is of importance, not only in a surgical point of view, to know that such is the nature of the inflammation which often follows amputation and some diseases of bone, but also as regards the diagnosis and treatment of the diseased states to which it so frequently gives rise in internal organs. Thus, we have not only purulent infiltration in the lungs, liver, brain, &c., but, in some cases, also gangrene and sphacelus, particularly in the two former of these organs, as consequences of phlebitis of the medullary membrane of bone.

5. *Mortification of muscular tissue.*—Inflammation of muscular tissue seldom terminates in mortification, unless produced by an injury which affects at the same time other neighbouring tissues. Gangrene and sphacelus of the muscular tissue of the organs of deglutition and digestion, and perhaps of the heart, sometimes accompanies similar states, or severe inflammation of the other tissues with which it is in contact, but particularly of the cellular tissue. The loss of substance, thus occasioned, of the muscular tissue in a hollow organ such as intestine, becomes afterwards a serious, and, perhaps, irremediable evil; for muscular tissue not being reproduced, a cicatrix, equal in extent to the loss of substance sustained, is formed, which, possessing a contractile property, gradually diminishes in bulk, and ultimately constricts, even to complete obliteration, the cavity of the tube in which it exists. Such instances are not rare in the small intestines after fever, and the writer possesses a delineation of a case in which there were three strictures of the small intestine, through which only a small probe or writing-quill could be passed.

We have not seen a case of gangrene of the heart, unless some forms of softening to which this organ is liable are to be regarded as of this nature. (See Softening of Organs.)

Gangrene and sphacelus of arterial and venous tissues may be noticed here, from the functional connexion which exists between them and the heart. They are observed more frequently in the latter than in the former tissue, but do not occur in either until after the cellular sheath of the vessels has been destroyed.

When gangrene or sphacelus of the *spleen* is observed, it is found to follow external injury followed by peritonitis, or, as it is believed by some, a morbid state of the blood, with which it is in general greatly distended, as in severe cases of some intermittent and remittent fevers of marshy countries. The appearances, however, which this organ presents in these fevers is perhaps in a great measure owing to putrefaction.

Mortification of particular organs from inflammation.

Having pointed out what appears to be the most important of the circumstances observed in mortification of the elementary tissues of the body, we shall now proceed to describe those which present themselves when this disease takes place in organs. In doing so we shall confine ourselves to the consideration of mortification of what is called the *parenchyma* of organs, or what in more precise language may be called the *compound tissue* of organs,—the result of a peculiar combination of the simple or elementary tissues.

We have already remarked that the frequency of mortification, the extent to which it proceeds, and consequently its severity, are, *cæteris paribus*, in proportion to the quantity of the cellular and vascular elements which enter into the composition of an organ. In this point of view no organ of the body is so conspicuous as the lungs, and in none does mortification occur so frequently or proceed to such an extent. Being exposed, too, to the direct influence of a great number of those agents which excite inflammation, as well as to the injurious operation of those causes which produce, mechanically or otherwise, great derangement of the circulation in general, the fre-

quency of the occurrence of mortification in this organ is very considerably increased. For these reasons, and because of the characters of the disease being particularly well marked, we shall commence with the description of mortification of the pulmonary tissue.

1. *Mortification of the pulmonary tissue.*—Although inflammation of the pulmonary tissue is extremely common, it does not frequently terminate in mortification. It is, however, highly probable that inflammation of this tissue proceeds frequently the length of the first stage of mortification or gangrene, without our being able to take cognizance of it during life, or, in a great many cases, to detect it after death.

At one period of the history of pathological anatomy, mortification of the lungs was recorded as a common occurrence. The fallacy of this statement was pointed out by Laennec, who considered *gangrene* (used by him in the sense in which we have employed mortification) as rather a rare disease; but it is by no means so rare as this distinguished author was disposed to believe. He states, in his work on "Mediate Auscultation," that he had only met with two examples of it in the course of twenty-four years, and that he knew of only five or six cases of it that had occurred in the Parisian hospitals during the same space of time: we ourselves have seen twice the number of cases in the same hospitals, during a period of not more than three or four years.

When, as a consequence of inflammation, the pulmonary tissue is affected with gangrene, its colour becomes of a deep red, approaching almost to black, whilst its consistence equals that of hepatized lung or liver. When pressed, it breaks down between the fingers like a portion of hepatized lung when similarly treated, but instead of pus, there oozes out from it blood and a dirty white or greenish fluid of the consistence of milk or treacle, having a very disagreeable odour.

When decomposition has taken place throughout the whole of the affected part, or in other words, when the state of sphacelus is produced, the pulmonary tissue seen under the pleura appears sunk beneath the surrounding surface, presents a dirty white, yellowish grey, brown, or greenish black colour, and frequently, when extensive, a mottled aspect, in which all these tints are perceived; it feels flaccid and pulpy, and, when cut into, appears as if converted into a putrid sanies, in which shreds of pulmonary tissue and bloodvessel float or lie detached, and which diffuses around the most insupportable odour of sphacelus.

Complete death of the pulmonary tissue may take place in several points of the same lung at the same time, but in such cases it is limited in extent, and is much more frequently the result of a septic agent than of inflammation. It is when it is confined to one point that it has been found to extend so as to occupy the fourth, the half, or even the whole of a lobe.

In both cases the sphacelated substance may be limited all round by the adhesive inflammation, or it may be confounded with a gangrenous state of the neighbouring tissue. In the first case we have what is called uncircumscribed, in the second circumscribed mortification. The more extensive, however, the state of sphacelus, the more rarely do we find adhesive inflammation to have taken place.

In the circumscribed and multilocular form of sphacelus, we have sometimes found it confined to one, two, or a very limited number of lobules, the line of separation between the healthy and diseased parts being distinctly marked by the interlobular cellular tissue. In this form of the disease, therefore, we are disposed to believe that the gangrenous inflammation commences in, and is confined to, the pulmonary tissue; whereas in the uncircumscribed and diffuse form it attacks both the pulmonary and interlobular at the same time.

The circumscribed and multilocular form of sphacelus just described may have its seat deep in the substance of the lung, or immediately under the pleura. In the first case one or more of the bronchial tubes are perforated, and thus afford an exit to the dead pulmonary tissue, which is gradually discharged by expectoration. In the second case, besides this salutary mode of evacuation of the sphacelated part by perforation of the bronchi, there is another which frequently takes place, and becomes the immediate cause of death, viz., perforation of the pleura. We have already said that sphacelus of the pleura pulmonalis, when a consequence of inflammation, depends on the previous destruction of its sub-cellular and pulmonary tissue, on account of its nutrition being derived from the vessels of these tissues. Sphacelus of either, therefore, is followed by sphacelus of the pleura, which then presents an appearance similar to a portion of skin destroyed by the cautery or caustic potass. When the slough thus formed is separated, or merely ruptured by the pressure of the fluids or air beneath it, a communication is established between the cavity of the pleura and that produced by the destruction of the pulmonary tissue: one of two consequences then follow; viz., acute pleurisy alone, or pleurisy combined with pneumothorax. In the first case the gangrenous excavation communicates only with the cavity of the chest; in the second with this cavity and the bronchi at the same time. It is this latter condition of parts which enables us to explain the formation of pneumothorax in this disease, although in some rare cases a gaseous product has been found without perforation of the bronchi, and which appeared to have been the product of decomposition.

When circumscribed sphacelus is not immediately followed by a fatal termination, the lung is found some time after to contain a certain number of excavations of an ulcerous character, the nature and origin of which were either imperfectly or not at all understood, until investigated by Laennec.*

2. *Mortification of the liver.*—Mortification of the substance of the liver is an extremely rare occurrence as a consequence of

* See Traité de l'Auscultation Médiate, &c. vol. i. p. 445; and the article ULCERATION in this work.

inflammation; so rare is it indeed, that we have not met with a single well-marked case of it in the course of twelve years, during which period the writer has been in the almost daily habit of inspecting the bodies of the dead, and of examining with care every organ of the body. Nor does it appear that it is a more frequent occurrence even in warm climates, where the liver is so often the seat of acute inflammation. "Gangrene," says Annesley, "has been remarked by many writers and teachers as one of the terminations of acute inflammation of the liver; but although we have observed this disease, and made *post-mortem* examinations of it, the number of which has not been exceeded by any other intertropical practitioner, we have never seen a single case of gangrene of this viscus. We are inclined to believe that the appearances which have been taken for gangrene have been merely that black, congested, and softened state of the organ which is sometimes observed in the more acute attacks of the disease supervening to congestion, or, at least, this state of the viscus having speedily run into gangrene after the death of the patient; and therefore, if gangrene had actually existed at the time of dissection, it is to be considered as a consequence of death rather than as a termination of the disease."*

3. *Mortification of the kidneys.*—Gangrene and sphacelus of the substance of these organs is very rarely met with, unless the exciting cause has been of a mechanical or chemical nature: we shall therefore defer what we have to say on mortification of the kidneys until we come to consider the influence of these agents in the production of this disease.

The *testes* and *mammæ* are occasionally affected with gangrene and sphacelus as the consequences of inflammation or mechanical violence, and both organs are sometimes so extensively destroyed as to be rendered unfit for the accomplishment of their important functions: but as the treatment of mortification of these organs requires the skill of the surgeon, we shall not enter into the description of its pathological characters as it occurs in them.

There now remains to be described, mortification of the *lymphatic* and *salivary glands*, and of the *brain* and *nerves*. In neither of these compound tissues, however, is this disease observed (unless in some very rare instances, and then limited in extent,) as a consequence of common inflammation. The former are not unfrequently affected with this disease, where they are superficially seated, and where they are exposed to the influence of certain putrid and septic substances carried into them by absorption, and to which we shall refer in another place. The latter have seldom presented any traces of gangrene or sphacelus except in cases of external injury, pressure, or ligature.

To render the enumeration of the tissues subject to death from inflammation complete, we may also mention the *teeth*, *hair*, and *nails*. Inflammation of the capsule, bulb, or roots of these bodies, is frequently followed by their decay and entire separation.

State of the vascular system in mortification.—Were we to confine our observations to the changes which take place on the external surface of organs affected with inflammation terminating in mortification, as we have done in the preceding pages, we should form a very imperfect idea of the real nature of this disease. In this as well as in every other morbid state, we must look into the interior of the affected organ, examine the several elements of which it is composed; determine the changes that have taken place in each, the order of their succession, and, as far as it may be possible, the influence which they exercise in the production of the various phenomena of the disease. The interesting experiments and anatomical and microscopical investigations which have been made by several distinguished pathologists on this part of our subject, will enable us to give satisfactory information on several of these important points.

When the transparent part of an animal, such as the web of the frog's foot or mesentery of the rabbit, is placed under the microscope, and submitted to the stimulating influence of a mechanical or chemical agent, the capillary vessels of the part, as well as the blood which under these circumstances flows into them, are seen to undergo a regular series of changes, referable to the hydraulic and dynamic conditions of both, and which constitute the pathological state of a part, called *inflammation*.

Without entering into the details connected with this interesting subject, it will be sufficient for our present purpose to state that when inflammation has arrived at what Kaltenbruenner calls its *perfect state*, that is to say, when the capillaries are distended with blood which has ceased to circulate, the part from a deep red soon changes to a dark brown or black colour.

Cessation of the circulation, coagulation, and discoloration of the blood, are the successive changes which announce that the functions of the inflamed part are about to cease. The change of colour which takes place is found to depend chiefly on a corresponding and similar change induced in the blood contained in the vessels of the affected part, or that has been effused during the inflammatory excitement. Soon after the stagnation of the blood, the globules of this fluid are seen to unite, adhere to the internal surface of the vessels, and form a solid dark-coloured mass occupying their whole caliber. The sensibility of the part rapidly diminishes after the coagu-

* Annesley on the Diseases of India, &c., vol. i., p. 434. The explanation given by the author of the appearances to which he refers may be correct, that is to say, that they may have been produced after death; but that any disease can "run into *gangrene* after death" is what we cannot admit without confounding together opposite phenomena, and the limits which language has established between them. *Gangrene* being the decomposition of a living tissue, can only take place in a body that is not dead. *Putrefaction* is the term which the author should have employed, and is used in contradistinction to that of gangrene, to denote the decomposition which takes place in dead animal matter.

lation of the blood, although the nerves themselves are not observed to undergo any perceptible change. The coagulation of the blood is also followed by the cessation of absorption, for the most active poisons introduced into a part, the vessels of which are thus obliterated, either produce none of the effects which are peculiar to them, or do so very tardily and ineffectually, in which latter case they may have found their way beyond the obliterated vessels by imbibition. Under these modifications of function, after a certain length of time nutrition ceases in the affected part, the temperature of which sinks to that of external objects. Its consistence diminishes so soon as decomposition commences, and the colour which it assumes varies with the quantity and quality of the fluids it contains, and the chemical changes which these undergo from the action of the gaseous products of decomposition. Death or mortification of a portion of the body succeeding to inflammation, we therefore regard as an immediate consequence of cessation of the circulation, of which we have examples on a large scale, in ligature and spontaneous obliteration of the principal artery of a limb, unaccompanied by the establishment of a collateral circulation.

The state of the vessels and of the blood which precede the physical signs of mortification may be regarded as representing that state of a part which we call gangrene. The blood has ceased to circulate, it is even coagulated; the application of artificial stimuli to the neighbouring tissues furnishes no evidence of their possessing sensibility or contractility. Yet, as under these circumstances we know that actual death may not have taken place, that the blood may resume its fluidity and circulate anew, and sensibility and contractility again return, the state to which we have alluded may properly be regarded as furnishing us with what may be called the anatomical and physiological characters of gangrene,—a state in which the functions of a part are suspended, analogous to that of the whole body in asphyxia, but not destroyed, whether we regard it as susceptible of recovery, or as an intermediate state which separates inflammation from mortification.

When the recovery of a part from the state of gangrene is about to commence, circulation becomes more active all round the circumference of the diseased part; the coagulated blood gradually disappears by the separation of its globules, and their transmission into the neighbouring currents; absorption is manifested by the more or less rapid removal of the effused fluids, sensation and motion return, and the part is restored to the healthy state.

We have already enumerated the changes which mark the transition from gangrene to mortification. The separation of the dead part takes place within limits fixed by the state of the vascular system. Thus, the line of demarcation between the dead and the living parts does not extend beyond the obliterated vessels; for before adhesive inflammation has taken place, they are found obliterated to a greater or less distance beyond the mortified part. Their obliteration is not necessarily the consequence of the effusion of coagulable lymph. It depends on the plastic property of the blood contained within the vessels, which unites with their living membrane, becomes organized, and thus secures their permanent obliteration.

Obliteration of the bloodvessels, as the cause of mortification of the kind of which we are now treating, is a subject deserving of the most serious consideration both of the surgeon and physician. For it is to this state alone of the bloodvessels in the vicinity of the dead part that immunity from one of the most dangerous consequences of the disease, viz., hemorrhage, is to be ascribed. The presence of coagulable lymph, its organization and union with the parts into which it has been effused, constituting what is called adhesive inflammation, contributes no doubt to prevent hemorrhage during the process of separation of the dead part, or of sloughing. But we are disposed to believe that it is the prevention of hemorrhage from the smaller vessels only that is secured by the adhesive inflammation, while that from the larger ones is prevented by the previous coagulation of the blood contained within them. That it is to the coagulation of the blood in the large vessels of a limb that we must attribute the non-occurrence of hemorrhage after sloughing, is rendered still more obvious from what occurs in some cases of extensive and spreading gangrene, of the inferior extremity for example, and to arrest which it is found necessary to have recourse to amputation. The limb is removed, but the large bloodvessels yield little or no blood; they are, in fact, obliterated by firm coagula. There is no adhesive inflammation present in such cases, and gangrene and sphacelus succeed to the operation, because of the vessels not having been divided above the point at which they were obliterated.

Such is the state of the large bloodvessels which we have found to accompany sphacelus without hemorrhage. When, on the contrary, hemorrhage occurs in this stage of mortification, these vessels are found pervious and filled with fluid or imperfectly coagulated blood; and the cellular and other tissues are more or less infiltrated with serosity, sero-sanguinolent and puriform fluids.

Terminations of mortification.—We have already enumerated the most important and conspicuous local effects of mortification of tissues and organs, such as changes in colour, consistence, sensation, motion, temperature, and bulk, to which we might add those of form, in consequence of loss of substance of various extent.

The solution of continuity which follows the separation of the dead part may, if formed in the substance of a solid organ, be followed by ulceration, instead of being repaired by granulation or the organization of coagulable lymph; or it may be followed by perforation, if the solution of continuity takes place in the walls of a hollow organ, as the intestine, or on the surface of a solid organ, as the lungs,—a termination of sphacelus to which we formerly alluded.

When the dead part is separated, and the affected organ is seated internally, it may either be retained for an indefinite period, or it may be almost immediately expelled through the natural passages, such as the bronchi, trachea, intestines, &c. The dead substance is thus sometimes evacuated entire, as in the case of sloughing of a portion of intus-suscepted intestine, and in some rare cases of partial gangrene of the lungs. In parenchymatous organs, however, the dead portion is much more frequently broken down into shreds by a species of maceration in the surrounding fluids before it is ejected, and is then accompanied by a greater or less quantity of these fluids at the same time.

Signs and symptoms of mortification.—To determine the existence of mortification of an internal organ is, in the great majority of cases, beyond the power of the physician. The evidence which he is enabled to collect from the modifications which take place in the functions of the affected organ, from the state of some particular system or of the economy in general, is frequently far from being sufficient to warrant him in giving a decided opinion on the existence of this disease. Besides, the derangements of function to which it gives rise are, in some cases, either so slight as not to be recognized, or of such a kind as not to be distinguished from others produced by very different morbid states. Nor can we fix any determinate relation between the extent of the disease and the severity of its effects, such, at least, as are made manifest to us through the medium of functional derangement. These remarks apply equally to both stages of mortification, and to the kind and degree of inflammation by which they are preceded. With regard to the latter, it is well known that mortification, and that too of the lungs, may succeed to inflammation so slight as not to have induced a degree of indisposition sufficient to excite the attention of the patient, far less to induce him to apply for medical advice. In such cases it is sometimes not until sphacelus has taken place, when the presence of a cavity can be detected by means of the stethoscope, and the contaminating influence of the putrid fluids has already commenced, that the unfortunate patient sends for assistance, or finds his way to an hospital.

There are certainly no general symptoms which can be considered as the exclusive effects of either state of mortification. The violence and extent of the inflammation by which mortification may be preceded, may lead us to *fear* such a termination, but cannot enable us to *detect* it when it has occurred, even when those symptoms—sudden prostration and sinking of the powers of life—and to which so much importance has been attached, are present. Inflammation alone gives rise to these fatal symptoms in persons naturally feeble, and in those in whom innervation and nutrition in general are so modified by previous excess or privation, as to give to diseases, the most insignificant in themselves, that peculiar assemblage of character generally known under the appellation of adynamia.

We have already enumerated, at the commencement of this article, the more common and obvious conditions of organs which, independently of the general conditions which we have just named, favour the production of mortification, when these organs are attacked with inflammation. We refer the reader to what we have said on this part of our subject, as furnishing additional evidence in favour of the opinion we have given regarding the difficulty of determining the existence of mortification by the manifestation of any peculiar modification of function of the organ in which it has taken place.

Although we reject, as a *sign* of mortification, the sudden occurrence of prostration and sinking of the powers of life in general, succeeding to inflammation, we must nevertheless regard these phenomena as of great and serious import in such cases, inasmuch as they indicate that the progress of the disease is not arrested, and that by means of absorption the system in general has been brought under the poisonous influence of the decomposed and putrid fluids of dead animal matter. These symptoms, which we attribute to the absorption of dead animal matter, are of course common to mortification from inflammation as well as from other causes.

The state of the pulse in persons affected with mortification of an internal organ is very various. If the previous inflammation has been slight, it may not have been much increased in strength or quickness, and may retain this state after the occurrence of sphacelus, and till near the period of dissolution, when it rapidly sinks, and becomes remarkably slow, feeble, and sometimes intermittent. If the inflammatory excitement accompanies the state of sphacelus, the pulse may continue quick, but it is feeble and easily compressed, and always sinks before death. The temperature of the skin is generally morbidly increased at the commencement, but becomes less than natural towards the termination of the disease, when the surface is often cold and covered with a clammy sweat. At the same time the tongue and teeth become covered with sordes, the breath frequently exhales a fetid odour, and there is occasionally singultus, low delirium, and picking of the bed-clothes, or a state of stupor terminating in coma; the countenance assumes a cadaverous aspect, and the whole body as well as the evacuations, which are sometimes involuntary, give out the most offensive fumes, impregnated with the stench of dead and putrid animal matter. In this state the patient dies unconscious, and generally without a struggle. These, the general effects of the absorption of the putrid fluids of sphacelated tissues, are not always so conspicuous; nor do they proceed in all cases to a fatal termination with the same degree of rapidity. When they assume the aggravated form just described, life is seldom prolonged beyond the third, fifth, or seventh day. But when they are marked chiefly by a state of

prostration, a quick, feverish, and feeble pulse, a hot skin, and an offensive smell of the secretions, the course of the disease may be prolonged to the second or third week, when it terminates as before described: it is only in this form of the disease that recovery has been known to take place.

The odour of gangrene, as it is commonly called, is perhaps the only pathognomonic sign of the existence of mortification. We have alluded several times to the presence of this odour in the breath of the patient and in the secreted and excreted fluids, as an almost constant sign of the contaminated state of the blood in the last stage of mortification. But the gangrenous odour to which we at present allude is that derived immediately from the affected organ, and which may, with few exceptions, be regarded as the only sign of the local existence of sphacelus to which we can attach a positive value. We need hardly remind the reader that it is not, however, present in every case of sphacelus;—that it is only either in those cases in which a communication exists naturally between the external surface of the body and the sphacelated tissue, or in those in which a preternatural communication has been established in consequence of the disease itself, and through which the putrid effluvia are discharged into natural canals, as in perforation of the bronchi and intestines from without inwards; or on the surface of the body, in perforation of the walls of the chest and abdomen in the opposite direction.

We have seldom an opportunity of detecting the putrid odour of sphacelus, unless when this disease occurs in the lungs, the digestive organs, the urinary organs in the male and female, and in the organs of generation in the latter. When present in the breath, it is necessary to discover its source, as it may have its origin in the mouth, pharynx, œsophagus, or stomach, or in the larynx, trachea, or lungs; this may be easily accomplished by submitting each of these portions of the digestive and respirating apparatus to a separate examination. It may not be unimportant to observe that extensive sphacelus of the stomach, or rather of accidental tissues formed in this organ, may occur, without the eructations with which it is often accompanied, or even the fluids then ejected by vomiting having any the slightest degree of putrid odour: a circumstance which we attribute to the property which the gastric acid possesses of removing the tainted smell of animal substances.

Much importance is not to be attached to this character of sphacelus when perceived in the alvine evacuations. We have already stated that the excreted fluids acquire this particular odour in consequence of the absorption and the subsequent separation from the blood of the putrid animal matter; consequently the presence of this odour in the dejections may be entirely owing to the elimination of these fluids by the mucous membrane of the intestines from the blood. It may indeed be laid down as a rule, that unless this odour in the alvine evacuations be accompanied by the presence of portions of the intestine, or rather of the mucous membrane of the intestine, it cannot be regarded as a sign of sphacelus of this organ. It is chiefly in some forms of chronic dysentery that the odour of putrefaction and the presence of sphacelated portions of the thickened mucous membrane are observed at the same time in the discharges which accompany that disease. An entire portion of intestine is never discharged unless in intussusception followed by sphacelus. We shall have occasion to notice this morbid condition afterwards, under the subdivision of the present subject which treats of mortification in consequence of a mechanical obstacle to the return of the venous blood.

With regard to the putrid odour of sphacelus in the fluids discharged from the urinary organs and vagina, it is only necessary to observe that, in the former, it always accompanies a turbid, bloody, or puriform state of the urine; and that, in the latter, there is present at the same time a sanious discharge, sometimes containing blood, and sloughs of the mucous and submucous tissues.

The putrid odour is never so conspicuous as in sphacelus of the pulmonary tissue, and when a communication exists between the sphacelated substance and the bronchi. It is conveyed by the expectorated fluids, composed of those coming from the seat of the disease, as well as from the mucous membranes in general. These fluids are sometimes of a dirty grey, brown, or green colour; puriform or sanious; contain sometimes shreds or small portions of the sphacelated lung; and are occasionally streaked with blood. If hemorrhage has taken place, blood alone may be expectorated in greater or less quantity. In sphacelus of this organ, too, there are various physical signs which, with those already mentioned, and particularly the latter, enable us to detect not only the existence of this state, but also its situation and extent, the state of the surrounding pulmonary tissue, and the mode in which the disease has terminated,—circumstances of greater or less importance as regards the prognosis and treatment.

The most important of these physical signs are the following; but we must observe that they are confined to the second stage of mortification, or sphacelus, and that those of the first stage, or gangrene, are in no respect different from those of pneumonia:—so soon as sphacelus has taken place, a loud crepitous rattle is produced, which gradually assumes a gurgling sound, as the quantity of fluids increase, and the sphacelated tissues become separated from the surrounding pulmonary substance, or broken down. The cavernous rattle continues for an indefinite time, and is replaced by pectoriloquism when the contents of the excavation are partially or wholly removed. The resonance of the voice is remarkably distinct and strong in excavations of this kind, particularly when large, and may, according to Laennec, be distinguished from that

which accompanies abscess of the lung, from its having nothing of that *floating* kind of sound of the latter, and is rarely accompanied by the *veiled puff*, so common in the abscess.

When the sphacelus extends to the pleura, and the dead portion is separated, thus establishing a communication between the cavity of the chest and that formed in the substance of the lung, we have, besides the signs already enumerated, those of pleurisy and pneumothorax combined with liquid effusion. If at the same time a communication exists between the bronchi and the excavation, there is heard either the *metallic tinkling* or the *utricular resonance*. The crepitating rattle of pneumonia, which is sometimes heard previous to the occurrence of sphacelus, may continue after the occurrence of it, and may, in some measure, serve to indicate the progress of the disease towards a fatal termination. We have never but once had an opportunity of hearing the crepitating rattle where it indicated the return of the pulmonary tissue to the healthy state. The excavation occupied two-thirds of the inferior lobe of the left lung, and the resolution of the disease was indicated, not only by the state of the pulmonary tissue around the excavation, which was crepitant, and did not contain more blood than usual, but likewise by the presence of an organized false membrane, which lined the internal surface of the excavation, a means which, as noticed first by Laennec, seems sometimes to be employed by nature to limit the progress of mortification.

We must again repeat, that with all these signs our diagnosis can never acquire a positive degree of certitude, unless they are accompanied by the putrid odour of sphacelus.

We have already said that the progress of mortification, although in general more or less rapid, is sometimes slow. Laennec speaks of it as existing in a chronic form in the lungs. It is then accompanied with hectic fever, sometimes considerable, but generally less intense than in most cases of phthisis; the skin feels hot, sometimes even disagreeably so, to the hand; and the expectoration and breath are fetid. This state is accompanied by rapid emaciation, and the disease may be readily mistaken for phthisis; more commonly, however, death supervenes before emaciation has made much progress, the disease appearing to have a greater tendency to produce cachexia than marasmus.

We regard the cure of mortification of the lungs as an exception to the rule, and we have certainly not witnessed this fortunate termination of the disease, except in two or three instances, in which it was not very extensive. In these cases too, the progress of the disease was limited at an early period, no doubt by the obliteration of the bloodvessels and adhesive inflammation. That such was the state of the pulmonary tissue around the excavations which were found to exist in these cases, we feel convinced, not only from the disease being stationary from the commencement, but from the general secondary symptoms of mortification, viz. those produced by the absorption of the putrid fluids, not having manifested themselves during the course of the disease. It is, however, stated by Laennec, that he has known several patients recover, who, judging from the extent of the pectoriloquism, had gangrenous excavations of great size. In one of those patients there was sloughing of the pleura as well as of the pulmonary tissue, giving rise to a pleurisy, which was not cured till after a period of fifteen months.

Prognosis of mortification.—The prognosis of this disease, in the last stage, is always unfavourable, because, on the one hand, of its being accompanied by a loss of substance, and on the other because of the affected organ or the constitution in general being frequently in a situation which the resources of our art can neither remedy nor relieve. Our prognosis will, of course, be greatly modified by the circumstances of each case; the extent of the disease, its seat, the state of the affected organ previous to its occurrence, the age and constitution of the patient, and the situation in which he was placed previous to the attack. In all cases in which we can determine that the progress of the disease has been arrested, will our prognosis be the more favourable; but in those in which the secondary symptoms which we have several times brought under the notice of the reader, are present, the death of the patient may be regarded as inevitable.

Treatment of mortification.—The treatment of mortification from inflammation must be conducted in reference, 1st, to the cause of the disease; 2d, to the disease itself; and, 3d, to its effects, mediate or immediate. With regard to the first head, the efficacy of the means employed will depend much on the extent and degree of the inflammation which accompanies the stage of gangrene or sphacelus, the nature of the affected organ, and the general condition and age of the patient. The progress of the inflammation may be arrested or its violence moderated by the prompt and well regulated use of antiphlogistic remedies, such as general and local bloodletting, saline purgatives, rest, quiet, and total abstinence from food. In those cases in which the inflammatory symptoms have been slight, even from the commencement of the disease, the antiphlogistic treatment has been found to be injurious rather than beneficial, both on account of the debility which is present, and because of its having appeared to retard or prevent the accomplishment of that salutary process by means of which the progress of the disease is arrested. There are other cases in which the use of antiphlogistic remedies is forbidden, by the nature both of the general and local symptoms. There is a total absence of pain, no sign of inflammation in the affected organ, and a state of general debility or prostration. The early occurrence of these symptoms, as well as their presence in the last stage of almost every case of mortification, have rendered many physicians

very cautious in the use of debilitating remedies, and have induced them to place more reliance on the judicious employment of tonics and stimuli, and other means calculated to support the strength of the patient, and assist nature in carrying on the process of elimination and reparation. It is only by a knowledge of the circumstances of each case that we can at all judge of the applicability of either mode of treatment, or when the one should be employed in preference to the other. It is on the same principles that we can reasonably hope to exercise a salutary influence over the disease itself, that is, as regards the removal of the dead portion, and preventing the effects to which it gives rise. The most dangerous of all the effects of mortification are those which follow the absorption of the putrid fluids of the sphacelated tissues, to remove or even mitigate which no means have yet been devised on which any reliance can be placed. It has been proposed to employ solutions of the chlorides of lime and soda, as washes, to destroy the putrid effluvia which accompany sphacelus. We are not certain how far they have been found to accomplish the end in view. Besides, these solutions can be had recourse to only in a very limited number of cases of this disease, and when confined to the organs of generation and the urinary bladder.

II. Mortification from a mechanical obstacle to the circulation of the blood. —The blood may be prevented from arriving at, or returning from, a part of the body by mere mechanical causes. In both cases mortification is the consequence of the cessation of the function of nutrition, either from a deficiency of the arterial or the stagnation of the venous blood. A deficiency of the arterial blood may be occasioned by ligature of the principal artery of a limb, a collateral circulation sufficient for the nutrition of the limb not having been formed; or it may follow in consequence of coagulated blood, or fibrine, organized or unorganized, occupying the entire caliber of such an artery or its principal branches, from ossification of the walls of these vessels, or their conversion into a solid fibrous or ligamentous tissue.

Stagnation of the venous blood may depend on obliteration of the veins caused by the pressure of tumours situated in their immediate vicinity; accidental products formed in their cellular sheath; or the presence of fibrine or other solid substances derived therefrom, formed within the veins, and either simply lodged within them, or more or less intimately connected with their lining membrane; and, lastly, diseases of the heart, which greatly obstruct or prevent the return of the venous blood to this organ. Mortification may also occur in consequence of the arteries, veins, and nerves having all at the same time been submitted to severe pressure, as in the case of ligature and tumours.

Mortification from a mechanical obstacle to the circulation of the blood is by no means equally frequent, either as regards the causes we have just named, or the part of the body in which it occurs. Mortification in consequence of the stagnation of the venous blood is much more often seen than that which follows an obstacle to the arterial circulation, owing obviously to a difference in the organization and relations of the arterial and venous systems, whereby the latter is more frequently and more easily subjected to the influence of mechanical agents, capable of modifying, in the manner alluded to, the circulation of the blood. Mechanical causes which compress or obliterate the veins are often incapable of producing the same effects on the arteries, from the circulation in the former tending to favour rather than oppose their operation, and which in the latter has a powerful influence in resisting every external force which tends to diminish their capacity. And besides, stagnation of the blood in the venous system, by whatever cause produced, may, correctly speaking, be said to depend on the relation which exists between it and the arterial system; that is to say, the mechanical cause is but an obstacle to the passage of the venous blood, while the quantity of this fluid and the extent of the stagnation that follows is determined by the arterial system.

The situation of parts and the mode in which their circulation is affected, are circumstances which modify in a remarkable manner the frequency of mortification. Mortification from mechanical causes which obstruct the circulation of the blood, occurs in the great majority of cases in the extremities, and far more frequently in the inferior than in the superior, partly from their being isolated from other organs which might facilitate the formation of a collateral circulation, and partly from their situation and position, both of which are unfavourable to the circulation of the blood. Mechanical causes, which produce general death when situated in organs on the integrity of whose functions life in general more or less immediately depends, give rise in them only to local death or mortification. In the former the operation of these causes is necessarily of short duration, and is always confined within narrow limits when it is carried to a degree to produce *sphacelus*. Should their influence extend to the circulation of the whole of an organ, such as the lungs or liver, the obstacle to the return of the blood from either being situated in the heart, a state of general congestion is produced, but which never amounts to what is properly called gangrene.

In the latter, on the contrary, mechanical causes which impede or interrupt the circulation of the arterial and venous blood, may continue to operate for a considerable length of time, producing all the regular stages of mortification, as various degrees of congestion, gangrene, and sphacelus. Mortification, however, does occur in the extremities without being preceded by these changes, the reason of which we shall endeavour to assign presently.

With regard to the relative frequency of mortification of the kind of which we are now

treating, it is also of importance to know that this disease is more frequently produced by disease of the heart than of the bloodvessels, and that in this case it is never observed in any other part of the body than the inferior extremities. There are, however, several circumstances, to which we shall particularly allude hereafter, which hasten the termination of congestion of these parts from disease of the heart, in gangrene and sphacelus, and without which such a termination would not unfrequently not take place.

From these general remarks on the influence of mechanical causes, operating through the medium of the circulation, in the production of mortification, and the comparative frequency of this disease in different parts of the body, it is obvious that the descriptive characters of this disease so produced must be founded on the phenomena which it presents when it affects external organs. We shall therefore commence with the description of that form of the disease which occurs most frequently, and which affects the inferior extremities in consequence of an obstacle to the return of the venous blood from these parts, produced by disease of the heart.

1. *Mortification of the inferior extremities from disease of the heart.*—The first local sign that an obstacle exists to the return of the venous blood from the inferior extremities is manifested by the appearance of slight œdema around the ankles. The serosity gradually accumulates in those parts, spreads from thence throughout the cellular tissue beneath the skin and between the muscles; the feet, and afterwards the legs, thighs, and scrotum in the male, and labia pudendi in the female, become swollen; the skin assumes a smooth and glossy aspect, feels tense, and sinks into the cellular tissue when pressed, and does not resume its former shape and situation till raised by the return of the serosity beneath it. The colour of the skin, at first natural, becomes pale and waxy, and may continue in this state during the greater part of the course of the disease. When discolouration of the skin is about to take place, it is seen to depend on the presence of a few subcutaneous veins, which gradually increase in bulk and number, coalesce in several points, and communicate a slightly mottled aspect to the skin, of a dull red or purple colour. On one or more of these points where the congestion is greatest, and where the skin is less yielding, as over the tibia and above the malleoli, phlyctenæ or large bullæ are formed by the effusion of serosity, either alone or mixed with blood, under the cuticle. When these burst, the cutis beneath presents a dark red or brown colour, and very soon is converted into a dirty yellow or ash-grey slough. The separation of the slough is sometimes preceded by an increase of redness in the surrounding cutis, which, from its anatomical characters and the increased temperature and pain by which it is accompanied, is obviously of an inflammatory nature. At other times the redness which precedes or accompanies the separation of the dead part is very slight, and is evidently owing to mere venous congestion, occasioned not only by the disease of the heart, but also by the serosity accumulated in the cellular tissue of the limb, which, from the pressure it occasions, further retards the return of the venous blood, and aggravates all the symptoms produced by the primary cause of the disease.

Although, after the separation of the slough, a loss of substance of considerable extent in depth may appear to have been produced, it perhaps never proceeds beyond the cellular tissue; and it is because of this tissue being greatly distended with serosity, that the loss of substance which follows sloughing appears to have penetrated deeply into the substance of the limb.

Congestion, gangrene, and sphacelus may take place on several parts of the leg, but they are in general limited to the parts we have enumerated, and rarely occur on the feet or toes.

We have already remarked that the temperature of the extremities is always below the natural standard during the first periods of the disease, and that it does not acquire a morbid increase till the distention of the cutis is great, and this tissue becomes discoloured from the congested state of the capillaries. An increase of the sensibility takes place at the same time, and is always greatest where the cutis is most distended, and sometimes amounts to a degree of pain of a darting, pungent, or burning character, which greatly increases the sufferings of the patient. Although the temperature and sensibility of the limb are sometimes very great while the cutis is still entire, but tense, congested, or inflamed, they are never so considerable as when sloughing has taken place, accompanied by inflammation of this tissue. It is also in such cases that the pulse becomes quick and the skin in general hot;—in one word, that febrile symptoms make their appearance. Under these circumstances life is seldom prolonged beyond a few days, otherwise the death of the whole limb would follow as the inevitable consequence of the increased disturbance of the circulation, occasioned by the febrile excitement;—a termination which the author of this paper has witnessed in two cases, in one of which the sphacelus extended even to the walls of the abdomen.

The progress of this kind of mortification, although generally slow, is occasionally very rapid. This difference depends chiefly on the two following circumstances,—a naturally unyielding state of the skin, and the effect produced on the venous circulation of the limb by the effused serosity. It is principally to the latter circumstance that we wish to direct attention, as it may suggest some means to prevent its occurrence and the evils by which it is followed. As soon as the blood has accumulated to a certain extent in the venous system of the inferior extremities, serosity is effused in greater or less quantity, and compresses the veins. A second obstacle is thus created to the return of the venous blood, and consequently the progress and termination

of the disease are greatly accelerated. These effects of compression from the effused serosity are first manifested by the sudden appearance of congestion of the skin, which generally occupies the greater part of the leg. The skin retains its glossy aspect, but becomes all over mottled with various shades of red and purple; is seen traversed in every direction by minute veins and capillaries distended with blood, and the whole limb acquires a degree of hardness peculiar to this state of the circulation. The sloughing which follows may take place without the supervention of inflammation,—at least without this state being marked by uniform redness of the skin,—is more extensive than in the previous form of mortification, but does not extend beyond the skin and cellular tissue.

The separation of the sloughs in mortification from disease of the heart is seldom followed by hemorrhage; and when it does occur, it consists merely in a slight oozing of blood from one or more points of the denuded surface. This circumstance, as well as the state of the blood generally found in the veins after death, is readily accounted for. The blood in the veins in the immediate vicinity of the sphacelated part of the limb, is found coagulated, or these vessels are filled with fibrine. More remote from this part, and sometimes in the greater part of the limb, the blood with which they are distended is also more or less coagulated, but becomes more fluid as we examine it further from the seat of the sphacelus.

Prognosis.—In no disease can our prognosis be more certainly fatal than in mortification in consequence of disease of the heart. Its very occurrence is a sure evidence that the disease on which it depends would soon terminate fatally without the aggravation of suffering which this, perhaps the worst of its effects, never fails to produce. The only favourable circumstance—if such it can be called—relates to the duration of the disease. If the mortification is the consequence of the stagnation of the blood occasioned by the disease of the heart alone, we may venture to predict that its progress towards a fatal termination will be slower than when to this, the primary cause, is added the obstructing influence of the effused serosity.

Treatment.—The treatment of mortification from disease of the heart is not only extremely restricted but entirely palliative. The general treatment which has been or is still employed against the primary disease, and which has been found ineffectual in arresting its progress, is also that which, if no such disease existed, would be adopted for the cure of the mortification. Under such circumstances experience has shown that little more can be done for the patient than to mitigate his sufferings by the frequent administration of anodynes; the application of cold lotions, warm fomentations or poultices to the affected limb; using one or other of these as the feelings of the patient or the stage of the disease may suggest. Both on account of the patient and the assistants, a solution of the chlorides should be used so soon as sloughing has taken place. The limb should also be kept in an elevated position by means of pillows; and as the foot is often cold while the leg is painfully hot, some relief is obtained by covering the former with warm flannel, and the latter with compresses that have been dipped in cold water or the saturnine lotion. It is probable that the occurrence of mortification from disease of the heart might in some cases be prevented by the early confinement of the patient to the horizontal position, by the occasional use of friction with a view to facilitate the venous circulation of the extremities, and the application of a well adjusted bandage from the toes upwards, which would not only prevent the occurrence of great congestion by equalizing the circulation throughout the limb, but also the œdema which follows, and so greatly aggravates the disease.

2. *Mortification of internal organs from a mechanical obstacle to the return of the venous blood.*—We do not believe that there is a single example of mortification of an entire internal organ from an obstacle to the return of the venous blood, and produced by a mechanical cause. We have already stated the reason of this exception, namely, the facilities afforded for the formation of a collateral venous circulation; and the duration of the mechanical cause capable of producing local death being limited by the greater importance of these organs. Mortification of portions of internal organs is, however, occasionally met with, and which can easily be traced to cessation of the circulation from compression of the veins: the lungs, liver, and intestines are the organs in which this form of mortification is most conspicuous. It occurs in the lungs when the cellular structure of these organs has become consolidated by the deposition of coagulable lymph, and produces that state of the pulmonary tissue termed *hepatization*. We allude here to the *grey* hepatization most frequently observed around tubercular excavations, and which is regarded as the consequence of chronic pneumonia. The colour of the indurated pulmonary substance may be grey, purple, livid, or nearly black, and its consistence sometimes such as to equal that of cartilage. In this state it is highly probable that it never regains its natural structure and consistence. When carefully dissected, not only are the veins contained within it found compressed or obliterated, but also the arteries are much diminished in bulk. In fact, all the elementary tissues of the indurated portion of lung are atrophiated; and if the accidental deposit by which these changes are produced is not removed by absorption, the former are soon deprived of their vitality, and both are converted into a soft substance, the colour of which will depend on that of the part previous to this change, as well as the degree of putrefaction which it may have undergone before it can be examined.

Sphacelus of the walls of tubercular excavations is sometimes produced in a similar manner. The veins and arteries which traverse the septa, or ramify in the walls of these excavations, become obliterated by the conversion of

the blood which they contain into masses of firm fibrine. This change may take place previously or subsequently to the formation of the excavations. In the former case the expectoration is copious, sometimes contains pretty large portions of tuberculous matter and softened cellular substance, the odour of which is extremely offensive. In the latter case the only change observed in the expectoration is a tinge of brown, dirty grey, or green, with perhaps a more marked odour of sphacelus.

Induration of the pulmonary tissue and compression of the veins may likewise be produced by the tuberculous matter, when deposited in such quantity as to occupy a large portion or the whole of the lobe of the lung. The author of this article has represented a striking example of induration from infiltration, as it is called, of tuberculous matter terminating in sphacelus, in the first Fasciculus of his work on the "Elementary Forms of Disease." The whole of the upper lobe of the right lung was converted into a solid mass as firm as a piece of boiled cow's-udder, of a pale straw colour, of a homogeneous aspect, and presenting here and there only a few faint traces of the interlobular sections. The upper portion of this lobe contrasted strongly with that we have just described. It was converted into a mass of dirty yellowish grey substance as large as an orange, some parts of it soft and spongy, others quite pulpy or consisting of a dirty grey sanies, in which the bloodvessels, veins, and arteries, were lying denuded and obliterated by firm coagula. There was no increase of vascularity, indicative of previous inflammation, in the infiltrated pulmonary substance, around this the sphacelated portion; and therefore we regard this case as strikingly illustrative of the manner in which local death is not unfrequently produced by the accumulation of accidental products in the parenchyma of organs.

When speaking of mortification of the lungs from inflammation, we alluded to the occasional occurrence of this disease without it, being preceded by the usual phenomena of pneumonia. Although we are not prepared to demonstrate that such cases should be considered as of the same nature as those we have included under the present head, we are satisfied that we have seen one or two instances of sphacelus of the pulmonary tissue depending on induration as a consequence of chronic pneumonia. This opinion is founded not only on the sudden occurrence of the state of sphacelus without the signs or symptoms of previous inflammation, but on the presence of grey indurated pulmonary tissue, which we found forming part of the boundary of that which was sphacelated: such a degree of induration could not have been produced by adhesive inflammation, subsequent to the sphacelus, as death took place within too short a space of time to allow of such being accomplished.

Sphacelus of portions of the liver is not very rare in those cases in which it is nearly filled with cancerous tumours. These tumours produce, mechanically, extensive obliteration of the veins; and when a portion of the liver becomes incarcerated by them, it is converted into a dark brown slough, generally soaked with blood, and sometimes mixed with softened and detached portions of the neighbouring tumours.

An obstacle to the venous circulation gives rise more frequently to sphacelus in the digestive organs than in the liver. It is chiefly in the intestines that cessation of the circulation from a mechanical cause is seen to terminate in sphacelus: we shall adduce one example only of sphacelus, namely, that which occurs in the intestines in the case of intus-susception.

We shall allude shortly to the mechanism of this morbid condition of the intestine, in order that the cause of the sphacelus, in which it sometimes terminates, may be clearly understood. When the superior portion of intestine passes into the inferior, or becomes invaginated, it carries along with it that part of the mesentery to which it is attached. If it does not suffer much compression, the invaginating process may go on to a great extent; but if it is compressed to such a degree that the return of the venous blood is obstructed, this stage of the disease is arrested, on account of the congestion which follows of all the coats of the invaginated portion. The congestion is not the consequence of inflammation; it is produced by pressure, and in the following manner: when the mesentery is put on the stretch by the descent of the superior into the inferior portion of the intestine, the veins belonging to it are compressed between the walls of both portions, just at the point where the invagination terminates superiorly. If adhesive inflammation takes place at this point, the peritoneal surfaces of both portions become united, and the veins obliterated. As the arteries are much less affected by pressure than the veins, they continue to pour their blood into the invaginated portion; this fluid gradually accumulates, and produces an extreme degree of congestion of the mucous and submucous coats, giving to them a deep red or almost black colour. In this state, however, the intestine is not deprived of its vitality. It is in a state of gangrene, but not of sphacelus; for its structure is still entire, and when it has been separated and evacuated, presents, after having been macerated for some time, so as to deprive it of the blood which it contains, the most perfect state of integrity of all its tunics. Occasionally, however, a portion or the whole of the invaginated intestine is found in a state of complete sphacelus, and is passed in the form of irregular spongy masses or shreds of a dirty ash grey, brown, or black colour.

It is not unimportant to know that the invaginated intestine may be detached in separate portions, and passed at different intervals of time. In such a case the physician might be led to suppose that there were several distinct portions of intestine invaginated, whereas there is only one portion. If the invaginated portion of intestine be considerable, it is, perhaps, never separated all at once; on the contrary, it is detached, as we have said, in several distinct portions, two, three, five, or even eight; dif-

ferences which depend on the manner in which the invaginated intestine is disposed of. For if considerable, it does not present a cylindrical form; it is drawn up into the form of abrupt, flattened, or angular coils, determined by the attachment of the vessels and mesentery, so that stagnation of the blood takes place successively in different points, and from below upwards, being always greatest at the inferior extremity of the invaginated portion.

The symptoms of intus-susception derive no peculiarity from the existence of gangrene or sphacelus, unless when a part or the whole of the invaginated portion is passed by stool. We may, however, observe that this disease may, in the great majority of cases, be distinguished from stricture of the intestines occurring after ulceration, by a careful examination of the previous history of the patient. Disorder of the functions of the digestive organs, referable to chronic disease of the intestinal canal, will be found to have existed for a greater or less length of time before the occurrence of those symptoms which indicate an obstacle to the passage of the food or fæces from stricture: these symptoms are but slight at first, repeated at irregular intervals of time, and become more aggravated at every succeeding attack; whereas in intus-susception the presence of a mechanical obstacle is announced suddenly without being necessarily preceded by any marked derangement of the functions of the intestine; the symptoms to which it gives rise are rapid in their course, steady in the increase of their severity, and are aggravated by all the internal remedies calculated to relieve or remove the former.

There are no means of distinguishing this disease from internal strangulation of the intestine until the sphacelated portion is passed by stool. The existence of the former disease may, perhaps, be suspected previous to this period by the oozing of blood from the congested mucous membrane of the invaginated intestine.

The natural cure of intus-susception furnishes us with the most interesting examples of the efficient good which can be accomplished by adhesive inflammation. The serous membranes being endowed with a property which enables them to supply a quantity of coagulable lymph sufficient for the full accomplishment of this process, by the lowest possible degree of inflammation, the solution of continuity which follows the separation of the dead portion of the intestine is often repaired without any appreciable disturbance of the economy. The union of the intestine, let it be remarked, is effected, not between a mucous and serous surface, but between the *two serous surfaces* of the invaginated and invaginating portions of the intestine, and just at the point where the invagination commences: there the separation takes place, and there also the union is effected previous to the separation, which is to maintain the continuity of the intestine, and secure the life of the patient. Under these circumstances the diameter of the intestine may not undergo any perceptible change, and the passage of the food or fæces is accomplished with the same facility as before the occurrence of the disease.

It is consolatory to know that patients may survive the loss of a considerable extent of intestine from intus-susception, and that, too, without their general health having suffered any perceptible alteration. By far the most remarkable instance of this kind that has come to the knowledge of the writer of the present article occurred in the practice of his excellent and distinguished friend, Dr. Forbes of Chichester, with whom he had the opportunity of examining several of the portions of intestine passed by the patient. There were no less than *eight* portions of intestine passed by stool, varying from eleven to thirty-two inches in length, the length of the whole amounting to *twelve feet of entire intestine!* Each portion was complete in itself, presenting in fact the appearance of healthy intestine, that has been allowed to remain for a certain length of time in alcohol. They consisted of the jejunum and ileum, some of them having their serous, others their mucous surface outwards (which is always the case when the intus-suscepted intestine separates in distinct portions), on the former of which the bloodvessels, on the latter the glandulæ agminatæ, were most conspicuously visible. The most interesting feature of this case was the complete recovery of the patient, at least from the immediate consequences of this disease. The subject of this remarkable case was a poor woman of the name of Ann Newland, resident at Emsworth, in Hampshire, and was a patient of Mr. Lyne, surgeon at that place. She had been confined to bed by an anomalous chronic affection for many years previously to the intus-susception. The first portion of intestine came away in the year 1826, the last in 1829. She died in March, 1831, aged thirty-seven years. The greater part of the intestine passed is preserved in the museum of the Chichester Infirmary.

This case also acquires great additional value from the circumstance that the form and dimensions of the intestine at the point where the solution of continuity had taken place, were found, after the death of the patient, to have undergone very little alteration. A slight contraction of the small intestine, and the presence of a thin, pearly-coloured false membrane, little more than half an inch in breadth, and surrounding it in the form of a zone, were the only external appearances which indicated the original seat of the disease. On the corresponding and internal surface of the intestine there was also seen a narrow, slightly elevated, smooth ridge, covered by mucous tissue, and traversing the whole circumference of the intestine, the walls of which, opposite, were considerably thickened.

If any doubt could remain that these appearances were to be admitted as positive evidence of the union and cicatrization of the original solution of continuity of the intestine, that doubt would be entirely removed by the fact that the solution of continuity had taken place in the situation of one of the glands of Peyer, and in such a manner that this gland was divided into two nearly equal portions, one of them terminating in the cicatrix, and the other being

situated at the extremity of one of the detached portions of intestine.

With regard to the treatment of mortification from intus-susception, there are two points which deserve the chief consideration of the physician; the reduction of the invagination, and the separation of the dead portion of intestine. The reduction of the invagination is not to be effected by the *direct* operation of any means which we have in our power to employ. If this is at all to be accomplished, it must be by preventing the accumulation, or diminishing as much as possible the quantity of the fluid contents of the intestine,—that is to say, by confining the patient to a state of absolute rest, by depriving him of food and drink as long as possible, by general bloodletting, and the use of emetics so employed as not to act upon the intestine. Purgatives must be avoided, as having the direct effect of increasing the disease. If this treatment fails to give relief, the physician should act as if there were a certainty that the reduction of the invagination is rendered impossible by the adhesive inflammation, and that a cure may be expected to follow the separation of the dead part of the intestine. Under these circumstances he must wait patiently, and endeavour to remove every cause which can tend to retard or prevent the accomplishment of this salutary result. At this period of the disease he cannot do better than enjoin rest and quiet, and support the strength of the patient by the frequent administration of small quantities of nutritious fluids, or enemata of a similar kind.

Numerous examples of mortification from an obstacle to the venous circulation are met with in those adventitious formations known under the denominations of scirrhus, cancer, medullary sarcoma, fungus hematodes, fibrous tumours, &c. We do not, however, think it necessary to do more than indicate the occurrence of the disease in such cases, as we have already alluded to it when speaking of mortification of the lungs and liver produced by a mechanical obstacle to the return of the venous blood. Such adventitious products, from their situation, connexion, and mode of development, are often destroyed in part, and sometimes entirely, solely on account of the veins in their immediate neighbourhood, or contained within them, being so compressed as to prevent the passage of the blood through them. These substances become gorged with blood, particularly at their circumference, where sloughing commences, which proceeds towards their interior, with a rapidity and extent proportioned to the degree of congestion by which it is preceded.

The rapid development of some of these accidental formations often depends on the destruction of the surrounding tissues by mortification, whereby they are relieved from the restraint imposed on them by external pressure. They now shoot forth with surprising rapidity, and undergo such a change in their conformation and other physical characters, that, although still the same disease, they are no longer recognised as such, and receive new names, which not a little embarrass the student of pathology.

3. *Mortification from obliteration of the arteries.*—Although this form of mortification, confined as it is almost always to the extremities, be regarded as the exclusive object of surgical treatment, we shall give a short outline of the pathology as it occurs in two distinct morbid states of the arteries of these parts, that the physician may be the better prepared to distinguish it from that which arises from disease of the heart, and another form of mortification of the extremities which still remains for us to describe,—viz. that occasioned by the use of unsound rye as an article of food.

The two forms of mortification of the extremities to which we here allude, originate, the one in spontaneous rupture of the internal and middle coats of the trunk of an artery, the other in the obliteration of a similar vessel or of its principal branches by the presence of organized fibrine, fibrous or osseous substances.

Mr. J. W. Turner, professor of surgery in the University of Edinburgh, was the first who directed the attention of the pathologist to the occurrence of spontaneous rupture of the internal and middle coats of an artery. There is, however, nothing in the histories of the cases which he has published which throws any light on the morbid condition of the arteries which precedes the rupture of their internal and middle coats. That such must have been the case is obvious from the following facts. One of the patients, whose case is related by Professor Turner, was in the act of raising himself in bed by resting on the palms of his hands, when he experienced a sensation as if something had given way at the joint of the right arm. Five days afterwards, the same patient, while in the act of moving his right leg, perceived a sudden sensation of numbness and weight extending from the ham downwards. Another patient, while turning his hand behind his back to put it in his coat-pocket, felt a sudden acute pain in the bend of the elbow joint, and a sensation of numbness in the hand and fore-arm. It is, therefore, obvious that in none of these cases the rupture, which was afterwards found to have taken place in the internal and middle coats of the brachial and popliteal arteries, could have been produced had there not existed a previous state of disease of these vessels. In one of the cases only did mortification take place. Half an hour after the rupture of the popliteal artery, no pulsation could be felt in any of the arteries of the foot, or in the ham. The foot was cold: no pain was excited by pressure on any part of the limb, but the patient complained of occasional cramp-like pains in the calf of the leg. The morning after the attack the foot was pale and cold, and below the ankle the integuments were entirely void of sensation when pressed, pinched, or tickled, and the muscles of the foot seemed to have lost the power of contraction. The next day several mottled purple patches appeared on the instep and fore-part of the ankle, which gradually extended over the whole foot, till the surface, by the fifth day, became

entirely livid. As the discoloration advanced, the foot swelled slightly, and became œdematous, and appeared to acquire an increase of temperature. Soon after the attack the patient complained of severe burning pain in the foot, and a feeling as if it were crushed, which continued till near his death. About the ninth day the soft parts above the ankle began to swell, and to be hot and painful on pressure; the swelling gradually increased, and extended till it reached the upper part of the calf of the leg. The integuments above the ankle began to become discoloured at the same time, and the discoloration increased till the lividity reached the calf of the leg, and at last rapidly extended nearly to the knee. The soft parts adjoining the discoloured skin were swollen and very painful on pressure; but no redness appeared, nor any inflammatory line between the dead and living parts. The parts discoloured were completely sensible, and the cuticle raised into globular vesications, filled with limpid or reddish serosity. The constitutional symptoms in this case were greatly aggravated by a previous state of disease. Death, however, did not take place until eighteen days after the pulse had ceased in the leg. The coats of the artery were found torn, thickened, and obliterated in several points by coagulated blood, fibrine, and lymph.*

The second form of obliteration of the arteries which gives rise to mortification, consists, as we have said, in the presence of fibrine, fibrous, or bony substances formed in these vessels. When the quantity of these substances is such as to interrupt or prevent entirely the circulation of the blood through the principal arterial trunk or branches of one of the inferior extremities, mortification is almost always the consequence, because of the advanced period of life at which this form of the disease generally occurs, and the very unfavourable state of the arteries to the formation of a collateral circulation.

It is to this form of mortification that we would confine the term *gangrena senilis;* the *idiopathic* and *dry* gangrene of authors.

We have already stated one of the reasons which have induced us to give a general outline of the kind of mortification which we are now describing, and we might have added a still more weighty reason for our doing so; viz. the important pathological evidence with which it furnishes us in regard to the production of mortification, independently of the previous existence of local inflammation; a subject on which it would appear some doubt is still entertained. We should not have thought it necessary to recur to this circumstance, having already shewn that mortification, from a mechanical obstacle to the return of the venous blood, and produced in a variety of ways, is not an uncommon occurrence in internal organs, were it not that the facts then adduced might be regarded as incomplete, from their being chiefly founded on the results of post-mortem examinations. In the form of mortification which we are now about to describe, no such objection can be raised, as all the facts which the pathology of a disease can afford as evidence of its seat and nature, are, in this case, equally conspicuous and decisive.

The first change which announces the occurrence of local death from obliteration of the arteries of one of the inferior extremities, occasioned by the presence of the accidental products which we have named, is a dark-red, purple, or almost black discoloration of the skin of the fleshy or under portion of one or more of the toes of the foot. There is, in general, no previous swelling of the affected toes, no increase of their temperature or sensibility. The discoloration alone is often the first circumstance which attracts the attention of the patient to the existence of the disease; and we have seen two cases in which the discoloration had gained the upper surface of the toes before the patients were aware of the presence of this insidious and fatal affection. In some cases, however, a prickling or tingling sensation, or a certain degree of numbness and cold, are perceived in one or more of the toes, and which, when examined, are already found to be discoloured; not red, hot, swollen, and painful, but of a purple or livid colour, colder than natural, not painful when pressed, and shrunk rather than increased in bulk. An increase of temperature, sensibility, and bulk of the affected toes, is, however, occasionally observed at or near the commencement of the disease; but as they are not constant, so are they not necessary changes. This, the first period of the disease, presents, indeed, none of the local characters of inflammation, if we except the circumscribed accumulation of blood on which the discoloration of the skin of the toes depends, the isolated existence of which is, however, of no value, inasmuch as its presence can be accounted for from interruption to the arterial circulation of the limb.

The discoloration extends slowly until it has pervaded the whole of the skin covering the toes, then proceeds upwards over the back and sides of the foot, and sometimes mounts nearly as far as the knee, although more frequently death takes place from the constitutional disturbance which ensues, before it has passed the foot or ankle joint. During its progress the discoloration generally presents the same purple or livid tint which it did at the commencement; and although it may be preceded by some swelling and congestion of the skin and subcellular tissue, its progress is seldom marked by the bright red colour of inflammation; and when inflammatory redness of the skin takes place, accompanied with heat, pain, and tumefaction, these phenomena must be regarded as effects of the disease which more frequently tend to increase than to interrupt or arrest its progress.

The bulk of the affected parts depends chiefly on the situation and extent of the obstacle to the circulation. If the obstacle be extensive, the quantity of blood admitted to

* On the sudden spontaneous Obliteration of the Canals of the larger Arteries of the Body, &c. by J. W. Turner, Professor of Surgery in the Royal College of Surgeons, Edinburgh. Edinburgh Medico-Chirurg. Society's Transactions, vol. iii.

the foot is too small to give rise to congestion; and this not taking place, there is little or no effusion of serosity. Hence there is no increase of bulk in mortification from this cause; and if the obstruction has been effected slowly, the foot and leg may even be atrophiated previously to their being attacked with mortification, the dead parts being shrunk, dry, and indurated. These physical characters of the disease are entirely owing to the hydraulic conditions to which we have just alluded; for if the obstruction to the passage of the arterial blood be only partial, and particularly if it has occurred suddenly, a considerable degree of congestion is induced, and consequently the effusion of a greater or less quantity of serosity, whereby the bulk of the foot, and more frequently of the leg, is more or less increased: even in this case, however, there is not any marked increase of bulk in the toes, the primary seat of the disease. It is in its progress upwards that the congestion and œdema become manifest; that the skin becomes tense and painful; and that the febrile symptoms, if they have not yet occurred, appear, increase rapidly in severity, aggravate the local affection, and hasten its fatal termination.

From the nature of the obstructing cause, and the unfavourable conditions under which it occurs, the progress of the mortification is seldom arrested; and if it is so, the separation of the dead parts is rarely accomplished, and perhaps a cure never effected.

It is stated by some pathologists that this form of mortification sometimes occurs in young persons, and is much more frequently met with in males than in females. The former statement we believe to be an error originating in an imperfect knowledge of the causes of this disease; for as we ourselves have never seen it in young persons, and as this statement has not been supported by other than mere negative facts, and these too very incomplete, we must continue to regard it as a disease peculiar to persons advanced in life, and occasioned by morbid states of the arterial system, which occur only in such persons, at least to such an extent as to produce local death.

With regard to the greater frequency of the disease in males than in females, we should say from our own personal observation, that this statement is correct only in so far as it regards its occurrence in the inhabitants of towns and cities; but that in those of agricultural districts, where the occupations and mode of living of both sexes are much of the same kind, it appears to occur as often in females as in males.

In every case of gangrena senilis which we have examined after death, we have found the arteries of the diseased limb obliterated in such a degree as to interrupt the circulation of the blood. The obstructing cause consisted, in five or six cases, of a fibrous tissue formed either in the walls or cavities of the arteries, whereby these vessels were converted into nearly solid cords of ligamentous consistence. This state we have traced from the toes more than half way up the leg: it was always connected with ossification of the larger branches and trunks of the thigh and other parts of the body. In other two cases, the obstruction depended on extensive ossification of the principal arteries of the limb; and in several others it was produced by solid fibrine formed around spiculi of bone projecting from the internal surface of the arteries.

Connecting this state of the arteries with the external appearances of the mortification with which it is accompanied, we can have no hesitation in admitting that this form of the disease is the immediate consequence of a deficient supply of arterial blood, and that therefore, if the facts already adduced were considered insufficient to prove that some of the other forms of mortification which we have described may also take place without being preceded by inflammation, those which we have now brought forward will, we trust, remove any doubts that may have been entertained on this highly important part of our subject.

The description which we have given of these two forms of mortification from rupture of the internal and middle coats of the arteries, as well as from obliteration of these vessels, is, we hope, sufficiently characteristic, and such as will enable the physician to distinguish them from other forms of this disease which belong especially to his department of the healing art.

III. Mortification from local and general debility.—As a state of local debility capable of inducing mortification is always connected with, and essentially depends on, a state of general debility, we shall confine the observations which we have to make on this form of mortification to the affection as it occurs under the influence of the latter condition of the economy.

Whatever may have been the causes of the general debility, we regard this state as constituting the essential condition of the disease;—a state in which the physiological and physical properties of the solids and fluids of the body are so modified, (we commonly say enfeebled or debilitated,) that every function of the economy is slowly, ineffectually, or imperfectly performed: innervation and nutrition in particular are so circumstanced, that even those agents on which the varied phenomena of health and life more or less immediately depend, now become the causes of disease and of death. Illustrations of this important fact meet the eye of the physician in the every-day occurrence of diseases of various kinds, but they seldom arrest his attention unless they occur under extraordinary circumstances,—such, in fact, as are observed in those cases of decay and death of the solids to which we shall presently more particularly allude. We have seen that mortification of various parts of the body may be produced by mechanical causes whose operation is entirely limited to the vascular system, in which they impede or arrest the circulation of the blood. This fluid, as well as the solids in general, may be in the healthy state up to the moment at which the local mechanical cause begins to operate and manifest its effects, and these are characterized by a diminution of

all those properties, the extinction of which is the death or mortification of the part thus circumstanced. A similar healthy condition of the solids and fluids may precede mortification from inflammation, but the phenomena of the disease are the opposite of the former. Local death does not take place until after the morbid stimulus has increased every property of the part to which it has been applied, to its maximum. The part is thus exhausted of its strength, if one may be allowed the expression, and being deprived also of the means of renewing it, from the changes which have taken place in its more essential elements, it soon sinks into a state of absolute death. In the form of mortification of which we have now to speak, the fluids of nutrition as well as the solids are, as we have said, in a previous state of disease, and this state is the cause of the general debility which constitutes the essential character of this form of mortification. Notwithstanding, we have classed it with the two former, because of their being all preceded by the same state of the circulation. In none of these three forms of mortification does local death take place without being preceded by cessation of the circulation ; a circumstance, we believe, of sufficient importance to authorize our having brought them all under the same general head.

The most marked examples of mortification from general debility are met with in individuals whose strength is greatly reduced by want and fatigue, by the violence of acute diseases of an adynamic character, and by chronic diseases accompanied with much pain, extensive suppuration, or which compel the patient to remain for a long time in the same position. Under these circumstances the local phenomena of mortification present, no doubt, considerable variety ; but those which constitute the type of the disease, whether local or general, are always the same, unless in so far as they vary in extent and degree. Thus, mortification from debility may be preceded by a certain degree of pain, increased sensibility and temperature of the part affected ; but these changes are not constant, and therefore not necessary to the production of the disease. A local accumulation of blood constitutes, in general, the first perceptible change in the part which is about to be deprived of its vitality. This may take place from the part being submitted to pressure from its own weight or that of the body, from slight friction, puncture, or similar causes. In some of these cases the blood accumulates, partly from the influence of gravitation, and partly from compression of the veins ; as, for example, in mortification of the soft parts covering the sacrum, heels, elbows, &c. of persons who have escaped the dangers of typhoid fevers, and who are left in that state of prostration which precludes the possibility of changing the position of the body. It is, perhaps, still more conspicuous in some patients similarly confined with paraplegia from injury of the spinal cord. Sloughing, or at least sphacelus, may have proceeded to a considerable extent before its existence has even been suspected ; the patient seldom complaining of any uneasiness till inflammation has been induced by the presence of the dead tissues.

A state of local congestion is also frequently the only change which precedes the sphacelus of the skin to which leeches have been applied, or which has been scarified or punctured. The skin around the leech-bites assumes a dirty purple, livid, or almost black colour ; looks sometimes as if it had been injected with ink ; presents no previous redness, heat, or pain, and is not swollen except where the blood is accumulated ; it drops off in the course sometimes of twenty-four hours, leaving a number of circular openings, which unite and spread by similar succeeding congestions and sloughing of the contiguous skin ;—effects which are always to be dreaded when it is found necessary to apply leeches to weak scrofulous children, greatly debilitated by confinement within the walls of an hospital, or low, damp, obscure, ill-ventilated dwellings.

The occurrence of mortification in scorbutus affords another striking example of the influence of general debility in the production of this disease. Portions of the skin often become gorged with blood, die, and slough, without our being able to discover that these parts have received any previous injury. The prostrate condition of all the functions of the economy, indicated by an unwillingness or the incapability to move ; the feebleness of the pulse, the fluidity of the blood, and the imperfect state of nutrition in the worst forms of this disease, convert, as it were, the natural and healthy influence of physical agents into a means of destruction. Even the mastication of the food necessary for the support of those affected with this disease, cannot be performed unless at the risk of inducing mortification of the gums, and other soft parts of the mouth. The sloughing of these parts from this cause is sometimes very extensive, accompanied by a continual oozing of blood, and occasionally terminates by the loss of the greater part of the teeth, and even portions of the alveolæ. For a more detailed description of the varieties of form, extent, progress, and termination, as well as the treatment of this form of sphacelus, we must refer the reader to the article Scorbutus.

There is one other form of sphacelus from general debility which requires to be more particularly noticed in this place. It is that which has received the names of *noma ; cheilocace ; stomocace gangrenosa seu maligna ; necrosis infantilis ; pourriture des gencives ; gangrène scorbutique aux gencives ; wasserkrebs der kinder ; gangrenous aphthæ ; water-canker.* The gangrene and sphacelus which have been described under these various appellations occur generally in infants, and in children from two to five years of age, attack the mouth and cheeks, and the external parts of the female organs of generation. Their occurrence in the mouth may be owing to the presence of several diseased states of the mucous follicles, mucous membrane, or walls of this cavity. Thus gangrene and sphacelus may follow inflammation of the follicles or mucous membrane of the mouth,

the inflammation being limited to these parts, as in follicular aphthæ, or combined with pharyngitis, scarlatina, small-pox, or scorbutus, examples of which will be found under these several heads. But the form of mortification to which we wish to direct the attention of the reader occurs in the parts which we have named without being preceded by any of these lesions. It commences, however, in the mouth, in the mucous membrane, and, perhaps nearly at the same time, also in the cellular tissue, generally of one, rarely of both cheeks. The general and local phenomena of the disease have been well described by Baron,* Isnard,† Billard,‡ Richter,§ and others, of which the following are the most important.

Symptoms.—In the first stage of the disease, the mucous membrane of one of the cheeks presents in some cases a small superficial ulcer without pain or discoloration. Sometimes there may be two or three ulcers, seldom more. In other cases, instead of an ulcer, a small whitish or yellowish grey spot appears on the mucous membrane, which sloughs, and gives rise to an ulcer similar to the former, or presenting the same colour as the slough by which it was preceded. It is not certain whether the disease commences by ulceration or sphacelus of the mucous membrane, but we are inclined to believe that it commences by the latter process. But, however this may be, there is observed nearly at the same time a greater or less degree of tumefaction of the cheek, opposite the ulcer or slough of the mucous membrane, which increases with great rapidity, and soon extends to the eyelids and lips. The skin of the swollen parts is pale and glistening, resembling wax, hard towards the centre of the swelling, and more or less elastic. A copious discharge of fluids takes place from the mouth, consisting at first of glairy saliva, and afterwards of a dirty sanies, which gives a strong offensive odour to the breath. There is no pain in the cheek, little or no increase of its temperature; and so little are the functions in general disturbed, that children affected with the disease in this stage are sometimes able to amuse themselves with their companions, and partake of their ordinary meals without any apparent inconvenience.

The commencement of the second stage is marked by the appearance of a dull yellowish grey discoloration of the skin on the centre of the swollen cheek, where it is hardest, and opposite the sphacelated mucous membrane of the mouth. The portion of skin thus discoloured soon becomes black, and sloughs; the whole substance of the cheek undergoes the same successive changes, and in the course of a few days, sometimes less than a week, the cheek, lips, and eyelids are converted into a soft putrid mass, which, falling off, destroys sometimes nearly the whole of one side of the face, lays open the cavity of the mouth, and exposes the gums in a state of sphacelus, the inferior and superior maxillary bones denuded or necrosed, and deprived of their teeth. In milder forms of the disease the sphacelus may be arrested before it has proceeded far in breadth or depth, or after it has destroyed only a limited portion of the cheek and lips, and without having attacked the bones. The general symptoms which accompany this the last stage of the disease, are sometimes so mild, so disproportioned to the local ravages of the disease, that one cannot help being struck with astonishment. There is even a craving for food, which the little victims devour with greediness and apparent relish, and which they continue to do even until within a few hours of their death. The intellectual faculties are seldom much affected. In other cases there are from the commencement a low state of fever, a weak quick pulse, heat of the skin, thirst, and loss of appetite. The fatal termination of the disease is likewise sometimes announced by a state of great prostration and colliquative diarrhœa, excited probably by the absorption of the putrid fluids, and their passage into the stomach and intestines. When this form of mortification attacks the labia, it presents the same local and general phenomena, commencing with a sloughing or ulcerated state of the mucous membrane of these parts, accompanied with the same kind of tumefaction and discoloration, and terminating in sphacelus, which spreads with great rapidity, and destroys to a greater or less extent the neighbouring parts.

From the above description of this form of mortification, little doubt can be entertained as to its being a disease arising in that state of general debility which we have already endeavoured to explain. All the phenomena which it presents are also so characteristic, that it is not likely to be confounded with any other disease except malignant pustule, from which however it may be distinguished, as has been observed by Rayer and others, from the latter disease, when it affects the cheek, always commencing on the external surface.

Prognosis.—The prognosis of this disease is extremely unfavourable when it attacks children in hospitals, for few of them survive its ravages. We have, however, seen its progress arrested in a few instances, and in two cases the patient survived the loss of a large portion of the cheek and a part even of the inferior jaw. When children are placed in more favourable circumstances, where they enjoy fresh air and receive all the care that their situation requires, the remedial means are more efficacious, and the mortality of the disease less considerable.

Treatment.—As soon as the disease is perceived, the slough or ulcers of the mucous membrane, whether of the labia or mouth, are to be touched with a mixture composed of equal parts of honey and muriatic acid, or with the latter alone. But when the disease is more advanced, when the swelling is conside-

* Mém. sur une affection gangréneuse de la bouche. Bulletins de la Faculté, 1816.

† Dissertation sur une affection gangréneuse particulière aux enfans. Paris, 1818.

‡ Traité des Maladies des Enfans, &c.

§ Der Wasserkrebs der Kinder, Berlin, 1828. Journal des Progrès, &c. tome iii. 1830.

rable, and the stage of sphacelus has arrived, Mons. Baron strongly recommends that the sphacelated tissues be divided, and the actual cautery, heated to whiteness, carried deep into their interior.* This treatment is said to be by far the most successful. Marjolin states that he has employed it with complete success, and also the nitrate of silver, in the state of powder, introduced into the incised sphacelated tissues.† The muriate of soda is also an efficacious remedy, as it is found not only to arrest the progress of the disease, but likewise removes the stench by which it is accompanied.

Every precaution ought to be employed to prevent the putrid fluids from being swallowed, and perhaps the best means of doing so is to wash out the contents of the mouth with a decoction of bark, or a gargle of muriatic acid and honey; and to prevent them accumulating, the patient should be made to lie on the affected side of the face, so that they may find a ready exit. The swollen parts should be covered with cloths dipped in an aromatic fomentation, and occasionally rubbed with the liniment of ammonia, or other stimulating substances. Although this disease originates in a state of general debility, the local treatment which we have pointed out is regarded as the only certain means of arresting its progress. The operation of general remedies is too slow to have any control over a disease which proceeds with such rapidity, and therefore general remedies must be regarded only as auxiliaries. They should consist of nutritious fluids and small quantities of wine, but the administration of the latter in particular must be regulated by the state of the digestive organs, which in this disease are often greatly disordered and highly irritable, and therefore require to be remedied by means suited to the kind of derangement which they may present in each individual case.

II.—Mortification from the violent operation of mechanical, chemical, and physical agents.

The mechanical agents which occasion mortification are violent blows and contusions of various kinds; the chemical, powerfully stimulating substances; and the physical, extreme heat and cold. All these agents produce the same ultimate effect in the part of the body which has been submitted to their influence; that is to say, they deprive, to a greater or less extent, such a part of those properties on which its existence depends. The effect of a contusion produced by a heavy weight falling upon or passing over a part of the body, may be partial or complete death of such a part; and that produced by a bullet, instantaneous death of the soft parts, to a certain extent beyond the limits of the solution of continuity which it occasions in its passage through them. Strong stimuli, intense heat and cold, may operate precisely in a similar manner. The destructive effects of these agents are, however, not always the same in degree or extent, nor are they always produced in precisely the same manner. In one case there may be no gradation of change, no intermediate state of disease which separates these destructive effects from the previous healthy condition of the tissues in which they are produced: local death may be the immediate consequence of the violent operation of such agents. In another, the vitality of the part which has been exposed to the operation of these agents is not entirely destroyed. In this case the part may be regarded as in a state of gangrene; and in the former, in a state of sphacelus. In the present case it may or may not be susceptible of recovery, the result being dependent on the subsequent changes which may take place in the affected part itself, or in those parts with which it is connected. Congestion and inflammation are the changes which always take place, to a greater or less extent, in gangrene of this kind. If they can be prevented from taking place, moderated or removed when present, the suspended functions of the part may be restored; otherwise the gangrene terminates in sphacelus.

The state of congestion and inflammation to which we have just alluded originate in opposite states of the vascular system. The congestion takes place in the gangrened tissues, because of the vessels being deprived of those properties by means of which they were enabled to propel the blood through them. They have ceased to contract, and consequently the blood, although carried into them in the usual quantity, accumulates in, and distends them to a greater or less extent. On the contrary, the bloodvessels situated beyond the gangrened tissues having received little or no injury, are stimulated either by the presence of the disease acting as a foreign body, or have been previously excited by the cause which produced the gangrene, to such a degree as to give rise to an increased influx of blood, to an increase of the sensibility and temperature, and other phenomena of inflammation. Under these circumstances the remaining vitality of the gangrened part is soon destroyed, and consequently a state of real death produced.

However important it may be in a practical point of view to be fully acquainted with all the changes which take place in the structure and functions of a part which has been submitted to the violent operation of mechanical, chemical, and physical agents, we shall not enter into a more detailed description of them than may seem necessary to our present purpose, as this part of our subject belongs almost exclusively to the department of surgical pathology.

We may, however, observe,—1. that the degree and extent of these changes of structure and function are proportioned to the intensity of the agent by which they have been produced, the degree of energy with which it has acted, and the duration of its operation;—2. that the recoverable or irrecoverable condition of the structure and functions of the injured part are essentially determined by similar modifications of the efficient cause;—3. that congestion or inflammation are subsequent changes depend-

* Loc. cit.

† Dictionnaire de Médecine, tom. x.

ing on the primary lesion or its agent, always effects and complications but never causes of the disease, unless secondarily and under those circumstances to which we have alluded, that is, when the part is left in a recoverable state, or in a state of gangrene;—4. that, therefore, mortification from the violent operation of mechanical, chemical, and physical agents, differs from that produced by inflammation, an obstacle to the circulation of the blood, and local and general debility; the disease, in the former case, consisting essentially in a simultaneous lesion of all the elements; in the latter, of one element only of the part in which it is produced. There are, no doubt, slight exceptions to these general conclusions; but considering them in a general point of view, they appear to us to be drawn from a series of facts sufficiently broad and distinct to render it necessary to consider apart these two forms of mortification, independently of the advantage of doing so in a practical and scientific point of view.

For the reason before stated, we shall confine the few observations which we have still to make on this form of gangrene, to some of the more remarkable phenomena which it presents when produced by the action of intense heat and cold on the external parts of the body, and strong stimuli on the digestive mucous membranes.

1. *Mortification from intense heat.*—The effects of intense heat on the surface of the body are a greater or less degree of excitement, a temporary or permanent suspension of the functions of the part to which it has been applied; or in other words, there is produced a state of inflammation, gangrene, and sphacelus. The states of inflammation and of gangrene do not require to be described, as the phenomena which they present in the present case do not differ materially from those which accompany the same changes when they occur without any obvious cause, if we except the rapidity of their progress, and also the more sudden and extensive development of phlyctenæ, bullæ, or blisters, particularly when the heat is applied by means of a fluid. The state of sphacelus produced by the direct application of heat presents several very characteristic appearances. The skin is of a yellow, grey, brown, or black colour; dry and hard; sunk below the level of the surrounding surface, and quite insensible. These are, sometimes, the only appearances which are at first perceived to follow the action of intense heat, and are certain indices of the complete death of the skin to a greater or less depth. The deeper-seated tissues may also be deprived of their vitality, but to what extent cannot be determined by any change which the cutis may have suffered. The inflammatory redness which succeeds to this state appears almost immediately, and indicates by the rapidity of its course and the peculiar colour which it assumes, the extent both of the gangrene and sphacelus, the existence of which could not be determined by any previous change of the cutis produced directly by the heat. We do not wish it to be understood that we are speaking of gangrenous inflammation. The degree of inflammation produced by intense heat may, certainly, be such as to give rise to mortification; but in the present case we wish to shew that both stages of this disease may be, and often are, the immediate effects of the physical agent in question, and, consequently, whether capable of being detected or not by any peculiar change in the affected part, precede the inflammation to which they are often ascribed.

The extent of the sphacelus may be said to be always increased by the subsequent inflammation; and parts that were only in a state of gangrene are, by means of it, converted into a state of sphacelus; and hence the necessity of preventing the extension or modifying the violence of the inflammation which succeeds to burns or scalds.

Whether the state of sphacelus may have been produced by the action of the heat or the subsequent inflammation, the limits of the disease are seldom defined before the end of a week or ten days. The dead are then separated from the living parts, and an abundant suppuration takes place from the denuded surface. The solution of continuity is often imperfectly repaired in consequence of the exuberant production of granulations, which, instead of acquiring the organization of the cutaneous texture, assume that of contractile tissue, which often gives rise to great deformity of the parts with which it is connected. The general as well as the local effects of intense heat in case of burns and scalds, are proportioned to the extent and violence of the injury produced by this agent. They are characterized by excessive pain, great mental agitation, and extreme thirst; the pulse is rapid and hard, the skin hot, and the secretions in general are diminished in quantity.

If a remission of these symptoms does not take place soon, the pulse becomes small and feeble, and the skin covered with a cold sweat; the sufferings of the patient are announced by wild delirium; or he sinks into a state of stupor accompanied with convulsion. In some cases of violent and extensive burns, these symptoms make their appearance almost immediately after, and are followed by death in the course of a few hours.

The general symptoms are greatly modified by the situation of the burn or scald, independently of the age, constitution, and temperament of the patient. For it has been observed that a burn of any of the extremities gives rise to much less constitutional disturbance than a burn of the walls of the chest or abdomen, although it may be of the same degree and extent in each of these parts. The greater functional derangement in the latter case depends, no doubt, on the vicinity of the disease to the important organs contained in the abdominal and thoracic cavities.

It has been asserted that the mucous membranes, and especially the digestive mucous membrane, are not only inflamed in all cases of burns of any considerable extent, but that the secondary fever that follows is chiefly owing to this lesion of the digestive organs.

With regard to the latter statement, nothing can be more obviously erroneous, as the intensity of the pain in all such cases is in itself sufficient to produce the secondary fever. However far the former statement may be correct, we have not had sufficient opportunity to determine. We have seen the respiratory and mucous membranes red and vascular in one fatal case, the patient having died at the end of four days. In two other cases this membrane in both of these organs was pale, and without any appreciable lesion. These two patients were females, and had the inferior half of their bodies severely burnt from their clothes having caught fire: both of them lived seven or eight days. It is possible that the difference in the duration of the disease in these cases may have had some share in effecting the difference observed in the state of the mucous membrane after death. But it is of greater importance to observe that the secondary symptoms were equally severe in all the three patients.

With regard to the local and general treatment of burns and scalds, we shall only observe that, in the latter, antiphlogistic measures, carried to the extent which the individual case demands, must always be had recourse to, although the secondary fever, when it occurs at an early period, and depends more on the shock which the system has received and the violence of the pain, is but little under the control of such measures. More benefit is derived from the administration of anodynes, and the use of those means which the surgeon has found to be most successful in allaying the local heat and pain of the injured part. Opiates are particularly useful in abating the great nervous excitement which accompanies this form of fever, and in procuring a temporary respite from suffering.

It is of much importance to distinguish between the febrile excitement which immediately follows the injury, and the secondary fever which is the consequence of the subsequent inflammation. As in the latter case, general bloodletting is always more or less useful. The same indication is pointed out when inflammation of an internal organ has taken place, although leeching and cupping are oftener to be preferred to the lancet. In stout young persons of a sanguine temperament it may be necessary to employ both.

2. *Mortification from cold.*—The local and general effects of intense cold are, in many respects, very similar to those produced by intense heat. If the degree of cold be not very great, the circulation and temperature, of the skin for example, when submitted to its influence, are increased, as is shewn by this tissue assuming a redder colour, and feeling warmer than before. On the contrary, if the cold be very intense, it may not give rise to any appreciable degree of local excitement; the vitality of the skin, and even of the deeper-seated tissues at the same time, may be either greatly reduced or entirely destroyed by the direct operation of this physical agent. There is, however, this difference between the local effects of heat and cold, viz. that the former may produce complete disorganization of the tissues submitted to its action; whereas the latter never produces such a change. In the former the local redness rapidly increases, in the latter it rapidly diminishes; and in the same manner does the sensibility increase and decrease under the influence of these agents respectively. (We are now speaking of the immediate, and not the subsequent effects of cold.) The general effects, or functional disorder produced by the immediate operation of cold, are very different from those produced by heat. If the cold has been limited in its operation to the extremity of a limb, complete death of the part may ensue without any general functional derangement being induced. But if the whole body has been exposed to its operation, every function becomes depressed, and a state of lethargy soon succeeds, from which the patient is often not to be roused, either by the entreaties of his friends or the best directed efforts of the physician.

The symptomatic fever which follows the local effects of cold does not take place until inflammation has succeeded to these effects, for it depends exclusively on the presence of this morbid state; and hence the similarity said to exist between the symptoms of mortification from cold, and those of mortification from heat. It is, in fact, only after the occurrence of inflammation that the local and general symptoms of mortification from these two causes acquire a striking similarity in kind, if not in degree.

Although a state of gangrene and sphacelus of a limb or a portion of a limb may be induced by the direct operation of intense cold, we may not be able to determine the existence of either until inflammation has taken place. It is, however, said that the toes and fingers have been seen to fall off, having been deprived of life on account of the intensity of the cold. But by far the most frequent occurrence of mortification is when a frozen limb is exposed to natural or artificial heat, as before a fire or during thaw. The blood that was before frozen thus regains its fluidity, and gangrene and sphacelus, if they were not previously, are now more or less rapidly induced. Under these circumstances, the skin assumes a dark red or livid colour, where it is in a state of gangrene or sphacelus, and the neighbouring skin acquires an erythematous blush, accompanied with a prickling or tingling sensation, and a feeling of weight or stiffness in the limb. By-and-bye phlyctenæ appear on the inflamed part of the limb, and grey, livid, or black spots on that part of it which is in a state of sphacelus. Then also putrefaction commences, and extends till its progress is arrested by the adhesive inflammation. In this kind of mortification, as well as in every other, the extension of the sphacelus depends much on the degree of the subsequent inflammation, to subdue and still more to prevent the occurrence of which every means ought to be promptly and sedulously employed.

The treatment of a frozen limb, for example, consists in rubbing it with snow or pounded ice, in order to re-establish gradually its sensibility and circulation, and afterwards the use of a circular roller carried from the toes upwards, the good effects of which depend on the obstacle which it opposes to the accumulation of the blood in the limb, and to the distention and swelling to which the presence of this fluid and the subsequent effusion of serosity give rise.

3. *Mortification from stimuli.*—The stimuli included under the present head, and which give rise to mortification, are those which exercise a chemical influence on the tissues with which they come in contact. The nitric, muriatic, and sulphuric acids may be cited as furnishing us with examples of chemical stimuli which produce local death when they are applied to the skin or mucous membrane of the digestive organs. The local effects of these substances resemble very much those produced by intense heat. Like the latter physical agent, they instantly destroy, to a greater or less depth, when strong, the cutaneous and mucous tissues. In both cases the vitality and texture of these tissues are destroyed, and the functional derangements of the economy are also very nearly the same, particularly when the former have been applied to the digestive mucous membrane. The functional derangement too, which follows the action of these chemical stimuli, does not arise in consequence of absorption, but, as is the case in intense heat, from the sudden shock which the nervous system receives at the moment they are applied, and the state of excitement of this system from the inflammation to which they give rise. Instead of a state of complete local death or sphacelus, we may have as the result of their action, when diluted, a state of gangrene, or simply inflammation, and which may, as in similar states produced by other causes, terminate in sphacelus. A state of sphacelus is, however, the far more frequent effect of their immediate operation in the undiluted state, to which inflammation occurs as a subsequent change, and which seldom proceeds, unless in the mucous membranes, beyond that degree necessary for the elimination of the dead part.

The local effects of these chemical stimuli are not often confined to one portion of the cutaneous or mucous tissues; they are generally perceived on several portions of both, the form and extent of which are subject to great variety, more particularly in the stomach; the states of vacuity and fulness, or the nature of the contents of this organ, modifying in a greater or less degree both of these local circumstances.

The changes of colour which indicate that local death has been produced by these chemical stimuli are well known; they are either yellow, yellowish brown, brown, or black, changes which seem to depend much on the quantity of blood contained in the part, and the strength of the acid which has been applied to it.

Perforation of the stomach, giving rise to a communication between the cavity of this organ and that of the peritoneum, is not unfrequently the consequence of the introduction of these acids into this organ, and we believe that when it does take place, it is generally soon after their introduction, and before the peritoneal inflammation which ensues has been sufficiently long established to furnish coagulable lymph, and unite some neighbouring organ with the stomach opposite that part of it which has been acted upon by the acid. Under these circumstances, therefore, the perforation is not the consequence of the separation of the sphacelated tunics of the stomach by their subsequent inflammation, but is the result of their immediate and complete destruction.

There are several important points connected with this part of our subject which merit particular consideration, more particularly the changes of colour and consistence to which chemical stimuli give rise in the mucous membrane of the stomach, to the former of which we have already alluded, but into the consideration of which we do not think it necessary to enter in this place, as we have already insisted on similar changes in the article Melanosis, where we have endeavoured to show that they may be produced by the action of the gastric acid after death, and present appearances so similar to those of the former as to lead the toxicologist and medical jurist to commit the most serious mistakes. As these chemical stimuli are classed among the poisons, we refer the reader to the article Toxicology for a description of the symptoms to which they give rise, and the treatment which they require.

III.—Mortification from the deleterious influence of certain poisons.

The poisonous substances which we propose to include under the present head are those which are derived from the animal and vegetable kingdoms. Some of these substances are natural, others morbid products. The former consist in a peculiar healthy secretion of certain animals, which is capable of producing disease or death in other healthy animals, and for which we have no distinctive appellation except the vulgar term of *venom*. The latter, derived from the animal kingdom, are generated by a state of disease of the animal solids and fluids, are capable of producing the same morbid state to which they owe their formation, when communicated, directly or indirectly, from one animal to another, and are termed *virus*. We have no specific denomination for the deleterious agent generated by the decomposition of animal matter, and by that diseased state of rye which gives rise to mortification.

Mortification arising from these different sources may be considered with advantage under the following heads:—1. mortification from a deleterious agent generated in healthy animals; 2. mortification from a deleterious agent generated during the decomposition of animal substances, and in animals in a state of disease; 3. mortification from a deleterious agent generated in vegetables in a state of disease.

1. *Mortification from a deleterious agent*

generated in healthy animals.—We have already said that a peculiar healthy secretion of certain animals is capable of giving rise to mortification, when directly applied to the body of another healthy animal. The most striking examples of this are met with in the effects which follow the bite of the *cobra di capella*, the rattle-snake, and the viper. When the poison of these animals is inserted into the cutaneous and cellular tissues of one of the limbs, the most acute pain is produced, which rapidly extends in both directions towards the extremities of the limb; the cellular tissue becomes œdematous, much swollen, and hard. If there be any redness of the skin around the wound, it is of short duration, and is succeeded by a livid discoloration, which increases in extent, followed by the formation of phlyctenæ, and diminution of the temperature of the affected part. The hard œdematous swelling of the skin and cellular tissue then becomes soft, crepitates when pressed, and a sanious discharge of a fetid odour runs out from the wound. During the short time these local changes are taking place, the functional derangement produced by the absorption of the poison proceeds with extreme rapidity, and it may terminate in death in the course of a few hours. Almost immediately after the insertion of the poison, a sense of great oppression is felt in the region of the heart; the respiration becomes laborious; there is great pain in the head or vertigo, and frequently pain in other parts of the body, but particularly in the stomach and intestines, accompanied with vomiting and diarrhœa; vision is also sometimes much impaired, and the pulse small and intermittent. As the influence of the poison becomes more extended, to these symptoms are added extreme debility, great anxiety, the most unquenchable thirst, cold sweats, hiccup, and frequent fainting fits; the skin assumes a sallow jaundiced aspect, and the breath becomes extremely offensive. Such is a general description of the local and general effects which follow the insertion of the poison of these animals into the cutaneous and cellular tissues. Although the local treatment is strictly surgical, we may state here that it consists, as recommended by Celsus, and very recently by Sir David Barry and others, in the application of a ligature to the limb between the wound and the heart, so as to arrest the venous circulation and intercept the poison; the use of the cupping-glass, and the actual cautery. Various topical remedies are recommended, and are said to have been employed with success. Indeed, the local appears to be much more successful than any general treatment that has yet been devised, in arresting the progress, or in preventing the baneful effects of the poison of these animals. The liquor ammoniæ is regarded as the best internal remedy that can be employed. It is also said that stimulating sudorifics have been found useful; but it does not appear that much reliance is to be placed on the use of internal remedies when the poison has once entered the system, and when it possesses such a degree of virulence as to destroy the vitality of the part to which it is originally applied. It is to such cases alone that our observations apply, as in milder cases mortification seldom occurs in consequence of the direct application of the poison.

2. *Mortification from a deleterious agent generated during the decomposition of animal substances, and in animals in a state of disease.*—The production of mortification from a septic agent, generated during the decomposition of animal substances, or in animals in a state of disease, being introduced into the blood or applied to the surface of the body or of sores, is by no means a rare occurrence. The most obvious and frequent examples of mortification of this kind are met with in the bodies of those who have died from mortification of some external part of the body, from whatever cause arising. Mortification of a portion of a limb, succeeding to inflammation, to a mechanical injury, to an operation, is often followed by mortification of some internal organ. The same may be said of mortification of one internal organ, giving rise to mortification of another internal organ, although it is by no means so frequently observed as in the former case. We have seen a considerable number of cases of gangrene and sphacelus of internal organs originating in the existence of similar states on the external surface of the body. That such is frequently the origin of mortification of internal organs there cannot be the slightest doubt; for it occurs when this disease affects an external part of the body from inflammation, as urgical operation, or other causes to which the internal organs, which are afterwards found to be in a state of mortification, were in no way whatever subjected. The septic principle is carried into the blood, and appears to give rise to a state of gangrene or sphacelus, without these being preceded by any perceptible intermediate change. For when we examine the organ thus affected, we do not perceive any of those changes which accompany inflammation, such as red induration or suppuration; nor are there any symptoms during the life of the patient which indicate the presence of a local disease. The lungs and liver may be extensively affected without the functions of either undergoing any modification which indicates the existence of such a disease. They are, however, modified, as well as those of every other organ of the body, by the contaminated state of the blood, to which we have already ascribed that peculiar assemblage of symptoms which make their appearance at the close of the fatal termination of sphacelus.

The morbid appearances of this kind of mortification of internal organs present several peculiarities. The tissues of the organ do not, as we have already said, exhibit any of those changes which constitute the anatomical characters of inflammation. They are, on the contrary, found to present those appearances which we observe on a part of the external surface of the body to which a virulent poison has been applied, viz. a circumscribed dull deep-red, livid, brown, or black colour, in which state they feel firmer than natural; or

they are of a dirty grey colour, of a soft pulpy consistence, or entirely decomposed and transformed into a grey or reddish-brown fluid of the consistence of pus, around which the other tissues may not present any material alteration. These appearances are most frequently observed in the lungs and liver. They may exist in several points of these organs at the same time; may occupy an extent of surface varying from the fourth of an inch to two or three inches; and are much more frequently situated towards the external surface, than in the central parts of these organs. In the lungs they are generally seen under the pleura, and if the patient survives a certain length of time the contaminating influence of the poison to which they owe their origin, the pleura sloughs, and pneumothorax is produced. We have seen two examples of this termination of sphacelus of the pulmonary tissue and pleura, arising in, or connected with, sphacelus of the ankle-joint in one patient, and in another with sphacelus of the larynx.

The production of gangrene and sphacelus from a septic agent generated in a state of disease is no less conspicuous in what is called *hospital gangrene*. Whatever may be the causes of hospital gangrene, this local disease may be communicated by means of the fluids of the diseased part being brought in contact with the surface of common sores, a scratch or prick, and, it is said, with the healthy skin. When the disease is thus produced, for example in a sore, the surface assumes a pale or livid aspect, becomes swollen and painful, and covered with a viscid grey matter tinged with specks of blood. The surrounding integuments soon present the same appearances, are converted into dirty-grey spongy sloughs, the extent of which, as well as the progress of the disease, is marked by the preceding discoloration, which is often of an erysipelatous character, affecting at the same time the skin and subjacent cellular tissue, and thence the adjoining lymphatic glands, which are also destroyed in the manner above stated. But although the state of sphacelus be often preceded by an erysipelatous redness, the separation of the dead parts is always accompanied by more or less hemorrhage, which shows that the plastic property of the blood by means of which hemorrhage is prevented, as well as the vitality of the solids, is destroyed in this kind of mortification. Dr. Hennen, in his *Principles of Military Surgery*, states that in the last stage of the disease there is a bloody oozing from the surface of the denuded parts; that in lifting up the edge of the flabby slough, the probe is tinged with dark-coloured grumous blood, with which its track becomes immediately filled, and that at this period of the disease repeated and copious bleedings take place which rapidly sink the strength of the patient. The sloughs, whether falling off spontaneously, or detached by art, are thickly studded with specks of arterial blood; and when hemorrhage takes place from an artery which it is necessary to tie, and which is ruptured by the ligature, the application of the tourniquet or other pressure is employed in vain, for while it checks the bleeding, it accelerates the death of the limb, which becomes frightfully swollen and horribly fetid.

The constitutional symptoms of this kind of mortification sometimes precede the local affection, at other times do not make their appearance until it is fairly established. But however this may be, they are characterised by greater or less derangement of the digestive functions, a feeble and quick pulse, and great weakness of mind and body. "Men," says Dr. Hennen, "who had borne amputation without a groan, shrunk at the washing of their sores, and shuddered at the sight of a dead comrade; or even, on hearing the report of his death, predicted their own dissolution, and sunk into sullen despair." The fatal termination of this frightful form of mortification is announced by extreme prostration, vomiting, hiccup, involuntary dejections, and coma.

The treatment of the present form of mortification will depend much on the state of body and mind of the patient, and the situation in which he is placed. When it occurs in a healthy individual, his removal from the place in which it was communicated to him, and the topical application of those remedies (the concentrated acids or actual cautery) which are now found to be most efficacious in arresting the progress of the disease, will in general effect a speedy cure. In such means, also, consists the most essential part of the treatment which the situation of those patients will allow in whom the disease occurs spontaneously, that is to say, without any direct cause, and whose mind and body have suffered from the injurious influence of disappointment and privations of various kinds. Cheering prospects, wholesome food, and change of situation, are well known to be the most effectual means of preventing and checking the ravages of this disease in hospitals, or other situations, in which a greater or less number of patients are confined, and without which all our remedies are often entirely useless, or procure only a temporary or partial benefit.

The next form of mortification produced by a septic agent generated by disease is that which is called *pustule maligne*, or *charbon* by the French, and *milzbrand* by the Germans. By some pathologists this disease is believed to originate in horned cattle, among which it sometimes prevails epidemically to a very great extent, and that when it occurs in man, it is always derived from such animals. By others it is said to occur *sporadically* in persons who have no connexion, either directly or indirectly, with animals so diseased. Be this as it may, the important fact is, that a septic principle is generated in this disease, which possesses the property of communicating a similar disease from one animal to another and from person to person. Hence it is that herdsmen, butchers, and tanners, and all other persons who handle the skin, blood, and flesh of these animals, are those in whom the malignant pustule or carbuncle is generally observed. Enaux and Chaussier regarded the occurrence

of the disease in such persons as strong proof that it was communicated to them by immediate contact; and in further support of this opinion, they adduce the facts that malignant pustule makes its appearance exclusively on those parts of the body which are usually uncovered, such as the face, neck, breast, and shoulders; the hands and arms, feet and legs; and that in general it is observed in such persons when it reigns endemically among cattle.*

Numerous examples are recorded of malignant pustule being communicated in the manner above alluded to, as well as of its being communicated to persons employed in dressing those affected with the disease. The blood appears to be strongly impregnated with the septic principle generated in this disease, for parts of the body on which this fluid has been deposited have soon after been affected with malignant pustule, and similar effects follow its injection into the veins, as was the case in the experiments of MM. Leuret and Hamont.†

Those who eat the flesh are also often affected with an eruption of malignant pustules, and other symptoms similar to those which the animal from which the flesh was taken presented.

Malignant pustule commences in the form of a small vesicle, filled with a somewhat bloody serosity, accompanied with a circumscribed œdematous swelling of the skin and cellular tissue beneath it, which soon extends in breadth, followed by an erysipelatous redness of the skin. As the swelling increases, the skin acquires a glossy aspect, and presents here and there small and large phlyctenæ. The erysipelatous redness soon assumes a livid tint; the central portion becomes brown or black, hard and insensible, whilst the surrounding parts are tense and emphysematous. These changes are produced with greater or less rapidity, and sometimes extend to a considerable distance, followed by extensive sloughing of the skin and cellular tissue. The local and general symptoms of malignant pustule resemble very much those which follow the bite of the viper, &c. which we have already described, and require nearly the same treatment.

Maurand‡ relates some cases of malignant pustule produced by the flesh or blood of overdriven cattle, although their bodies presented no appearance of disease. It would appear that the flesh of such animals may be eaten with impunity when cooked, but that if the blood or raw flesh be applied to the wounded skin, or even to the unbroken skin, diffuse cellular inflammation is excited, or malignant pustule produced, which frequently terminate fatally; and M. Dupuy states that the malignant pustule or carbuncle of cattle may be produced by applying to a wound the blood of an animal that has died of gangrene of the lungs.§

The carbuncle of plague and the malignant pustule present precisely the same local characters as those which we have just described, and seem to owe their origin to a similar cause, viz. the development of a septic agent, and which in the former seems to be formed during the progress of the disease in which it is observed. The number of the pestilential carbuncles vary considerably, and are generally in proportion to the gravity of the disease which they accompany, and in which they originate. Pestilential carbuncle, like malignant pustule, may be communicated by contact or inoculation; and it is said by Diemerbroëck and Desgenettes, may prove fatal without giving rise to the general symptoms of the plague.*

There can be no doubt that a septic agent is developed during the decomposition of animal substances, apart from the living body, capable of producing mortification. This state, however, is always preceded by erysipelatous inflammation, which spreads with great rapidity and proceeds to a great extent, and followed during its progress by extensive sloughing of the skin and cellular tissue, and is accompanied by the same kind of general symptoms that characterize the action of all septic agents on the economy. It is difficult to say how far wounds received in dissection or in the inspection of dead bodies, and which are followed by diffuse erysipelatous and gangrenous inflammation, depend on the presence of a septic agent developed during the progress of disease, or after death. One thing is certain, that the frequency and severity of the disease which follows such wounds, has, so far as we can perceive, no connexion with the ordinary changes of the solids and fluids produced by putrefaction; for the results of our own experience are in accordance with the generally received opinion, that it most frequently occurs after wounds received in the examination of recent bodies, and also in the bodies of those who have died of inflammatory effusions into the serous cavities. Nevertheless similar consequences follow pricks and wounds from putrid bones, and the contact of putrid animal matter with the abraded surface of the skin; and Cullerier says that gangrene sometimes attacks the penis of those persons employed to clean out the cesspools in Paris, if they are affected at the time with gonorrhœa.

It would appear that a septic agent is developed in various grains in a state of disease, but more particularly in rye, which, when used as an article of food, has frequently given rise to one of the worst forms of mortification. This form of mortification has, perhaps, been exclusively observed in various parts of the continent of Europe, and particularly in those districts of France, Germany, and Switzerland, in which rye forms the chief article of food of the inhabitants. In these and various other parts of the continent, the local and general effects of spurred rye, as it is called, have been

* Enaux et Chaussier, Méthode de traiter les morsures des animaux enragés, &c. suivie d'un précis sur la pustule maligne. Dijon et Paris, 1785.

† Journal des Progrès des Sciences Médicales, 1827.

‡ Histoire d'une Maladie très singulière, &c. in Hist. de l'Acad. des Sciences, 1766, i. 97.

§ Revue Médicale, 1827, ii. 488.

* *Diemerbroëck*, Tractatus de Peste, 1665. *Desgenettes*, Histoire Médicale de l'Armée d'Orient, 1802.

observed and described by several physicians, but it was not until the year 1597 that they were traced to the internal use of that diseased grain. Since then repeated epidemics have occurred, and always during rainy seasons, and which have prevailed most in places naturally moist and of a poor soil,—circumstances to which, in fact, the ergot or cockspur owes its origin. We shall not stop to enquire into the causes of the spur in rye, and besides shall confine ourselves to a general description of its effects. The effects produced by the use of spurred rye as an article of food are very various. In some individuals the influence of the poisonous ingredient is chiefly exerted on the brain and nervous system, the most remarkable symptoms being vertigo, dimness of sight, pain, loss of sensibility, cramps and convulsions, yellow discoloration of the skin, thirst, and feeble pulse. These symptoms are greatly modified in degree in different individuals, and are sometimes slow, and at other times very rapid in their progress. In the most acute form of the disease death may take place at the end of one or two days, preceded by dreadful cramps and convulsions of the whole body. Even in the milder cases, the convulsions are more or less severe towards the fatal termination of the disease; and hence this form of the disease is called *convulsive* ergotism by French writers, and is vulgarly denominated in Germany *kriebelkrankheit*, or creeping sickness. In other individuals, placed apparently in similar circumstances, the most remarkable effect which follows the operation of the same septic agent is gangrene or sphacelus of certain parts of the body. Hence this form of the disease has received the name of *gangrenous ergotism, necrosis ustiliginea, seu epidemica.*

The local, like the general effects of spurred rye, present considerable variety. The following description of them taken from the works of those authors who have witnessed the disease in various parts of the continent, contains the principal forms under which they have appeared. In one class of patients seen by Dodart, the disease was characterized by vertigo, a malignant form of fever, great drowsiness, and gangrene of the inferior extremities. The gangrene was preceded by a sensation of numbness in the legs, which became afterwards painful, slightly swollen, but not inflamed. The skin was cold and livid, and the sphacelus commenced in the centre of the limb, and did not reach the skin till some time after.*

In a second class of patients, in which the disease was observed by Noël, surgeon to the Hôtel Dieu of Orleans, the sphacelated parts were dry, livid, or black: these appearances commenced in the toes, and gradually extended sometimes as far as the thighs. In some the sphacelated parts separated spontaneously; in others the progress of the disease was arrested by scarifications.

Lang, who observed the gangrenous ergotism in Lucerne, Zurich, and Berne, says that the disease commenced with lassitude and a sensation as of insects creeping under the skin, without fever. Soon after the extremities became cold, pale, wrinkled, and benumbed, and at last quite insensible and incapable of motion; afterwards acute pain was felt, referable to the central parts of the limbs, which was exasperated by heat and mitigated by cold applications; there was then, also, fever and headach; the pain extended from the hands and feet to the shoulders, legs, and thighs; and lastly, the affected parts became dry, shrunk, and black, and dropped off at the joints. Entire extremities were thus separated from the body without hemorrhage. Many patients lost both legs, several the arms, and a few both legs and arms.* In other cases, the chief symptoms were, at first, spasmodic contractions of the limbs, afterwards great weakness of mind, voracity and dyspepsia, which generally terminated in fatuity or sphacelus.† The parts most frequently attacked with gangrenous ergotism are the inferior extremities. Men are more subject to the disease than women, and children and old people than adults.

From the above description of the local and general effects of spurred rye, it is by no means easy to say in what manner this poisonous article of food operates so as to produce mortification. One thing, however, appears certain, that it is not by an inflammatory process of the part which becomes the seat of the disease. That cessation of the circulation and loss of the sensibility and motion of the limb observed to take place at an early period of the disease, are not the consequences of inflammation, is clearly proved by the nature of the local, if not the general symptoms which we have detailed. All these local changes appear to be produced as direct consequences of the spurred rye, acting through the medium of the blood or nervous system, or both at the same time. For we have seen that the dead parts are separated without hemorrhage, and it is stated that the blood, when taken from a vein, is dark and so very thick that it only oozes out from the orifice of the wound.

In several animals who died after having been fed for some time on spurred rye, and who presented several of the symptoms already mentioned, gangrenous spots are said to have been found in the stomach, intestines, and liver. But the morbid anatomy of this disease is extremely imperfect, and does not enable us to offer any explanation either in regard to the nature of the disease itself or its complications; or to suggest any means other than those already employed in its treatment, and which may be said to be almost entirely empirical. Bloodletting, emetics, and purgatives have been employed by some; tonics and stimuli by others; and lastly, anodynes and narcotics, all of which methods of treatment appear to have been more or less successful in one form of the disease, and of little or no avail in another. Stimu-

* Journal des Savans, 1676.

* Descriptio morborum ex usu clavorum secalinorum cum pane, 1707.

† Rust's Magazine, xxv. to which the reader is referred for a detailed account of the local and general effect of spurred rye.

lating lotions, warm fomentations, and friction appear to mitigate the local symptoms, and along with the general treatment, sometimes to arrest the further progress of the disease.

(R. Carswell.)

MUMPS.—See Parotitis.

NARCOTICS, (from νάρκη, *stupor*,) syn. *hypnotica*.—These are medicines which in small or moderate doses produce temporary excitement succeeded by depression, which is generally followed by sleep. This definition does not comprehend the anodyne power strikingly displayed by many narcotics; because, although it is undeniable that many of them are capable of alleviating pain, yet, as this is not a general property of narcotics, it cannot correctly enter into a definition of the class

Narcotics are commonly confounded with sedatives, but there are sufficient reasons for separating these two classes. In the first place *narcotics* operate as diffusible excitants, and by a proper regulation of the dose, and its administration at short intervals, their exciting influence only is obtained; in the second place, the depression or collapse which follows the administration of the full dose of a narcotic is the result of the previous excitement; and although this is not in the direct ratio of the degree of excitement, yet, if the excitant effect be considerable, and raised to its acmé, the succeeding collapse is proportionate. On the other hand, *sedatives* immediately depress the vital energies by a peculiar action upon the nervous centres, without causing previous excitement; and, if the dose be sufficiently large, they destroy both mobility and sensibility. Such are the distinctions between the effects of the administration of narcotics and sedatives, —distinctions undoubtedly sufficient to authorize the separation of these classes of medicinal agents.

The first effect of a moderate dose of any narcotic is an augmentation of the action of the heart and arteries, followed by an elevation of the heat of the whole body, and a slight sensation of fulness in the head. These symptoms are accompanied with an unusual exhilaration of spirits and aptitude for exertion; effects which, however, in a little time subside, and are followed by languor and drowsiness, gradually terminating in perfect sleep. The augmented arterial action is succeeded by a small, feeble, and irregular state of the pulse; the temperature of the body is lowered; and the respiration, which in the first instance was accelerated in the ratio of the augmented vascular action, falls below the natural standard; an imperfect decarbonization consequently is effected in the pulmonary circulation; so that the blood transmitted to the brain being inadequate for due excitement, the whole system necessarily languishes. The function of the skin is, however, increased, and passive diaphoresis occurs, accompanied by itching and the dilatation of all the erectile tissues: finally, the glandular excretions are diminished, the mouth feels dry, and both the bile and the urine are evidently defective. The influence on the stomach varies according to the state of the organ; if the narcotic be taken into an empty stomach, it diminishes the desire for food; if swallowed at the time of taking food, the organ is enervated, and chymification suspended; if a short time after a meal, the process of digestion is arrested; and if vomiting be excited an hour or two afterwards, the food is ejected in the state in which it was swallowed. The same effects follow the introduction of a narcotic into the rectum: the intestines, besides, frequently lose their ordinary contractility, and costiveness ensues. This, however, is the result of a moderate dose of only some narcotics; others rather increase than diminish the peristaltic motion of the intestinal canal.* After awaking from the sleep induced by a narcotic, the individual frequently experiences slight headach, some degree of nausea, languor, and a more than usual susceptibility of impression, with tremors of the hands, which continue until some excitant, such as coffee or a glass of wine and water, be swallowed. By degrees these symptoms subside, and the system remains in its accustomed state, unless the dose of the narcotic have been more than can be termed moderate, in which case headach, sometimes vertigo and confusion of ideas supervene and continue for several hours; whilst anorexia, constipation, and a scanty urinary discharge are experienced for a considerable time, and the individual is left weak and uncomfortable.

If the dose of the narcotic substance be so large as to prove poisonous, headach, vertigo, imperfection of vision, and stupor, are experienced, without any previous apparent excitement; the person soon becomes motionless and insensible to external impressions; he breathes slowly; and for some time the expression of the countenance denotes only sound and deep repose. By degrees the features change, and acquire a ghastly character; the breathing, under the influence of some narcotics, is stertorous, as in apoplexy, under that of others it is soft and natural; the pulse becomes irregular, sinks, and at length is almost imperceptible; the muscles relax, the jaw falls, and death rapidly closes the scene. Many of the symptoms following the administration of such large doses of narcotics resemble, in some respects, those attending *apoplexy*; in others, those of *epilepsy*; and occasionally those of *hypertrophy* of the brain; but in every case the distinction is apparent, when the circumstances preceding and attending the attack are duly investigated.

* These effects of narcotics on the alimentary canal are greatly modified by disease. In subacute inflammation, or a highly irritable state of the mucous membrane, vomiting is not unfrequently induced; in a relaxed condition of that membrane, the atony is augmented, and indigestion and constipation confirmed; in cancerous ulceration of the stomach, instead of allaying pain, narcotics cause pain, and excite vomiting and rigors, and the brain becomes powerfully affected. In irritable states of the intestinal canal, however, especially when spasm is present, they allay griping, resolve spasm, and produce an anodyne and salutary effect.

Thus, in apoplexy there are generally premonitory indications of the threatened attack; and when the sopor has commenced, the patient cannot be roused to any consciousness, which is not the case in narcotic poisoning. The same kind of sopor attends epilepsy; it terminates suddenly, and the attack of the paroxysm is abrupt. Cerebral hypertrophy is a slowly progressing chronic affection.

The influence of narcotics is modified by a series of circumstances; for example, by the nature of the narcotic, the extent of the dose, the time of the day at which it is administered, the combination in which it is given, the state of health of the individual, habits of life, age, sex, and temperament; climate, and idiosyncrasy. Before entering into the consideration of these, let us examine, briefly, the questions—do the effects of narcotics result from their direct influence on the nervous system? or is it secondary to their introduction into the circulation? These are points which have been long and strenuously agitated, and on which the most opposite opinions are maintained. There is no doubt that narcotics are in many instances received into the circulation, and that they are most active; indeed, so much so as to produce almost immediate death, when they are directly conveyed into it; as, for instance, by injection into the veins: yet even in this case their influence may be propagated by nervous communication, as we are led to conclude from the experiments of Messrs. Morgan and Addison,* who discovered that they produce in the sentient extremities of the nerves on the inner coats of the bloodvessels a peculiar impression, which is conveyed to the brain along these nerves. This is also demonstrated by the rapid effects on every part of the system which follow their administration by the mouth; often in a space of time too short to be the result of absorption. It is also well known that, when the dose has been so large as to be suddenly followed by fatal effects, the whole quantity of the narcotic administered has been found in the stomach. Some striking objections, it is true, have been made to the conclusions drawn from the experiments of Mr. Morgan and Dr. Addison; but the explanation of the manner in which the effects of narcotics are diffused over the body does not rest on their experiments: the nature of the nervous system enables us to comprehend readily the manner in which this communication of impression is effected.

The primary action of narcotics is not confined to the nerves of the stomach; for if any narcotic, opium, or atropia,† or daturia,‡ for example, be applied to the surface of the body, the same results follow, although in a diminished degree, as display themselves when they are taken into the stomach. If the application be made to an entire membranous surface, the energy of the narcotic influence is not in the ratio of the absorbing power of the surface; and if it be injected into the thorax, between the lungs and the ribs, the action is more energetic than when the narcotic is taken into the stomach. The absorption, however, of narcotics cannot be doubted; and when a narcotic substance is applied to a wound, it is probable that in this case it operates chiefly by its absorption into the blood;* but although its influence can be impeded by a ligature on the bloodvessels, yet its operation does not essentially depend on its introduction into the circulation. When it is injected into the veins, the animal, as has been already stated, instantly expires, and this without convulsions. In this experiment all the muscles of the body are rapidly deprived of their contractility; and, therefore, the action both of the heart and of the respiratory muscles ceasing, death must necessarily follow. If these remarks be correct, it is evident that narcotics operate on the *brain* and the *spinal column* by entering the circulation when they are taken in moderate doses; but when they are swallowed in quantities sufficient to prove rapidly fatal, this effect is the consequence of their immediate influence on the nervous system; and when they are taken into the circulation, their effects may be still referred to the direct impression which they make on the nervous system. The nerves most particularly affected by narcotics are the respiratory; for when artificial respiration is maintained for some time in an animal poisoned by a narcotic, the animal recovers.

A question naturally suggests itself—how do narcotics produce sleep? Much difficulty attends the solution of this question; but some approach towards it may be attained by keeping in view the state of the vital functions during sleep. In this condition of the body, the pulse beats more slowly than when the person is awake; the temperature of the body is diminished, the perspiration is decreased, and nearly all the secretions are suppressed. Now on whatever principle narcotics act, if their primary stimulant influence is followed by a diminution of the force and frequency of the circulation, and at the same time of the respiratory effort, the change of the venous into arterial blood must be necessarily impeded; and this alone, by weakening the energy of the brain, will cause sleep. Such, at least, is the theory which the writer of this article is inclined to offer. It may be objected that this explanation applies equally to all stimulants; and such is really the case, as all transitory stimulants, according to the extent of the dose, operate like narcotics, and produce sleep. But there is still something connected with the anodyne influence of narcotics which we cannot readily explain, and which requires a more intimate acquaintance with the nervous system than we at present possess.

Circumstances which modify the action of narcotics.

1. *Nature of the narcotic.*—The general effects

* An Essay on the Operation of Poisonous Agents on the Human Body. London, 1829.

† The active principle of belladonna.

‡ The active principle of stramonium.

* M. Lesieur of Paris applies narcotics to blistered surfaces in preference to their internal administration.

which have been described as resulting from the administration of a narcotic are those which opium produces. When acetate of morphia is substituted for opium, and a full dose is administered, another symptom displays itself: the patient, when in the horizontal posture, is attacked with shocks, as if electrified; the head is thrown backwards as in opisthotonos; and a paralytic condition of the bladder of urine supervenes, although there is no diminution of the secreting powers of the kidney. If the muriate of morphia be employed, little or no excitant effect is perceived, whilst the sedative influence is most obvious. Belladonna, hyoscyamus, and aconitum, are more directly anodyne, and even in small doses affect the sight more than any other narcotics; and when the two former are overdosed, and delirium succeeds, it more resembles the delirium of intoxication than that of narcotism. Irregularity of arterial action characterizes the operation of conium, the pulse being in some instances sunk, in others increased to one hundred or more during the whole time of administering the medicine. When over-dosed, the breathing is more oppressed, and the thorax more constricted than with any other narcotic, while the countenance assumes the aspect of that of a man who has been strangled. Digitalis accumulates in the system, and veratria (colchicum *autumnale*) operates chiefly on the duodenum, producing copious bilious stools; thus lessening febrile action, and allaying pain.

2. *Extent of the dose.*—The influence of small and large doses of narcotics has been stated; and in many morbid states of the habit they may be employed to produce either stimulant or sedative effects. Unless the dose be large enough to diminish sensibility, they cannot be administered with the view of procuring sleep. In cases of inflammation, after the use of the lancet, large doses of narcotics are generally productive of the most salutary effects; on the contrary, small doses are likely not only to counteract the benefit derived from the bleeding, by their stimulant influence, but, if their administration be repeated, to augment the evil. In all painful and spasmodic affections the extent of the dose is to be limited only by its effects: thus in tetanus, one hundred drops of the tincture of opium have been administered every hour with the best effect; and the writer of this article, in cases of gall-stones and renal calculi, has given upwards of eight hundred drops of the officinal tincture of opium in less than twelve hours, without any effect but that of relieving pain and aiding the passage of the concretions: indeed narcotics may be persevered in to any extent as long as they display no determinate action on the habit. The dose in such cases requires to be progressively augmented; if no relief be afforded in three or four hours, it should be doubled, and so on until the benefit anticipated be obtained.

3. *Period of the day.*—When narcotics are administered in the morning, especially on an empty stomach, considerable excitement is induced, and the anodyne and hypnotic effects of the medicine seldom follow; on the contrary, if the same dose be given in the evening, little excitement supervenes, and the desire of sleep is so great that it is impossible to avert it.

4. *Combinations.*—Narcotics, when uncombined with other substances, produce the effects already described; but in combination with many different substances, their operation is greatly modified. Thus, in conjunction with tonics, instead of checking chymification, they promote the appetite and favour the digestive function; aromatics oppose their sedative influence, and delay their soporific effect; combined with diaphoretics, whilst the function of the skin is augmented, their influence on the brain is diminished. Acids promote their powers; whilst alkalies, by decomposing their active principles, and withdrawing the acids which render their alkaloids soluble, diminish them, and in many instances render the narcotic inert. We shall notice these effects of combination in describing the individual narcotics.

5. *Habit.*—Narcotics lose their influence when they have been taken daily for a considerable time; and doses have been swallowed under such circumstances which would at first have proved fatal. This effect of habit in modifying the action of narcotics has not been satisfactorily explained, although M. Charvet has attempted it in reference to opium. He assumes that the state of congestion of the brain is admitted as the effect of an overdose of opium, and supposes that the frequent use of the drug renders this less considerable; or that the brain, accustomed gradually to the flow of blood and resulting compression, at length is enabled to bear it with impunity, in the same manner as when a serous effusion gradually occurs, or a tumour is slowly developed in the brain.* There is much ingenuity in this explanation; but the power of habit in modifying and resisting the influence of some narcotics is not extended to all; and, indeed, there is little similarity of action among narcotics: each has its own specific or peculiar action on the nervous system, a circumstance which enables the physician to accommodate narcotics to the constitution of his patient. This is peculiarly striking with respect to the anodyne and hypnotic properties of narcotics: after the failure of one, the administration of another will fulfil the intention of the subscriber whether it is intended to allay pain or procure sleep. It is an equally curious fact, and one of practical importance, that this force of custom in reference to one narcotic does not render the system less susceptible of the impression of moderate doses of another: the opium-eater, accustomed to take a drachm of his favourite narcotic daily, may be lulled to rest by a few grains of henbane or conium.

It is unnecessary to mention many instances in proof of the extent to which the doses of narcotics may be carried with impunity by those who have long accustomed themselves to their use. Russell, in his History of Aleppo, states that Mustapha Shatar, an opium-eater in

* *Charvet* de l'Action comparée de l'Opium.

Smyrna, took daily three drachms of the drug, and felt a necessity for increasing the dose. Dhere, a French author, mentions the case of an officer of the same nation who took a drachm of pure opium daily, and appeared in good health, although an alvine evacuation was procured once only in eight days, sometimes once only in fifteen days. But no work affords so much curious information on this part of our subject, and so displays the extent to which the doses of some narcotics may be carried, as the Confessions of an English Opium-eater. It is, nevertheless, true that the habitual use of narcotics wears out the powers of life, and leads on to premature old age. The symptoms which follow the use of opium, for example, thus indulged in, closely resemble those brought on by excess in venery; marasmus and decrepitude supervene; the mind equally suffers; and the wretched individual sinks into the grave a deformed and slavering idiot.

6. *Age.*—The younger the person, the more energetic is the action of narcotics on the system; they even prove injurious to the fœtus, when they are prescribed to relieve cramps, or allay inquietude in the mother: thence the necessity of caution in administering them to infants, in whom both convulsions and epilepsy have followed their use.

7. *Sex.*—Narcotics exert a more powerful influence on women than on men, a circumstance which might, *à priori*, be expected from the greater susceptibility of the female constitution. To pregnant females, also, narcotics must be administered with the greatest caution, as in this condition of the female habit a state of the cerebral function frequently occurs, which is augmented by the operation of narcotics, and might be productive of dangerous consequences.

8. *Temperament.*—There is but one opinion respecting the power of temperament in modifying the operation of narcotics. In the *sanguine* temperament the nervous system is highly sensitive and susceptible of every impression, and the body predisposed to inflammatory action. There can be no doubt that narcotics will produce a more powerful impression on such a temperament than on the opposite or *melancholic*. In those persons, for example, who are easily affected by wine, and in whom inebriety is quickly produced, a small dose of opium causes powerful cerebral excitement; thence the maxim of Tralles, "Illi vero omnes qui vinum non bene ferunt vix bene ferent opium." On the same account, a condition of habit likely to favour cerebral congestion is much more likely to be powerfully influenced by narcotics than a spare habit—a fact which ought never to be lost sight of in practice.

9. *Climate.*—The action of narcotics is powerfully modified by climate. The same dose of a narcotic which produces only beneficial effects in Great Britain, has been found to operate too powerfully in Italy; some attention is, therefore, necessary, in prescribing narcotics, to accommodate the doses to the nature of the climate in which the physician is practising. On the same principles, season modifies their action, and smaller doses are required in summer than in winter. These observations seem, nevertheless, at variance with the result of temperature on opium, the brain being less affected when the patient is kept in a temperature which excites perspiration than in one which is cooler. M. Hecquet* explains this influence of temperature in the case of opium, by saying, that as heat favours the flow of sweat, the opium is carried out of the habit with it, and is thus prevented from affecting the brain. Charvet supposes that, as copious sweating diminishes the mass of the circulating fluids, and renders the cerebral compression less powerful, the sweating may be regarded as a favourable crisis which guards the brain from over-compression. Both opinions are hypothetical; and it is more likely to depend on the greater irritability of the habit in warm climates than in cold, and the consequent greater susceptibility of impression.

10. *Idiosyncrasy* is more likely to influence the action of narcotics than any other classes of medicines. In some individuals opium, for example, even in moderate doses, produces restlessness, delirium, and convulsions; in others miliary eruptions; and in some its soporific effects are never experienced until the day following that on which it is taken.

With regard to the employment of narcotics, were it consistent with our plan to enter into the history of this class of remedial agents, we should remark on the very early period in which mankind appear to have been acquainted with their effects. In every nation and among every people, from the southern islander, who chews the kava, and with his own saliva manufactures the intoxicating bowl, to the polished European who indulges in the fermented juice of the grape, all seek in narcotics, not only oblivion from pain, but a balm for the cares and sorrows of life—"ducunt sollicitæ jucunda oblivia vitæ."

When narcotics are taken in over-doses, they produce the effects which have been already described: post-mortem examinations of the body display the brain gorged with blood; and not unfrequently water is found in the ventricles. In cases of supposed poisoning by narcotics, however, care must be taken not to confound the symptoms with those arising from diseases; in particular, apoplexy and epilepsy, which, as has been already stated, display symptoms closely resembling some of those attending poisoning by narcotics.

With regard to the *practical employment* of narcotics, it is obvious that they ought not to be prescribed in cases in which their primary excitement would prove hurtful, unless the dose be large enough to induce symptoms of diminished sensibility and lessened action without any previous excitement; and experience teaches us that this is the result when a large dose of a narcotic is administered, particularly when it is taken immediately after a copious abstraction of blood; but if the dose be small, the opposite effect follows, proving

* Vide Charvet de l'Action de l'Opium, p. 58.

that the patient may be either greatly benefited or materially injured by the extent of the dose of the narcotic, which it may be thought proper to prescribe. Thus if, in a case of pleurisy, the pulse be hard, quick, and forcible, and the pain of the side so acute as almost to prevent even a half inspiration, if a free bleeding be resorted to, two grains of opium in conjunction with the same quantity of calomel and a quarter of a grain of tartar emetic may be prescribed with the prospect of much benefit; but if half a grain only were ordered, not only would no advantage accrue from the narcotic, but the stimulant effect alone being obtained, the benefit of the bleeding would be counteracted rather than maintained, and the repetition of the dose would only increase the evil. In this respect the action of narcotics does not differ from that of direct stimulants. In all cases, therefore, of increased excitement, when pain or restlessness demands the administration of a narcotic, the dose should be sufficiently large to obtain at once its anodyne effect without the primary stage of excitement.

The stimulant influence of narcotics in small doses is frequently taken advantage of in the treatment of fevers of a low or typhoid type. The tincture of opium, for example, given in doses of ten minims at short intervals, augments the strength of the pulse, rouses the vigour of the system, and sometimes supports the strength.

Narcotics may be arranged under two distinct heads, namely, *direct narcotics* and *indirect narcotics*. Under the former may be placed all those substances which produce their effects by a direct impression on the nervous system, without necessarily entering the circulation: under the latter those which enter the blood before acting upon the nervous system; for even when they enter the circulation, their influence is still exerted upon the nerves. The continental physiologists have made many experiments to ascertain the manner in which narcotics operate, and have deduced this inference, that the narcotic must be transmitted to the brain through the blood before it acts; but it is more probable that in full doses direct narcotics operate by an immediate impression on the sentient extremities of the nerves.

The number of narcotics is considerable, but the most valuable are *opium* and the salts of *morphia*, *henbane*, *conium*, *belladonna*, *lactucarium*, and *camphor*. It is incompatible with the plan of this work to enter upon the natural history, chemical properties, and pharmaceutical preparations of these substances; it is to their importance and employment as remedial agents that we have to direct the attention of our readers.

Like all other narcotics, *opium* exerts a primary stimulant effect on the living system, whether it be introduced into the stomach or into the rectum, or injected into a vein, or applied to wounds or ulcers, or rubbed on the surface of the body. When taken into the stomach in a solid form, it undergoes partial digestion; this process separating, in a great degree, the active principles, the *meconate of morphia*, the *narceine* and *narcotina*: thence the salts of opium act more rapidly than the entire opium.* During the continuance of the stimulant effect of opium and its salts, the cuticular secretion is augmented, but some of the other secretions are diminished: the urine, for instance, is scanty and high coloured; and after this state is over, the pale, clay-coloured aspect of the alvine discharges indicates a greatly diminished excretion of bile. The stimulant effects of a moderate dose of opium are soon dissipated; and the administration of a much smaller dose, after a short interval, produces more intense effects than the first dose, although the reverse of this follows the continued use of the drug. If the opium be taken on an empty stomach, the excitement is greater than when it is swallowed soon after a meal: in the first case the pulse remains small, although hard, and symptoms of cerebral congestion rarely appear; on the contrary, symptoms of congestion appear sooner, and are more obvious, if the same dose be taken just after a meal. From experiments made by Dr. Crumpt and others, it is evident that the exciting influence of opium differs little from that of other stimulants; but the sleep which follows the excitement of wine and ordinary stimulants differs from that procured by the influence of opium; nor do these possess the power of opium in relieving pain: it is therefore fair to conclude that, in its sedative influence, opium is distinguished from all other stimulants.

Although it is probable that the effects of opium on the living system are attributable to

* The components of opium are—

1. *A volatile oil*, on which the odour of the drug depends, but existing in such small quantity that it can scarcely be procured in a separate form. Water distilled from opium contains it, and is productive of slight cephalalgia when snuffed up the nostrils, but it displays no other narcotic property.
2. *Gum*, including *bassorine*.
3. *Extractive*, partly simple, partly unusually oxydized.
4. *Resin*, with which the colouring matter is closely combined; and this in conjunction with the volatile oil may be the source of the stimulant property of the drug.
5. *Caoutchouc*.
6. *Narceine*, a new principle lately discovered by M. Pelletier; it is crystallizable, is soluble in water and alcohol; insoluble in ether; and has a bitter styptic taste. Its action on the animal economy is unknown.
7. *Meconine*, another new principle, also discovered by the same able chemist; crystallizable; little soluble in cold water, but very soluble in hot water.
8. *Morphia*, in combination with meconic acid as a bimeconate.
9. *Narcotina*, which has been supposed to be the stimulant principle of the medicine.
10. *Sulphates of lime and of potassa*.
11. *A brown acid*.
12. *Lignine or woody fibre*.

† An Inquiry into the Nature and Properties of Opium, &c. 8vo. 1793.

its direct influence on the nervous energy, yet it must be admitted that there are facts which tend to shake this opinion; and one of the strongest is related by M. Barbier, from which it appears that an infant was affected by the milk of its mother, who had taken a large dose of the wine of opium. But as alcohol is undoubtedly taken up by the absorbents, it is probable that the absorption of the opium in this case is to be attributed to the vehicle; and it is only by admitting the direct influence of opium on the sentient extremities of nerves, that we can explain the relief obtained in instances of severe pain.

Many circumstances, as has been already stated with respect to narcotics in general, modify the operation of opium on the living system. The first of these is age: opium operates with most energy on the young, consequently the greatest caution is requisite in administering it to infants, in whom it often excites convulsions; even in the state of syrup of poppies, too often administered to infants by lazy nurses. A low irritative febrile state, depending on the continued cerebral excitement produced by the medicine, gradually brings on marasmus, and undermines the powers of the constitution. The influence of sex is less than that of age; but still experience has proved that women are more easily affected by opiates than men.

The effect of custom in modifying the influence of opium on the system is so well known as scarcely to require it to be noticed. The extent of the dose to which it may be carried by those in the habit of taking it daily is wonderful, but still larger doses may be given to allay pain and spasm. Dr. Chapman mentions that, in a case of cancer in utero, he has given the tincture to the extent of three pints in twenty-four hours, without any other effect than that of relieving pain.

The combination of other substances with opium greatly modifies its action on the system. When combined with antimonials, not only are its diaphoretic powers increased, but it is rendered less likely to impede the other secretions. With acids, half the usual dose will produce the effects of a full dose, an effect evidently resulting from the production of a more soluble salt, the acetate, the citrate, the sulphate or the muriate of morphia, according to the acid employed. When we order it with the view of procuring sleep, we should not combine aromatics with opium, as these increase its stimulant, but lessen its sedative influence.

Morphia, the active principle of opium, exists, as we have already said, as a bimeconate in opium; but when it is separated from the other components of the opium, it is generally administered in combination with acetic, or muriatic, or sulphuric acid, as an acetate, a muriate, or a sulphate.* Any one of these salts, when administered in doses of a quarter of a grain repeated at short intervals, causes a sensation of fulness in the head, some obscurity of sight, tingling of the ears, cephalalgia, vertigo, and a tendency to sighing and sleep. The pupils are sometimes dilated, at other times contracted, and sometimes are not at all affected; the pulse is not much accelerated: occasionally there is a sensation of itching all over the skin, frequently nausea, and a difficulty in passing urine. In large doses the cerebral excitement is alarming. From some observations made by M. Bailly, in the Hôpital de la Pitié in Paris, it appears that full doses of acetate of morphia sometimes excited shocks like those of electricity, when the person was lying in the horizontal position: the muscles lost much of their contractility, and the sight was greatly impaired. As, in these cases, the pulse was diminished both in force and frequency, Bailly was led to infer that morphia acts as a sedative on the heart, and as a stimulant on the nervous system; it would, perhaps, be nearer the truth to say that it acts as a stimulant on the nerves of sensation, and as a sedative on those of motion. It seldom increases the temperature, although sometimes its salts greatly augment the exhalent function of the skin. In over-doses, whilst the upper part of the body is bathed in a viscid sweat, the lower extremities are cold; there are violent tremors; the body acquires a livid hue; the face has a pinched and cadaverous aspect; and death ensues without convulsions.

The *black drop* has all the properties of acetate of morphia in combination with aromatics.*

From what has been said, it is evident that in prescribing opium we must always keep in view both its stimulant and its sedative influence.

Practical employment of opium.—In *in-*

* Acetate of morphia is thus prepared: a specific quantity of morphia dissolved in alcohol is saturated, accurately, with pure acetic acid; and the solution evaporated with the gentle heat of a vapour-bath to dryness. The sulphate is prepared in a similar manner, care being taken to employ the acid in a dilute state. The muriate may be readily prepared by precipitating an aqueous solution of opium by means of muriate of baryta; a meconate of baryta, which is insoluble and falls to the bottom of the fluid, and a muriate of morphia which is soluble, are obtained. By evaporation of the fluid, the muriate crystallizes in tussocks consisting of aggregations of acicular crystals; by pressing these between colourless blotting paper, the narcotina is separated, and the muriate obtained in an impure crystalline state. It is purified by repeated solutions and recrystallizations.

* The black drop is prepared by rubbing half a pound of opium, reduced to powder, with four pounds of verjuice, one ounce and a half of nutmegs, half an ounce of saffron, and three ounces of sugar. These ingredients are fermented with yeast for six days; the fluid is then to be decanted, filtered, and inspissated in the air to the consistence of syrup. The strength of the black drop compared with that of tincture of opium is as three to one. An excellent preparation, which owes its activity to the citrate of morphia, is ordered to be thus prepared in the Brunswick Pharmacopœia. "Dissolve four ounces of opium in forty-eight ounces of water, acidulated with six ounces of lemon-juice; filter and evaporate to the consistence of an extract in a water-bath." The citric acid, in this case, decomposes the bimeconate of morphia, and affords a more soluble salt, the citrate of morphia, which is conjoined with the gum and extractive of the opium.

termittent fevers the employment of opium is as old as the time of Galen. The best time for administering it is an hour before the expected paroxysm, as at this time it weakens the force of the attack, and sometimes prevents its accession; a result probably due to its stimulant property, whilst, at the same time, its sedative quality allays the morbid irritability connected with ague. The dose should be large; for example, from forty to sixty minims of the tincture. When given during the hot stage, as Lind recommended, it renders that stage shorter and milder, lengthens the intermission, and greatly promotes the influence of bark or the sulphate of quinia in curing the disease. In combination with calomel, in doses of a grain of each, it also enhances the sanative powers of tonics, in cases which resist them when given alone. But if opium fail to check the accession, it should not be given in the succeeding paroxysms, as the repetition of it in such a case only tends to induce debility.

In *continued fevers* the use of opium is more questionable than in intermittents. It should not be ordered if the temperature of the surface be much greater than natural, unless there be a tendency to perspiration, which it accelerates, and thence proves beneficial. If pain and watchfulness demand its use, the dose should be large, and it ought to be united with calomel and tartar emetic, a combination which greatly lessens its stimulant properties. In this combination and with James's powder, Dr. Currie employed it with great advantage after the cold affusion. In the advanced stages of typhus, opium is useful as a general stimulant, in doses of from six to ten minims of the tincture, or from three to six minims of the black drop, in combination with camphor and other cordials. When, in the early stage of continued fever, the pulse is full and hard, the heat of the surface greater than natural, the thirst considerable, and there is much headach. the use of opium is not admissible. Even in the sinking stage of this disease, wine is a better and more permanent stimulus. In typhus, the symptoms that chiefly indicate the use of opium are low muttering delirium, watchfulness without increased heat of skin, diarrhœa, and subsultus tendinum: the dose should be small, frequently repeated, and cool air freely admitted to the chamber of the patient. If the delirium, however, be accompanied with flushing of the face, impatience of light, and throbbing of the temples, it must not be administered.

If opium be prescribed to counteract watchfulness, it should be recollected that this may arise from very opposite causes. When it is accompanied with great heat of surface, restlessness, tossing about in the bed, and determination of blood to the brain, it proves deleterious; if none of these symptoms are obvious, then opium is the best means for overcoming such a state of watchfulness. It should be given in full doses, in a solid state combined with calomel, at the usual time of rest; and during its operation the scalp should be kept cool by enveloping the head in a cloth wet with a cold lotion. In low delirium it may be given at the same time as ammonia; but if, as sometimes occurs, it increase the delirium when it is taken into the stomach, then it may be applied by aid of friction dissolved in oil.

The best preparations of opium are the *tincture* of the pharmacopœias, the *black drop*, the *liquid laudanum of Sydenham*, the *solution of the muriate of morphia*,* and the *acetate of morphia*.

With regard to the extent of the dose, it should be held, as a general rule, that double that which is required to produce sleep in a state of health should be administered in disease; if acetate of morphia he preferred to any of the other preparations, when narcotic not hypnotic effects are desired, the following formula will be found useful:

℞ Morphiæ, gr. ii.
Acidi acetici, *m* ii.
Misturæ amygd. amaræ, *ƒ* ℥vi.
Syr. tolutani, *ƒ* ℥i.

Tere morphiam cum acido et syrupo, dein adde misturam. Sumatur quarta pars sextâ quâque horâ.

In the *phlegmasiæ*, notwithstanding the general rule that opium should not be administered during the presence of active inflammation, until the system have been relieved by bleeding, there are cases in which it proves highly useful; as for instance, when the inflammatory action is of a passive kind, as in malignant ulcerated sore throat, and in chronic rheumatism. But even when it is of the opposite description, as in pleurisy, if venesection be freely employed, nothing is so likely to subdue permanently the inflammatory action as large doses of opium in combination with calomel and tartar-emetic. When the inflammation is in the substance of the lungs, as soon as dyspnœa is relieved, and the symptoms are reduced to cough and restlessness, opium may be given with the hope of the greatest advantage: indeed, all acute inflammatory affections of the chest may be benefited by opium thus preceded by antiphlogistic measures. In peripneumonia notha, both in that variety which constitutes the catarrhus suffocativus of old age, and that in which there is a congestion of blood in the pulmonary vessels, opium is useful. In the first place it forms an active and useful ingredient in stimulant expectorant mixtures, with ammoniacum and squill; and in the second, after the congestion is partially relieved, the liberal administration of opium in combination with demulcents is productive of much benefit. It may be said that this opinion is at variance with the common idea that opium retards expectoration; but in reply to this objection, let us examine what the state of the chest is in pneumonia. We find that the pain is aggravated by a full inspiration, and that, in order to obtain this, the patient must be nearly in the erect posture. Now, under this state the necessary change cannot be effected on the blood; and in the irritable state of the bronchial membrane the secretion of its natural mucus is hurried, and the sputa consequently thin and acrid. In this condition, opium, acting

through the pneumogastric nerves, allays pain, and enabling the patient to take a fuller and more perfect inspiration, it is easy to comprehend how a thicker and more slowly secreted mucus will be coughed up more easily than a thinner and more irritating matter. It is on this account that opium, instead of restraining, frequently promotes expectoration.

Opium is indisputably a most useful medicine combined with ipecacuanha, or camphor, or ammonia, as circumstances may require, in malignant peripneumony. In ophthalmia it is exhibited under the same restrictions as in pneumonia. If pain and irritation be excessive, it may be given even before bleeding has been resorted to, in which case it should be combined with calomel and tartar-emetic. Externally no application is more useful, after the active inflammation has been subdued by topical bloodletting. The old *solutio opii vinosa* is preferable to the vinum opii of the modern pharmacopœias, as it contains only half the quantity of opium and an aromatic. It acts partly by its stimulant, partly by its narcotic properties.

Opium has now almost supplanted the use of the lancet in acute rheumatism: it should be administered in full doses, immediately after active purging, in combination with colchicum. In the chronic form of the disease the opium may be combined with sulphate of quinia, or with infusion of menyanthes *trifoliata* acidulated with muriatic acid, which gives activity to the opium by forming a muriate of morphia.

In gout, even in that variety of the disease which is named retrocedent, opium is truly our sheet-anchor, and it must be given in full doses. In some cases it has been administered in doses of ten grains twice a day with advantage; and no consequent inconvenience is experienced if the dose be not too hastily lessened. In the acute form of the disease, opium is most useful when combined with colchicum. Something in this combination is due to the specific action of the colchicum on the gall-ducts. It has been supposed that the opium diminishes or impedes the biliary secretion, because the evacuations which follow a dose of opium are frequently pale; but this only indicates a diminished excretion. In the lower animals poisoned by opium the gall-bladder and ducts are turgid with bile, although very little had found its way into the duodenum. Now, as colchicum stimulates the gall-ducts, the combination of this remedy with opium removes the objection to its employment in gout, as far as regards the biliary secretion.

It is almost unnecessary to say that in cases of biliary calculi impacted in the gall-duct, or in nephritic inflammation arising from the irritation of renal calculi, either in the pelvis of the kidney or in the ureters, the best results are to be anticipated from the use of opium, particularly when the stomach is so irritable as to reject, by vomiting, every thing received into it. In this case, on account of the advantages to be expected from proximity of action, the opium is most beneficial when exhibited per anum, dissolved in oil. In suppression of urine, also, from calculi irritating the bladder of urine, or from stricture of the urethra, opium in combination with calomel is the medicine most to be depended on; and the same combination acts as a powerful anodyne in chordee, and the painful micturition of gonorrhœa. Neither large doses of opium alone, nor large doses of calomel, produce the effect of the combination of these medicines. Two grains of each may be administered in the form of a pill every second or third hour. The writer of this article, however, has sometimes found it better to order eight grains of calomel and two of opium, to be taken every eighth hour until relief was obtained.

Small-pox is the disease among the exanthemata in which opium is most decidedly indicated; and we are indebted for this fact to the sagacity of Sydenham. In the distinct form of the disease it is not required unless convulsions occur, or the eruptive fever be accompanied with much restlessness. Perhaps the practice of Sydenham, of administering opium every night in confluent small-pox, has been too indiscriminately followed. It is not required in the greater number of cases during the progress of the eruption, although it is occasionally useful for promoting the maturation of the pustules; and after the eruption it is indicated, under the same circumstances as in typhous fever, in conjunction with cinchona bark and wine. It is also useful in the secondary fever, if diarrhœa supervene; for notwithstanding the authority of Sydenham, purging at this time ought to be restrained to a certain extent. In measles, the employment of opium is contraindicated in the commencement of the attack, but after the inflammatory symptoms are subdued, and the cough remains, then opium in combination with calomel and ipecacuanha will be found beneficial, and still more so if the diarrhœa, which to a certain extent is useful, proceed too far. In that form of the disease which is of a malignant nature, rubeola *maligna*, as the fever is of the typhoid type, opium is indicated, and may be given throughout the attack, under the same regulations as in typhous fever.

Much difference of opinion exists respecting the employment of opium in hemorrhages. When febrile symptoms exist, these should be subdued before opium is prescribed; when the hemorrhage is connected with much debility, laxity of the solids, and a thin state of the circulating mass, then opium in combination with astringents and tonics should be administered to allay the irritability which always accompanies this state. In hemoptysis, when no inflammatory state of habit exists, when the bleeding is kept up by cough, and is accompanied with watchfulness, opium is likely to prove useful: in the opposite state, if much irritation exist, it should be combined with either digitalis, or acetate of lead, or hydrocyanic acid, and cold both topically and generally applied.

In phthisis pulmonalis opium is administered to allay cough, and to moderate diarrhœa when it is present. If the accession of the hectic paroxysm be well marked, it should be

given at that period. It is usually administered at bed-time; but as it is apt to excite much perspiration, it is preferable to defer it until early in the morning, when the cough is most severe. The soluble salts of morphia, especially the acetate, are preferable to opium, as they do not excite perspiration in small doses. The following formula will be found very serviceable:

℞ Acidi acetici diluti (aceti dist.) ℥iv.
Acetatis zinci solut. P. E. ℥i.
Tinct. opii *m*xii.
Decocti lichenis Islandici ℥xi. M.
Haustus quintâ quâque horâ sumendus.

In no disease has opium been more frequently employed than in dysentery; but there is much difference of opinion as to the propriety of this practice. If pains and tenesmus continue after the bowels have been freely evacuated, opium, combined with ipecacuanha, will be found useful; but during its use the bowels should be freely evacuated once at least in twenty-four hours. When the tenesmus is very urgent, the opium should be exhibited, in conjunction with demulcents, in the form of enema; and towards the close of the attack, when the disease may be regarded as having passed into diarrhœa, opium is the proper remedy. In bilious colic, and some other affections of the bowels in which pain and spasm arise from the action of highly irritating matters on the coats of the intestines, and in which purgatives do not act freely, experience has proved the propriety of combining opium with purgatives. In conjunction with calomel in large doses, it allays the irritation both of the stomach and the intestines, removes spasm, and consequently aids the operation of the purgatives. Indeed, in almost all spasmodic affections opium is the remedy to be relied upon, whether the spasm arise from the action of some irritating substance on the moving fibre, or from irritation kept up by debility: the cure consists in removing the irritating cause, and diminishing the susceptibility of the muscular fibre by restoring its tone. The term "almost all" is employed, because in some spasmodic affections opium seems to produce deleterious effects: thus in hay asthma it augments fever, headach, and the wheezing and suffocative tightness across the chest, which characterizes that singular disease. To answer both the above intentions opium is admirably adapted, when it is given in combination with sulphate of quinia and other tonics.

In idiopathic tetanus, opium is a remedy of great power; in traumatic tetanus it is of less value even in the largest doses. In the idiopathic form of the disease, opium should be early administered, as the progress of the attack is rapid, and the power of deglutition may be soon lost. The extent to which the remedy may be given is limited only by its effects; many ounces of the tincture have been taken before its effects have been felt. Its stimulant influence quickly disappears, on which account, even after the spasms are controlled by it, the use of it should not be discontinued for some time. A case is recorded in which fifteen hundred grains of solid opium were taken in the course of seventeen days; and another in which twenty fluid ounces of the officinal tincture were swallowed in twenty-four hours: both cases recovered. In general the following rules should regulate the progressive increase of the dose, and its repetition. If the spasms be moderate, ten or twelve minims may be given every hour; but if no relief be afforded in three or four hours, the dose should then be doubled, and so on progressively until the expected benefit be obtained, after which the dose should be diminished in the same ratio. No intermission should be permitted whilst the spasms continue. When deglutition is impeded, the opium should be administered per anum, and a solution of it in oil be rubbed upon the spine. Much advantage is derived from rubbing this oily solution on the jaw in trismus—a proof of the direct influence of opium on the nervous system.

In epilepsy, except in cases which are kept up by habit, after the removal of the irritation which first caused the convulsions, opium is not useful. In such cases a large dose is required to break the habit, but a purgative should be given at the same time, as in no disease is costiveness so injurious. The old physicians, even Sydenham, relied much on the influence of opium in chorea; and if the attack be complicated with hysteria, after the bowels have been freely opened, it frequently proves useful. But the plan of treating chorea with powerful purgatives, and afterwards with the carbonate of iron or with the nitrate of silver, is so successful as to leave us little to regret, should opium fail altogether in relieving the disease. In another painful affection also, tic douloureux, opium has so frequently disappointed our hopes, that more reliance is placed on the influence of tonics than on narcotics in this disease.

The watchfulness of maniacal patients early led to the use of opium in cases of insanity: the only objection to its employment is its tendency to cause costiveness; but this is obviated by combining it with aloetics, which operate on the bowels without weakening the soporific power of the opium conjoined with them. By procuring sleep, and thereby severing the catenation of morbid sensations, opium is often highly beneficial in insanity, especially that form of it which is produced by habitual drunkenness. In these cases there is generally a pallid countenance, a cold clamminess of the surface, and other symptoms indicative of great debility, accompanying the want of sleep; under which circumstances the question of life or death is often involved in administering or withholding the use of opium, and in no situation can the judgment and discrimination of the practitioner be more seriously employed.

In syphilis, opium has been used as the sole means of cure; but although experience has demonstrated that opium cannot be relied upon for this purpose, yet as an adjunct to mercury it is of great value: it enables the system to bear a large quantity of mercury with impunity, and also allays the state of morbid irritability which frequently remains

after the cure of syphilis, and, consequently, favours the return of health.

In diabetes mellitus, opium has a powerful influence in restraining the quantity and moderating the saccharine quality of the urine. The dose must be carried to a considerable extent to effect this purpose, to six or eight grains in twenty-four hours; but too often the evil returns as soon as the dose is diminished. In one case recorded by Dr. Warren,* five grains of solid opium were taken four times a day with evident advantage. Its beneficial influence has been referred to its augmenting the action on the skin, and consequently diminishing that of the kidneys; but as other diaphoretics do not cure diabetes, this theory of its operation is not satisfactory.

Besides the benefit arising from the employment of opium in the diseases already noticed, advantage is also taken of its administration in many morbid states of the system, to lessen irritation, to relieve pain, and to induce sleep; and undoubtedly, whether it be taken into the stomach or applied to the surface of the body, its place for these purposes can be supplied by no other substance. But, like some of the choicest gifts of Providence, it is abused and frequently employed as a poison, and this statement might be closed by tracing the symptoms produced by an overdose of opium or of its salts, and pointing out the remedy; but for this information we must refer our readers to the article Toxicology.†

Digitalis is generally regarded rather as a diuretic than a narcotic, but under certain states of habit it exerts a decided and important narcotic influence. It operates directly upon the nervous system, producing first stimulant and afterwards sedative effects. This influence of foxglove was first satisfactorily observed by Dr. Hallaran in a case of insanity, in which the tincture of foxglove was given by mistake for the tincture of opium, and from the effects which presented themselves, he was led to conclude that foxglove cannot be advantageously exhibited under "the pressure of high arterial action;" a fact which, indeed, might have been inferred from the repeated observations of its uselessness as a diuretic in dropsy, when an inflammatory state of the habit exists. Dr. Hallaran, taking advantage of his accidental discovery, employed opium as a narcotic in cases of mania, attended with diminished excitement, and the benefit was such as to enable him to remark regarding it, "I am encouraged to proceed with as much confidence in the hope of recovery, as I would in cases of lues, from the mercurial influence." "Insane persons," he adds, "have repeatedly assured me, on approaching to recovery, that they within a very few minutes have had a consciousness of relief, both as to mental and corporeal sensations, from the use of digitalis. One in particular, who for a time had been intent on self-destruction, declared to me that the propensity was never present so long as its efficacy had remained."* The mode of administering digitalis in mania is to commence with ten minims of the tincture for a dose, three times a day, in a glass of water, and to add two minims to every dose until sleep be procured, or until nausea or vertigo be experienced, in which case its use should be instantly laid aside, and ammonia and cordials with opium liberally substituted. In this manner Dr. Hallaran has carried the dose "to one hundred drops with safety and advantage;" and the writer of this article has frequently carried it to sixty minims three times a day, with no other result than sleep, quiet, and the restoration of the patient to sound health and intellect. The best form of the medicine for producing these desirable effects is the tincture, made with the recently dried leaves, collected in June, in dry, warm weather, and dried without artificial heat.

In phthisis, digitalis acts also as a narcotic, but it is fitted rather for the advanced than the early stages of the disease. M. Neuman, of Berlin, has extolled its influence as a narcotic in chronic catarrh, when this depends on a state of erethism of the mucous membrane of the bronchi. He gives it in the form of infusion, made with ʒii. of the dried leaves in ℥vi. of boiling water, one table-spoonful of which is administered every hour, until nausea, or a sensation of constriction of the throat, or irregular pulse, supervene. The use of the medicine is then suspended for a week, and again renewed if the disease be not removed.

During the use of digitalis its sedative power on the circulation is to be carefully attended to, and its accumulation in the system closely watched, as by carrying it too far and producing extreme debility we may endanger the life of the patient. When the symptoms of poisoning display themselves, (see Toxicology,) in addition to the means already recommended for counteracting them, much benefit will be obtained from the application of a blister to the pit of the stomach. From the difficulty of preserving foxglove leaves so as to retain their active properties, the infusion is a bad form of preparation, and the powder should not be employed unless it retain the beautiful green colour and the peculiar odour of the recently well-dried plant. In prescribing the tincture also, it must be borne in recollection that the bichloride of mercury, corrosive sublimate, and nitrate of silver, are incompatible with it.

Henbane, hyoscyamus *niger*, is very generally employed as a narcotic in all the cases in

* Transactions of the College of Physicians, vol. iv.

† The best works on the nature and properties of opium and its salts are those of—Dr. *Christen:* Opium historicè, chemicè, atque pharmacologicè investigatum, 1820.—M. *Charvet:* De l'Action de l'Opium et de ses Principes constituans sur l'économie animale, Paris, 1826.—Dr. *Crump:* On Opium, 8vo. 1788.—Dr. *Leigh:* Experimental Inquiry into the Properties of Opium, 1786.—*Wilson:* Experimental Essays, 1795.—*Deguise*, *Dupuy*, and *Leuret:* Recherches et Expériences sur les Effets de l'Acetate de Morphine, 8vo. Paris, 1824.

* Practical Observations on the Causes and Cure of Insanity, by W. S. Hallaran, M.D. p. 107-8.

which opium has been found beneficial. Its active principle is supposed to be an alkaloid, which has been obtained in a separate state, and named *hyoscyamia*; it is taken up both by water and alcohol. The forms in which henbane is administered are tincture and extract. The formula of the London Pharmacopœia for the preparation of the tincture is adequate for every practical purpose; that for the extract might be improved. Mr. Plumbe has procured an extract by macerating one part of the dried plant in four parts of alcohol for four days, filtering the tincture, and evaporating to dryness in a water-bath; it has a beautiful green colour, and retains all the active properties of the plant.

As a narcotic, henbane is analogous to opium in its effects. It operates directly on the nervous system, augmenting the force of the pulse, and increasing the heat of the skin before it produces sleep. It neither confines the bowels nor affects the brain so much as opium. In large doses, however, it operates as a virulent poison, and in some habits excites a pustular eruption.

Although henbane was employed as a narcotic by the ancients, yet Stoerck first investigated its value. He employed it in all painful diseases; and owing to its tendency to relax the bowels, it has been found very serviceable in ileus and colica pictonum, in combination with colocynth and scammony. Mr. Brande recommends it as well adapted for allaying the pain and irritation caused in the kidneys by red gravel. Smoking the leaves in the manner of tobacco soothes the pain of toothache and relieves the dyspnœa in spasmodic asthma. When applied to the surface, in the form of extract, it dilates the pupil; and much comfort to the feelings of the patient is derived from henbane in the form of a poultice in scrofulous ulcers and open cancer.

The tincture is the best form of administering henbane; but it is most frequently employed in the form of extract. The dose of the tincture is from *m* xv. to *ʒ*iſs; that of the extract from *gr.* ii. to *gr.* xii. Alkalies destroy its narcotic properties; they consequently are incompatible in prescriptions with it, and may be employed as antidotes, when it displays poisonous effects either from an over-dose or from idiosyncrasy.

The results of Stoerck's employment of *conium* in cancer and fistulous sores recommended it as a narcotic to the attention of modern practitioners. It possesses considerable narcotic powers; but so much depends on the drying and preservation of the leaves, either in their entire state or in that of powder, and on the preparation of the extract, as well as the state of the patient at the time of its administration, that few narcotics have perplexed practitioners so much as conium, and to these causes we must attribute much of the varying opinions respecting its influence as a remedial agent. Keeping these facts in view, conium has been found useful in acute rheumatism, scrofula, syphilis, and especially in cancer, the pain and irritation of which are supposed to be more effectually under the control of conium than of any other narcotic. In these cases the dose should be gradually increased until indications of an overdose begin to display themselves. These are nausea, dimness of sight, headach, drowsiness, vertigo, acceleration of the pulse, sweating, dryness of the mouth, diarrhœa, and, if the system be not relieved, coldness of the extremities, sinking of the strength, and a fatal result. Some, not all, of these symptoms usually present themselves before any perceptible beneficial change in the diseases which have been named is effected by conium. In many of the cases in which conium has proved beneficial, its use has been continued for some time, and the cure has proceeded in the direct ratio of these sensible effects. On this account the dose of conium requires to be progressively augmented until the symptoms of its influence be sufficiently obvious. The pulse in some instances sinks; in others it is maintained full, and at 100 or more, during the whole time of exhibiting the medicine. Sometimes the function of the kidneys is augmented; sometimes that of the skin; sometimes no effect is produced on the sensibility of the habit; occasionally this is greatly diminished. In that variety of paralysis which is complicated with rheumatism, in which deficiency of motion is attended with acute pain, conium has been found highly beneficial. In six cases of this affection treated with conium in the Edinburgh Infirmary, by Dr. Home, three were relieved and three were cured, although two of them were of long standing, and one in an old person. We have witnessed much benefit derived from it in chronic rheumatism, in keeping down pain; and in chronic sciatica our experience authorizes us to say that it is more to be depended on than any other narcotic. In intermittent cephalea, conium has been found to be an excellent adjunct to tonics. In scrofula, notwithstanding the testimony of Stoerck in its favour, we have not been able to perceive that it effects more than any other narcotic; and except in soothing the cough, the same character may be bestowed upon it as a remedy in phthisis. In overdoses, besides the symptoms already mentioned, its effects greatly resemble those of opium.

The extract, which is the only preparation of conium in the London Pharmacopœia, is a bad form of the medicine, owing to the difficulty of preserving it; whenever a saline crust appears on the surface, it is no longer of any value. The tincture of the Edinburgh and the Dublin Pharmacopœias is a better form of preparation. We have found it particularly useful, when administered in combination with hydrocyanic acid in a light decoction of cetraria Islandica, in long-protracted hooping-cough accompanied with much debility, and when the cough is kept up by habit. The dose of the extract is from *gr.* i. to *gr.* vi.; that of the tincture from *m.* x. to *m.* xl. in any bland vehicle.

The atropa *belladonna*, deadly nightshade, possesses considerable influence as a narcotic, and some peculiar properties which require to

be noticed. According to the analysis of a distinguished German chemist, M. Brande, its active principle is an alkaline substance, which he has named atropia, and which, in combination with either sulphuric or muriatic acids, is procured in beautiful white prismatic crystals, possessing in a concentrated degree the powers of the plant. The preparation most employed is the extract, which, however, is a very uncertain medicine, unless it be prepared in vacuo, the atropia being volatile and exhaled during the evaporation of the infusion. Belladonna, in whatever form administered, requires to be given in minute doses at first, and then to be gradually augmented until symptoms of its influence on the system become apparent. These are dryness of the throat, vertigo, dilatation of the pupils, slight dimness of sight, extravagant delirium, and an eruption on the skin closely resembling that of scarlatina.

The efficacy of belladonna has been well ascertained in painful and spasmodic affections: in hooping-cough it has been found useful in doses of an eighth of a grain, gradually increased until the sight is affected, and a scarlet eruption overspreads the skin, accompanied with some degree of headach. Whilst these symptoms continue, the cough ceases, but returns as they disappear; but by renewing this state and maintaining it for a sufficient length of time, the disease is always shortened. In neuralgia, both internally administered and externally applied, belladonna has been advantageously employed. The influence of the extract on the radiated fibres of the iris, so as to dilate the pupil, was first proposed as a method of facilitating the extraction of cataract by Professor Reimarus; and for the same reason it is frequently employed for aiding vision during the progress of cataract. A small quantity of the extract, softened with water, is applied upon the eyelid: in a short time the pupil dilates, and the effect continues for many hours. An ointment formed with 3i of the extract and 3vii of lard, affords great relief in the pain of hemorrhoids; and in chordee when rubbed upon the perineum: the powdered leaves, sprinkled upon cancerous sores, greatly abate the pain of these ulcers. The narcotic influence of belladonna cannot indeed be justly depreciated. In prescribing it, alkalies should not be combined with it, as they render the medicine inert; and the same result takes place when the atropia is converted into a tannate, by administering any of the preparations of belladonna with astringent vegetable decoctions or infusions. Dr. Reisinger has proposed to employ atropia instead of the extract or the infusion of belladonna; on the ground that it exerts a direct sedative influence on the nervous energy, whilst the extract and the infusion exert a primary stimulant power like other narcotics.

Belladonna, when given in overdoses, produces such an effect on the stomach that the organ rapidly ceases to be excitable by emetics: under such circumstances the advantages of the stomach-pump are great; for it is obvious that, notwithstanding the paralysed state of the organ, we may produce much mischief by inconsiderately augmenting beyond a certain point the dose of an emetic.

Like every other narcotic, the activity of belladonna depends greatly on the manner in which it is prepared: in general so little care is bestowed on the preparation of the extract, that it is difficult to apportion the dose. When the evaporation is conducted in vacuo, as recommended by Mr. Berry, the dose must be considerably less than that usually prescribed.

The genus *lactuca* yields a white proper juice, which has much of the properties, at least of the sensible properties, of opium. When inspissated, this juice, procured from the lactuca *sativa* and lactuca *virosa*, is the lactucarium of the Edinburgh Pharmacopœia. The narcotic properties of lettuce were very early known; Galen, who in the decline of his life suffered from watchfulness, found much comfort in eating lettuce in the evening: and every one who has indulged the same luxury, must have experienced the soporific effects of this plant. Dr. Coxe instituted a set of experiments to ascertain how far lactucarium resembles opium in its medicinal effects; and his results were confirmed by the subsequent experiments of Dr. Duncan. Dr. Coxe's experiments led him to regard lactucarium as precisely the same as opium in its medicinal properties; but although it may be employed as a substitute for opium, in persons who from idiosyncrasy cannot take opium without suffering, yet its properties are not exactly the same. In our opinion it is one of those substances which may be well spared from the Materia Medica, as the same effects which it produces can be obtained from modified doses of opium.

Camphor is a narcotic, which, like opium, possesses both stimulant and sedative properties: when it is taken into the stomach in moderate doses, it exhilarates, but in large doses excites nausea, vomiting, and even inflammation of the organ. It is so penetrating, that, independent of absorption, it seems to pervade every part of the frame. It displays its stimulant and sedative powers in nearly the same manner as opium, the stimulant effects always preceding its sedative operation. Its influence is exerted directly on the nervous system, producing sleep and relieving pain; and this is so very powerful that people employed to open packages of camphor have occasionally fallen asleep. As a stimulant, camphor is extremely diffusible, its influence being rapidly extended over the system, and disappearing sooner than that of any other narcotic: it is, therefore, well adapted for procuring a sudden and transitory excitement, in cases in which this is required, and in which its continuance would prove hurtful. When it is intended that it should exert a stimulant influence, like opium, it should be given in small doses, and repeated at short intervals: when its sedative effects are required, it should be administered in large doses and at considerable intervals.

Camphor may be employed in every kind of fever: in intermittents, during the paroxysm, to allay irritation and procure sleep; in continued fever, to subdue spasmodic twitchings,

calm delirium, and remove watchfulness; but in these respects it is inferior to opium. It is, however, an agreeable and useful adjunct to opium in fever. In the phlegmasiæ, camphor is frequently prescribed on mistaken principles, under a conviction that its primary action is sedative. Thus in ophthalmia it is sometimes prescribed as an external application in the inflammatory or active stage of the disease; whereas it is only suited for that passive state which is the result of the scrofulous diathesis, and old chronic inflammation of the conjunctiva.

In the exanthematous fevers it is useful for promoting the eruption, and restoring it when it has receded: in confluent small-pox in particular, attended with much of the typhoid character and with petechiæ, it aids in maintaining the powers of the constitution, and the maturation of the pustules; abating the tendency to convulsions which frequently accompanies this form of the disease. One curious result of the external use of camphor is stated by Rosenstein: he says, that if the skin be smeared over with a camphorated ointment, no pustules will appear. In spasmodic affections, camphor may be administered so as to act either as a stimulant or a sedative; but in either case it is inferior to opium. In mania, the powers of camphor have been greatly overrated: it lowers the pulse of furious maniacs sometimes to fifty, and an evident sedative effect follows, but without any diminution of their sufferings. "By its duration," says Dr. Hallaran, "the countenance eventually assumes a livid aspect; the extremities also become cold and insensible, and equally livid with the face. The arterial blood seems as if concentrated in the vessels immediately issuing from the heart; the action of the lungs is impeded; and congestion, determining to the head, is often the inevitable consequence. The power of reaction of the heart, under such difficulties, is in fact suspended; and the torpor of the system previously existing is thus greatly aggravated."* Dr. Hallaran thence regards it as a very uncertain medicine in the treatment of mania. In nymphomania, however, camphor has been found highly beneficial; and it is also an admirable adjunct to opium in that variety of insanity which frequently follows a continued course of intoxication.

The opinion that camphor has the power of allaying the strangury which occasionally follows the use of cantharides was first hazarded by Dr. Grainger in the beginning of the last century, and is still credited by many; but it is erroneous: Dr. Heberden, indeed, has demonstrated, that when freely administered camphor causes strangury. The idea that it diminishes salivation is not better founded.

In prescribing camphor, its precipitation from the alcoholic solution, suspended by mucilage in any bland vehicle, is a good form of administering it: or it may be held in solution in water by means of carbonic acid. It has been also successfully used in the form of a vapour bath by some of the continental physicians. The patient is placed on a chair with an open cane bottom, beneath which a chafler, covered with a plate of iron, is placed; the whole apparatus is surrounded with a blanket, which is pinned round the neck of the patient. A dessert-spoonful of camphor in powder is then thrown upon the iron plate; it is instantly volatilized, and involves the body in an atmosphere of camphor vapour. The patient perspires freely; and in three-quarters of an hour afterwards he may be rolled in a blanket and carried to bed. The sweating must be maintained by tepid fluids. In chronic rheumatism this fumigation should be repeated three or four times a day, and continued for some time after the pains have disappeared. The dose of camphor is generally too small; its narcotic influence being seldom obtained from less than half a drachm: we have given it, with advantage, to the extent of four drachms in the day, in low fever. It operates with more energy when administered per anum than when taken into the stomach: the camphor is quickly felt in the breath; an indescribable uneasiness succeeds, then vertigo, with pallidness of countenance, chilliness, and a low intermitting pulse. Opium, brandy, and ammonia are the means of counteracting these effects of camphor.*

We consider it unnecessary to enter more particularly into the consideration of the narcotic agents: the *ethers*, *alcohol*, and some vegetable matters, operate by exerting a direct influence on the nervous energy through the medium of the circulation; but this does not affect their practical utility. It only remains to close our remarks on narcotics with a few statements respecting the influence of what may be termed *mental* narcotics. Mental impressions rouse or depress the nervous energy according to circumstances; we consider those impressions narcotic which at first rouse the system, but by repetition at length exhaust it, in the same manner as stimulant material narcotics exhaust, and induce sleep. *Sound* is one of these mental impressions; but it is necessary to explain that it is not the repetition of sound, but of the same sound, which produces the narcotic effect. When sound is varied, the opposite result occurs, the attention is kept awake; and it is a law of the system that the variation of the stimulus renews the excitement in such a manner, that collapse is prevented for a greater length of time than when there is a repetition of the same sound. It is the monotony of sound, therefore, such as the gurgle of rills, or small water-falls, the voice of a dull preacher, the moaning of the breeze, &c. that is followed by soporific effects; and on the same principle, slow and plaintive music has been found practically useful in the treatment of some peculiar cases of insanity. In this case, the slower, longer-continued, and less varied the impressions are, the more powerful is the sedative influence of the music; and some-

* Practical Observations on Insanity, &c. p. 130.

* The best work to be consulted on camphor is the Traité de Camphre, by M. Grauffenaur, Strasbourg, 1823.

thing is also produced by the period of the day and the situation in which the listener is placed. The stillness of evening is highly favourable to the employment of music as a soporific agent;

> "—— let the sounds of music
> Creep in our ears; soft stillness, and the night
> Become the touches of sweet harmony."

And when sleep is induced, there is much less likelihood of its being disturbed than if it occur during the day. *Gentle friction* and *titillation* produce also soothing effects, on the same principle as the monotony of sound; in cases of pain we have seen them prove useful, by transferring the attention from its seat, to the mild and agreeable impressions of the friction; and this acquires power by joining it with monotony of sound. Thus we know that patting an infant on the back, whilst at the same time the nurse hums a monotonous tune, is almost always sure to produce sleep. Were it requisite, many instances of the beneficial effects of mental narcotics might be brought forward; but enough has been said to shew the importance of not disregarding them in cases in which they are likely to prove beneficial.

(A. T. Thomson.)

NEPHRALGIA AND NEPHRITIS. In several of the morbid affections incidental to the kidneys the symptoms are, as we have endeavoured to shew in a former article, (KIDNEYS, DISEASES OF,) so nearly alike as to render it very difficult, if not impossible, to distinguish between them during the life of the patient. Nor is accuracy of diagnosis of much importance in some of these affections, the treatment of which experience has taught us is to be conducted not only on the same principle, but in the same manner as regards its minutest details. But to distinguish clearly between nephritis—inflammation of the substance of the kidneys, or of their capsules and surrounding cellular membrane—and nephralgia—pain of the kidneys from calculus—is of great moment, since the remedies most proper for the one would be unavailing or injurious in the other. In nephritis, especially in that species where the capsule is the seat of inflammation, bloodletting is absolutely necessary; but in many cases of nephralgia bleeding would do harm. Again, opiates are not proper in nephritis, at least not till the inflammation has been decidedly arrested; while in nephralgia they are often eminently serviceable from the commencement of the attack.

In order to form this correct diagnosis, let us take the definition of nephritis as we find it laid down by Dr. Cullen in his Nosology, and let us observe wherein it is applicable to both the diseases in question, and wherein it applies to nephritis only. The definition is as follows: "Pyrexia; pain in the region of the kidney, often following the course of the ureter; frequent desire to pass urine, which is either limpid and colourless, or very red; vomiting, numbness of the leg; retraction or pain of the testicle of the same side."

Now, what we are most carefully to attend to in the above definition is *the pyrexia*—the fever, and the description of fever. All the other symptoms are common to both nephritis and nephralgia; indeed the *pain* in the latter affection may be much more intense than in inflammation of the substance of the kidney, and quite as severe as when its capsule is inflamed, but the pulse is little, if at all, affected, and the other signs of inflammatory fever are absent. But if, with the symptoms of the local affection, we find a frequent hard pulse, a loaded tongue, great heat, and dryness of skin, we may at once pronounce the disease to be nephritis.

While we are careful not to mistake these two affections of the kidney for each other, we must also be upon our guard lest we confound either of them with certain other diseases which are accompanied with symptoms very similar. They have, for instance, been mistaken for lumbago; but here again the definition will assist us. In lumbago there is seldom much fever; there is no nausea; the urine does not present the appearances which indicate affection of the kidney; in lumbago the pain varies; it is most felt upon resuming the erect posture after the body has been bent, whereas in nephritic affection it remains much the same in every position.

Nephralgia and nephritis may both be mistaken for inflammation of the psoæ muscles; but in inflammation of those muscles there is neither nausea nor retraction of testicle, nor alteration in the flow or quality of the urine; the pain is increased considerably on rotating the thigh, and, if the disease have long subsisted, there is great emaciation.

Nephralgia may be mistaken for enteritis; for, as Dr. Pemberton has remarked, enteritis sometimes commences with such severe pain across the loins as absorbs all other sense of uneasiness; and in nephralgia there is often a sympathetic pain in the abdomen, midway between the os ilium and navel, which is extremely acute, and much increased upon the slightest pressure. We have met with instances where this sympathetic pain has been even greater than that arising from inflammation, and where the lightest possible covering could not be borne without distress to the patient. Now, in a case of nephralgia, should the medical practitioner fall into the error of pronouncing the disease to be enteritis, and proceed to treat it accordingly, that error, though it would prove a sufficiently inconvenient one to the sick person, and would reflect discredit upon himself, might not prove a fatal one; but how lamentable, as well as disgraceful, would be the consequence of his mistaking enteritis for mere nephralgia! The practitioner should, in every case, be cautious; he should put together all the symptoms, and carefully weigh their aggregate force, before he ventures to pronounce a decided opinion upon the disease. In severe nephralgia he will particularly remark, that though the pain and tenderness upon pressure, in the situation above mentioned, are exquisite, yet neither the pulse,

nor the temperature of the skin, nor the expression of countenance, are those of a person labouring under inflammation of the peritoneal covering of the intestines; neither is there the same obstinate constipation, the bowels being generally acted upon by emollient enemata.

Another disease, with which a nephritic attack is liable to be confounded, is colic. The mistake is not perhaps, as Galen observes, of much moment, since, at the commencement, the mode of treatment in both is pretty much the same. Still, however, it is proper to distinguish between them. In colic the pain is more paroxysmal; there are intervals of absolute ease; there are gripings and distention of the lower bowels; and the pain, instead of being in the loins, and following the course of the ureter, is chiefly about the navel; there is no numbness of the thigh or leg, or retraction or soreness of the testicle.

It is further to be remarked that a pain in the region of the kidney, extending through the ureter, and accompanied by almost all the other symptoms of a nephritic attack, will sometimes take place from hysteria, so that, to adopt the language of Sydenham, it is extremely difficult to distinguish whether these symptoms arise from calculus, or from some hysterical affection, unless perhaps some misfortune having greatly distressed the patient a short time before the disease came on, or the discharge of green matter by vomiting, should shew that the symptoms are rather to be ascribed to hysterical than to calculous affection. It is indeed very difficult to arrive at any certainty here: we should, however, carefully investigate all the symptoms; we should enquire whether the patient has previously been subject to hysteria; we should endeavour to ascertain whether the uterus and its appendages are in a healthy state, whether menstruation be performed with regularity, and whether the secretion be natural, and we should particularly observe the state of the urine.

Nephritis, as has been already observed, is no otherwise to be distinguished from nephralgia than by the symptoms of inflammatory fever which attend it; and these symptoms will be more or less marked according as the disease occupies the capsule of the kidney and its surrounding cellular membrane, or its substance. In the former case, there will be pain —burning, pungent, and great—in the region of the kidney; there will be inflammatory fever strongly marked. In the latter case, the pain will be less urgent,—it will be more of a dull heavy pain, and the accompanying fever will be more moderate; but still the pulse will be more frequent and harder than in a fit of the gravel simply; the tongue will be furred, the skin hotter than natural; the symptoms will be those of subacute inflammation. The former has occasionally been observed as an idiopathic disease; the latter occurs only in consequence of calculi retained in the kidneys, or external injury, or perhaps hydatids. The difference of intensity in the symptoms, depending upon the seat of the inflammation, seems, until of late years, to have been overlooked by authors of the highest reputation.* The late distinguished Professor Gregory, when, in his admirable lectures, he spoke of idiopathic and symptomatic nephritis, appeared to regard both as affecting the substance of the kidneys; he did not, as far as we recollect, throw out any hint of their capsules and surrounding cellular membrane being the chief or the only seat of idiopathic nephritis.

We have thus endeavoured to point out how nephritis and nephralgia may be distinguished with tolerable certainty from each other, as well as from certain affections of the surrounding parts; but no small degree of obscurity yet remains: it is extremely difficult to discriminate between an affection of the kidney itself, and disease of other parts of the urinary system; for one extremity of that system so readily and so rapidly sympathises with the other, that the same set of symptoms will often occur wherever the disease in the urinary organs may be located. Thus, a stone in the bladder may give rise to all the sensations of disease in the kidney, and a calculus in the latter may produce every feeling of disease in the bladder. We would, therefore, impress upon the mind of the young practitioner the importance of extreme caution in pronouncing upon disease of the urinary system.

We now proceed to offer a few observations upon some of the symptoms which belong equally to nephritis and nephralgia; and first as to the pain generally following the course of the ureter. This pain in the region of the kidney is a very common but not an essential symptom; it sometimes is entirely wanting, and sometimes is so obtuse that it is not noticed, until vomiting comes on and attracts the physician's attention and induces him to make minute inquiries: in other instances it is extremely severe, yet, upon examination after death, the kidney of the suffering side has been found free from all trace of disease, while the opposite one has been completely disorganized.

Another symptom which is also usually but not invariably present, is dull pain, or numbness of the thigh and leg. Attention to the distribution of nerves will enable us to comprehend this affection of the lower extremity, as also that of the testicle, which frequently occurs. We have only to bear in mind that the semi-lunar ganglion of either side sends off branches which unite together, and with branches of the par vagum, to form the solar plexus, from which may be traced nerves going to various parts, and among the rest to the kidneys and the testes. The renal and the spermatic plexuses are derived from the same source, i. e. from the great solar plexus formed by the sympathetic and par vagum; and if we trace the sympathetic

* Boerhaave, for example, says, "*Ipsos renes* verâ inflammatione occupari scimus ex dolore ardente, pungente, magno, inflammatorio, loci ubi renes sunt; ex febre acuta, continua, concomitante."

into the pelvis, we shall find that it is connected with the nerves which pass to the leg. To account for the derangement of stomach, the eructation, nausea, and vomiting which attend nephritic affection, we have also to recollect what nerves concur to form the renal plexus, and what nerve it is that supplies the stomach.

The frequent desire to pass urine may well be explained upon the principle of irritation. The secretion is either scanty, very high-coloured, and mixed with blood, or it is limpid and nearly colourless. The former appearances we may expect to find when calculus is present, or when the affection has been induced by violent horse exercise or by external injury; the latter are more likely to take place in acute idiopathic inflammation. Sometimes there is total suppression, a symptom, as we have already shown in the article Ischuria Renalis, to be of very formidable character; it is not, however, necessarily a fatal symptom where the kidneys are primarily affected: we have known it to subsist for above a week in a case of nephritis from calculi, and where the inflammation terminated in abscess, as was proved by purulent matter in considerable quantity being passed with the urine. In this case the head was little affected, and though there was great pain, with most distressing nausea and retching, the pulse was hardly more influenced than in an attack of gall-stone.

Acute idiopathic inflammation of the kidney may be produced probably by any of the general causes of inflammation, but especially by exposure to cold, or violent exercise on horseback. Cases of this description are, however, of very rare occurrence. It does not appear that Dr. Baillie ever met with an instance of inflammation of the capsule of the kidney; and the late Professor Gregory used to state in his lectures, that he never saw a case of pure idiopathic nephritis. Symptomatic nephritis, i. e. inflammation of the substance of the kidney, or nephralgia with inflammatory symptoms, is, however, far from uncommon. Its most usual exciting cause is calculous matter blocking up the tubuli uriniferi, or calculi formed in the pelvis of the kidney and obstructing that cavity, or the canal of the ureter. But it may also arise from other causes, as from a blow, or a bruise or strain, from severe exercise, long confinement in a recumbent posture, plethora, acrid diuretics, excess in the use of spirituous liquors, poisons.*

There is a great connection between nephritic affection and gout. In some individuals the two diseases make their assault simultaneously; in others they alternate: we find some members of a family affected with gravel, and others with gout; and families have been known where all the men had gout, and all the women gravel. It is to be observed that the former disease is more common in men, owing, probably, to their freer mode of living. The descendants of gouty parents seem to be hereditarily disposed to both diseases. In a family with whose history the writer of the present article is intimately acquainted, the paternal great-grandfather and his wife died martyrs to gout, the one at the age of forty-three, the other at forty-five: their elder son had occasional smart fits of gout till the age of sixty-five, when they left him to return no more till his death, which happened in his eighty-eighth year; his elder son, a man of very temperate habits, never had gout, but died at sixty-six of severe disease of the urinary organs: the two sons of the latter, who have both reached the middle of life, have hitherto been entirely exempt from gout, but both exhibit a disposition to nephritic affection.

Inflammation of the kidney may terminate in any of the ways of other inflammations: it may terminate in resolution; or a profuse sweat, or a copious flow of urine, high-coloured, thick and mixed with mucus, may carry off the disease; or the same may be effected by a considerable discharge of blood from the hemorrhoidal veins. The relief afforded by such a discharge has been noticed by the great father of medicine;* and his commentator Galen observes that the untimely checking of habitual hemorrhoids has given rise to nephritic affection.

To the intimate connection which subsists between nephritic affection and gout, allusion has been already made. That the sudden suppression of the latter may occasion ischuria renalis, or renal inflammation, is well known; and a decided attack of gout supervening upon nephritis may effectually relieve the kidneys. If, however, the symptoms be protracted beyond the seventh day, suppuration will in all probability ensue, and will be declared by its usual symptoms, as frequent irregular rigors, dull, heavy, throbbing pain, &c. The entire kidney may be thus consumed, and in its place may be found a collection of pus: cases of this kind are not uncommon. Again, the inflammation may terminate in an indurated condition of the kidney: its natural structure may be partially or totally lost; it may degenerate into what, by the most skilful morbid anatomists, has been considered a truly scirrhous state, and then permanent lameness may be the consequence. Lastly, nephritis may run into gangrene, as is well attested by Boerhaave and other systematic writers. Such a termination is doubtless extremely rare at the present day; but an example of it has been given by Dr. Turner in the fourth volume of the Transactions of the College of Physicians in London.

We now approach the subject of *treatment*; and, first, of that of pure idiopathic nephritis, which may be disposed of in very few words. The inflammation must of course be met by the same prompt and energetic measures which we are accustomed to employ for the purpose of arresting acute inflammation of other parts. Bloodletting, both general and topical, is a re-

* A peculiar irritation, it is said, has been produced in the kidneys by arsenic, especially by the fumes of that mineral.

* Τοῖσι νεφριτικοῖσι αἱμορροΐδες ἐπιγινόμεναι ἀγαθόν. Sect. 6, aph. 11.

medy of the first importance, and it should be employed early, and with freedom, lest suppuration or gangrene ensue. The whole of what is understood by the term *antiphlogistic regimen* should be strictly enforced. The warm bath and fomentations should not be neglected. Mild diluents may prove useful; and perhaps some of the class of diuretic medicines, as the infusion of digitalis; but all diuretics which possess a stimulant property should certainly be avoided. It is of importance to unload the bowels, and afterwards to maintain their action; but saline purgatives, being disposed to pass off by the kidneys, are improper in this disease. The mildest laxatives alone should, in the first instance, be tried; such as a draught with one or two drachms of oil of almonds, or castor oil with manna, repeated every third or fourth hour; should this fail, castor oil in a larger dose may be exhibited; or the compound infusion of senna with manna; or, in the event of the bowels continuing obstinately costive, recourse may be had to stronger purgatives, as jalap with calomel. It is, however, to be recollected that, owing to the nausea which is so constant an attendant of nephritis, it will frequently be found impossible to administer either oily or other laxatives by the mouth. Emollient glysters, or glysters of warm water only should then be thrown up, and we should desist from all attempts to administer medicine in another mode until the stomach become more settled. Emollient glysters are useful both as fomentations and evacuants: by this employment we may unload the colon, to unload which is of considerable importance. Blisters have been recommended by some authors of credit, but we should protest against their being resorted to.

If, after the lapse of six or eight hours, the pain and heat in the region of the kidney be not relieved, and the hardness and frequency of the pulse remain, nearly the same quantity of blood should again be drawn from the arm and from the loins by cupping or the application of leeches; and should the inflammatory symptoms still continue, a repetition of the same means may be necessary. We must be guided here, as in acute inflammation of other organs, not by the quantity of blood drawn, but by the impression produced upon the system by its abstraction.

Such is an outline of the plan of treatment to be adopted in pure nephritis. If it terminate in resolution, or by any critical discharge, little will be left for the physician to do afterwards; if, in spite of the most active measures, it run on to suppuration, the treatment must be such as will be hereafter pointed out. If the sudden cessation of pain, hiccup, clammy perspiration, feeble intermitting pulse, great prostration of strength, ischuria, or dark flaky offensive urine, indicate that gangrene has taken place, the case is indeed all but desperate; strong cordials and stimulants must then be resorted to: recovery *may* follow, but a fortunate result is a sort of miracle.

In symptomatic nephritis, inflammation of the substance of the gland, from calculi or any other of the causes above enumerated, our treatment must be conducted upon the same principles as in the foregoing species, but, as the inflammatory symptoms are less marked, the same freedom in the use of the lancet will hardly be required at the onset, and seldom will there be need to repeat venesection. Local depletion seems more applicable in this grade of the disease. When, however, the pain has come on very suddenly, and is extremely acute, blood should be taken to the amount of ten or twelve ounces from the arm; recourse should be had to the warm bath or hip-bath; and, if circumstances seem to demand it, local depletion may be subsequently employed. When the disease has been induced by a strain, or blow, or bruise, or by violent exercise, &c., a second bleeding may sometimes be necessary, and a strict adherence to the antiphlogistic regimen will be expedient; but when it appears clearly to arise from calculus, we may generally, after one moderate bleeding, and opening the bowels by mild laxatives, have recourse to opium, in the dose of a grain every second or third hour, according to the urgency of the pain. Opium is in fact the grand remedy in calculous nephritis; it moderates the pain, and checks the vomiting, relaxes the spasm, and promotes the descent of the stone into the bladder. If the affection be simply nephralgia, bloodletting will seldom be required; yet if the pain be extremely acute and long continued, it may be expedient, as a measure of precaution, to take away blood in moderate quantity by cupping from the loins, or even from the arm, since, though none of the essential symptoms of inflammatory action may be actually present, or at least none which we can detect, we can never be sure that inflammation will not supervene, or that it is not already obscurely existing; and we must constantly bear in mind that a degree of renal inflammation, not to be discovered during life, is sufficient to produce abscess of the kidney or the total destruction of the gland.

In nephralgia, having first unloaded the bowels by a brisk cathartic, or, if the stomach be in a very irritable state, by a purgative glyster, opium in a full dose, and repeated at short intervals, is of great service, and glysters of starch, with laudanum, may also be employed. Every mean should be resorted to to favour the descent of the stone into the bladder, and to afford the patient a chance of its being passed by the urethra. To increase the flow of urine, mild diluent liquids should be freely taken; with the view of relaxing the parts, fomentations should be diligently used; and, as soon as possible, the patient should be placed in a warm bath, and, while in the bath, he should endeavour to pass urine; the attempt will often succeed under these circumstances, though it has failed before. The means to be adopted, by way of obviating a return of nephralgia, are those which have been found most efficacious where the *lithic diathesis* is known to prevail. Alteratives and aperients should be exhibited so as to promote the proper actions of the organs concerned in the digestive process. Five grains of the compound calomel

pill may be given every other night, or five or six grains of hydrarg. cum creta, with an equal quantity of rhubarb and a grain of ipecacuan. In robust habits we may prescribe from two to three grains of calomel, combined with four grains of James's powder and three grains of compound extract of colocynth and of extract of hyoscyamus, to be taken at bedtime twice a week, and to be followed up the next morning by a Seidlitz powder, or by three drachms of Epsom salts, a scruple of carbonate of magnesia, and six of powdered ginger, in half a pint of tepid water. A teaspoonful of magnesia in soda-water, or twenty minims of the liquor potassæ in linseed-tea or barley-water may be given twice a day, or more frequently, according to the urgency of the symptoms. But one of the most valuable medicines we possess is the diosma crenata; the infusion of its leaves has often given decided relief to nephritic patients when various other remedies have totally failed.* We have repeatedly witnessed its soothing effects, and it appears to possess a tonic property—it seems to give tone to the stomach. It is a valuable addition to the Materia Medica, and merits a more extensive trial and more careful observation as to its effects than it has hitherto received.

In cases where there is great weakness of the loins, accompanied perhaps by dull heavy pain, mechanical support will frequently afford great relief. For this purpose a tight bandage may be applied, or a plaster, such as the emplastrum cumini, emplast. ammoniaci, or emplast. oxyd. ferri rubri.†

When an abscess forms in the kidney, it may open in the loins, or it may burst into the pelvis of the organ, and be discharged with the urine. In the former event the aid of the surgeon will be required. If the abscess be of a scrofulous nature, the termination of the case will in all probability be unfortunate. The surgeon will have to deal with sinuses, which will prove very troublesome, yet by means of setons they may sometimes be healed. If the ureters be plugged up with scrofulous matter, there is no chance of a cure, but temporary relief may be afforded; the sinuses opening at at an inconvenient part may be healed by seton, and an outlet be made in a more favourable situation. In the latter case, should the abscess be the result of common inflammation, the patient has a good chance of recovery. Balsamics, as the Chian turpentine, may be employed, and the uva ursi may be of service. Should it be, as it commonly is, of a scrofulous character, the prognosis must be unfavourable. In such cases generally the infundibula, pelvis, and ureter partake of the disease; more or less symptomatic fever attends, and the patient is worn out by the irritation and drain. Such, however, is not always the case; patients do occasionally recover against hope, whether by the resources of nature alone, or the aid of medicine, may admit of great doubt; but certainly it is the bounden duty of the medical attendant to bring into the field those remedies which have the reputation of being useful in scrofulous disease—sarsaparilla, cinchona, liquor potassæ, conium, cum multis aliis.

The termination in gangrene is happily of rare occurrence; and when such is the termination, nothing is to be expected from medicine.

We would, in conclusion, impress forcibly upon the minds of persons who have once suffered under an attack of nephritis or nephralgia, the consideration that they are extremely liable to a recurrence of the complaint, and the importance therefore of caution as to diet, exercise, &c. Their diet should be plain and of easy digestion, and repletion should be studiously avoided; they should be sparing in the use of strong liquors, and should especially abstain from acescent wines; they should take regular and moderate exercise; they should not acquire the habit of spending many hours in bed, nor should they make use of a feather bed; they should avoid exposure to cold and damp, particularly the getting wet in the feet.

(H. W. Carter.)

NEURALGIA. The term neuralgia, derived from νεῦρον, a nerve, and ἄλγος, pain, signifies pain in a nerve. The pain is in some cases felt in the chord of a nerve, and follows its track: in other cases the pain is felt in the ultimate twigs into which the nerves split, so that a space, or spot, or an organ, and not the track of any particular nerve, aches or is acutely sensible. When it evidently takes the course of a nerve, the case is clear, whatever be the character of the pain; but when it affects an organ, a space, or a spot, we pronounce the disease to be neuralgia from the character of the pain and the absence of such other circumstances as would be sufficient to occasion it.

In the most exquisite cases the pain is excruciating, sharp, sudden, stabbing, or plunging, as patients frequently express themselves; more violent at one moment than another, and sometimes greatly mitigated or absent for a longer or shorter period; induced instantly, like an electric shock, by motion or pressure, even by brushing the point of the finger along the affected part, or it being shaken or blown upon by cold air. Firm pressure is frequently borne, and gives ease. If a secreting organ is in the neighbourhood, it is excited. For example, when some nerves of the face are affected, a paroxysm of pain may be induced by masticating, swallowing, blowing the nose, or even by speaking; and a flow of tears, nasal mucus, or saliva, is frequently observed. If there are small muscles in the neighbour-

* The diosma crenata has been long known to British botanists as a plant highly esteemed among the Caffres as a remedy in nephritic complaints. It is noticed, upon the authority of Sherard, in Ray's Historia Plantarum, tom iii. lib. 30, p. 91, under the title of Spiræa Africana, or Buchu of the Hottentots, and is there stated to constitute the principal ingredient of a certain powder in use amongst them—"primarium ingrediens pulveris Cyprii Hottentottorum." It has within the last few years been favourably introduced to the notice of the profession in this country.

† Of these the best perhaps is the emplast. oxydi ferri rubri, on account of its stiffness and adhesive quality, not from any effect which we can suppose the iron to communicate.

hood, they experience twitchings; and, in the severest cases, large and distant muscles may be convulsed. From these circumstances some have called the disease neuralgia *spasmodica*, but, we think, most improperly, because they are only incidental, and the severest neuralgia may occur without them. The pain may be dreadful and occasion delirium.

Such an affection was formerly called *tic douloureux*, painful tic; the latter word signifying a sudden catching or convulsive motion, such as is noticed in the face or other parts of some persons, and is as it were a local chorea, and such as is noticed in some horses that convulsively bite the manger. Persons with such catchings experience no pain. But when twitchings occur in neuralgia, they are attended by pain, and therefore to their name—tic—in this disease, the epithet douloureux was added. As the disease was first noticed and distinguished in the face, where there is an abundance of small muscles and consequently twitchings usually attend it, the twitchings attracted as much attention as the pain, and the disease obtained its designation from both symptoms. Sometimes, between the shooting pains, there is constant aching; and sometimes the part feels painfully benumbed. We have known the neighbouring parts, which were not in pain, benumbed.

The attacks may last days, weeks, or months; and may recur after intervals of days, weeks, months, or years. They may occur chiefly after exciting causes, or without any obvious reason. They generally occur without warning, but have been preceded by peculiar sensations and some kind of indisposition. The disease may be suspended or may cease, by nature or through art, or may end in apoplexy, insanity, emaciation, and death.

It most frequently attacks the ramifications of the fifth pair, and the first and second branches of the nerve suffer oftener than the third. We notice it therefore particularly over the orbit, under the orbit, in the cheek where the pes anserinus is spread, in the mouth, and along the lower jaw, and in the lower teeth. Some doubt that it is ever felt in the portio dura; others declare they have known it in that nerve. An hospital patient of ours complained of it not only in the cheek, but in the course of the portio dura from the stylo-mastoid foramen. We do not see why the disease should be confined to nerves of sensation. Two, or even all the three, branches are sometimes affected, and the pain may extend even to the other side of the face. We have known it extend down the neck to the shoulder, and along the inside of the arm to the ends of all the fingers and the thumb. Various nerves of the legs, arms, fingers or toes, are occasionally the seat of the disease; and an intercostal, a lumbar, and even the spermatic, nerve, has been attacked. The pain may be confined to one nerve, or to it and its branches, may extend to other nerves in the neighbourhood or at a distance, or it may affect nerves distant from each other, simultaneously or successively, and change its seat backwards and forwards. The pain does not always shoot in the course of the nerve, but frequently in the opposite direction. It may not shoot from a nerve through all the twigs, but only through some.

Neuralgia of this character was perhaps first distinctly described in 1756 by André, the French surgeon of Versailles, in his work upon the diseases of the urethra. Dr. James Fothergill, in the fifth volume of the Medical Observations and Inquiries, published in 1776, described it as occurring in the face, and without being aware that André had anticipated him—and no wonder, when we consider the singular mode in which André promulgated his facts—and he tells us that he never saw more than fourteen instances of it. We have not seen so many. He observed it oftener in women; but this greater frequency is not a general fact. He never noticed it in persons much under forty years of age, and this observation, we believe, is confirmed. It is rare in children, yet continental writers record cases of it in subjects but seven and nine years old.

Pain of exactly this character, and not to be accounted for by inflammation or organic disease of the part, now and then attacks organs or spots, and not the track of any nerve. The breast, for example, the heart, the testis, may so suffer; and once we witnessed it apparently in the kidney. The character of the pain, and the absence in the part of the ordinary causes of pain, justify us in regarding it in these cases as neuralgia.

In other cases it is not the character of the pain, but the evident situation of it in one or more nerves, that proves it to be neuralgia. Pain is frequently not stabbing and sudden, not of the description above given, but equally deserving to be called neuralgia, because affecting the course of a nerve. It may be acute, though not electric nor excited by the slightest friction; it may be a constant aching. When a nerve is inflamed, there is great pain. When a portion of a nerve has been seen of an uniform dark red colour after death; when a portion has been found diseased and enveloped in gangrenous cellular tissue; or about double its natural size, of a violet red colour, and strewed with ecchymoses of the size of pins' heads; or a serous, bloody, or purulent effusion has been discovered among its fibres; or nerves have been found hypertrophied and connected with fungous ulcers; when a nerve has been bruised, lacerated, or half divided;—pain of greater or less intensity had been felt in the nerve or the parts upon which it is distributed.* Cotugno, Cirillo, Chaussier, Bichat, &c. have seen similar appearances after neuralgia. In some cases of disease of the brain or spinal marrow, even where paralysis is produced, pain is felt at a distance: the paralysed parts sometimes ache severely in hemiplegia. In epilepsy and hysteria pain is sometimes felt in the course of nerves. A portion of the pain in structural disease of all organs may occasionally occur in the branches and twigs of the nerves irritated by

* See Abercrombie's Researches on the Diseases of the Brain, &c.

it. Nerves also frequently suffer pain from rheumatism. There is decidedly a rheumatic neuralgia. The exquisite neuralgia, described as tic douloureux, may arise from those vicissitudes of temperature that occasion rheumatism, and may be rheumatic. But pain, not of that description, though perhaps very acute, perhaps dull and aching as is usual in rheumatism, is every day witnessed in the situation of nerves, in persons who have rheumatism in those situations, and who have been exposed to cold, or perhaps cold and wet; and it yields as readily to the treatment of rheumatism as the ordinary rheumatism of other parts. The neurilema, which is a fibrous membrane, is probably still more affected than the nerve, since rheumatism is chiefly a disease of the fibrous membranes. In rheumatic neuralgia we observe all the varieties of suffering occasioned in other parts by rheumatism: sometimes acute pain, with tenderness, heat, and even throbbing, and aggravation of the pain by heat; sometimes dull aching only; sometimes pain on motion, pressure, or other modes of mechanical irritation; sometimes remittent, intermittent, or even periodical, pain. The pain is sometimes exquisite and sudden, assuming the character of tic douloureux, which, we may remark, not only when rheumatic, but sometimes when not apparently so, may assume a periodical type. It is the clear situation of the pain in a nerve, and not the character of the pain, when it is not like the pain called tic douloureux, that justifies us in rheumatism to pronounce it neuralgic. The nerves chiefly attacked by rheumatism are the sciatic and the branches of the fifth. It is frequently very inflammatory, so that the surface is tender, hot, swollen, and even red. Sometimes no marks of inflammation are discoverable, and warmth and other stimuli relieve. In the case of the face especially, (one side only of which is usually affected, and perhaps not only the nerves, but some of the surrounding parts,) there is a great tendency to periodical intermission, and the paroxysms usually occur in the evening.

In hysterical females, portions of the surface occasionally become exquisitely tender, so that the least pressure with the extremity of the finger, such as would not occasion pain were the peritoneum or viscera inflamed, even the sudden falling of the bed-clothes upon it, causes anguish. The surface of the front of the body is most frequently affected, sometimes only of the abdomen, sometimes only of the chest; sometimes portions of the back only suffer, particularly at the spine; and sometimes nearly the whole surface of both the trunk and extremities. As no pain is felt while the part is not compressed, perhaps this condition ought not to be called *neuralgia*. But the absence of heat, swelling, redness, and of all signs of internal no less than of external inflammation, and of structural affection and serious disease, the perfect inutility of all the remedies of inflammation, the power of the remedies of pure nervous affection and neuralgia, prove it to be a morbid sensibility of the nerves of touch, and perhaps make it merit the epithet *neuralgic*. Cases of this description are occasionally mistaken for chronic peritonitis and other inflammatory diseases; and, when the tenderness is felt in the course of the spine, it is too often set down as a mark of disease of the spine or its ligaments, or perhaps the whole case is referred to an affection of this portion of the spinal chord, while the morbid sensibility of the spot is merely one of the number of symptoms. We saw this tenderness in an *hysterical* and neuralgic middle-aged *man* who had been exposed to malaria.

The nature of neuralgic affections may be evident during life, and immediately, or not till after a lapse of time; may become evident after death only; or may never be discovered.

Inflammatory conditions of the nerves and structural changes, as well as mechanical causes of irritation, may be detected during life if the seat of these conditions is within the reach of observation: and symptoms may be induced which clearly point out inflammation or structural change, even should these be beyond our observation. Occasionally, however, the seat and cause of the irritation is not only beyond observation during life, though discoverable afterwards, but no symptoms are produced which indicate them. After exquisite neuralgia, or that kind denominated tic douloureux, the cranial bones have been found of unusual thickness, so that it was fancied that probably they had in some degree compressed the nerves. There is, however, no proof that the neuralgia was the effect of the growth of the bone. The latter might have been only one of several morbid changes going on in the head, and some of which caused neuralgia. The state of all the nerves should have been accurately ascertained. In insanity and idiotism the bones are sometimes of enormous thickness through the general tendency to disease in the head, and the insanity is not ascribable to it, but the whole is the result of the tendency to disease in the head. Here, too, there is generally no neuralgia. To show that in some cases of neuralgia the cause becomes obvious after a time only, we may state that Dr. Abercrombie quotes one case of exquisite neuralgia of the face that ceased on the removal of a piece of china which had been there fourteen years, and another of ten years' duration that ceased on the extraction of a tooth. Sir Henry Halford mentions the case of a lady who laboured under violent tic douloureux till an apparently sound tooth was extracted on account of the attacks being frequently preceded by uneasiness in it, and that a large exostosis was found at its root. He relates the case of a nobleman who was liberated from the disease by the exfoliation of a portion of bone from the antrum maxillare. To ascribe neuralgia, however, to these causes in most cases is very unpathological. In ordinary rheumatism, which is not inflammatory, in that form which is unattended by heat, and in which there is mere aching relieved by warmth and all stimulants, and probably greatly influenced by atmospheric changes, the real condition of the part is unknown. The same is true, not only of this rheumatism when affecting nerves, not only of the corresponding

form of rheumatic neuralgia, but of that exquisite neuralgia, when not rheumatic, and when no inflammation nor structural change, nor mechanical cause, can be detected before or after death. Good pathological anatomists declare they have frequently been unable to detect any unhealthy appearance on careful dissection. Occasionally the pain may be sympathetic, may depend upon no fault of the nerves or even the nervous centres, but upon disorder of the digestive organs. Even such an origin cannot always, in obscure cases, be presumed; and we confess that, allowing some of the blame to be deserved that is laid upon the digestive organs as causing all kinds of diseases of all parts—a vulgar assumption easily made and saving a world of investigation and accurate reasoning,—we have never seen one case of neuralgia referable to such an *origin*.

Since this is true of the nature and causes of neuralgia, we see how various must be its course and its termination, and how various the prognosis as well as the mode of treatment required in different cases.

When inflammation is obvious or presumable, whether rheumatic or not, local bleeding, mercury, colchicum, and the whole antiphlogistic plan, general and local, are appropriate. Should these not succeed soon, anodynes may be added; and the pain may, from an inflammatory commencement, degenerate into pain without inflammation, and demand at last solely the treatment of another form of the disease. When rheumatic and yet not inflammatory, the remedies of this form of rheumatism in other parts are required;—stimulants internal and external, tonics, mercury, and all modes of counter-irritation. Coldness indicates stimulants. Among internal stimulants, besides generous diet, the ammoniated tincture of guaiacum is one of the best. It should be exhibited in such quantity and frequency as to keep the patient comfortably warm. A dose of half a drachm may be sufficient, or six drachms may be required; and a frequency of three times in the twenty-four hours may be sufficient, or the dose may require repetition every two hours; and in general both may be diminished after the remedy has been continued for some time, because it stimulates more and more, and its effect lasts longer. When there is debility, and especially paleness, iron in full quantities operates in the most salutary manner, much more so than quinine. The hot bath, of water or vapour, the douche, electricity, blisters, moxas, smapisms, tartarized antimony, croton oil, and acupuncture, frequently cure, if combined with all other appropriate means. Mercury carried to ptyalism frequently cures, provided the strength will bear it, and the rest of the treatment is well conducted. Even the cold shower-bath or cold douche, if followed by good friction, will cure. A warm temperature of the atmosphere around the patient, and warm clothing, may be indispensable. Anodyne narcotics may be absolutely necessary; and the salts of morphia, stramonium, and belladonna, carried to a due extent, are by far the best, and sometimes alone will cure.

If the disease is seen to depend upon any organic affection, or upon a mechanical cause, the treatment will be evident. Should no structural or mechanical cause, and no inflammation be discoverable, and should the disease be of the exquisite character, then iron is the best remedy. The use of the subcarbonate of iron was discovered by the late Mr. Hutchison of Southwell. The old dose of half a drachm or a drachm will sometimes succeed. But while exhibiting this remedy in various diseases, we soon discovered that it might be given without any inconvenience in far larger quantities than was imagined.* Even children of eight years old will often take half an ounce or six drachms every four hours. If given in twice its weight of treacle, it rarely constipates. But strict attention should be paid to keep the bowels open during its employment, because, being an insoluble substance and bulky, if it is not regularly discharged, its accumulation may be considerable and produce inconvenience. If doses of a drachm every six hours fail, it should not be relinquished till those large quantities also have failed. Although it is the best medicine at present known under these circumstances, it frequently fails altogether, and still more frequently the disease returns, but perhaps yields again and again to it. In all cases of neuralgia, whether exquisite or not, unaccompanied by inflammation or evident existing cause, iron is the best remedy. Probably other forms would answer as well as the subcarbonate. When iron fails, or affords but imperfect relief, it may be serviceable by improving the general health. Less frequently curative as is this medicine than we had hoped from Mr. Hutchison's statements to find it, the power it was proved by this gentleman to possess over the disease induced us to try it in other nervous affections; and in those which are less frequently connected with an inflammatory or structural condition, its power is very great. The first other disease in which we employed it was paralysis agitans, and the first case was cured. In most other cases we have been disappointed, and probably from organic change of the nervous substance frequently existing. The next disease was chorea, and as that is comparatively seldom dependent upon structural change, we have never once failed in curing it with iron, except when it has been partial or of very long standing—circumstances in which structural change is highly probable. Even in two cases of tetanus out of three we were successful with it; and in the third, which was fatal, there was too little time to exhibit it.

Quinine, arsenic, belladonna, stramonium, colchicum, are said sometimes to cure this exquisite form. The want of attention to the stomach and bowels, and of the observance of good habits, will aggravate it. Relief is said to be obtained occasionally by the application of steam to the part, and sometimes by ice. The application of the strongest narcotics, and all irritants and escharotics, as well as the actual cautery, have occasionally done good.

* See a Paper by the author of this article in the 13th Volume of the Med. Chir. Transactions.

When all has failed, the division of the nerve, or the removal of the part, if possible, may be proposed, provided no cause in another part is obvious, and provided the pain is invariably limited to one part. Galen was acquainted with the division of the nerve as a remedy in the disease; but a royal French surgeon-maréchal appears to have been the first who performed the operation. Unfortunately it very rarely cures. One portion of the divided nerve suffers again, or the disease reappears in some other part. Too often there has not been even temporary relief. Yet amputation of the finger or thumb, in which the disease was seated, has succeeded, when the cause of the affection was local.*

When neuralgia arises from malaria, whether ague has also been produced or not, quinine or arsenic, long continued in the largest and most frequently repeated doses that can be borne without the least inconvenience, are the best remedies; and when it is periodical or intermittent, without evident connection with malaria, they are excellent. But sometimes a full dose of extract of stramonium or belladonna, repeated every hour or two from just before the attack is expected to the termination of every paroxysm, succeeds better.

(John Elliotson.)

NIGHTMARE.—See Incubus.

NOLI ME TANGERE, or LUPUS. The name of *lupus*, which was occasionally used by the older writers on medicine and surgery to signify any ulcer having a destructive tendency, (quasi, voracious as a wolf,) was appropriated to the particular disease of which we now treat by Sauvages, who considered it a species of cancer, and called it "cancer lupus." The other term by which it is equally well known is of a still older date; and it is no longer certain in what it originated. Some authors affirm that, the ichorous matter which was formed by the ulcerated parts being supposed to be contagious, this name was given to include an expressive warning to beware of the contact of a thing which produced such fearful and unsightly effects. Others state, with greater appearance of probability, that "touch me not" refers to the inutility of using topical remedies in its treatment. However this may be, the terms lupus and noli me tangere are synonymous in British medicine, and have always signified the same thing since they have been used in any definite sense. Biett, indeed, uses the latter term to express malignant ulcers of a cancerous origin; but he will not, we hope, be imitated in this, as this application of it would only serve to add to the confusion which already exists as to the proper comprehension of this disease. We shall revert to this, and to other names which have been used indifferently with it, as we proceed.

There is scarcely any disease of so formidable and obvious a nature about which such uncertain and ill-defined notions prevail. It must have been known to the earliest antiquity. Celsus clearly and forcibly distinguished it from cancer under the name of *cacoethes;* and it is not a little remarkable that the remedies which he recommends are the same which at the present day are most relied on. While other diseases of the integuments have been investigated and described with a minuteness of research which some have considered superfluous, systematic writers have slurred over this with a scanty and superficial notice quite inconsistent with its importance. Some writers pass it over altogether, and others handle it in a manner which gives us as imperfect a notion of the malady almost as if they had left it altogether untouched. This does not surely arise from the rarity of its occurrence, or from the insignificant nature of the affection. A slight acquaintance with the practice of any considerable hospital or dispensary affords a melancholy proof both of its frequency and its ravages. In Dr. Good's "Study of Medicine" we find the subject dispatched in about a page, in which short space he has contrived to insert so much of error that no person acquainted with the disease could recognise it from his description. Bateman, in his valuable "Synopsis," devotes ten pages to aphthæ; but lupus he is also content to dispose of in one. For the comparative neglect of this subject he excuses himself by stating that he is not aware of any medicine which has been of essential use in its cure. We suspect, however, that one chief reason why the subject has been treated in so insufficient a manner lies in the essential difficulties connected with it. And these are in fact very great. Nature herself does not appear to have assigned in many cases accurate limits to it; at least in the study of these destructive ulcerations the observers of nature are frequently at a loss to find means for drawing the line of demarcation between true lupus and diseases considered to be of a different pathological nature. In our description of the varieties, or rather species of this malady, we shall observe a somewhat similar plan to that of M. Biett, whose lectures, detailed in the work of MM. Cazenave and Schedel, deliver the best digested history of it to be met with in any language.*

Lupus commences by the slow development of a tubercular induration in the tissue of the true skin or mucous membrane; sometimes, perhaps, in the subcutaneous or submucous cellular tissue. According to its situation this

* Med. Chir. Trans. vol. iv. and vol. viii.

* Abrégé pratique des maladies de la peau, d'après les auteurs les plus estimés, et surtout d'après les documens prises dans la clinique de M. le Docteur Biett, par MM. A. Cazenave et H. E. Schedel, &c. &c. We wish to acknowledge our obligations to this book. It is written in an unpretending style, but is now justly reckoned, both in this country and Germany, to contain more enlightened information on cutaneous diseases than any other recent work. We cannot but express a wish that Great Britain afforded such an opportunity for the cultivation of this branch of medical study as the Hôpital St. Louis at Paris does.

tubercle is either single, or else several appear together. While it makes its slow progress towards the surface, the skin takes on a violet colour, which spreads before the advancing tubercle, and seldom yields except to destructive ulceration. After an uncertain time the tubercle makes its appearance on the surface, cracking the cuticle, and forming a coarse laminar scab, from under which exudes a foul ichorous discharge. The crust, which is the surface of the tubercle, is very closely adherent; it spreads and sometimes falls off, exposing an ulceration of a malignant aspect underneath. The latter extends *pari passu* with the tubercular crust; but sometimes it spreads beyond the space which this occupies: every time that this falls off, a greater extent of ulceration is visible; and thus it proceeds, unless checked by art, till it commits the most frightful ravages.

This general character of the disease applies to it more particularly when it has its seat on the face, which, in genuine lupus, is the case in nineteen instances out of twenty. But even in this situation it has much variety which a general description cannot include. In describing it more particularly then, we will separately consider it in three forms:—*first*, lupus in which the ulcerative process destroys chiefly in depth; *second*, that in which the destruction and cicatrization do not manifest any open ulceration, and are accompanied by an hypertrophied state of the skin; *third*, lupus which spreads mostly superficially. This division of the subject differs but in the succession from that of M. Biett. It appears the most practical, and therefore the best adapted for closing with the difficulties with which the subject is attended.

1. *Deep or erosive lupus.*—The first species in our division is that in which the ulcerative process proceeds from the surface towards the centre. We have placed it first because it is the real type of the disease, the undisputed lupus or noli me tangere. The French writers have given to the disease the name of "dartre rougeante" after M. Alibert, who has divided the latter into three species. His *dartre rougeante idiopathique* agrees with this species, which is more especially the lupus of the nose. It very rarely occurs in any other place; but having run its destructive course on that organ, it not unfrequently spreads to the adjacent parts. On the alæ nasi, or at the point, a small tubercle makes its appearance, having its seat more or less deep in the true skin. As it advances, it assumes a livid colour. The skin around it becomes somewhat swollen and painful, and also assumes more or less of a livid or violet hue. After a period, which is various in different cases, a crust forms on the surface of the tubercle, of some thickness, and under this an ulceration extends. The crust falls and is renewed; and at every time that it is detached, it is found that the ulceration has destroyed a deeper layer of the skin. This proceeds very slowly for a long time, the loss of substance taking place nearly insensibly. Although new portions of the incrustation are frequently falling off, and always carry away with them a part of the subjacent tissue, it is not till this process has been going on for a considerable period that the destruction which it has caused is perceived.

In most cases this ulceration is accompanied by a constant discharge, from the nostril of the side affected, of a thin fetid matter. This latter phenomenon may originate in two ways. It may arise from inflammation of the Schneiderian membrane, propagated from the irritation of the tubercle producing the destructive ulceration of the skin. This is a frequent origin of the discharge; and where it is caused in this manner, it is neither so unremitting nor of such a bad quality as in the other case: it partakes here, in fact, more of the character of a common mucous coryza. The other source of the discharge is the actual commencement of the tubercular development in the mucous membrane of the nose itself. It is an indubitable fact that the disease very often commences here. It even sometimes produces much internal destruction without manifesting any morbid alteration in the skin. The history of its progress, when the disease begins in the mucous membrane, is different from that of its cutaneous origin; and we are disposed to think that, not considering this, it has been erroneously stated that it sometimes begins without any tubercular formation. But when we take into account the different structure of the two tissues, the process is quite analogous, whatever apparent difference the first stage of their progress may present. Its beginning in the mucous membrane is after the following manner. After some redness and inflammatory swelling in one of the nostrils, a thin, dark scab forms on the lining membrane, which, if it be torn off, is soon reproduced in the same way as the crust of the external tubercle. The destruction goes on under this thin layer until it corrodes the mucous membrane and the subjacent tissues just in a way corresponding with that in the tubercles before described. The difference lies not in the character of the disease, but in the nature of the tissues. In the mucous membrane, from its soft, pulpy texture and moist surface,* it is impossible to have the solid induration, denominated a tubercle, which the firm structure of the skin, covered by its dry cuticle, permits, unless by the deposition of a foreign structure, which does not take place in lupus; but there does take place a degree of condensation of its tissue; and in some places where it is most firm in structure, as the hard palate, we have known small tubercles to be formed. The crusty exfoliation takes place in both situations;

* In other cutaneous diseases a similar relation exists between the mucous membrane and the skin when the former becomes invaded by a disease proper to the latter. Papular eruptions, as lichen, sometimes extend inside the mouth; but here they take on the appearance of aphthous vesicles. In squamous diseases not unfrequently the internal membrane becomes affected; but instead of scales, which, from the nature of the mucous membrane, could not form on it, excoriations take place.

but it is modified as to its density and thickness by the nature of the membrane which secretes it. It is in this form, where the tubercular deposition commences within, that the discharge is sanious and fetid, being in this case the actual secretion from the ulcer; whereas in the former case it is mucus produced, as we have explained, by the irritation propagated to the pituitary membrane.

But whether it be in the cutaneous or mucous tissue that the disease begins, after a short period the progress of it becomes identical. The subjacent cellular tissue and the muscles yield to the ulceration and are destroyed; the cartilages follow in their turn, and very frequently the bones themselves are not protected from its ravages, but partaking in the general destruction, are corroded *pari passu* with the soft parts on the same level. This seems to be the distinguishing property of lupus, and of this particular species more especially. In most other diseases (where there is no actual deposition of morbid structure, as in cancer, &c.) the morbific action affects one tissue in particular, and is more or less confined by its specific irritability to this. But in lupus this does not by any means hold; its ravages have no respect to contrariety of organization: having destroyed the seat of its original development, it continues to eat its way through every tissue which opposes itself in its progress, until its further course is limited either by the destruction of the organ or by artificial means.

To return to the history of its progress. The destruction is generally complete in one of the alæ, or the point of the nose, before it spreads farther on its surface; but sooner or later the disease extends so as to embrace both sides; and wherever it takes up its ground in advancing, it is by the same tubercular deposit with which it began. Sometimes after having destroyed the tip of the nose or one of the alæ, it forms a puckered cicatrix, and seems to be nearly healed up; but it rarely stops in this manner. More generally, after a while, new tubercles become developed in the midst of the cicatrix itself, which ulcerate and destroy with all their original virulence. While the destruction spreads externally in the manner described, in general the internal parts are not exempted from the disease. In the majority of cases some part of the nasal fossa is simultaneously affected with it. The inner surface of the alæ corresponding to the external disease is a common place to find it internally; but the septum narium is the part where its ravages are most generally met with. In such cases the discharge is constant, and becomes an additional subject of disgust to the poor patient. The crusts which collect on the septum and on the turbinated bones nearly block up the passage of the nostrils. Sometimes, indeed, union takes place by adhesive inflammation between the alæ and septum, which has to be divided by the knife and cauterised. Where the disease is not checked by the appliances of art, nature seldom interferes to make its ravages but partial. The soft parts of the nose being destroyed by a gradual external progress, and the internal disease having broken up the septum, the entire organ is thus carried away, and in its stead remains but a square aperture partially divided by a partition, a hideous memorial of its devastating course. The bones sometimes limit its course after it has destroyed all the soft parts; but if it be not arrested before it has gone so far as this, these are also involved. It is at least common for the ossa nasi to be affected; and cases are met with where the destruction invades the superior maxillary bones: usually, however, when the ossa nasi fall, and the septum has been destroyed, it pursues its course no further among the bones.

This is the general account of its ravages, and it seldom stops, unless checked by art, till it fulfils it. Some variety will of course be met with in its course and in its terminations. Instances will be met with where it has disappeared after carrying away one of the alæ nasi; others where it went no further than to carry away the point of the nose. These are singular cases, and will be generally found to have been brought about by art. We have lately seen a case, however, where the alæ nasi on one side was taken clean away by the disease, which then stopped spontaneously. In other instances it has run a more superficial course from the beginning, and having eaten through some of the layers of the skin, becomes cheeked. In such a case it sometimes leaves the nose thinned on the sides, and running into a sharp-pointed tip. It is in these cases that the orifices are liable to be closed by the adhesive inflammation of the internal surfaces.

With respect to the stages of the disease, and the time which they take to run their course, they are by no means definite. The tubercles remain indolent for many months, but when they ulcerate, the disease generally makes quicker progress. No corresponding relation exists between the duration of the malady and the destruction which it produces. While in some it remains without effecting any important loss of substance for several years, in others the whole nose is destroyed in a few weeks.

We must again notice the frequency with which lupus occupies the pituitary membrane. Bett describes with exactness the case where it commences internally, and eats its way from within outwards, its arrival at the skin being preceded by a livid colour. The same author states that it sometimes commences in the skin, and having in its course reached the opening of the nares, it traverses their floor; it then descends along the soft palate, and having destroyed it, returns along the palate bone, eating away the roof of the mouth. But no author has, we think, dealt sufficiently on the disease as running its course entirely within. It has been long known, indeed, that ulcerations of a bad kind occur at the back of the pharynx, destroying it deeply, and carrying away the uvula and soft palate. These too are often called in surgical works by the improper name of "herpetic ulcers," which infers that they partake of the nature of lupus, as this was

and is still too often designated by the term "herpes exedens."* But they often occur in other parts of the nasal cavity, where they are less obvious; and the insidious latency with which they commit extensive ravages is sometimes very extraordinary. A great part or the whole of the septum narium may be destroyed without its even being discovered by the patient or by his friends. The chief complaint which is observed is a stuffing in the nose and head, which at length proceeds so far as to alter the voice. This is generally attributed to cold or catarrh. It is always accompanied by a foulness of breath, which might lead to an investigation of its real source; but this is attributed to worms by the patient's friends; for it is to be observed that this internal lupus occurs almost always in children under twelve years of age.

Its insidious character we have seen strongly illustrated in some cases that occurred in dispensary practice, particularly in two observed by the author's friend, Mr. Smyly. A child about three years of age was brought to the dispensary by its mother, who asked for some worm medicine to give it. She said that the child's general health was tolerably good, but that she had a habit of picking her nose, and she was certain that worms was her ailment from her foul breath. Her nostrils were examined, and it was found that the septum was quite perforated by a lupoid ulceration, which reached nearly to its anterior extremity, and extended backwards so far that its termination could not be discerned. Mr. Smyly applied a strong solution of nitrate of silver to the edges of the ulceration, and enjoined that the child should return frequently to have it treated with the necessary vigilance. She did not return, but was met accidentally some time afterwards by Mr. Smyly, who examined the ulceration anew, and found it stationary. She did not go back, she said, because there was nothing the matter with her nose. She had been brought to an apothecary who gave her medicine for worms, and assured her that this was the whole origin of her complaint. The details of the other case are so remarkably similar, that it would be needless to recount them. Superficial examinations in such cases will often betray the medical practitioner into deep error. We were impressed strongly by the above facts with the necessity for circumspection. In another case of this internal lupus which occurred to the author last summer, in a girl of fourteen years of age, the voice became completely changed into a nasal tone, and a curious convulsive heaving of the respiratory muscles took place during sleep. A constant coryza, with some fetid discharge, led the author to suspect lupus of some part of the nasal fossa, although nothing could be discerned by inspection. It has lately made its appearance at the root of the nose near the lacrymal sac on each side, and confirmed the suspicion entertained of the source of the disease. We notice it for the purpose of calling attention to the effect which the disease appeared to have on the breathing during sleep.*

2. *Lupus with hypertrophy.*—This form agrees with the first in many points, but its progress and its results are different. Like the former, its seat is frequently the nose, but it does not affect in particular the alæ and tip. It often occurs at its upper part between the eyes and on the forehead just above it. The angle of the eye and the cheek beneath it are not unfrequent localities. It may, however, occur on any part of the face, and, according to Biett, even affect the whole face. It begins likewise with tubercles, but they are not like the round hard bodies of the former species. They are rather soft, ill-defined rugosities, having a purplish hue, which spreads from them to the surrounding skin until a circumscribed patch of the latter presents this colour. No open ulceration takes place in the tubercle, but if any single one be watched, it will be found gradually to disappear, leaving a slight furrow behind. This takes place partly by desquamation from the surface, but chiefly by an interstitial absorption going on in the body of the tubercle. Whilst this process is going on in one tubercle, others are growing beside it, and in their turn they undergo the same imperceptible destruction and cicatrization. At the same time the whole unhealthy patch of skin becomes swollen, and presents a peculiar indolent aspect and doughy feel. When this tumid state of the skin goes on to a certain extent, the tubercles are no longer prominent, but the depressions left by the cicatrices are more evident. The base of these often exhibits a white creamy streak, con-

* This name was employed before proper limits were given to cutaneous nosology. To continue to use the term herpes or herpetic in the present day in any other than the vesicular disease so called, only tends to confirm error.

* This singular effect certainly depended on the disease of the nostrils, for the lungs were ascertained to be quite sound by a careful stethoscopic examination. The breathing was performed quite naturally during the day, but the moment sleep came on, the respiratory muscles were thrown into a kind of clonic convulsion, which increased with the intensity of the sleep. The writer was called twice to witness it for the purpose of getting further light as to the nature of the disease. Two things struck us as of peculiar physiological interest in considering this spasmodic action of the muscles of respiration. First, its occurring only during sleep, and secondly, its being confined to one side. The following explanation occurred to us:—the spasm was remotely caused by the want of free respiration. The purely voluntary muscles withdrew their assistance during sleep; and the instinctive respiratory muscles having then more to do, they were easily thrown, in a weak irritable child, into spasmodic action. The spasm having for its end apparently the perfect freedom of action of the muscles of one side, and this the opposite side to which the obstruction existed in the nasal fossa, we could not help seeing an analogy between this and the cases where, an obstruction existing in one lung, the patient instinctively lies on the diseased side, to leave the muscles of the sound side perfectly unrestrained in the respiratory motion. If this be a true analogy,—and we were persuaded, whilst considering the case, that it was,—the obstructed state of one of the air passages of the nose produced a sympathetic effect on the lung and the muscles of respiration of one side,—a striking illustration of the sympathetic consent which subsists between the various parts of the respiratory apparatus.

trasting with the purple colour of the tubercles, which lie generally on each side of the cicatrices. When the disease then is of some standing, it presents the appearance of a swollen circumscribed patch of the skin, of a violet colour, and in this area there are spots of a deeper hue, denoting the surface of the tubercles, and white marks, the cicatrices of tubercles which have disappeared under the slow process before mentioned.

This form, although also a very chronic malady, spreads more quickly than the first; its manner of extending its limits is the following. On the edges of the morbid surface flat tubercles arise, similar to those by which it at first commenced; their destruction is effected by the desquamation before mentioned, while those inside the area, of an older date, are removed by the interstitial cicatrization. By this double process much destructive change takes place in the tissue of the part affected, for although there is no open ulceration, and there seems to be an actual hypertrophy of the skin, the latter has lost all the characters of healthy skin. It is not painful even to slight pressure. It evidently extends to the subcutaneous cellular tissue; indeed it would appear from feeling it, that most of the deposit which constitutes the swelling exists in the latter. This enlargement presents to the touch something of the feeling of elephantiasis; and Biett relates a case where the swelling of the face proceeded to such a degree as to present the appearance of the most frightful form of this disease, with the additional circumstance of the livid hue proper to lupus. Such an excessive tumefaction is, however, a very rare effect of the disease.

It may continue for years without producing any serious consequences of a constitutional or of a local nature, save the existence of the morbid state of the skin just described. Of itself it has not the least tendency to healing. If it does not go on increasing, it remains inert for an indefinite period. It appears to be much more under the control of internal medicine than the former species. When it begins to yield to the action of any remedy, the livid patch of skin, and particularly the tubercles, shew signs of an unwonted activity by becoming a little hot and painful, and the colour changing to a deeper red; the hypertrophy then gradually diminishes, and the skin slowly recovers somewhat of its own suppleness and texture, but it never returns entirely to its original state. Its cure has been brought about by the accidental occurrence of an erysipelas, attacking the skin beside the lupoid patch. The encroachment of the inflammation on the morbid structure roused the torpid state of the latter, upon which a new and healthy action followed, which removed the disease.

We must here notice a form of the disease in which this second species is complicated with the first. It is as frequently met with in practice as the second form, and is more difficult to deal with, because we have not the same hopes from internal remedies, which are sometimes successfully employed in the latter; nor can we use the local escharotics with the same prospect of advantage as in the first form, where the disease is more circumscribed. When the affection is of this compound nature, it begins with a tubercle of the first species, which becomes covered with the crust, as before described. A very ordinary place for its commencement is under the lower eyelid, and here it produces very serious effects by the destruction which sometimes ensues. Tubercles of the character of the second species make their appearance at an indefinite period after those of the first have been going on, and the livid hypertrophy of the skin accompanies it. Here, then, the two kinds of lupus already mentioned simultaneously exist and modify each other. The deep ulceration of the first kind is sometimes cicatrized by the hypertrophic action which accompanies the second species, but still new tubercles from which become encrusted and have the ulcerative character in the adjacent spots. This is the course of a case at present under the author's observation. In a woman aged forty-five, a tubercle of the first species appeared at the angle of the eye; it formed crusts and ulcerated during eight months, when others of a softer nature and more livid colour sprang up beside them; in its progress it reached the edge of the nose, and here took on the character of the hypertrophic lupus; but there always remained one of the tubercles with the crusts and the deep ulceration of the first species;—the disease having spread across the nose, and in one spot sunk so deeply in it that the mucous membrane became affected. About fifteen months after its commencement it developed itself on the hard palate and spread towards the velum. A perforating ulcer, which succeeded to a hard tubercle of the first kind, is now nearly closed by the cicatrization which is going on around it. This case affords a good illustration of the kind of affection which we describe as a combination of the first and second species. The double character of ulceration in depth and hypertrophic cicatrization was evinced both in its first development under the eyelid and on the nose, and in its posterior eruption on the roof of the mouth.

Besides this combined form of the malady, the first and second form may exist separately at the same time. Whilst the hypertrophic lupus is manifested on the forehead or the cheek, the eroding species may be pursuing its course on the alæ or tip of the nose. It is sufficiently common also,—and we should have mentioned this before, as it occurs not infrequently in the first form,—to find pustules of impetigo in the neighbourhood of the lupoid patches. A crop of these impetiginous pustules often form scabs across the nose, while the tip is engaged with the more intractable lupus; but generally there are observed but a few scattered pustules in some locality adjoining the latter, as, for instance, on the nose, lip, or cheek. This complication of lupus has given occasion to some writers to make use of the term impetigo erodens.

3. *Superficial lupus.*—The third form of lupus is that which ulcerates superficially. Biett de-

scribes this species first; and were we to classify the species of this disease according to the comparative frequency with which they occur, we should have followed his example. We have, however, doubts whether this species can in reality be regarded in the light of a variety of the true lupus. It appears to us to differ very widely from the first species, the real *noli me tangere*, which, as we have before stated, is the true type of the disease. It has, indeed, considerable affinity to the second form in external characters, but we think it generalizing too much to consider it as congenerous with the lupus of the nose. As the points of resemblance which it bears to the second form may induce some to regard the latter as a kind of link connecting this superficial ulceration with the first form, we shall give its description here, and superadd some considerations developing our views of its nature.

The history of this third form is not so uniform as that of the last; the superficial destruction which is essentially its character arises variously and proceeds in different ways. The variety which allies it to the second species originates by tubercles, or rather tuberosities, in the skin, large and soft, and differing little from the surrounding parts in colour. These remain for a long period indolent, but as they increase in size, and grow beyond the skin's level, they assume a dusky livid colour, which spreads to the adjacent skin for a considerable space. Ulceration at length commences on the surface of the tuberosities, and as their bases have become by this time nearly joined, as the ulcerative process spreads, it presents often, for a large extent, but one continued surface. A thin ichor is secreted by the surface, which sometimes concretes on the edges into closely adhering scabs; but these are not like the solid crusts which cover the tubercles in the first species. The ulceration has a great tendency to extend its ravages, and in doing so it does not spread by direct absorption of the skin, but by the renewed production of these tubercular indurations which had originated the disease. A circumstance which is remarkable in its history is this—that often, while ulceration breaks out in the new tuberosities, it closes up in the old places, and in this manner it has been known slowly to travel over a great space. The cicatrices which it leaves behind are of the most disfiguring kind, but they are not painful unless pressed upon, or when the patient indulges in spirituous liquors, in improper diet, or excessive exercise. If they be situated where there is a depth of soft parts, they are puckered, and evidently engage the subcutaneous cellular tissue. Even under the best directed medical efforts it is a long time before the ulcerative process entirely leaves these cicatrices. There remains generally at the inferior extremity of the cicatrising surface a spot which refuses to heal, and from this the ulceration is ready to spread again if the medical efforts be relaxed, or from very slight causes. And even when they become perfectly healed, they are often the seat of a new outbreak of the disease. In such instances they become deeper and more extended, and resemble very exactly the scars left by deep and extensive burns. If they occur near any of the natural openings, they may produce much impediment by narrowing these in their puckered growth; and besides this inconvenience, if they occur at the mouth they give rise to a very disfiguring aspect by contracting the commissure of one of the lips, and thus destroying their symmetry. These marks are often observed on the face and neck; and they are not less common on the skin of the thorax and the extremities, where they are often of a very great extent.

Marks of a similar description are often met with which have ensued on a very different process. We find on the face and on the extremities cicatrices which have not been preceded by any tubercle or even by any ulceration. The following is their manner of forming. The skin takes on a reddish hue, and appears a little swollen. After a short time, on this morbid part a slight exfoliation commences, and by this process the skin becomes plainly thinned. When this has continued for a certain period, the skin becomes pale again, and even less coloured than the sound surface adjacent to it. It becomes also smooth and glossy, and this makes a difference between the cicatrices which remain after this affection, and those ensuing upon the tubercles and ulceration, in that the latter are more or less puckered. The cause of this difference is obvious. In the affection we at present describe, the superficial layers of the skin are nearly exclusively engaged in the exfoliation; while, as we have seen, the morbid process is much more deeply seated where the scars ensue upon the tuberosities and ulceration.

There is another affection of the skin, of an analogous character, which deserves to be placed in juxta-position with the last variety. In this the deep layers of the skin and the subjacent cellular tissue are exclusively the seat of the disease. It manifests itself by the skin assuming a livid colour, and becoming hard and stiff. This may remain for many months without showing any actual disorganization. At length, probably by the formation of a small abscess arising from the irritation of the sloughing cellular tissue, the destruction which has been going on in the deep parts of the skin is brought to light. From the opening made by the abscess, which is generally enlarged by the practitioner, if he has not originally made it, a large quantity of sloughing cellular tissue of a yellow colour and firm consistence will be discharged. On the dislodging of these sloughs and the use of appropriate dressings, deep cicatrices slowly form, similar to those above described. The few cases of this affection we have witnessed occurred on the leg. We notice it under the head of the superficial form of lupus, notwithstanding that it affects the deep layers of the skin and the subjacent tissue, because it bears an analogy to it in progressing in a horizontal direction. It appears in fact to differ from the variety last described only in affecting the deep layers instead of the superficial.

These are the varieties of the form of lupus which destroy superficially. Doubtless the chronic nature of its progress, the purple colour which generally more or less attends it, and its frequent origin by what we have denominated tuberosities (to distinguish them from the tubercles of the first form), are circumstances which show a seeming analogy between it and the other species, particularly the second; but notwithstanding these, we imagine that those who have given attention to the subject will think that we are justified in doubting the propriety of making it congenerous with the other forms, at least with the lupus of the nose. It appears to have a different constitutional origin; it is curable by different remedies; and it terminates differently. In several cases of this nature which we have observed, it happened in persons who were at one time the subjects of venereal disease. In some others we think it could be traced to that analogous state of the system produced by courses of mercury. But much more frequently it depends on scrofula. In short it appears to us that it is decidedly a scrofulous disease. This idea is rather strengthened than opposed by what we have just remarked as to its sometimes being found connected with a syphilitic or mercurial taint in the system, as it is known that the sequelæ of mercury or of syphilis are easily developed in a scrofulous constitution, at the same time that the latter modifies the nature of the resulting affection. The variety of this third form, which spreads by the superficial ulceration of the tuberosities, is evidently the same with the so-called scrofulous ulcer. Biett does not recognise this in terms, but we apprehend that it is easily to be collected from his description of the affection. It is without doubt to this species that Rayer alludes in his list of synonyms, where he enumerates "ulcères scrofuleux, scrophule vulgaire vasculeuse." But it appears of still more importance with respect to the nature of this superficial ulceration to establish its identity with the esthiomenic or corrosive scrofula of M. Lugol, in which the iodine has proved such a powerful agent. And with regard to this we know that some practitioners have been successfully employing this remedy against it without being aware that there existed any doubt as to its scrofulous origin, or that it was included under the name of lupus in the works of writers of authority.*

The success of iodine in this superficial ulceration, while it seems an evidence of its scrofulous nature, may be regarded as one criterion of the difference of its nature from the two former species, for against these it is found to possess little or none of the virtues which have given it such a high place in scrofulous affections. Where we state our opinion of the relation which subsists between the two first species and scrofula, it will further appear what connexion this third form stands in with the other two.

Having thus described the phenomena and course of the different species of the disease, we have here to mention some particular accidents which its destructive nature sometimes gives rise to from its occurring in certain localities. One of these, which has attracted much notice from its disastrous consequences, is the destruction or eversion of the lower eyelid. This occurs in the first form, or probably still more frequently in that combination of the first and second which we have described. One or two tubercles having formed just under the eyelid, their ulceration perforates the conjunctiva, and goes on to destroy a great part or the whole of the lower lid. Besides the shocking disfiguration which this produces, more serious effects follow. The protection which the palpebræ afford the eyes is by this interrupted; the tears escape through the broken surface instead of by their natural channel; and inflammation of an unmanageable kind ensues, which causes loss of sight on this side by producing opacity of the corneæ. The puckered cicatrices sometimes form under the lid, drag it down, and thus produce its eversion. Epiphora and its consequences follow here as inevitably as where the lid is destroyed, if it be not prevented by surgical means, which are more available in this case than the former.

When the nares, the velum, or the palate are the seat of the disease, the voice is always more or less altered. It is only, however, when the destruction is very great that the articulation is entirely lost. Partial deafness is sometimes produced when the disease affects the Eustachian tube, as occurred lately in a case which happened to the author, where the disease spread from the nares and velum. When the disease has its seat in the superior parts of the nasal fossa, it may produce destruction of a fatal nature. Lallemand* is of opinion that in many of the cases recorded by old authors, where abscess of the brain broke and discharged pus by the nostrils, the latter was produced by caries of some of the bones forming the roof of the nares. This is a situation in which lupus occurs more frequently than is at all supposed. The considerations which this writer offers in proof of his positions, are, we think, quite satisfactory, and apply to lupus; for we are persuaded that caries of the bones of the

* Confusion must daily occur as to this malady from our inattention to precision in names. Rayer's synonyms are, "Dartre rougeante, herpes esthiomenos (herpes exedens, *Biett*), ignis sacer, formica corrosiva, lupus vorax, noli me tangere. Scrofule vulgaire vasculeuse, ulcères scrofuleux, &c. Every day adds to these, for it would appear that every one relating a case considers that former appellations may be disregarded, and that he may change or add according as some peculiarity of the case or his own ingenuity supplies him with new terms. Thus, in the account of two interesting cases of this superficial ulceration detailed in the Medical Gazette, December 15, p. 367, they are denominated "strumous phagedenic ulcers." A copious supply of names is a proof that the subject has not been reduced to clear limits; but adding to them of *libitum* only increases the difficulties, and in fact virtually does away with the utility of nosological arrangement altogether.

* Lettres sur l'Encéphale et ses dépendances.

nose is much more frequently the effect of this disease than of all the other causes to which it might be referred. The occlusion of the nares has been already referred to. This event may occur even in the early stages, where the destruction commences by the falling of the crusts from time to time, and all throughout its course there is a tendency in the swollen edges to unite by cicatrization.

Such accidental results of lupus are amongst its most important consequences. Some of them are rare, but it appears highly necessary to know beforehand the tendency to their occurrence, that we may be watchful when the disease exists in any locality exposed to them, if by any means we may be able to devise a treatment calculated to arrest them ere they proceed to such disastrous effects.

There is in lupus little or no sympathetic disorder of the system: it is quite unaccompanied by fever. The gastro-pulmonary mucous membrane, which is so frequently either primarily or secondarily affected in other diseases of the cutaneous tissue, is very rarely affected. The disease may exist for several years, and in this period effect a great destruction, while the general health retains a perfect integrity. Biett mentions that in cases of extreme malignity, where its ravages proceed unchecked by nature or by art, death has been known to happen from the supervention of a chronic gastro-enteritis attended by a slow fever and colliquative diarrhœa. This termination has, however, been so rarely observed that it may be doubted whether the internal affection and fatal result should not be considered as accidentally occurring during the progress of the lupus rather than depending on it. However this may be in certain peculiar instances, it is a well ascertained character of the disease that its ravages give rise to a remarkably trivial amount of general disorder, although it usually happens in individuals of weakly constitutions.

Causes.—It is very rare to meet any of the varieties beyond the age of forty, so that it is to be considered a disease of youth. Between the ages of six and sixteen it is more common than at earlier or later periods. It appears that the female sex is more subject to it than the male. This has been satisfactorily established to us from the observation of a considerable number of cases. It is also a fact that it is particularly prone to occur in those weakly lymphatic habits in which the period of puberty arrives late, and the menstrual function is feebly performed. Authors assert, and we believe experience proves it to be true, that it is much more common in the country than in town, and in places where vegetables and fruits form the chief food. In the city of Dublin, where the poor are inured to poverty and uncleanliness, it is very commonly met with, although some of the worst cases which are found in the hospitals come from the country parts of Ireland.

Pathology.—The predisposing causes are important elements in considering the pathological nature of lupus; and in treating of the latter we would be understood as particularly referring to our first two species, for we regard the third, as we have before stated, to be a true scrofulous malady. We must consider also that Rayer had in mind this form of the disease exclusively, when he asserted that nearly all the individuals in whom the tubercles of lupus occur have been known to be subject to scrofulous affections in their youth, such as glandular swellings in the neck, groins, or axillæ; for such an incontestable proof of its scrofulous nature can refer only to the superficial ulceration, and can by no means be truly predicated of the first two species. But, although this be the case, we cannot overlook the fact, which is evident from considering the last paragraph, that the state of constitution in which scrofulous diseases manifest themselves, and the circumstances which predispose to their development, are also particularly favourable to the production of lupus. On the other hand, it is also certain that the latter considerations are quite insufficient to establish it as a scrofulous disease, as it is found in persons of quite the opposite diathesis, and more particularly because it resists the remedies which are found so beneficial in scrofula. It was for a long time reckoned to be a cancerous disease; and it would be wrong in a discussion concerning its nature to omit mentioning this opinion. The progress and result of lupus give some colour to the notion of its affinity with cancer. Such loose resemblances, however, have never been sufficient to allow accurate pathologists to recognise their identity. Many of the oldest physicians already marked some of the distinctions between them. Celsus, as we have seen, distinguished them with particular accuracy. Wiseman, and others of our early writers, also laid down excellent rules for making a diagnosis between them. Without entering here particularly into their differences, we content ourselves with remarking that the symptoms, both local and constitutional, are quite different in the two diseases; and that lupus is as decidedly distinct in character from cancer as it is from scrofula.

But notwithstanding that it is impossible to identify it on the one hand with scrofula, as some writers do, or to reckon it as a form of cancer, it seems to us that in searching for its true nature, it may be profitable to recollect the frequency of its occurrence in scrofulous constitutions, and not to lose sight of the circumstances in which it resembles cancer. Now, with regard to the latter, it may be remarked that the hypertrophic state of the skin in our second species is not unlike the deposit of a new tissue, and also that in our first, which we have often laid down as the type of the true lupus, the ulceration is as unsparing in its destructive course as cancer. Besides the true cancer, there are cancerous ulcers which come still nearer the lupus of the nose in character, and cancerous tubercles which differ indeed from the tubercles of lupus in some important

particulars, but still they appear to shew an approximation in the character of the two maladies. Dr. Jacob has given the history of three cases of an interesting kind in the fourth volume of the Dublin Hospital Reports. Notwithstanding his arguments to prove that they are neither cancer nor lupus, it appears to us that their description answers perfectly to the character of the latter carried to a great extent. At that time the history of lupus was comparatively but little known, and scarcely any good account of it was to be found in books. Ravages to so great an extent are seldom found in this situation resulting from lupus or even from cancer, but the description answers so well to the former disease that no doubt exists in our minds but that it was really lupus.

Were we called on to declare our opinion of the essential character of lupus, we should say that it is an intermediate pathological state between cancer and scrofula, partaking somewhat of the nature of both, but constituting a state in which, by the blending of these two diseases, many of their peculiar characteristics are lost. In the lupus of the nose the double nature appears so proportioned as for each to neutralize the other more perfectly than in any other of the forms; and departing from this on either side, pathological gradations can be traced which degenerate to true cancer on one side, and on the other, passing through the hypertrophic and superficial lupus, lose themselves in scrofula. Besides the considerations offered above in support of this view of its nature, we consider that it is much strengthened by other circumstances, as, for instance, the action of iodine, carbonate of iron, and arsenic on the respective varieties. The first of these is found to possess signal virtues in the third form, which is a scrofulous disease; it is much less useful, if it have any effect, in the second form; and it is quite inert in the first. Whatever powers the arsenic and carbonate of iron possess are almost exclusively available in the first form; and it may be remarked that, while they have no efficacy in scrofulous diseases, they sometimes are found to palliate affections of a cancerous nature. Although this view of the pathology of lupus has not, as far as we know, been advanced before, we put it forward with some confidence, as we think it accords with the facts which are known on the subject. But the question demands much ulterior discussion, in accordance with that cautious spirit of laudable scepticism which the modern cultivators of medical science have been taught to use in weighing the worth of pathological doctrines.

The influence which a syphilitic taint in the constitution has in the production of lupus acts in two ways. One, the most obvious, is, where it gives rise to a secondary syphilis, assuming the character of lupus, but to be distinguished from it, as we shall immediately point out. Another effect is to predispose to the true lupus. How far these may be really differences only in degree of the syphilitic infection of the constitution we will not pretend to say, but in practice the two states occur. A striking case, which the author has observed, will illustrate our meaning. A woman, aged forty-seven, came from the country with an extensive lupus of the nose and of the palate; it was that combination of the first and second species which we have described above. She had had primary venereal symptoms seventeen years before, but no secondary disease of the skin, throat, &c. ever followed. She has borne eight children since, of which the first six died either before or immediately after birth. This was the way in which the disease showed itself. She herself attributed the death of her offspring to the contagion of syphilis, and there is no doubt but that she was right, as two of them came away in the putrid state, which is not an uncommon effect of this virus on the fœtus in utero. Her two last children, however, lived and enjoyed good health. The lupus has now existed two years, and has never exhibited any of the external characters of the venereal affection, which it is sufficiently easy to distinguish. This, then, is an instance where the original syphilitic taint predisposed to the formation of lupus, without impressing on it the marks which denote it to be a form of secondary syphilis.

A vague opinion was once entertained that the scanty pus which the ulcerating tubercles supply is contagious, and that it propagates the malady on any part of the body with which it comes accidentally in contact. This notion survived the old error which was so long a time prevalent in the schools, that all pus was corrosive; for even when it became established that purulent matter was a bland instead of an irritating fluid, exception was made in respect of that formed by some kinds of ulceration, and lupus was amongst the number. In fact, it is still imagined by many that the pus which oozes from the ulcerating tubercles is the means by which the slow destruction is effected. That it produces any specific effect as a direct chemical corrosive, is, however, no longer tenable; nor can it even be admitted that any considerable action is to be attributed to whatever irritating properties this discharge possesses. If it drop from the nose upon the hand or arm, it produces no perceptible effect. A patient with lupus of the nasal fossæ, in whom we had an opportunity of confirming this, yet complained of a smarting from it as it trickled through the nose. While, then, it is denied that the pus has any specific agency in the destructive results of this disease, it must be supposed to maintain more or less irritation on the ulcerating surface, as is the case with common ulcers which discharge an ill-conditioned sanies.*

Diagnosis. — It may be easily imagined

* See the sixth number of the Edinburgh Medical and Surgical Journal for an account of a curious case related by Dr. Grenville, under the name of "Herpes exedens vermiculatus," in which a very copious discharge which an ulcer furnished was proved by experiment to possess the power of generating the same ulcer in a part inoculated by it. On microscopically examining the pus, it was found to be full of animalculæ of various shapes and sizes.

that the diagnosis of a disease of such obvious characters as lupus will be made with facility. This will be rendered more certain if a clear knowledge of its different species and their stages be kept in mind. But, as it has been often confounded with other diseases, it will give us much confidence in our diagnosis to be forewarned of the affections which might lead us into error. We shall, therefore, point them out briefly with their diagnostic marks.

The pustules which constitute the elementary form in acne are succeeded by round indurations, which have a deeper purple colour than the surrounding skin. When these collect in clusters, as they sometimes do, near the point, or on the alæ of the nose, they have some resemblance to the tubercles of lupus in their first stage, and have been mistaken for them. This error will be avoided by attending to the different nature of the tumours in question. In acne they have been preceded by pustules, some of which are probably still to be met with in parts where the affection is least advanced, and besides this there exists round the base of the tubercle in acne a dull redness from which the lupoid tubercle is quite free, as the latter makes its way slowly over the skin without any marks of inflammation; for the violet discoloration which precedes it does not deserve that name. The hypertrophic lupus, when situated on the nose or forehead, is also not unlike acne, but the history is very different, and even a slight attention will discover the cicatrices which lie between the tuberosities in the former, and thus at once distinguish it.

It might be sufficient to mention the possibility of mistaking the crusts which form in certain kinds of impetigo and porrigo for lupus; but notwithstanding their general dissimilarity, the mistake has been made. The mind is preoccupied with the idea of lupus in every incrusted appearance which is met with on the alæ nasi or its immediate neighbourhood, and these pustular affections sometimes occur here in a very chronic form. In examining the case then, we must search for the primitive form of the eruption which has furnished the crusts. Small pustules will be more or less obscurely detected, with inflammation in the skin diffused between them, if these belong to porrigo or impetigo. Moreover, the crusts which might cause the mistake are quite opposed in their character to those of lupus, being irregular, soft, and easily detached; while in the latter, as we have frequently had occasion to state, they are of a firm consistence, and confined for the most part to the surface of the tubercle which forms them, and to which they generally adhere with great tenacity.

It is stated by authors that the elephantiasis of the Greeks is liable to be confounded with the hypertrophic form of lupus. But the tuberosities which occur in elephantiasis are round, knobby, and of a dusky sallow or fawn colour, which overspreads the whole face. If even they be confined to the face, they spread over it here and there, not affecting (as this form of lupus) the arrangement of a circumscribed patch. In some aggravated forms of this disease the tuberosities ulcerate, and furnish black crusts, which might impose on an unwary observer for lupoid incrustations; but tuberosities will be found, which have not gone on to ulceration, presenting the marks of distinction before laid down. This malady, besides, is rarely confined to the face, and when it has made some progress, it is attended with constitutional symptoms which do not belong to any form of lupus. Finally, its great rarity in this country prevents us from being often put to the necessity of making the comparison, while our knowledge of their points of resemblance will keep us from being off our guard.

Cancer is an affection which must be carefully distinguished. Whether the affinity which we suppose to exist between them be grounded in fact or not, it is of the utmost practical importance to separate the two diseases when we have to consider them with regard to treatment. Some cancerous tubercles commence with a warty tubercle, having a considerable resemblance to incipient lupus. It will, however, be observed that they are for the most part solitary, while the lupoid tubercles are scarcely ever so, at least for any length of time. Their bases too are deep-seated, and attached by a root which ramifies in the surrounding tissue, which is not the case in lupus. The most striking difference is the pain, which, as we have seen, is nearly totally absent in the beginning, and indeed throughout the whole course of lupus. Cancer is the seat of deep lancinating pains almost constantly, which are easily increased by improper applications, and permanently removed by none. Without multiplying points of difference, one more, with those already recited, will be amply sufficient to diagnosticate the two maladies. The circumstance to which we allude is the age of the individual. We have seen, with respect to lupus, that it is a disease of youth; but cancer is seldom or never met with below the age of forty. Biett is desirous of appropriating the name *noli me tangere* to cancerous tubercles, but at the same time insists that it should be carefully distinguished from lupus. We have not adopted his suggestion on this head, because we think it would only serve to confound the affections, which we are desirous with him to keep separate. There has always existed much discrepancy between the French and British ideas of cancer, and it would undoubtedly only serve to increase it were we to assign to this disease a term which has been hitherto uniformly appropriated to lupus.

Syphilis assumes the guise of this malady, as it does that of most other cutaneous diseases. We shall not here discuss the important theoretical question, whether we are to consider diseases of the skin produced by a venereal infection of the constitution the same actual diseases as when they occur unconnected with any constitutional taint, or whether we are to regard them as a class *per se*. For the exposition of this problem we refer to the article Syphilis. It is, however, of undeniable importance to have the means of distinguishing ordinary lupus from that of venereal origin.

The crusts which form in the syphilitic affection are much darker-coloured than those of the genuine lupus, and the surrounding skin is of a dark copper hue. The tumefaction which more or less attends the real lupus is absent, and the crusts are dry and permanent, and very seldom give place to any open ulceration. If the latter do ensue, it is to be recognized by the well-known characters of the syphilitic ulcer which infallibly attend it, viz.—the deep centre, and the raised, hard, and swollen edges. We have lately seen a case of syphilitic rupia, situated on the point of the nose, which at the first view we mistook for lupus, but on a little closer examination we found that the only point of agreement was the situation of the scabby crust. It was dry, hard, and flat, adhering to the tip of the nose with still greater tenacity than the crust of lupus. There were present also symptoms of venereal affection in the throat, and the patient had had venereal iritis. These were quite decisive of the question in themselves. In investigating doubtful cases, these additional constitutional symptoms should always be sought for, and the history of the disease obtained. But as to the latter, it must be remarked that negative evidence is not to be held decisive, nor is it even of much value if the other marks be present, as it is well known that patients will often refuse to admit the possibility of their having had syphilis, while undeniable proofs of its existence are manifest. There is a syphilitic affection which commences in the cartilages and bones of the nose, and having destroyed them by caries, attacks the soft parts. The bones having yielded, the nose becomes flat, and the alæ expanded. In this state the affection might be confounded with the hypertrophic lupus, for the root of the nose becomes somewhat swollen and livid; but it will be seen that this description differs from lupus in its progress, its appearance, and its results. It will be unnecessary to compare them more minutely.

Treatment.—The treatment of lupus has from the earliest periods of medicine been an object of great importance in practice. It does not put the life of the patient in jeopardy, but the hideous ravages which it effects, and the sure though slow progress with which it marches, render it a formidable disease. Yet intractable though it be, its sanability by the efforts of medical art is perfectly ascertained. Cases are even to be met with where a spontaneous cure has taken place by the cicatrization of the surface. Where this does occur, it generally belongs to the first form, and the cicatrix is perfect and permanent. There is much less security in the cicatrices of the other species. When the malady is left to itself, such a termination is very rare, and must be regarded as the exception; for the destruction seldom ceases till the nose is nearly level with the face, and then, which is a remarkable circumstance, it sometimes does show a tendency to stay its ravages. In many cases, however, it continues its progress on the cheek to a fearful extent. Experience teaches us, on the whole, to employ the means in our power sedulously and with vigour, and encourages us never to lose hope of arresting its progress; but it also lays before us the difficulties of a most obstinate disease, and cautions us against being too sanguine in our prognosis.

The treatment resolves itself, in this as in most cutaneous affections, into general and local means. We have seen that the system shews but little sympathetic action in this disease; we should not, therefore, *a priori*, expect that internal remedies would avail much; they form a part, however, of every well-digested plan of treatment. In some cases their efficacy is more considerable, and many cases will occur where they will demand our first and most particular care. On the other hand, the disease will be found in some patients who are in such good general health that it would be inexpedient to lose any time in the exhibition of general remedies. In these the local means will form the main resource, and whatever others may be employed will be directed rather to obviate particular symptoms than to make any impression on the disease through the constitution.

a. Internal remedies.—When a cachectic state of the system accompanies the malady, if its cause be recognized we must apply all our resources to remove this. If this ever stands to lupus in the relation of cause and effect, it is where it happens in the poor, when indigence exposes them to unwholesome and insufficient diet, with cold and uncleanliness. The low torpid state of the system which these induce will be evidently best obviated by reversing as much as possible the condition of the patient, substituting a light animal diet, and all the comforts which hospitals and other public or private charities afford. If we can detect any diseased action in the chylopoietic viscera, this will receive a particular attention; for whether this be regarded as a cause or merely as a concomitant effect, no favourable change in the local malady should be anticipated as long as it remains. Gentle aperients and tonics will tend much to the gradual improvement of the system. Occasional doses of the pilula hydrargyri and pilula rhei composita will be a useful remedy when the liver is found to perform its functions torpidly. The old authors, who looked so much to the state of the blood in pathology, attended much to the use of such remedies, and their practice in this disease is not thrown into the shade by any in the present day.

If the individual be obviously of a scrofulous habit of body, he should be kept steadily under the use of appropriate internal remedies for some time. This should be done whatever be the form of the malady with which the patient is affected. But, as we have already stated, the superficial lupus will be the form usually met with in such constitutions, and therefore that for which an anti-scrofulous treatment is particularly calculated. For the remedies proper to be used, we refer to the article Scrofula. We may mention here, however, that our experience of iodine has inspired us with great confidence in its efficacy.

We have seen striking amelioration produced by the use of the solutions which Lugol recommends. The proto-ioduret of mercury is one of the preparations of iodine which has proved of most utility. The ulceration has been observed to heal under its use with a rapidity which is quite foreign to its indolent character. The fourth part of a grain was given twice a-day to a girl of fifteen years of age, who had a large patch of deep ulceration with tubercles on the front of the leg. After ten days of its use the mouth became affected, contrary to the intentions of the physician, and in three weeks time an ulceration which had been forming a year and a half was almost cicatrized. We should add that the iodine was used externally also as a lotion, and in cataplasms. Its efficacy, however, appears to be confined to the third form, as whatever trials have been made with it in the lupus of the nose, or even in the hypertrophic form, have quite disappointed expectation.

The muriate of barytes was commended by Bateman for its efficacy in promoting the resolution of the tubercles. It does not appear to what species the latter belonged in which he employed it, but later authors object to its use, that it is a dangerous remedy from its energetic action on the stomach. The muriate of lime has been proposed as a substitute, having the same properties, and free from these objections. One drachm of the *solutio muriatis calcis* is to be mixed in a pint of water, of which a table-spoonful may be given once or twice a-day at first. This is to be progressively increased after a few days, till ten or twelve spoonfuls be taken daily. Preparations of iron have been at various times extolled. The muriated tincture and the carbonate are more relied on than any other. The latter, particularly, has been set forward with a zealous advocacy by writers who confounded the noli me tangere with cancer. It is doubtful whether they are entitled to any confidence in either, but as the cases in which they have been reported to have effected a cure were undeniably lupus, they deserve a trial.

Arsenic is a remedy which has been extensively employed, and the authority of most writers agrees in recommending its internal use. It is found to exert considerable influence in checking the progress of the tubercles, and even in altering the character of the ulcerated surface. It is variously administered. It forms the active ingredient of *the Asiatic pills*, a medicine which enjoys great reputation on the continent.* Fowler's solution is the preparation which is most approved of in these countries. This is to be commenced with the small dose of three drops, to be taken thrice a-day: it may be gradually increased to ten drops, but the greatest vigilance is to be observed during its exhibition. (See Lepra.) Practitioners of merit prefer minute doses of corrosive sublimate, carried to the extent of touching the gums, to any other internal means. It would be unprofitable to swell our catalogue by recounting other internal remedies whose effects are more doubtful, and we believe that those above mentioned comprehend all that have gained any merited reputation.

b. External applications.—These form by far the most important part of the treatment, and indeed often constitute the whole of it. It is always in combination with these that the efficacy of internal remedies has been developed, for no one would think of relying on the latter without using some of the local applications which have been at all times the essential therapeutic resource.

The local applications are of two kinds: *first*, those which are intended to exalt the vitality of the part, and thus to promote the resolution of the disease; *secondly*, those which, acting as cauteries, destroy the morbid part, and excite a healthy action in the surface beneath it.

The stimulating applications may be tried where the disease presents itself in the stage of tubercle. The attempt to effect the resolution of the malady will be more feasible in proportion to the earliness with which it is made, and also to the activity which the surrounding skin appears to possess. If the skin shew that the circulation is actively carried on, it will be often useful to apply a few leeches to the neighbourhood of the tubercles before commencing the use of the resolvent applications. Dr. Mac Farlane has experienced the good effects of such a plan, and recommends it in these words: "Sometimes the progress of a lupoid tubercle may be arrested and the ulceration prevented by the application of leeches round its base, especially when the tumour is painful and covered by inflamed integuments. This, followed by evaporating lotions and alterative doses of calomel, will not unfrequently subdue the inflammation upon which the progress of the disease depends, and reduce it to that indolent and chronic state in which friction with an ointment, containing the ioduret of zinc or mercury, may be beneficially employed to promote its absorption." These iodurretted ointments are topical applications of decided efficacy. Besides these, Biett is in the habit of using the ioduret of sulphur, made, as the metallic iodurets, into an ointment, in the proportion of fifteen grains to an ounce of simple ointment. This is to be applied with gentle friction to the tubercles and the skin surrounding their bases. It stimulates the skin powerfully, and has a greater resolvent effect on the nascent tubercles than any other similar application. Rayer objects to its use in this manner that it is apt to produce erysipelatous inflammation of the surrounding skin; but this is an infrequent consequence, and when it does occur is not to be deemed an injurious effect; on the contrary, it has been observed to be a means of dissipating the disease by communicating its sthenic action to the torpid tubercles.* In the hypertrophic lupus

* They contain about one-thirteenth of a grain of white oxide of arsenic, and somewhat more than half a grain of black pepper in each pill.

* See an interesting observation quoted in the Archives Générales de Médecine, t. xxiv. p. 584,

ıe employment of these resolvent ointments is articularly indicated; indeed, in this form ur hopes of cure must depend chiefly on such pplications, aided by an appropriate internal nedication.

When the tubercles are once ulcerated, or hen they are already far advanced towards is point, those stimulating applications are too eeble to be further of any efficacy. There is ne lotion which comes under this head, which ome experienced practitioners still confide in; e mean a solution of arsenic of such a rength as to produce only its specific stimuting effects on the sore, in the hope of changg its action. The solution of Fowler conins the arsenic in the best proportion for this pplication; with this the surface of the tuberles should be sopped twice or thrice a day, hen this method is judged expedient. It s generally agreed, however, that it is the isest practice in such stages to have recourse t once to escharotic applications.

Arsenic is the substance which is almost niversally allowed to be the most suitable scharotic which we have the command of in upus. This has been anciently established, s we find it first on the list of the "*medicamenta aduventia*," which Celsus proposes. ts superiority over the other caustics appears o consist in this, that it produces a slough romptly and certainly, which confines itself o the parts immediately touched by the arsenial preparation. The methods of employing his powerful mineral have been varied by lifferent practitioners. Justamond's application was once a very favourite form. This s made by fusing in a crucible two parts of ulphuret of antimony and one of white oxide f arsenic. The resulting compound, being ulverized, is of a blue colour. Sir A. Cooper s accustomed to use an ointment consisting of white arsenic and sulphur, a drachm of each, nixed with an ounce of spermaceti ointment. le directs some of this to be spread on lint, nd to be applied to the ulcer for four-and-wenty hours, at the end of which it is exected that a black slough will be formed, and when this falls, the surface is to be dressed with simple ointment. Other eminent practiioners employ it mixed with simple ointment lone, rejecting the admixture of any other ubstance to modify its action. When we desire to apply it to indolent tubercles, it is sometimes found that these are covered by a thick uticle, which impedes its action, for the rsenic has scarcely any effect on the cutaneous surface as long as the cuticle remains entire. Some advise that in such a case a small blister should be raised previous to its application; but this end will be probably better answered by mixing some cantharides with the arsenical ointment. Mr. Adams has successfully employed the following ointment:

℞. Unguenti cetacei, ℥ß.

Oxydi arsenici, ʒi.

Emplastri cantharidis, ʒiii. M. fiat unguentum.

He has also found that the callous edges of an old lupoid ulcer, which had resisted other arsenical applications, yielded a slough freely under the use of this for a few days.

Whichever method may be selected for applying arsenic externally, a certain degree of caution will be requisite. It will be prudent to apply it at one time to no larger a surface than a shilling would cover, and having produced in this space the desired eschar, a new portion may, if necessary, be attacked. This way of proceeding is found to be very effective in establishing a healthy action in the new surfaces, as well as to fulfil the end for which it was adopted, that is, to obviate any unpleasant consequences which might arise from spreading the arsenic over a large surface. While it will be prudent to make use of this remedy with that vigilance which our acquaintance with its powerful action on the animal economy must inspire, it is to be recollected that it is a perfectly safe application. All practitioners who have been accustomed to use it testify that they have never witnessed any of its dangerous effects produced on the constitution by its regulated use. There are indeed two cases mentioned by Dr. Mac Farlane, where, being spread upon extensive ulcerations, it was followed by severe inflammation of the gastro-enteric mucous membrane, apparently in consequence of its absorption into the system. These examples are, however, exceptions, and serve rather to exhibit the rarity of constitutional disorder consequent upon its use; but they also shew us the necessity of observing the cautions in applying it which we have suggested.

The arsenical paste is the application which has the most decided caustic powers, and on this account it is by many preferred to the other less energetic escharotics.* In the old cases of extensive destruction the edges acquire a degree of callousness which it requires the most potent remedies to affect; in these it is found advisable to produce a prompt and decided slough with rapidity, as it is found that less energetic means, which act more slowly, only allow of new productions under the imperfect slough, which increase the ravages sometimes to a prodigious extent, of which one of Dr. Jacob's cases is an example.† In these instances and wherever the strongest cautery is required, the arsenical paste may be used. Its employment demands particular caution not to surpass a limited area in its application, as besides the results alluded to in the last paragraph, it almost invariably causes a severe erysipelatous inflammation of the face. This may in some cases be of little consequence, but it must in all

where, during the treatment of a lupus of the nose in the state of tubercles, an erysipelas which was epidemic in the ward, attacked the patient's face. It had been very fatal amongst the individuals whom it had seized, but in this patient it proceeded no further than the face, where it ran its course safely, and at its disappearance brought about the complete resolution of the tubercles.

* The arsenical paste is made by mixing the "poudre arsenicale" of Frere Côme with saliva into the consistence of a paste. This powder consists of arsenic, cinnabar, and burnt leather. (See Rayer's Formulaires.)

† Dublin Hospital Reports, vol. iv.

be prevented from running too high by the ordinary means of leeches and proper remedies. Some habits could not safely sustain this. We should, therefore, confine the use of this energetic caustic not only to the kind of ulceration which requires it, but also to individuals whose constitution will enable them to bear the erysipelas which attends its use.

In cases where the effects of the stronger arsenical applications might be injurious, M. Dupuytren recommends a powder, whose action is, he says, specific, not caustic. It is composed of calomel and arsenic in the proportion of one part arsenic to two hundred of calomel. The quantity of arsenic may be doubled if it be required more active. It is sprinkled directly on the ulceration by means of a dossil of lint, or made into a paste with thin mucilage. It is to be left on till it falls away of its own accord, and renewed several times till it produce a new action in the ulcerated surface, and a tendency to cicatrise. This is found to be a very suitable application in children, females, and individuals of a delicate habit and irritable skin. Dupuytren applies it to unhealthy cicatrices, having in the first place produced a new surface by cauterising them, and this appears a very excellent method of employing it. Although this powder is much milder in its action than the other arsenical applications, the same cautions are to be observed in its employment, for whatever is to be apprehended from the absorption of the mineral, may as readily occur from this as from the more concentrated preparations.

The nitrate of silver and the muriate of antimony, which are so commonly used in other ulcerations, seem to be superseded by the arsenical cauteries; but the former does not deserve to be neglected; we can answer for its efficacy in changing the unhealthy surface. The concentrated nitric acid is a favourite escharotic with some experienced men. In that variety of the third form where the deep layers of the skin and the cellular membrane are the seat of the destruction, it is amongst the best applications for causing separation of the sloughs and cicatrisation.

A preparation, called "le nitrate acide de mercure," is in high repute at the Hôpital St. Louis, from the success with which MM. Richerand and Cloquet employ it in producing healthy cicatrices. It is made by dissolving a drachm of the proto-nitrate of mercury in an ounce of nitric acid. The ulcerated surface is to be touched with it by means of a dossil of lint, and some scrapings of lint moistened with the same solution to be also laid upon the part. Its immediate effect is very painful, but this does not continue. It is also an excellent application for the soft flabby edges of unhealthy, half-formed cicatrices, which, we should remark, are always to be treated with the same energy as the open ulcer; they are certain otherwise to relapse sooner or later into this condition.

The actual cautery was formerly much esteemed in this malady, but now is but seldom employed. We believe, nevertheless, that it is sometimes amongst the best methods for obtaining a satisfactory eschar that we possess. It should never be employed, however, in lupus of the nose, for the cartilages become affected by a bad kind of inflammation and swelling from its use, which increases the evil. Their defective vitality is not capable of producing a slough. But where the disease occupies a different situation, it is still used with much success.

These methods of destroying the diseased surface are generally preferable to extirpation by the knife, which has, however, been practised with the most favourable result.* Cases may happen where it can be had recourse to, in which the mineral escharotics are inapplicable, as, for instance, where a solitary tubercle is situated very near the eye. It is of particular importance to arrest its progress as soon as it can be recognized in this situation; but the cauterising substances would be dangerous applications in the vicinity of the eyeball; so that here, if other things permit it, excision by the scalpel will be the preferable practice.

In employing the escharotic applications, it must be a rule with the practitioner to persevere in their use till the whole of the morbid structure is destroyed. In order to effect this, it will in general be required to repeat them several times, for when the eschar falls, although the new surface present a healthy aspect, the cicatrix may form imperfectly, and afterwards break out again into open ulceration. To diminish the chances of this event, it will be wise not to trust to the destruction of the mere face of the ulcer, but rather to repeat the cautery, to procure a deeper and healthier surface, which will give us better confidence in its cicatrisation. During the progress of the latter, attention must be frequently given to the opening of the nares, as their edges have a great tendency to unite during this process. It is sufficient here to revert to the frequency of this accident, and in individual cases the ingenuity of the practitioner will suggest means to promote or to remedy it.

When the cicatrisation is accomplished, every means should be put in practice to fortify the constitution against the risk of a relapse. To this end it has been proposed to insert an issue or seton in the nape of the neck. This would be, doubtless, particularly in young persons, a wise precautionary measure. It may, however, be stated in general, that if the remedies be steadily persevered with till the malady be quite removed, the cicatrices will stand sound. The Tagliacotian operation has been performed where the nose had been destroyed by lupus. Fears were entertained that the skin taken from the forehead for the new nose would not form a junction with the old cicatrized edges cut to promote union by the first intention, and that the dormant malady might be reproduced by the operation: the union was, however, completely established,

* Nouveau Bibliothèque Médicale, t. iv.

and the cicatrix maintained its integrity, because the cure had been complete.

(James Houghton.)

NURSING.—See Lactation.

NYCTALOPIA, Νυκταλοπία, *(th. νὺξ, ὄψ,) Night-blindness.*—A considerable degree of confusion has prevailed among authors in the use of the term *nyctalopia*. Some have employed it to signify blindness by night, and others blindness by day; while it has also been used indiscriminately to denote either of these conditions. The most approved acceptation, however, among the best and by far the most numerous authorities, would appear to be that of night-blindness, while the opposite condition of blindness by day is properly designated by the word hemeralopia. This is the sense in which the terms are used in the present article.

History and causes.—Nyctalopia is little known in this country, but in the torrid zone, and in those parts of the globe where the heat and light of the sun are powerful, it is frequently met with. It occurs in Africa, in Asia, and in America, and is said to be more common in China than in Europe. In the East and West Indies, and in the Mediterranean, it is no unusual disease among our soldiers and seamen; and on the eastern shores, and in the islands of the Adriatic, it is at times very prevalent. It has also occasionally assumed an epidemic form in different parts of France, Germany, Poland, and Russia; and in some situations it appears to be endemic. Wherever it occurs, it preserves the same characters, varying only, in individual cases, in the severity of its attack, in the length of its duration, or from constitutional peculiarities of the patient.

In persons affected with this disease, when the sun sets, vision begins to be indistinct, and becoming gradually more imperfect as the light diminishes, it is at length entirely suspended. The blindness continues during the darkness of night: in proportion as the day-light returns, sight is restored, and it again becomes perfect when the sun appears above the horizon. Blindness and vision continue, in this way, to correspond with the setting and rising of the sun, and the approach and the remission of the paroxysms are in general gradual; but in some instances the blindness comes on suddenly at sunset, and disappears at sunrise in a similar manner.

The degree of blindness varies. In the early stages of the disease it is in general partial, and the patient can see objects in a clear light; but as the complaint advances, the powers of vision become more impaired. Some patients are incapable of discerning the moon or the stars, or even the light of a candle when placed close before their eyes; and some can perceive these bodies, but not the objects which are illuminated by them; while others can barely distinguish light from darkness. After a lapse of time, varying in different cases, the blindness is often complete, and the patient cannot perceive any object after sunset, even in the brightest artificial light.

According to Mr. Bampfield, if the disease is allowed to continue in this degree of severity, the sight will, in the course of time, become weak during day-light, and the eye will not be able to bear the direct or reflected rays of the sun, without pain and temporary blindness being induced.* Such cases, however, are not of common occurrence.

But even when this irritable state of the eye has not been induced, it would appear that, on some occasions, the patient, when placed in an obscure situation,† is incapable of distinguishing objects by day as well as by night; but this state does not seem to have been often remarked, and it would appear that a condition exactly the reverse of this has also been sometimes observed.‡

In general there is no uneasy sensation, or visible alteration in the eye, to indicate the presence of any morbid affection. Some authors, however, describe the pupil as being immoveable and contracted; whilst others say that it becomes immoveable and dilated, particularly during the night. These discordant accounts may, perhaps, have arisen from examinations of different states or stages of the disease; for Mr. Bampfield, whose opportunities of observation were extensive, says, that after it has continued long, and in the worst stages, "the pupil is often contracted, and the eyes and actions of the patient evince marks of painful irritation, if the eyes are exposed to a vivid light, or if he look upwards." In another place he observes, "the pupil of the eye is considerably dilated both by day and night, in the proportion of about one case in twelve, and at night the pupil is often dilated, and does not perform its expansions and contractions when exposed to the moon or artificial light."§ These were also generally cases which had been long protracted.

Although no medical treatment has been employed, the disease, after continuing for a longer or shorter period, frequently undergoes a spontaneous cure. In temperate climates, its usual duration is from one month to six weeks; but within the tropics its continuance is generally much longer, extending from a few weeks to three, six, or nine months, and even occasionally to a still longer period. On some occasions it would appear to be congenital;‖ and it is also alleged to be at times hereditary.¶

* See Medico-Chirurg. Transactions, vol. v. p. 39; also Manardi Epist. lib. xv. Epist. ii. p. 431.

† Radii Scriptor. Ophthalm. Minor. vol. iii. p. 176, 177, 179, 192. Lipsiæ, 1830.

‡ See Lettres Edifiantes, tom. xxiv. p. 434.

§ Medico-Chirurg. Trans. loc. cit. p. 42.

‖ See a case where the patient, 20 years of age, had had the disease "from the first time he was able to take notice of things." Philosoph. Transact. vol. iii. p. 38. Also the case of a patient, 23 years old, who states, "se a quatuor jam annis laborare cæcitate nocturna." Halleri Disputat. tom. i. disp. xxii. sect. 2. Lausannæ, 1757. Also an account of its occurring in three individuals of the same family, in Radii Scriptor. Ophthal. Minor. loc. citat.

¶ Rees's Cyclopædia, art. Nyctalopia.

The natives of cold countries who reside within the tropics are said to be more subject to this complaint than the indigenous inhabitants; and those Europeans who have once had an attack are very liable to a recurrence of it while they remain in a warm climate.

Within the tropics, the disease may be almost considered as endemic, and does not appear to be more prevalent at one season than another. But in temperate climates it most generally occurs during or after the protracted heat and dazzling light of summer and autumn. In Germany it prevailed as an epidemic in the months of July and August;* and in Russia Dr. Guthrie says it is most frequent in June and July during the hay-harvest.† All the cases which the writer of this article met with in the Mediterranean took place in the end of summer and in autumn. It is, however, by no means confined to those seasons. Hippocrates names it among the diseases that occur "circa brumam," and adds that the greater number had relapses "ante æquinoctium."‡

Even at the season of the year when the heat has not arrived at its greatest height, but when the sun is long above the horizon, the disease has appeared as an epidemic among troops exposed to much watching and fatigue. The most remarkable instance, perhaps, is that recorded by Dr. Guthrie in the Edinburgh Medical Commentaries. "I was lately desired," he says, "to give an opinion on a curious phenomenon that happened last war in Finland, where a Russian detachment, ordered to attack a Swedish post during a light night in spring, had like to have mistaken one another for enemies, and occasioned bloodshed, owing to some hundreds in the column being *blind after sunset*. The complaint seized the soldiers in spring, when the nights, from the short absence of the sun, and the strong reflection from the snow, must have been very fatiguing to the eyes, at a period of much martial vigil and alarm; surprises on both sides being then very frequent, more especially nocturnal."§

Night blindness has been described as endemic in different countries. We have an interesting account by Chamseru,‖ of its annual occurrence in this form in France, at Roche Guyon and the neighbouring villages, in some of which it occasionally affects as many as one in nine or ten of the inhabitants. It appears every year in spring, about the middle of March, and continues for three months; sometimes also returning in the autumn. The soil is here composed of chalk and marl, upon beds of burrstone (meulière) and flint (caillou), and the disease principally attacks those who are much exposed by their labours in the fields to the reflected heat and light from this dazzling surface. As the summer advances the ground becomes covered with verdure, and being no longer capable of reflecting the brilliant light of the sun, the disease disappears for the season.

According to Richerand, the inhabitants of the northern regions, where the ground is covered with snow during the greater part of the year, become, at an early age, the victims of this disease. He also says that among artisans the same morbid state of the vision is sometimes produced from long exposure to a great intensity of artificial light.*

Nyctalopia is a disease more common to the labouring classes of people, and those who are exposed to much fatigue, watching, and other debilitating influences—whose diet is often scanty, or even unwholesome.† The epidemics which are referred to above were confined to persons of this description; and its frequent occurrence among our seamen leads us to the same conclusion. A few instances are recorded of its affecting individuals among the better ranks, but in such cases the habits and mode of life of the patients have not been described with precision, so as to justify us in forming a different opinion.

In many cases nyctalopia appears to be a purely local or idiopathic disease; but still more frequently it is the consequence, or at least the concomitant, of some other affection. All the instances of it which came under the observation of the writer, happened to individuals more or less affected with sea scurvy; and several medical authors and surgeons of the navy have remarked the frequent co-existence of the two diseases.‡

It is very often symptomatic of derangement of the digestive organs, so much so that Scarpa,§ Schmucker, Richter, and several other authors, seem to consider the disease as almost entirely originating in this cause.

Some morbid condition of the brain would likewise appear to be occasionally present; for headach and vertigo, pain and watering of the eyes, &c., have been enumerated as precursory or concomitant symptoms.‖

Hippocrates¶ and Celsus** state that females, whose catamenia are regular, are not subject to attacks of this disease, but later observations sufficiently prove the general inaccuracy of this opinion. It is indeed true that the proportion

* "Calore solis existente maximo — remittente solis æstu desiit hæc nyctalopia." Halleri Disput. loc. cit. sect. 8.

† Edin. Med. Comment. decad. ii. vol. ix. p. 288.

‡ De Morb. Vulgar. lib. vi. sect. vii.

§ Edin. Med. Comm. loc cit. p. 285 et seq. See also Ephem. Natur. Curios. dec. iii. Ann. vii. and viii. append. p. 131.

‖ Hist. et Mém. de la Société Royale de Médecine, ann. 1786, Paris, 1790.

* Elements of Physiology, p. 284, edit. 1812.

† *Haller*. Disput. loc. cit. sec. xx; Gregor. Horstii Oper. Med. tom. ii. lib. ii. obs. 34. p. 106; also *Chamseru*, op. cit. p. 139.

‡ See Observations on Hemeralopia, or Night Blindness, by Andrew Simpson, surgeon, p. 31, &c. Glasgow, 1819; Blane on Diseases of Seamen, third edition, p. 485.

§ *Scarpa*, Mallatie degli Occhi, p. 252. Pavia, 1801.

‖ "Quandoque fit propter communitatem stomachi et cerebri." *Avicenna*, Cannon. lib. iii. Fen. iii. Tract. iv. c. v. p. 561. See also *Haller*, Disput. loc. cit. sec. vi. and Lond. Med. Observ. and Enquiries, vol. i. art. xiii. p. 3. Lond. 1771.

¶ Op. cit. Prædict. lib. ii. sect. ii. p. 110.

** De Medic. lib. vi. cap. vi. p. 369. Lugd. Bat. 1730.

of males affected is in general greater than that of females; but this arises from the circumstance that the latter are usually exempt from the same degree of hard labour in the fields, and other debilitating causes. For similar reasons young children are seldom affected by it.

Persons of different temperaments are equally liable to nyctalopia; and it is not peculiar to those who have eyes of any particular size or colour.

Nyctalopia has been attributed to various other causes, such as eating rice, sleeping in the sun, the use of poisonous vegetables, a fit of anger,* &c. It appears from Haller† that the inhabitants of Bavaria ascribe the disease to the use of bread in which darnel is present; and this opinion is one of great antiquity; for both Virgil‡ and Ovid§ mention that "lolium" was believed to be hurtful to the sight; and Plautus‖ expressly says that it produces nyctalopia.

Pathology.—In order to produce distinct vision, a due proportion of light is necessary to excite the retina. The quantity required for this purpose depends much on the impressions which have been previously made on the organ. When the eye has been exposed to a strong light, a fainter illumination will not suffice to enable it to discriminate objects; while, on the other hand, vision will be painfully acute, even in a comparatively obscure light, to those who have previously been in a state approaching to entire darkness. Thus the prisoner becomes gradually enabled to perceive the objects in his cell; while the man who has been exposed to the reflection of the sun's rays from the snow is rendered for some time incapable of seeing in the less dazzling though clear light of day. From the operation of the same law, the eye, in nyctalopia, after being exposed to a long and brilliant sunshine, is not excited by the feeble light which continues after sunset, and vision entirely ceases.

When an organ is often and highly stimulated, its sensibility, it is well known, becomes impaired. The long-continued action of light accordingly produces a state of torpor or insensibility of the retina, which becomes greater in proportion to the degree of predisposition and length of time during which the exciting causes continue to operate. In the early stages of the disease, before any considerable insensibility of the retina has been induced, vision is observed to be more or less perfect in a clear light, and according to the degree of illumination. But after a lengthened attack, the increasing torpor of the retina renders it insensible to the stimulus of even a bright artificial light. While this torpid state of the organ remains, the pupil continues dilated and immoveable on the approach of a light which is not of sufficient intensity to excite the retina in the degree requisite to produce vision.

Nearly the same explanation applies to that state of protracted disease in which the eye has become unable to bear the direct or reflected rays of the sun. The heat and light which occasion the insensibility of the retina, at the same time stimulate the vascular portion of the eye, so as to produce a degree of inflammation. It is in this state that the eye becomes irritable, and the pupil contracted, in order to exclude the excess of light. For while the retina preserves its natural sensibility, the contractions and expansions of the iris in most instances go on unimpaired, and the eye appears as in perfect health.

Perhaps it may be thought that, if the disease be owing to an insensibility in the eye produced by the intensity of the sun's light, the patient ought also to be blind when removed to an obscure place during the day, seeing that in both cases the stimulus of light is withdrawn from the eye. This, however, we find, is not always the case. In explanation it may, perhaps, be alleged that the action of the sun's rays, for the *whole duration* of a long day, will more effectually contribute to produce that state of the organ which constitutes the disease than when they act only for a shorter period. The inference seems to be reasonable, but it would require to be confirmed by repeated observations.

Diseases of the brain, and such other causes as induce repletion in that organ, may also produce nyctalopia by injuring the optic nerves, either at their origin or in their course, and thereby so impeding their functions as to render them incapable of transmitting the slight impressions which are made on the retina by a faint light. The last stage of this form of the disease would constitute complete amaurosis.

The well-known sympathy which exists between the stomach and the organs of vision will readily account for nyctalopia appearing so often as an attendant on disorders of that viscus.

The varied illusions and other affections of vision familiar to persons subject to dyspeptic disorders, are analogous in many respects to this disease.

A very different and almost mechanical cause has been assigned for this disease by different authors, namely, a rigid and contracted state of the pupil, whereby a sufficient quantity of light is prevented from reaching the retina. It is very evident that such a state of the pupil might occasion the disease; and it seems to be sometimes observed, as several authors have mentioned its occurrence.*

Diagnosis.—Nyctalopia can scarcely be con-

* Lettres Edifiantes, loc. cit. p. 434.

† Disput. loc. cit. sect. xxi.

‡ —— interque nitentia culta
Infelix lolium, et steriles dominantur avenæ.
Georgic. lib. i. vers. 153.

§ "Carcant loliis oculos vitiantibus agri."
Fast. lib. i. vers. 691.

‖ "*Sceledrus.* Mirum est lolio vicitare te tam vili tritico.
Palæstris. Quid jam? *Scel.* Quia luscitiosus.
Miles Gloriosus, p. 475. Coloniæ, 1578.

* *Avicenna*, Cannon. lib. iii. Fen. 3, Tract. iv. cap. v. p. 561. Dan. *Sennert.* Opera, tom. iii. lib. i. par. iii. sect. ii. cap. xliv. p. 256. Lugd. 1656. Th. Zuinger, Pædojatreja, obs. xxv. p. 142. Basiliæ, 1721. Fel. Plateri Praxeos Medic. tom. i. cap. vi. p. 193. *Herm. Boerhaave* de Morb. Oculor. p. 159. Gottingæ, 1750. Gregorii Conspect. Med. Theor. p. 81. ed. tertia.

founded with any other disease. Yet in a complaint of such frequent occurrence in the navy and army, and which affords such facilities for carrying into effect the schemes so often devised by seamen and soldiers to enable them to evade their duty, it would be an object of importance, if any sure diagnostic symptoms could be pointed out. The present state of our knowledge does not, however, enable us to do so with any thing like precision. If contracted or dilated pupil were an invariable concomitant, this would afford a ready mode of discrimination; but these states of the pupil have been rarely observed, even in cases of long duration. As there are no direct means by which the disease can be detected,* attention must, therefore, be paid to the character, habits, and conduct of the individual, and there are few instances in which investigation and experiment will not suffice for its discovery. For some remarks on this point, see the section on *Blindness*, in the article Feigned Diseases, vol. ii. p. 136.

Prognosis.—The prognosis in nyctalopia may generally be considered favourable; and, when proper means of treatment are speedily adopted, the disease is seldom protracted. It even frequently undergoes a spontaneous cure; and the instances are rare in which it is followed by any bad effects. It has also been occasionally removed by the supervention of diarrhœa, of hemorrhage from the nose, and of abscesses and eruptions about the head and face. In two of Dr. Forbes's cases,† epiphora succeeded; and according to Mr. Bampfield,‡ lippitude and myopism are sometimes consequent upon it. This author also states that total loss of sight has been known to ensue, and refers to Bontius in support of this opinion. But from the passage in Bontius,§ it is somewhat doubtful if the disease which is alluded to was nyctalopia. Some authors, however, have been of opinion, that the treatment of the disease is not always successful. According to Sennertus,‖ and Etmuller,¶ it is seldom cured, and Boerhaave** says, "nullum remedium scio, quod hoc malum tollere possit."

Treatment.—Physicians have very generally endeavoured to adapt their mode of treating a disease to the theory which they have formed respecting its cause. This remark has been fully verified in the treatment of nyctalopia. The *humoral* pathologists, who supposed the disease to depend upon a superabundance, thickening, or congestion of the humours, had recourse to such remedies as they considered adapted for diminishing, altering, or evacuating the various humours of the body in general, and of the eyes in particular. For these purposes they recommended *attenuant diet* and bleeding, both general and local. They employed also purgatives, particularly those which they considered as suitable to diseases of the eyes—"oculis appropriata." Nor were other evacuants omitted—*sternutatoria*, *pituitaria*, and the like. Various local applications were also made use of, such as collyria, unguents, and powders, elaborately compounded with all the superfluous science, and multifarious ingredients resorted to in ancient pharmacy. Some things were recommended as remedies on principles evidently the most absurd. Thus, according to Galen and Celsus, *hieracion* was advised, because "accipitres aiunt scalpendo eam, succoque oculos tingendo, obscuritati visûs mederi; ob idque vocant hieracion."* *Euphrasia* was thought good for the sight, from an imaginary resemblance between the spots on its petals, and the eyes. Many other equally fanciful examples might be adduced, but it may suffice to quote the following from an author of high celebrity:—"Capras negant lippire, quoniam eæ quasdam herbas edant: item dorcadas: et ob id fimum earum cera circumdatum nova luna devorare jubent. Et quoniam noctu æque quoque cernant, sanguine hircino sanari lusciosos putant, nyctalopas a Græcis dictos."† Thus it would appear that, from the visual faculties possessed by those animals, of seeing by night as well as by day, the employment of their livers in the cure of nyctalopia took its rise. This is a remedy, the astonishing powers of which have been extolled, both in ancient and in modern times, and in countries the most widely separated, with a confidence truly inexplicable. The livers of various animals were occasionally employed; but those of he-goats, of bullocks, and of sheep, were preferred. Sometimes the vapour of the heated liver was applied to the eyes; at other times the viscus itself was given to the patient to eat; in both cases frequently after it had undergone the most complicated preparations, particularly with various stimulating substances. It is difficult to believe in the production of a cure by such means; and yet it would require no small degree of incredulity to set aside altogether the evidence which has been adduced in favour of these remedies.

A recent German writer has given a remarkable instance of the apparent power of this hepatic treatment of nyctalopia. As the account is altogether curious, we give the narrative at length. The author, Dr. Edward Meissner,‡ informs us that in a small town in Podolia, on the banks of the Bug, having a

* "———— il n'y a point de signes qui fasse connoître cette maladie, hors le rapport du malade." Maître-Jean, Traité des Maladies de l'Œil, 2de partie, ch. iii. p. 246, à Paris, 1740.

† Edin. Med. and Surg. Journ. vol. vii. p. 419.

‡ Medico-Chirurg. Trans. loc. cit. p. 40.

§ De Medic. Indor. lib. iv. p. 32. Parisiis 1645.

‖ Opera Omn. tom. iii. par. iii. § ii. cap. 44, p. 227. Lugduni 1656.

¶ Opera Omnia Comp. Colleg. Pract. lib. ii. art. 1, p. 33. Lond. 1701.

** De Morb. Ocul. § 158. Gottingæ 1750.

* Foresti Opera Omnia, lib. xi. obs. 38. Francof. 1634.

† C. Plinii Secund. Natur. Hist. tom. iv. lib. xxviii. § xlvii. p. 616. Parisiis 1685.

‡ Bemerkungen aus dem Taschenbuche eines Arzes wahrend einer Reise von Odessa, &c. *Halle* 1819. See also Encyclopädisches Wörterbuch. B.V. p. 388. *Berlin* 1830.

population of about 2000, some weeks before Easter, in the year 1816, he met with more than a hundred cases of nyctalopia. "I discovered this," he says, "accidentally one evening, when my surgeon, a Jew, came home hurt, having been overturned by the man who drove him, and who had suddenly become blind as the sun set. Upon inquiring why none of these people were brought to me, I was told that they very well knew how to cure themselves, and would do so as soon as they were at liberty to use the means. It was then the time of fast, when those of the Greek church use no animal food, but live chiefly on bread and grits prepared with oil. I was assured that at the same period every year a great many people were seized with nyctalopia, but that when Easter came they ate the liver of a black cock or black swine, and were cured in a few days. I had ten of these people brought to me both during the day and in the twilight, but could perceive nothing particular in their eyes, except a great immobility of pupil. In other respects they were all in perfect health, and would submit to no other kind of treatment, assuring me that they knew they would be quite free from their malady within fourteen days without my medicines. On Easter day they began to eat liver *and other animal food*. Two of those I had examined, on the third day saw as well as ever; and all were completely cured by the following Sunday."

The writer of this article has repeatedly seen a cure *apparently* produced by fumigating the eyes with the vapour of bullock's liver. The disease occurred in persons who were in some degree affected with scurvy; and various measures had been employed for its removal without benefit. The patients themselves had recourse to the bullock's liver, and declared that one or two fumigations entirely cured their complaint.

We are as yet but little acquainted with *nervous* diseases, and are too well aware of their intermitting nature to put implicit faith in the efficacy of such a remedy. The disease in these as in many other instances, may have undergone a spontaneous cure; or it may have owed its removal to some cause which was unknown or unobserved. It must be acknowledged that the *minute* history of nyctalopia is still very imperfect.

Could any remedial exhalations have proceeded from the broiling liver? or, did the application of heat alone suffice to excite the torpid retina into healthy action?

In the case of the Podolians above mentioned, it is obvious that we are entitled to attribute the case as much, *at least*, to the general change in their diet, as to the specific influence of the black pig's or cock's liver.

Viewing nyctalopia in the light of a more rational pathology, it is hardly necessary to say that, to give hopes of successful treatment, regard must in all cases be had to the nature of the causes which immediately induce the disease. If it appear to proceed from fulness of blood in the head, or any affection of the brain, bleeding and other means, tending to remove such a condition, are of obvious propriety. If derangement of the digestive organs give rise to the complaint, emetics, purgatives, or such other remedies as are suitable for removing the primary disease, must be employed; and when scurvy, or any other general affection of the system prevails, the appropriate means for its removal will be adopted as the first step in the treatment; and after the chief predisposing cause has been subdued, attention will then be paid to the treatment of the local affection. Nyctalopia, however, is often unaccompanied by any specific or formal disease, and appears to depend upon general and local debility. In such cases our efforts will be directed to restore the general strength of the body, and more particularly of the eyes; and this will be most readily accomplished by avoiding the exciting causes, and by employing tonics and stimulants, both general and local. Dr. Guthrie informs us that, in a week or fourteen days, the disease "is cured by the use of a bitter tonic infusion,* although the patient continue his daily hard labour, providing he sleeps as at other seasons during the night." Although the complaint may certainly be in this way removed, yet a cure is induced still more speedily by the application of blisters to the parts immediately adjacent to the local affection. They stimulate the eyes more effectually than general remedies do; and as during their application the patient is usually allowed to go to rest at night, they constitute an important part of the remedial process in the case of seamen or others subject to night-watching. The merit of more particularly recommending blisters, and determining their efficacy in the cure of this disease, belongs to Mr. Bampfield, though the remedy is not new, as they are known to have been employed from a remote period. His words are, "A succession of blisters to the temples, of the size of a crown or a half-crown piece, applied tolerably close to the external canthus of the eye, has succeeded in every case of idiopathic hemeralopia which I have seen. Under their application, the retina appeared to regain its irritability, and sensibility to impressions from light, in the same gradual manner as it was deprived of it."† In his practice, one or two applications were often sufficient to remove the complaint; but the third, fourth, or fifth generally produced a complete recovery. The instances are but few in which there was occasion for a greater number of blisters; or by keeping them open, the cure was generally completed within a fortnight. During the time in which they are applied, exposure to a bright light ought to be carefully avoided; and the patient should be allowed a sufficient time for sleep. The eyes may also be frequently bathed with cold water, or some tonic and astringent lotion.

* Made, he believes, from the "Centaurea Cyanus" of Linnæus. Edin. Med. Comment. loc. cit. p. 288.

† Medico-Chirurg. Transactions, loc. cit. p. 47.

Besides blisters, other local stimulants have been employed, particularly the vapour of ammonia; frequently, however, with indifferent success. The stimulus of electricity has been used with advantage; and, reasoning from analogy, it might be expected to prove highly beneficial, as also galvanism.

It may be proper just to notice in this place the analogous but reverse lesion of vision, termed *Hemeralopia* by those who give the name of nyctalopia to the affection of which we have been treating, in which the patient is blind during the day, but sees comparatively well at night. This disease is noticed by Hippocrates, and many other authors, both ancient and modern; but as it has never fallen under our own observation, except as a mere symptom of ocular inflammation, and as its occurrence as an idiopathic affection is, we are convinced, extremely rare, we deem it unnecessary to give any particular account of it. It may no doubt arise from such local affections of the retina of an organic though unknown kind, as to entitle it to be considered idiopathic; the relative excess of light producing here the same effect as its relative deficiency did in nyctalopia. When, however, not the immediate consequence of inflammation of the eye, it has commonly been observed as the temporary attendant of hysteria, or as a symptom of worms, or other irritation sympathetically affecting the brain generally, or the optic nerves in particular. It therefore deserves no separate consideration in this work as a distinct disease.

(James Grant.)

OBESITY.—This term, from the Latin obesitas, *fatness, corpulency*, its synonym *polysarcia*, from πόλυς, *much*, and σὰρξ, *flesh*, and many others of similar import, are used to signify an excessive development of fat in the body.

Of all animal solids, fat may be named as that which may vary most in quantity without material infringement on the health. Thus we see persons in very various degrees of fatness or leanness enjoying the best health; and even the same individual, under different circumstances of diet and regimen, may become fat or lean without any corresponding change in the well-being of his body. There is, nevertheless, in most individuals, a certain degree of stoutness which best comports with that regular balance of functions which constitutes perfect and permanent health. This degree in some persons may not rise above leanness; and in these even a moderate degree of embonpoint is often a precursor or a sign of disorder; whilst in many, a fulness and rotundity of person is natural, and not only consistent with, but indicative of perfect health. This statement shews the impossibility of defining absolutely what degree of obesity is to be considered as morbid, although in its excessive degrees it is unquestionably a disease and a cause of disease. Cullen describes obesity as morbid "when it renders persons from a difficult respiration uneasy in themselves, and from the inability of exercise, unfit for discharging the duties of life to others."*

Fat may be developed in excess at any period of life, but some ages are much more disposed to obesity than others; and these are infancy and maturity. Infants at the breast sometimes acquire a prodigious size from the deposition of fat. Usually this is chiefly confined to the subcutaneous tissue, and very little affects either the cavities or the interstices of the muscles; but when such children are affected with somnolency and a shortness of breath, which renders sucking difficult and movement laborious, the accumulation of fat may be supposed to be more general, and to oppress by its mass the organs of respiration, circulation, and motion. This condition is almost uniformly caused by an excess of nourishment, and is not unusually attended by a torpidity of the bowels. Fat infants are generally good-tempered; and it is difficult to say whether this be a cause or a consequence of their fatness; but a fretful disposition is generally consorted with an irritability of the secretory organs, which is opposed to any superfluous growth. The obesity of infancy generally diminishes after the second year; and it is not unusual to see the subjects of it become as thin as other children before the age of puberty. The demands of other solids of the body, which the increasing exercise at this period produces, operate against the superfluous deposition of fat; and the fuller development and greater activity of the mental faculties perhaps have a similar effect. In some of the most remarkable cases on record, however, the inordinate development of fat continued and increased regularly from infancy upwards. A German girl, who was exhibited some years ago in Paris on account of her prodigious size, at her birth weighed 13 lbs.; at six months, 42 lbs.; and 150 lbs. at four years. She shewed great physical strength as well as size, for when six years old she was able to carry her mother. She ate much milky food in her childhood, and afterwards drank large quantities of tea, but did not eat more than another person. She menstruated at the age of nine years, and always enjoyed very good health, being active and lively in her disposition. At the age of twenty she weighed 450 lbs.; she then could carry in each hand a weight of 250 lbs., and could walk for an hour without requiring rest, but her breathing was short on going up stairs. Her arms measured eighteen inches (French) in circumference; and the fat formed annular rolls, as in the thighs of very fat infants.† Many similar cases are related in Mr. Wadd's amusing monograph on *Corpulency*, from which we extract the following.

Isaac Butterfield, born at Heightley, near Leeds, Feb. 20, 1781: in November 1782 he measured three feet in height, thirteen inches round the arm, two feet two inches round the thigh, sixteen inches across the shoulders, and

* First Lines, ed. by Cullen and Gregory, vol. ii. p. 208.

† Dict. de Médecine, art. *Polysarcie*.

weighed near one hundred weight. He died Feb. 1, 1783.

A child named Thomas Hills Everitt was publicly exhibited in London in 1780. He was not remarkably large when born, but began to increase rapidly when six weeks old, until his death, which happened at eighteen months. At eleven months he measured three feet nine inches in height; two feet six inches round the breast; three feet one inch round the loins; one foot ten inches round the thigh; fourteen inches round the leg; eleven inches and a half round the arm, and nine inches round the wrist.

Mary Tate, aged twelve years, the daughter of a publican in Cambridge, and one of twins, weighed thirteen stone; the other child died at two years. When Mary was born, she was not larger than is usual, but began to increase at five years; and at six she was publicly exhibited. Her parents were corpulent. She was attacked with a fever which prevailed at Cambridge a few months before her exhibition, and recovered without any apparent diminution of size. Mr. Wadd has collected a great number of other instances of obesity, but as they are merely named, with scarcely any particulars of their history, they are objects of curiosity rather than of medical interest. In most of the well-recorded instances of obesity in early life, there has been an uncommon development of muscular strength; and in this respect the obesity of childhood differs from that supervening in after-life.

A remarkable case of obesity in early age was lately brought before the Royal Institution by Mr. Pettigrew. It was a boy, twelve years of age, who weighed 198 lbs. The great increase of his bulk took place after confinement in consequence of a fracture of one of his limbs. His health is now good, and his habits, appetites, and mental development present nothing uncommon for a boy of his age. He is not deficient in activity, but he says that he cannot lift more than five stone weight.

After the completion of longitudinal growth, the adipose membrane again receives the overflow of the nourishment of the body; this is less remarkable in males than in females, in whom the nutrient function is naturally more active. In both sexes, however, the irritation of the generative organs at the early epoch of maturity seems to have a remarkable effect in diminishing the plumpness of the body; and the absence of this influence in eunuchs produces the sleek smooth surface so remarkable in their bodies, in which the inequalities of bone and muscle are buried in a bed of fat. It is a familiar fact that some of the lower animals fatten much more readily after the removal of the testicles or ovaries. It is perhaps partly in connection with this circumstance, and partly from the abatement of other excitements of youth, that obesity more frequently and more decidedly shews itself as maturity advances; and it is after the fortieth or forty-fifth year that it attains its greatest degrees. The diminished mobility of both mind and body which is perceptible at this age, and the greater inveteracy of habits of living, render corpulency then a much more serious evil than in earlier life; for these circumstances, unless steadily and vigorously counteracted, will infallibly increase it in a degree that must abridge life by encroaching on the functions of various internal organs, and laying the foundation of fatal diseases. This we shall see sufficiently explained in the situations which fatty accumulations occupy at these ages. Besides the thick bed of fat in the subcutaneous tissue, and in the interstices of the muscles, the mediastinum, the pericardium, the mesentery, and the omentum, become the seats of prodigious adipose depositions. Such subjects, besides a largeness and rotundity of body and limb generally, have a protuberant abdomen, and the loose texture in the axillæ, under the chin, and about the mammæ of women, becomes in like manner distended with fat. The effect of these accumulations is mechanically to oppress the adjoining organs; hence shortness of breathing and asthma, weak or irregular action of the heart and palpitation, an oppression and consequent disorder of the digestive apparatus, inability of movement, obstructions to a free circulation of the blood, and dropsical effusions. The cavity of the head is the only one which escapes the deposition of fat; and this exemption exposes its contents to a still greater evil. The various obstructions to the circulation, and the increased pressure to which the mass of fat throughout the body subjects it, produce a determination of blood to the head, and congestion; whence arise somnolency, torpor of the mental and animal functions, and sometimes apoplexy and sudden death.

We have hitherto considered obesity as a simple hypertrophy, but there is reason to believe that in many cases the fatty substance encroaches on the nutrition of other structures. In very fat subjects, both in man and in the lower animals, the fibres of the muscles are often interspersed with depositions of fat, sometimes to such a degree that the latter constitutes the greater part of what once was muscle, and the remaining fibres are commonly softer and paler than is natural. All the muscles are liable to this change, and the heart among the rest; the consequence necessarily is a diminution of their contractile power. We have seen the heart thus more than half converted into fat; the adipose tissue of the base and surface having encroached on the muscular fibres, so that at the base and along a great part of the wall of the right ventricle, and at the septum of the ventricles, these fibres only formed a thin stratum irregularly terminating in the adipose tissue. Laennec describes this state of the heart, and says that "the fatter the heart is, the thinner in general are its walls; and on cutting into them the scalpel seems to reach the cavity without encountering almost any muscular substance, the columnæ carneæ appearing merely as if bound together by the internal lining membrane."* He dis-

* Dr. Forbes's Trans. p. 637.

tinguishes it from fatty degeneration by the marked difference between the muscular fibre and the fat, the latter seeming rather to have superseded the fibres than to have been formed in them. The effects of this change must be unquestionably to render the action of the heart weak, and the circulation languid and inefficient; and some of the instances of the sudden death of fat persons may reasonably be ascribed to a rupture of the organ in this weakened state. M. Bertin describes a case of the rupture of a prodigiously fat heart. But the mere diminution of power in the heart, and its oppression by a load of fat, without any rupture, seem to have caused death in some cases. Dr. Brian Higgins of Dublin, the first discoverer of equivalents in chemistry, appears to have died from this cause; and there are many similar examples on record. These forms of obesity must have a tendency to increase; for as fat is deposited in and around the muscles, they will be less disposed to that habit of exercise on which their development mainly depends, whilst obesity and its causes will increase together.

Without dilating this article with cases of extraordinary obesity, we may state generally that the fat, which is computed to constitute an average of from 1-10th to 1-15th of the weight of the body in persons of ordinary degrees of stoutness, in extreme cases amounts to 4-5ths; and the absolute weight, which runs commonly from 10 to 14 stone (14 lbs.), has been known in remarkable cases of this disease to reach to from 30 to 50 stone. Mr. Lambert, of Leicester, who is always placed at the head of the list, weighed 52 stone 11 lbs. There is detailed in the twelfth volume of Corvisart's *Journal de Médecine et de Chirurgie*, an interesting account of a case of obesity by M. Dupuytren, with a full description of the tissues affected, and the proportion of fat in various parts of the body: an extract from this has already been given in the article Hypertrophy, and it is therefore unnecessary to repeat it here.

Obesity is sometimes partial; and it has its seat in no part more frequently than in the omentum, which has been known to increase to the weight of 20 or 30 lbs. This gives the appearance of what is vulgarly called a pot-belly. The mediastinum is likewise occasionally filled with fat without a corresponding obesity of the body; and the double chin often occurs as a partial obesity. The mammæ, abdominal parietes, and nates of women are likewise sometimes the seats of fatty enlargements; the latter are so to a ludicrous degree in the Bosjesman Hottentots.

Pathology.—Fat is an oily matter contained in minute vesicles which are agglomerated together in masses in the cellular tissue of various parts of the body. Whether there is a peculiar adipose tissue, or whether the fat is deposited in the common cellular structure, is a matter of dispute amongst anatomists. Dr. W. Hunter described the adipose tissue as distinct, and as consisting of cells which do not communicate with one another. He grounds his opinion on the following facts. The parts where fat most commonly accumulates are not those which are most subject to œdematous and emphysematous swellings, nor do the forms of parts increased by fat, and of those whose cellular tissue is distended by serum, resemble each other. Adipose accumulations do not pit on pressure, or gravitate towards the most dependent part, as anasarcous effusions do: the scrotum, so commonly the seat of the latter, is scarcely ever affected with fatty enlargement. W. Hunter's opinions have been adopted by Monro, Mascagni, Bichat, and Beclard. Haller, Wolff, Hensinger, Majendie, and Meckel deny the existence of a peculiar adipose tissue, and consider that fat is merely deposited in globules in the cellular structure. Meckel supposes the fat to be a solid, manifesting itself in globules, which make cells for themselves in the mucous tissue, in which he asserts there is naturally no cellular division or communication. A minute examination of human fat does not confirm this latter opinion, for it traces its globular form to the presence of an investing membrane, while the contained oil is liquid or solid, and the animal temperature according as elain or the stearin prevails in it, which varies in different parts of the body. We are, therefore, disposed to retain Dr. Hunter's view, which is confirmed by the distinct and characteristic appearance which the adipose substance presents when surrounded by serous infiltration of the cellular tissue.

There has been an equal discrepancy of opinion as to the place of the formation of fat. Haller and Majendie consider it as a simple exhalation from the blood. Dr. W. Hunter ranks it as a secretion elaborated by the specific tissue in which it is found; whilst Sir E. Home has framed a curious hypothesis, that it is formed from the fæcal part of the food in the colon, whence it is taken up by the blood-vessels, and deposited in different parts of the body. Almost the only argument urged in favour of this last notion is a supposed resemblance between the retention of fæces in the colon, and certain cases in which decayed animal matter is converted into adipocire: this resemblance is very slender and distant; and if Sir E. Home has proved that an oily matter is sometimes present in the fæces, he has failed to prove that it is either formed there, or conveyed thence into the system; whilst on the other hand there are on record cases which prove that fat may be formed and deposited in the body without any aid from the colon. Thus the subjects of artificial anus have been known to get fat, although no fæces passed through the large intestines.*

The question whether fat exists ready formed in the blood, or is only elaborated at the point in which it is deposited, is much of the same nature as that respecting other secretions, such as urea, bile, mucus, &c. Commonly none of these are detected in the blood, but under some circumstances they may each be found to

* See Dr. Mackeever on Laceration of the Uterus, p. 48. 1824.

exist there; and the presence of fat giving a milky aspect to the serum* is not so uncommon as to exclude the probability that it always exists, but in proportions too small to be readily appreciated unless circumstances lead to its accumulation. And we have the positive testimony of Drs. Christison and Babington, and more recently of M. Lecanu, that there is always fatty matter in the blood, according to the latter chemist, in ordinary cases amounting to from three and a half to six and a half in a thousand parts.† These facts, coupled with the well-known presence of oily matter in the chyle, remove much of the difficulty of explaining the rapid accumulation of fat in the body under some circumstances, and its still more speedy reduction in others. These changes, if not the result of simple exhalation and absorption, are obviously more nearly allied to them than they were formerly considered to be; and although the secernent power of vessels is undoubtedly concerned in the deposition of fat, we must not overlook the cohesive quality of this substance, by virtue of which it agglomerates to matter of its own kind, whilst watery liquids have but little affinity for it. Hence we can perceive why blood surcharged with fatty matter from the chyle promptly deposits it, especially where adipose substance already exists; whilst for its removal there must be an augmented energy of the absorbent function. This view, which is but an hypothetical one, would assign the chylopoietic viscera as the probable seat of the formation of fat, although there may be reason to believe that it becomes modified and perfected in its progress through the circulation.

Another conjecture has been proposed by Dr. Bostock, that fat is formed like other secretions from the blood; and its production, by removing a superfluity of hydrogen, is a means of maintaining a uniformity in the composition of the circulating mass. The kidneys are the emunctories of azote, and the lungs of carbon, whilst fat, the prevailing ingredient of which is hydrogen, may maintain the balance by carrying off the superfluous hydrogen. If this were the mode of its production, the excessive development of fat ought to be accompanied by an unusually copious secretion of urea by the kidneys, a circumstance not, as far as we know, attributed to cases of obesity.‡

Of the excretions, that of the liver bears the nearest analogy to fatty matter; and this fact suggests a question whether an obese diathesis may not be sometimes connected with a comparative torpidity of this viscus.

Causes. These may, as usual, be divided into predisposing and occasional. The predisposing, as consisting in a peculiar habit or temperament of body, is frequently hereditary. At the first glance we may be led to say that the predisposing cause is the most powerful, inasmuch as no mode of diet and regimen will succeed in making some persons fat, whilst others increase to a great size, without, in these particulars, exceeding the bounds of moderation. A more comprehensive survey, however, of the symptoms in different cases suggests that the constitutional cause is not always of the same nature, and that therefore it has a varying share in the production of morbid obesity. A full diet, especially abounding in oily, carneous, saccharine, and farinaceous matter, will seldom fail to fatten a person naturally disposed to corpulency; and if to this, rest of body and mind be added, this effect is almost certain. Some individuals, having a strong constitution and good general health, require these to make them fat, and become so only in proportion as they indulge in them. These persons, in whom the predisposing and exciting causes may be said to be nearly balanced, constitute a large proportion of the cases of moderate obesity that are commonly met with. In them the circulation and other functions are effective and regular, the secretions free, and the bodily and mental powers little embarrassed. Their corpulency is merely an overflow of health, the deposition of fat being the outlet by which the bloodvessels deliver themselves from impending plethora, and is accompanied by an increase rather than a diminution of other solids. This form we would denominate *sthenic* obesity. A preponderance of the same predisposing cause, the hypertrophic diathesis, gives a more marked form of the disease, and constitutes the greater number of those cases of uncommon size and strength which are frequently shown about the country. When this form of obesity becomes much pronounced, by the embarrassment which it causes in the functions, it tends to pass into the second variety of the disease, which we would term *asthenic*.

In asthenic obesity the predisposition is still more strong, and probably consists of a greater number of constitutional causes. This predisposition is frequently hereditary, and is commonly allied with a leucophlegmatic temperament, a soft languid pulse, defective excretions, and a low irritability of the body. There is in

* We once saw this milky appearance of the serum very remarkable in the blood of a corpulent patient suffering under an attack of pneumonia; she had been largely bled previously.

† Journ. de Pharm. Sept. & Oct. 1831.

‡ We cannot omit the opportunity to express here our conviction, that a more frequent and habitual attention to the state and composition of the excretions would greatly enlarge our knowledge of the pathology of diseases. The interesting study of animal chemistry has established to a certain degree that the great excretory organs, the liver, the lungs, and the kidneys, act as balancing forces, which keep the blood of a uniform nature; and it must therefore be obvious that the inordinate or imperfect action of any of these would lead to a more or less disordered state of this fluid, which must necessarily react on the functions at large. Without advocating an absolutely humoral system of pathology, we cannot but view a disordered state of the fluids as an important link in the concatenation of diseased action, and as a main object of therapeutic efforts. For a clear insight into this subject, much patient and well-directed research is required; and had we a few more such inquirers as Dr. Prout, we might sanguinely look forward to the attainment of this point.

such individuals a sufficient activity of the first part of the digestive process; but a somnolent disposition, often present for some hours after meals, indicates the admixture of chyle in the circulation, and a tardiness in its assimilation. The chyle thus supplied probably abounds more in fatty particles than in albuminous globules. Until, therefore, the former are deposited from the circulating mass in the adipose membrane, the blood does not recover its natural and most healthy constitution. There is good reason to believe that naturally this adipose matter is always at the command of the absorbent functions, and that, in case of the excretions being augmented in a greater ratio than the supply of nutriment, it is taken into the circulating mass to make up for the waste. In a person of sanguine temperament the demand on the adipose membrane equals the supply: such an individual makes blood fast, and suffers from plethora before there is any considerable increase of fat in the body. A person of spare habit, again, is liable to neither form of hypertrophy; as either the incapacity of his digestive organs, or the activity of his excretions, preclude all superfluous accumulation. In asthenic obesity, on the other hand, there is a defect in the assimilatory process by which the oily matter is made available to supply the excretions of the body; and this defect may be either in the absorbent function, or in that action by which the matters excreted are formed; but it is most probable that the same defect of tone which manifests itself in the state of the body generally, extends to both these functions. Hence asthenic obesity resembles atonic dropsy, in which it not unfrequently terminates: it occurs towards the later periods of life, and in persons whose constitutions have been weakened by various excesses. It is not unfrequently the accompaniment of chronic disease of the liver, and more rarely of the stomach; and is sometimes a symptom of a chlorotic state in young women. It is in this form of obesity that the muscles become paler, lose their substance, and are displaced by depositions of fat.

We have already stated that good living and a life of ease are the most efficient occasional causes of obesity; this is universally acknowledged; and Dr. Arbuthnot says, "you may see an army of 40,000 soldiers without a fat man; and I dare affirm that by plenty and rest, twenty out of the forty shall grow fat." The portly appearance of butchers, landlords of inns, and butlers, is obviously referable to their good living and moderate exercise.

With respect to the quality of food which is most fattening, much variety is seen: either animal or vegetable diet being capable of producing the most marked effect, if taken in sufficient quantities. Thus the negroes of the West Indies, and the Chinese slaves, sometimes acquire an enormous size during the sugar season by drinking the cane juice; and it was remarked by Galen, that the keepers of vineyards, who live on nothing but figs and grapes, become fat. The ladies of Tunis and Tripoli are fattened, to please the tastes of their lords, with farinaceous food, and a seed called *drough*. "Among the Asiatics there is a sect of Brahmins who pride themselves on their extreme corpulency. Their diet consists of farinaceous vegetables, milk, sugar, sweetmeats, and ghee. They look upon corpulency as a proof of opulence; and many arrive at a great degree of obesity without tasting anything that has ever lived."*

Malt liquor, consisting of a saccharine and feculent infusion, rendered readily digestible by the stimulant and stomachic properties of the bitter and spirit with which it is combined, is highly nutritious, and some of the most remarkable subjects of obesity have been addicted to excessive indulgence in ale or porter. The following case is related by Mr. Wadd.

"A few years ago a man of about forty years of age hired himself as a labourer in one of the most considerable ale-breweries in the city. At this time he was a personable man; stout, active, and not fatter than a moderate sized man in high health should be. His chief occupation was to superintend the working of the new beer, and occasionally to sit up at night to watch the sweet wort; an employment not requiring either activity or labour: of course at these times he had an opportunity of tasting the liquor, of which it appears he always availed himself: besides this he had constant access to the new beer. Thus leading a quiet inactive life, in a short time he became of such an unwieldy size as to be unable to move about, and was too big to pass up the brewhouse staircase: if by any accident he fell down, he was unable to get up again without help. The integuments of his face hung down to the shoulders and breast: the fat was not confined to any particular part, but diffused over the whole of his body, arms, legs, &c. making his appearance such as to attract the attention of all who saw him. He left this service to go into the country, being a burthen to himself, and totally useless to his employers. About two years afterwards he called upon his old masters in a very different shape to that already described, being reduced in size nearly one half, and weighing little more than ten stone. The account which he gave of himself was, that as soon as he had quitted the brewhouse he went into Bedfordshire, where having soon spent the money he had earned, and being unable to work, he was brought into such a state of poverty as to be scarcely able to obtain the sustenance of life, often being a whole day without food; that he drank very little, and that was generally water. By this mode of living he began to diminish in size, so as to be able to walk about with tolerable ease. He then engaged himself to a farmer, with whom he staid a considerable time, and in the latter part of his service he was able to go through very hard labour, being sometimes in the field ploughing and following various agricultural concerns for a whole day, with no other food than a small pittance of

* Wadd's Remarks, &c. p. 89.

bread and cheese. This was the history he gave of the means by which this extraordinary change was brought about. He added, his health had never been so good as it then was."

In another case, from the same writer, more of the asthenic kind, the subject, a woman who died suddenly at the age of forty-four, weighing twenty-three stone, had subsisted chiefly on vegetables and pastry, and drank large quantities of milk and water, consuming above a gallon in the course of each night. She was totally incapable of rising from her bed, and required three strong men to place her in her chair.

While these cases shew that the quantity more than the quality of nutritious aliment supplies the disposition to obesity where it exists, it is at the same time certain that fat meats, butter, milk, the saccharine, the finer farinaceous, and the oily vegetable substances, with malt liquors for drink, are the most fattening kinds of food; and varied combinations of these are more effectual to this end, inasmuch as they are more inviting to the appetite, and more manageable, even in large quantities, by the digestive organs, than simple substances however nutritious.

Besides food there are other circumstances which contribute greatly to the production of obesity. Absolute rest is less powerful than some kinds of moderate exercise, as it can seldom be indulged in without such an interruption to health as would prevent the fattening process. The obesity which ensues on absolute rest is generally more of the asthenic kind. There is no mode of living that seems to dispose more to obesity than that of a regularly employed coachman. The gentle exercise and free exposure to the open air which their occupation entails upon them, gives a good appetite and easy digestion; and while they seldom fail to indulge these, they are rarely called upon for those exertions of the lower extremities, or of the whole frame, that reduce the body by a general increase of the excretions.

Mental repose, both of the powers and passions, has been considered a great promoter of obesity. We think, however, that the sluggish minds and easy tempers of fat people are as often the effect of the phlegmatic constitution which disposes to obesity, as a cause of this state. They are frequently accompaniments of asthenic obesity; and a somnolent inactivity of the mind, as of the body, may be the effect of an advanced state of any kind of corpulency: but the case of David Hume, the historian, who became very fat during his intellectual labours, and that of Napoleon under the most powerful excitements of passion and mental energy, and many others which we could cite, prove that fat and stupidity are not such inseparable companions as Lord Chesterfield represented them.

The national differences which are observable in the disposition to obesity are probably referable more to the temperament, diet, and habits of the people, than to any peculiarities in climate. It has been stated that obesity sometimes commences after convalescence from a fever, or after a course of mercury; and all that can be said in explanation is, that these influences seem to produce in various respects a change in the constitutional diathesis, as other morbid tendencies, not pre-existent, are occasionally developed by the same causes. We have known a partial accumulation of fat succeed to repeated attacks of erysipelas in the part; this bears more analogy to common hypertrophy.

Treatment.—It is sufficiently obvious from from all that has preceded, that diet and regimen constitute the most effectual means of cure in this disease; and Dr. Radcliffe's pithy motto, "to keep the eyes open and the mouth shut," promises more benefit than any medicinal prescription. The following cases, which are only specimens out of a very long list, will illustrate the efficacy and safety of this plan, as well as its modes of application, better than mere general rules.

Mr. Wood (the miller of Billericay, whose case is related by Sir George Baker in the Medical Transactions of the College of Physicians,) at his forty-fourth year had attained such a size that he was a burthen to himself, and incapable of performing common acts of exertion. At the suggestion of the rector of his parish he resolved to follow the example of Cornaro in a life of abstemiousness. He had been accustomed to indulge in large quantities of ale and animal food, with an unsparing proportion of fat. These he left off gradually, and substituted puddings of flour and milk; and at last, one made of sea-biscuit, eaten twice only in the day, was his only food. He first substituted water for beer, but afterwards brought himself to do without any liquid. By this plan he reduced himself ten or eleven stone, and was "metamorphosed from a monster to a person of moderate size; from the condition of an unhealthy decrepid old man to perfect health and the vigour and activity of youth."

A country tradesman, aged about thirty, of a short stature, and naturally of a fresh sanguine complexion and very fat, applied to Dr. Fothergill for assistance. He complained of perpetual drowsiness and inactivity; his countenance was almost livid, and such a degree of somnolency attended him that he could scarcely keep awake whilst he described his situation. Dr. Fothergill advised him immediately to quit all animal food, to live solely on vegetables and every thing prepared from them, allowed him a glass of wine and a little beer occasionally, but chiefly confined him to water. He pursued this plan very scrupulously, lost his redundant fat, and grew as active as usual in about six months. Dr. Fothergill recommended a perseverance for a few months longer, then to allow himself light animal food once or twice a week, and gradually to fall into his usual way of living. He grew well and continued so.

A young unmarried woman, about twenty-three years of age, of low stature and very fat, consulted the same physician, on account of great difficulty of breathing, somnolency, and incapacity for any exercise. It was a hardship to her to be obliged to go up stairs,

and at last to cross the floor of her apartment. It seemed to Dr. Fothergill that mere obesity was her principal malady; indeed she had no other complaint but such as might be accounted for from this supposition. She was ordered to pursue a vegetable diet, and in the summer to drink the waters at Scarborough. She conformed to these directions, became more agile, less sleepy, less averse to exercise: she walked up stairs at Scarborough from the Spa, a task of no little difficulty to people much less encumbered. A continuance of the same diet was urged: she was dissuaded from it by her friends, and died of fat in the twenty-seventh year of her age.*

A gentleman of great respectability in the mercantile world, who weighed thirty-two stone nine pounds, put himself upon a strict diet of four ounces of animal food, six ounces of bread, and two pounds of liquid, in twenty-four hours. In one week he lost thirty pounds weight, and in six months he was diminished the astonishing quantity of one hundred and thirty-four pounds. His health and spirits were much improved; and considering his remaining size of twenty-three stone, he was very active.†

Mr. W., of Whitehaven, at about thirty years of age weighed twenty-three stone, ate and drank with great freedom, and in great abundance. He became at length so lethargic that he frequently fell asleep in the act of eating, even in company. By the advice of Dr. Gregory of Edinburgh, he took a great deal of exercise, lived sparingly, and slept little. The prescribed diet was brown bread and tea; but the patient, finding it necessary to fill his stomach, ate a great quantity of apples: and to enable him to take the necessary exercise, he found a pint of port or sherry per diem indispensible. He retired to rest at eleven, and rose between four and five o'clock. His only medicine was three brisk purges a week. By this system he reduced himself to fifteen stone, with great improvement to his health.‡

A baker, living in Pye-corner, attained the weight of thirty-four stone, and could not move out of his chair for many years. He would frequently eat a small shoulder of mutton five pounds weight, and proportionably of other things, and drink a gallon of good beer. He was moreover of a costive habit, and required four times the strength of an ordinary purgative to operate on him. He with great resolution persisted for one year in living on water-gruel and brown bread, and lost nearly two hundred pounds of his bulk.§

These cases sufficiently prove the efficacy of a plan of abstinence; but there are cases in which its application will require some caution and modification. It is especially in relation to the treatment that we wish to preserve the distinction between the sthenic and asthenic varieties of obesity. The former will bear measures that would be insufficient or unsafe in the latter. Thus a sudden and total prohibition of animal food and fermented liquors would lower the circulation, already too languid in the asthenic form; and by retarding the absorptive process, and weakening the locomotive powers too much for exercise, change the disease from obesity to a cachectic dropsy. Experience has shewn, on the other hand, that persons of robust constitution, when affected with obesity, may with impunity even abruptly reduce the quantity and quality of their aliment, and with the most beneficial results. The inexpediency of laying down any absolute plan for the treatment of obesity will, therefore, be obvious; and the necessary distinctions may very well be comprehended in the two kinds into which we divide them.

Treatment of sthenic obesity.—The circulation is here supposed to be vigorous, the digestion good, and the absolute strength not impaired; although the activity be greatly diminished by the inroads of the disease. The indications here are, therefore, 1. to remove the accumulated fat; 2. to exclude from the system all material of nourishment beyond what is necessary to supply the demands of the excretions; 3. to ensure that the nourishment that is taken in be applied only in this way. All these indications may be fulfilled by diet and exercise.

The food should be very moderate in quantity; this is the most important point, and the next is that it be not too nutritious in quality. The breakfast may consist of tea and brown bread (not more than four or five ounces) without butter. If there should be a feeling of great exhaustion in consequence of the scantiness of this allowance, a dried herring or a hard-boiled egg may be added. The brown bread which is made by several bakers in London, containing the finer particles of bran and a proportion of rye-flour, is to be preferred, as it is less nutritious, and acts on the bowels more than any kind of bread or biscuit. As long as active exercise can be persisted in, we do not think it advisable to exclude entirely the use of animal food. A few (three or four) ounces of lean meat, white fish, poultry, or game, with a proportionably sparing quantity of the less nourishing vegetables, such as greens, turnips, pulse, sorrel, chiccory, &c. with two or three glasses of white wine if required, may constitute the dinner. If the absence of the habitual quantity produce a painful sensation in the stomach, the only supplement that may be added is cucumber or salad without oil or egg in the dressing; or, if preferred, an orange or two, an apple, or a few gooseberries, strawberries, or currants, with little or no sugar, may be taken to allay the cravings of a dissatisfied appetite. Although it is desirable not to tempt by variety, nor to allow more than three articles for the principal meal, yet the varying of these from day to day keeps the stomach in tone, and reconciles the patient somewhat to the difficult task of great moderation. Very little liquid should be taken during dinner, and the liquid meal after it should be

* Med. Obs. and Inq. † Wadd, p. 82.
‡ Wadd, p. 85. § Wadd, p. 102.

restricted to a single cup of tea or coffee with little or no sugar or milk; for we are convinced that copious libations of any kind at this time hurry the chyle into the circulation in an imperfectly assimilated state, and, therefore, more abounding in oily particles. There should be no solid food taken after dinner; or if the appetite be very craving, an orange, a roasted apple, or a cup of thin gruel with a little lemon-juice in it, taken half-an-hour before bed-time, should suffice; these contain but little nourishment, and tend to keep the bowels in a soluble state.

The habit of active exercise is quite as necessary as abstinence, and it requires as much resolution to observe it. In advanced stages of obesity, horse-exercise is almost the only kind that can be pursued, the legs being unequal to support their burthen for a length of time sufficient to be useful; but the patient must submit to the roughest paces of his sturdiest horse. When walking can be accomplished, the legs must not be spared: this is the best exercise to reduce bulk, both because it can be more readily resorted to and longer persevered in, and because, being most general, it excites the excretions more than other kinds. It may, however, with advantage be varied with digging, rowing, dumb-bell exercise, and various other gymnastic pursuits. At least two hours out of the twenty-four should be imperatively devoted to the energetic practice of some of these modes of exercise; and the more beyond this, the speedier will be the reduction of bulk. Corpulent persons ought to limit their period of sleep as much as possible, by rising early to take a walk or some exercise before breakfast; and the disposition which they frequently have to sleep during the day and after meals should never be indulged in.

A very salutary kind of exercise, and one that may conveniently be allotted for the fasting task, is vigorous friction of the limbs and body by the hands or with a flesh-brush; and this may be advantageously preceded by the shower-bath, or copious cold ablution. These means promote the action of the absorbents, and improve the tone of the cutaneous circulation.

There is little need of medicines in the slighter degrees of sthenic obesity; for the functions are generally pretty well performed. If the bowels require aid, and the dietetic means before recommended fail, a black draught or a colocynth pill occasionally will suffice. But in more advanced states purgatives may be indicated as depletories, especially if there be also determination to or congestion of blood in the head; in this case calomel and jalap, alternated with salts and senna, or the compound gamboge pill, will be required twice or three times a week. It has been thought useful in some cases to diminish the appetite for food by squill, ipecacuanha, and other nauseating medicines: we do not recommend this generally, as nausea is a weakening influence, and renders exercise a painful effort; but there may be cases in which the natural appetite cannot be stinted without real suffering: in these, small doses of ipecacuanha, or, what is better, dissolving in the mouth a camphor lozenge or smoking a cigar, may occasionally be resorted to, to relieve this craving sensation. As to vinegar and other acids, which formerly were reputed remedies in obesity, we cannot but follow Cullen in condemning their use, since their effect is only in proportion as they counteract the digestive process; and the risk which they entail, of exciting chronic diseases of the stomach and bowels, far outweighs their thinning powers, which often fail when unsupported by diet and exercise. Soap and alkalies were highly recommended by Dr. Flemyng;* and as they have a certain chemical affinity for fat, and increase the secretion of urine, they seem to promise advantage: but the illustration of their efficacy in the case described by Dr. Flemyng falls greatly before the numerous examples of cure by abstinence and exercise. As adjuncts to these means, alkalies may prove beneficial, and especially in the common complication of gout with obesity, ten to twenty grains of soap in the form of pills, *m*xv. to xxx. of the liquor potassæ, or four to eight grains of the subcarbonated alkalies in ℥i. of camphor mixture, may be given twice or thrice in the day.

Treatment of asthenic obesity.—The indications here are to increase the activity of the functions of circulation and absorption, and to improve the tone of the digestive and locomotive organs.

Abstinence is an important agent in this as well as in the other kind of obesity, and the outline of the diet before sketched may be followed here; but the reduction of the quantity of the food must be made more gradually, and the quality with greater care adapted to the powers of the digestive organs. Thus, if there be a disposition to gastric irritation, the milder and more farinaceous articles are to be chosen, their quantity being still limited; but if a nervous dyspepsia accompany the obesity, which is the commoner case, such kinds of animal food which have been already recommended, together with a little spiced rice and a small quantity of white wine, once a day, are more eligible; no salads or supplements of any kind being allowed, and the breakfast being restricted to biscuit or dry toast, with tea or coffee. The quantity of these articles must be gradually but steadily diminished as far as the strength and general health of the patient will permit.

The defect in muscular power which commonly attends asthenic obesity considerably limits the means of exercise. Horse-exercise is still generally practicable; and the oftener it is resorted to the better. An important substitute may be obtained in friction of the body and limbs; this is a powerful mean of promoting the absorption of superfluous matter, and of giving vigour to the sanguineous circulation of the surface. Where there is a relaxed state of the body and an

* Discourse on Corpulency. London, 1780.

easily perspirable skin, friction should be preceded by the salt-water plunge or shower-bath; but where the skin is harsh, with a deficient reactive power of the superficial vessels, it may with the greatest advantage be combined with the vapour-bath in the manner of Indian shampooing, which is very effective in giving laxity and freedom to the cutaneous circulation. In proportion as the muscular strength is restored, it must be engaged in other kinds of exercise to the utmost of its power; and in the ratio of its increase will be almost infallibly the diminution of the torpid bulk of the body and its accompanying disorder.

As there is often considerable derangement of the organic functions, the aid of medicines is frequently required in asthenic obesity. Those most needed are those which increase the excretions, and improve the tone of the animal fibre; and by a judicious administration of such evacuants and tonics much good may be effected. If there be a deficiency in their action, the bowels must be moved; but strong cathartics are not eligible, as they disorder the digestive function, already weak, and weaken the whole frame. In common constipation or torpidity of the whole canal, aloes in the dose of three to five grains, with a grain of sulphate of iron, twice a day, is exceedingly well adapted to fat phlegmatic subjects with languid circulation. If the colour of the evacuations indicate a defective secretion of bile, a very common symptom in this form of obesity, calomel or blue pill must be occasionally combined with these medicines; and if there be such a torpidity of the absorbent function as to cause œdema, pitting on pressure, in the fat of the legs and feet, two or three grains of gamboge may properly be added. Great advantage may in some cases of the same kind be derived from a course of a saline chalybeate water, as that of Cheltenham.

Of tonics, the alkaline preparations of iron are the most eligible, as they seem to facilitate the conversion of chyle into blood, and promote the secretion of urine, without increasing the appetite for food. The mistura ferri composita, and the tinctura ferri ammoniata are the most convenient preparations; and an attenuant and diuretic effect may also sometimes be usefully obtained by joining with them a little carbonated alkali and nitre. In no cases is this treatment more beneficial than in the obesity which occasionally accompanies defective menstruation in females; and whether this disorder be a cause or only a concomitant, it is highly important that the periodic evacuation be restored to its normal proportion.

Analogy suggests that considerable benefit might be obtained from the use of iodine, in its known sorbefacient capacity, in the asthenic forms of obesity; but we are not authorised by direct experience to recommend it. Where other complaints, such as dyspepsia, dropsy, &c. are complicated with obesity, they must be treated in the usual way. Obesity may, however, furnish a reason for modifying our practice when the subjects of it are attacked with other diseases. Fat persons do not generally bear bleeding well; purging suits them better: but they are often more readily lowered by any evacuation than their appearance would lead us to expect.

The period during which it is necessary to pursue the treatment recommended above can only be determined by the effect produced. It may be useful and satisfactory to the patient to put to the test of the balance the beneficial operation of his plan; but a restored activity, and the removal of the discomforts of obesity, give a surer criterion of his improvement; if these are accomplished, although he should still retain some largeness of bulk, there is no longer reason to consider it a disease. The return to a more generous method of living should, however, be made very gradually, and with circumspection; and nothing should deter the individual from pursuing those habits of active exercise that have mainly contributed to free him from his burthen.

(C. J. B. Williams.)

ŒDEMA, (*οἴδημα*, from *οἰδέω*, *to swell.*)—This term properly signifies a swelling of any kind, but is now confined to a swelling of a dropsical nature, situated in the cellular tissue. When the œdema is developed under the skin, it appears in the form of a tumour, which retains the impression of a finger or any other body that has been applied with a slight degree of force to the surface. It has usually been regarded as a species of anasarca; and unquestionably it has much analogy with this affection. In the present article, however, we shall confine ourselves to the consideration of those œdematous affections which are not connected with a general dropsical diathesis, and which may exist for an indefinite length of time without extending beyond the original site.

Œdema appears under very different circumstances; and we are inclined to believe that, at different times, the nature of the effusion into the cellular membrane is different; the external appearance certainly is so. We are not, however, able to prove that such a difference does exist; and we shall therefore content ourselves with stating the different circumstances under which a swelling, having the character we have assigned to œdema, may happen, and the variation of treatment which such differences demand.

Œdema exists in the commencement of phlegmonous inflammation through the whole extent of the affected part; and throughout the progress of inflammation, it occupies the extreme boundaries of the diseased part in a greater or less degree. In some instances, in consequence of the nature of the affected parts, the inflammation does not pass beyond the œdematous stage before it proves fatal. Such appears to be the case in the disease to which the term *œdema glottidis* has been assigned, the cellular membrane of the glottis being the seat of a serous infiltration, which gradually closes the rima glottidis, and destroys the patient by suffocation. In pneumonia, also, portions of

the lungs are found in the œdematous stage, the similarity of which to anasarcous effusion has been remarked by Laennec. More commonly, however, the inflammation proceeds to induration and suppuration, at least of the centre, and the œdema is found only in the circumference. M. Gendrin has given an account of the pathological state of the cellular tissue in this which he terms an active œdema. He has derived his information from observing the processes set up in the cellular tissue in the neighbourhood of a wound.

The cellular membrane close to the wound is hard to the touch; its areolæ are infiltrated with a reddish, opaque, and gelatinous matter, and pressure gives issue to a reddish, opaque, and mucus-like serum. Beyond the inflammatory redness, there exists during life a serous infiltration which is rather elastic; and this infiltration is greater in proportion to the natural relaxation of the cellular tissue, and the inferior situation of the part. After death the œdema increases, but the elasticity diminishes. The œdema extends into the intermuscular cellular tissue, and the vessels of the part are evidently enlarged.

Of the treatment of this kind of œdema we need say no more than that it is that which is appropriate to inflammation, of which indeed it is only a stage. (See Inflammation.)

The affection which has been termed "skin-bound," and which occurs in infants, is also a variety of œdema; but as Dr. Carswell has given an excellent account of it under the head Induration, we shall refer the reader to that article for information respecting it.

Œdema is a common consequence of rheumatism, particularly of that form which is called *arthritis rheumatica*. It may either be the remains of the active inflammation of the joints, or it may from the first appear as simple œdema. It may occur in the knees and ancles, but the most common situation is the back of the hands. It forms a cold, thick, puffy swelling, and generally white, and it is sometimes, but not always, rather tender. It is frequently the seat of dull aching pain, and the patient can make very little use of the limb. The fingers are stiff, and the hand cannot be closed. When the affection is recent, fomentations frequently repeated, and continued for half an hour at a time, will sometimes remove it very quickly, and the patient is cured as it were by a charm. More commonly fomentations are useless, as also are local warm and vapour baths; they do not even afford a temporary relief. Stimulating mercurial liniments are more useful, and generally succeed in removing the œdema in the course of a month. Dr. Elliotson appears to have employed the hydriodate of potash, but we have ourselves had no experience of it in these cases. When, however, the mercurial liniment fails, as sometimes it will, the preparation in question may make a good substitute. Its property of increasing absorption certainly points it out as a probable remedy. Occasionally a certain degree of œdema will remain during life, the patient having at the same time a tolerably free use of the limb.

While the treatment is thus directed to the local affection, the state of the general health must not be neglected. Few diseases, perhaps, are more manifestly attended with disorder of the digestive functions than rheumatism, and this disorder is not unfrequently aggravated by the remedies which are employed in the acute stage. Unless, however, when this stage is past, immediate attention be paid to the state of the digestive organs, the disease, even in its acute form, is very liable to return. The treatment of rheumatism becomes, therefore, the treatment of dyspepsia, and only by success in relieving this latter affection can we hope permanently to relieve the former. (See Rheumatism.)

Œdema is one of the most common attendants upon amenorrhœa. Amenorrhœa itself depends upon two opposite states of the system, a state of plethora, and a state of debility and exhaustion. In both these œdema may exist. In the former, or the plethoric state, together with the common symptoms of plethora, there is usually much pain in the lower extremities, particularly in the lower part of the leg and round the ancles; and this pain is worse towards night, at which time also the œdema is much more considerable than in the morning. Upon examining the legs, the parts corresponding to the pain are usually cold to the touch, hard, and of a purplish colour; and this colour varies from a very light tint to an actual livid hue. It sometimes resembles purpura so far as the colour is concerned, but there is evidently no extravasation. At other times real purpura exists, and many petechial spots are present. The œdema is usually in these cases very firm, not readily yielding to the finger, and the impression is very quickly effaced. Frequently there is considerable tenderness in the course of the femoral vein, and the most common site of this tenderness is just before the vein pierces the tendon of the triceps to pass into the ham. This variety occurs in girls of a florid appearance and plethoric habit, and the usual period of its occurrence is between eighteen and twenty-five years of age. The tenderness of the vein, which probably depends upon some inflammation of the vessel, is not, however, peculiar to this diathesis, nor to this period of life. It frequently occurs in that condition which is neither very evidently plethoric nor feeble, and which equally resists an extreme mode of treatment, whether depleting or tonic. The countenance of these individuals is sallow and unhealthy, but does not exhibit that fair and pellucid appearance which distinguishes those who are the subjects of œdema in consequence of exhaustion.

The individuals last mentioned exhibit the common symptoms of amenorrhœa from debility, the quick, rolling, and easily compressible pulse, the palpitation of the heart, excessive nervousness, &c.; and the œdema of the lower extremities is both more considerable than in the former varieties, and much softer. It yields

readily to the fingers, and retains their impression for some time. In some persons the œdema is so great that the swollen part overhangs the shoe excessively towards evening; and though it disappears during the night, when the patient is in bed, it returns in two or three hours after rising, gradually increasing till evening, when, from the weight and stiffness of the limbs, the patient is compelled to place them in the horizontal position, the only position in which she can obtain ease.

Œdema occurs also in women at that period which is known as *the change of life*, and is in this case, so far as our experience extends, always dependent upon a plethoric state of the system. It varies from the œdema which we have described as occurring in young persons of a florid complexion, by the absence of the livid colour, and by the swellings being much less firm and resisting.

The description above given of the different circumstances under which œdema occurs, sufficiently points out the proper mode of treatment. In the first, or plethoric variety, not only must the general remedies be employed, as bleeding and purging, but if there be any tenderness in the course of the femoral vein, leeches should be applied to the tender part, and they should be repeated again and again, so long as any tenderness remains.

The second or middle variety requires a mixed treatment, as we have already indicated; leeches, if any tenderness is present in the course of the femoral vein, and alternate tonic and depleting remedies as the symptoms vary.

The œdema in the third variety, in which the system is suffering from exhaustion, is most benefited by the exhibition of steel; but for a more complete direction for treating these cases we refer to the article Amenorrhœa, of which disease œdema is usually one symptom.

When œdema occurs at the change of life, there are so many symptoms which intimate a plethoric state, that there can be no hesitation in recurring to depletory measures, both bleeding and purging; and as the œdema is very liable to return, till the catamenia are entirely suspended, the repetition of these remedies will be required as often as this happens.

Old persons are frequently subject to œdema of the lower extremities, and which, as their debility increases, extends higher and higher towards the trunk, yet seldom assumes the general phenomena of dropsy, there being neither a decrease in the flow of urine, nor any other inconvenience experienced excepting what is the consequence of the weight and stiffness of the limbs. Sometimes it seems to become at length connected with a dropsical diathesis, and after many years have elapsed, during which this œdema has remained stationary, ascites and general anasarca ensue.

So long as the disease remains merely in the state of œdema, nothing more is required than to support the integuments by means of a laced stocking or bandages; when, however, dropsy supervenes, it must be treated upon the principles which have been laid down in the article Dropsy.

Excessive fatigue is also a cause of œdema. Soldiers, after long marches, are subject to swellings of the ancles, and the œdematous state of the legs of horses after over-work is well known to horse-keepers, who are also aware that it is merely a state of debility; hence they bandage the legs of such horses in the stables, that the cellular tissue may have an opportunity of recovering its tone.

Œdema will also be caused by any thing which obstructs the circulation of the blood through the venous system; hence it is common in the latter months of pregnancy, from the pressure of the uterus upon the iliac veins. Ligatures also have a similar effect. The presence of œdema in the arm in cancer of the breast is probably to be accounted for on the same principle. It seldom happens till the disease has made considerable progress, and in the cases which have fallen under our notice, the axillary glands have been much affected. In our experience this œdema is much more common after the removal of the breast, and upon the recurrence of the disease, than in those cases in which no operation has been performed.

These appear to be the principal forms under which œdema may appear. How far this is an affection really different from anasarca may certainly be questioned; there is, however, in all the cases we have referred to, this peculiarity, that the affection is entirely local; that it by no means necessarily leads to dropsy; and that life may terminate without any apparent progress being made in converting it from a local to a general affection of the system.

(John Darwall.)

OPHTHALMIA. Under this head it is proposed to consider inflammation of the conjunctiva only, although, strictly speaking, the term is more applicable to inflammation of the eye itself. The universal use of the term to designate inflammation of this membrane has probably arisen from this being the most frequent and obvious inflammatory affection of the organ. In approaching the consideration of this subject the student should first pause to ascertain whether his knowledge of the structure and functions of the conjunctiva enable him to announce the changes reasonably to be expected from inflammation of its texture, and afterwards should determine whether observation justifies his anticipations. The conjunctiva being a modification of the common tegumentary membrane, intermediate between the skin and mucous membrane, the changes produced by inflammation are of the same character as those induced by the same cause in these two structures. These changes are, increased vascularity, tumefaction, pain, and altered secretion. The increased vascularity is characteristic: when the inflammation is slight, the enlarged vessels present the appearance of a distinct red network spread over the white sclerotic; when more intense, the appearance of distinct vessels is lost, and the surface assumes a uniform deep

red colour. The tumefaction is inconsiderable unless the inflammation be very severe, in which case the vessels become enormously distended with blood, and the subjacent and surrounding cellular membrane loaded with serum, constituting the appearance technically denominated *chemosis* on the globe of the eye, or producing a most distressing prominence of the lids. The pain is uniformly at first such as is produced by the presence of a grain of sand beneath the eyelid, but it subsequently is accompanied by a sensation of heat, producing the same description of distress as arises from a scald. The intense aching pain experienced in violent inflammation arises from the globe of the eye becoming involved in the disease. The conjunctiva being lubricated by a fluid derived from a source different from its own surface—the lachrymal gland—the first alteration in the nature or quantity of the secretion from the surface cannot be ascertained. The alteration, however, becomes speedily obvious, and is as characteristic of the disease as the other changes enumerated, purulent matter in considerable quantity being poured out. It must not, however, be assumed that the secretion of purulent matter is a necessary consequence of conjunctival inflammation; instances of the contrary will presently be adduced.

Inflammation of the conjunctiva presents the distinct characters above enumerated, because it is inflammation of a structure of equally distinct anatomical character, but it is so completely modified by circumstances, that few other inflammatory diseases appear in so many different specific forms. The inflammation of this membrane is either circumscribed in the form of pustule, or diffused, as in the different varieties of purulent ophthalmia. Either or both of these are again modified by the presence of other diseases, and hence gonorrhœal, variolous, and other distinct species.

Inflammations of the conjunctiva may, therefore, be divided into *pustular* and *diffused;* the *pustular* into common pustular and variolous, and the *diffused* into catarrhal, severe purulent, gonorrhœal, and the purulent of infants. The grounds upon which these specific distinctions are established will be stated as each is submitted to inquiry.

While considering the nature of conjunctival inflammation in general, it is expedient to consider also the principles which are to guide us in the treatment of that inflammation. The resources available for the removal of inflammation in other structures are equally available in this. The activity of the circulation is to be diminished by general and local bloodletting—the contents of the stomach and bowels removed by emetics and purgatives—the condition of the system which nauseating medicines produce is to be induced—inflammation in the vicinity, or counter-irritation as it is called, is to be excited by blistering—the temperature of the inflamed part is to be lowered by cold applications—or the condition, whatever it may be, which warm moisture causes, should be encouraged by warm fomentations. In conjunctival, more than in any other form of inflammation, the practitioner has had recourse to the immediate application to the part of those remedies to which astringent, sedative, or irritating properties are attributed, and in considering their application to each form of disease, their comparative value will be submitted to inquiry. Particular circumstances may demand additional remedies or peculiar management—the inconvenience arising from accumulation of purulent discharge is to be avoided—the gumming together of the lids obviated—the vessels of the surface may require to be opened by scarification, or the serum of *chemosis* discharged by puncture. It may be necessary to produce the peculiar constitutional effects of mercury—to encourage the secretions of the skin, intestines, or liver—to restore the flow of milk from the breasts—to regulate the functions of the uterus—or to reproduce suppressed discharge of blood from piles. The consideration of conjunctival inflammation in detail will prove the importance of paying the most careful attention to the differences of constitution presented by different individuals, in order to substitute tonic medicines, and invigorating diet and regimen, for a system of depletion and abstinence. It is obvious that each specific form of this disease will require a corresponding variation in the application of these principles, and that the treatment must be modified with every modification of the symptoms induced by circumstances.

In studying the progress and treatment of conjunctival inflammation, the practitioner should never lose sight of the marked and important distinction to be drawn between the inflammation and its consequences. Hitherto this distinction has been so far made as to form a division of the disease into the acute and chronic stages, but it is worth considering whether the condition which is called the chronic stage should be considered analogous to that which exists during the inflammatory or acute stage. The alteration in the treatment to be adopted when the disease assumes the chronic form, and which is carefully inculcated by every practical writer, proves that those symptoms which are to be subdued by depletion and other similar means have disappeared. It is true that the increased vascularity, augmented and altered secretion, and even painful sensation still exist, but in a very different degree, and of very different character. The tense, tumid, glazed chemosis subsides, and is succeeded by a soft, pulpy, villous vascularity; the secretion from the surface is profuse, and its purulent nature more remarkable, and the painful sensation is mitigated and unaccompanied by the scalding which characterizes the distress of the inflammatory period. The eye is not injured or destroyed by conjunctival inflammation unless the inflammation extend to the other textures, producing sloughing of the cornea, or suppuration of the eyeball; or unless it produce the altered or disorganized state of the membrane which leads to vascularity or opacity of the conjunctiva covering the cornea, or granular condition of the lining of the lids.

1. *Mild inflammation of the conjunctiva.*—That there is a form of conjunctival inflammation entitled to the above appellation, which presents a specific character perfectly distinct from every other, there can be little doubt. It is rather vaguely defined by authors under the title of catarrhal ophthalmia, but does not appear to be considered so completely different from the severer purulent ophthalmia as its history, at least according to the writer's experience of the disease in Ireland, warrants. It is distinguished, as the title implies, by the comparative mildness of its symptoms, the vascularity never passing into true chemosis, or inducing sloughing of the cornea; the pain not being so severe, and the purulent discharge being much less copious. It occurs in spring and autumn, is epidemic or endemic, and, whether contagious or not, attacks several individuals in the same family. It affects young persons more frequently than adults, and sometimes seizes a great number of children in schools or other institutions where they are collected. The following is the history of the disease. The patient experiences a sensation of itching, with slight uneasiness, as if a mote or eye-lash had passed beneath the lid, which is greatly aggravated by the efforts made to remove it by rubbing or handling the eye. If the organ be now examined, nothing more can be discovered than an increase of vascularity with a copious flow of tears. Next day all the characteristic symptoms may be recognized. The conjunctiva lining the lids, especially the lower, has acquired a uniform deep red appearance, and that covering the sclerotic presents an equal vascular network, permitting the white structure of the former membrane to appear in the meshes or areolæ; the vessels not crowding together so as to produce the deep general redness of the chemosis of severe ophthalmia. This vascularity is well represented in Mr. Wardrop's work on the Morbid Anatomy of the Eye, which contains more well-drawn and faithful representations of diseases of this organ than any other accessible to the student. There can be no difficulty in distinguishing this characteristic vascularity from the equally characteristic vascularity of the sclerotic in internal inflammation of the eye. The high degree of vascularity, with prominence of the membrane from effusion of serum beneath it, constituting the appearance denominated chemosis, never perhaps exists in mild purulent conjunctival inflammation, and therefore, when it does occur, must be considered evidence of the presence of the severer form of the disease. The secretion of purulent matter from the surface is most obvious after the night's rest; the eye-lashes are gummed together by it; clots produced by the evaporation of the more fluid parts of the discharge are formed at the angles; and when the lower lid is depressed, flakes and films of it may be observed in considerable quantity. The existence of purulent discharge is not so obvious in the course of the day, especially if the patient has been in the open air, the irritation of the surface causing such a flow of tears as removes it as fast as it is secreted. In this case inquiry should be made as to the state of the eye upon awaking in the morning, and the patient should be allowed to remain for a quarter of an hour with the eyes closed, when, upon depressing the lower lid, flakes of yellow matter may be seen floating in the tears. The sufferer experiences repeated attacks of scalding pain, with copious flow of tears, so much resembling the effects of a mote or grain of sand beneath the lid, that he can scarcely be persuaded that such does not actually exist. Vision is not very materially impaired during the prevalence of these symptoms, but there is generally a slight degree of haziness experienced, especially when looking at the flame of a candle, and occasionally alarm is excited by tenacious films of purulent matter adhering to the cornea.

The symptoms here enumerated continue for two or three days; the period depending much upon the circumstances under which the patient is placed: they then begin to yield and alter, the painful sensation of a foreign body beneath the lids, with scalding and flow of tears, becomes less frequent, the vascularity loses its intensity and shining appearance, and the purulent discharge is more freely secreted. Subsequently, these symptoms gradually diminish and finally disappear, leaving the parts somewhat more vascular and irritable than before this attack; but in a few weeks this condition disappears, and the recovery is complete. That this is the true history of the symptoms, progress, and termination of mild conjunctival inflammation in a healthy subject can scarcely be denied; but it is not the history of the disease as it is observed in daily practice. This simple form of inflammation must obviously disappear after passing through its different stages, unless the natural processes tending to recovery be interrupted. This interruption, however, generally takes place. The disease is frequently exasperated, and the efforts of nature to restore the healthy functions of the part suspended by injudicious, unnecessary, or injurious interference; or it is so modified by scrofulous constitution or by neglect, filth, and deficient food and clothing, that its character is totally altered.

The treatment of mild conjunctival inflammation is as obvious as the disease is simple. The bowels should be emptied, and the secretion from the mucous membrane of the intestinal canal excited by purgatives in moderate and repeated doses. The infusion of senna and tamarinds, with the addition of sulphate of magnesia and of tartrate of antimony in the proportion of a grain to eight ounces, may perhaps be preferred for this purpose. The abstraction of blood by the lancet is seldom required; but it is frequently necessary to apply eight or ten leeches to the hollow of the temple behind the external angular process of the frontal bone, or over the cheek bone. The bites of leeches in the thin and flaccid skin of the eyelids generally produce so much irritation and inflammation, that their application there is often injurious. Locally, cold or warm applications may be resorted to, ac-

cording to the relief the patient experiences from one or the other. If there be much heat and scalding pain, a light fold of old linen wrung out of cold water may be laid over the closed lids, and changed as it becomes warm; or a soft sponge or scrap of flannel wrung out of hot water, and held in the hollow of the hands beneath the eyes, may be used to induce the soothing effects of warm moisture. At bed-time the edges of the lids should be smeared with cream, unsalted butter, or any other oily application not rancid or burned. Rest of the lids should be enjoined, as the constant friction of the surface greatly increases the irritation; the eyes should be kept closed as much as possible; but the patient should not be immured in a dark room, or have his eyes covered with a shade, as is frequently practised. The propriety of applying astringent washes to the inflamed surface during the first stage of the disease may be justly questioned. It is not to be denied that such applications may have the effect of arresting the progress of the disease at once; but if they have not that effect, they are liable to produce an increase of irritation. In Dublin, where no adequate relief is afforded to the destitute poor in their own homes, it is often expedient to endeavour to cut short the disease by the direct application of a strong astringent solution, to prevent the establishment of that chronic vascularity and opacity of the cornea which filth, starvation, and rags would otherwise produce. For this purpose a saturated solution of acetate of lead or alum may be resorted to with perfect safety and decided effects, and a few drops introduced between the lids every night and morning. To remove the vascularity and that condition which accompanies the secretion of purulent matter, weaker astringent solutions may be used more freely. Five grains of alum or of the acetate of lead to an ounce of water make a wash as efficient and safe as any other of the various salts resorted to for this purpose: the comparative value of these will, however, be presently considered.

In addition to the above observations, an abstract of Mr. Lawrence's valuable account of catarrhal ophthalmia, delivered in his lectures, may not be inappropriate. He observes that it originates from atmospheric causes or peculiarities, is caused by exposure to cold, and corresponds to catarrhal affections of other mucous membranes. In individuals predisposed to this affection, being out in an east wind for a quarter-of-an-hour, or half-an-hour, will sometimes infallibly bring on an attack. He enumerates the following symptoms:—stiffness, smarting, uneasiness from exposure to light, watering, and external redness, followed by mucous discharge, without considerable pain or intolerance of light. The conjunctiva becomes of a scarlet colour in mottled patches at first, but subsequently of uniform appearance, the redness commencing at the circumference, and extending to the cornea. Sometimes spots of ecchymosis occur in the vascular network from the activity of the inflammation, and occasionally pustules round the margin of the cornea; but true chemosis never exists. The characteristic symptom of a sensation of a foreign body beneath the lid he attributes to the irregularity of surface produced by vascular distention. The secretion from the surface is at first thin, but subsequently becomes of a thicker consistence and whiter colour, resembling pus, at first confined to the inner angle of the eye, or to the fold of reflection of the conjunctiva, but afterward is poured out in sufficient quantity to agglutinate the lids at night. These symptoms are accompanied by those of inflammation of other mucous membranes, and are found to remit by day and to become exasperated at night. The affection, he says, passes through a certain course and then subsides, yields readily to treatment, and is, generally speaking, free from danger unless improperly treated. It is distinguished from the severe purulent ophthalmia by its milder character; and although the appearances of the two approximate, yet the difference is rather in degree than in kind. The disease, he observes, demands mild antiphlogistic treatment: cupping and leeching in ordinary cases, and occasional venesection in full habits; an active aperient, sometimes an emetic, followed by saline and sudorific medicines and diluent drinks. Locally, he recommends warm in preference to cold applications; but observes that the latter are sometimes comfortable to the patient, and not injurious; and after the inflammation subsides, suggests the application of blisters, exposure of the organ to the air, and he objects to shading the eye unless there be intolerance of light.

2. *Severe inflammation of the conjunctiva, commonly called purulent ophthalmia.*—The severer form of conjunctival inflammation presents itself in three different shapes, the *Egyptian*, or, as it is called for distinction, the *purulent* ophthalmia, *gonorrhœal* ophthalmia, and *purulent* ophthalmia of infants. These three forms, if not specifically distinct, and characterized by peculiar symptoms, are at least distinguished from each other by origin, history, progress, and consequences. The common severe purulent ophthalmia is to be now considered. This disease probably always existed in the form in which we at present occasionally observe it; but the attention of the profession was particularly called to it upon the return of the troops from Egypt, among whom it spread with such uncontrollable violence and destructive consequences, that it acquired the title of Egyptian ophthalmia. The following history of the disease, as it occurred at that period, is extracted from Dr. Vetch's Treatise on Diseases of the Eye. "The British army which formed the first expedition to Egypt left that country in three divisions. Great part of the whole touched at Malta, and a considerable portion also at Gibraltar, at which places ophthalmia not only continued to present itself in the regiments which had brought it with them, but was communicated at the former place to several women with whom the soldiers associated; and at Gibraltar it became from that

time by no means an unfrequent complaint among the troops who had never been in Egypt. On the whole, however, the climate of Gibraltar has proved rather favourable than otherwise to the amelioration of the complaint. From Malta and Gibraltar the greatest part of the army proceeded to Great Britain and Ireland. In two regiments of fencibles disembarked at Portsmouth, the disease continued to present itself from the time of their landing until they were disembodied a short time afterwards. The regiments disembarked in Ireland having been placed in the same barracks and garrisons with the Irish militia regiments, the infection appears, from such evidence as I have been able to obtain, to have been communicated to them. If the disease existed at all in England, it seems to have been entirely overlooked till the summer of 1804, when it appeared with alarming violence in the second battalion of the fifty-second regiment, at that time stationed with the light infantry division in barracks, near Hythe in Kent. Not a man of this battalion had been in Egypt, and it was entirely composed of a body of volunteers received in one draft from the Irish militia, and very shortly after their arrival at Hythe the disease made its appearance. It continued to disseminate itself more extensively in this regiment during the remaining part of 1805; and in the following summer of 1806 it also began to prevail in the first and second battalions of the forty-third regiment, and the first, second, and third battalions of the 95th, all stationed at the same place and under the same command. Whether the disease was spread from the battalion in which it first commenced, or was derived from the same source, that is, the Irish militia, of which the others were equally composed, it would be now difficult to determine. The battalion in which this renewal of the infection first shewed itself in this country was the second of the fifty-second, and a very considerable number of cases had occurred in the first battalion when it embarked for Sicily in 1806. From the time of their landing in Sicily the disease continued to cripple this otherwise fine battalion. Part of the army of Sicily was dispatched to Egypt, and on its return to Sicily a fresh stock of the infection of ophthalmia was brought with it; but the disease, or an infectious ophthalmia of the same character, was in the first instance carried to Sicily from this country by the first battalion of the fifty-second regiment. From this station alone, I believe more than one hundred and thirty cases were sent home totally blind. When the disease had existed for some time in the light infantry brigade, composed as I have already stated, of the fifty-second, forty-third, and ninety-fifth regiments, stationed in Kent, it broke out in other regiments which had no communication with the former, but had formerly suffered much from the disease in Egypt, though till this period it had remained either altogether dormant, or prevailed in an extent so limited as to escape attention. Three hospital stations were established for the exclusive reception of those affected with the disease, towards the latter end of 1807, to the superintendence of which I was appointed. The numbers were chiefly composed of men from the regiments already mentioned; but in the summer of 1806 it contained no less than nine hundred cases, consisting of detachments from more than forty different corps. Previously to the sailing of the expedition to Walcheren in 1809, the number of acute and highly purulent cases was also very great, but as they were received in an early stage of the disease, there was little or no eventual loss, and from that period the disease continued to decline."

Dr. Vetch proceeds to account for the disappearance, temporary suspension, and recurrence of the disease, by attributing such recurrence to relapses with return of purulent discharge occurring in crowded barracks. He ascribes the comparative exemption from the disease enjoyed by the French army to the circumstance of their not being confined to barracks or subjected to fastidious discipline, but bivouacking in the field, or being quartered on the inhabitants of the towns they occupied; and in proof of it, instances the exemption enjoyed also by the English troops in the peninsular war. In Ireland, at the period alluded to by Dr. Vetch, the disease raged with perhaps still greater violence, and in consequence of want of sufficient accommodation for the numerous cases in the military hospitals, wards were opened for their reception in Stevens's hospital under the direction of Mr. Colles, where the writer had an opportunity of observing its extensive ravages, and the comparative value of the different means adopted for its removal. That the disease here spoken of is the same as that now observed, and commonly denominated purulent ophthalmia, can scarcely be doubted; and although its appearance among the troops in Egypt, and its subsequent history, has conferred upon it a certain distinction of character, yet it can scarcely be denied that it existed previously, and perhaps more particularly in Ireland.

The condition or symptoms which characterize the severer forms of conjunctival inflammation or purulent ophthalmia, whether Egyptian, gonorrhœal, or infantile, are the chemosis or turgid vascularity with effusion of serum into the subjacent cellular membrane; sloughing, abscess, or ulceration of the cornea; and alteration in the structure of the conjunctiva leading to granular lids and vascular and opaque cornea. The symptoms as they actually occurred in the form of the disease just alluded to are so well described by Dr. Vetch, who enjoyed ample opportunities of observing the disease, that his account is here introduced. "The first appearance of inflammation after the application of the virus is observable in the lining of the lower eyelid. It assumes first a mottled appearance and then a fleshy redness. A little mucus is generally present at the doubling of the conjunctiva at its lower part. The disease I know from observation may remain in this state for twelve hours before it invades the conjunctiva covering the eye;

sometimes it may be longer; and in some cases where the contact of the virus has been slight, or removed by immediate washing, the disease never went farther than producing the redness of the lining of the palpebra. In sclerotic inflammation the lining of the eyelids preserves in some degree its natural whiteness, especially just under the tarsi, for days and weeks. The progress of the inflammation, when it extends from the conjunctiva of the eyelid to that covering the globe of the eye, is often so rapid as to elude any distinct observation; but frequently it advances more gradually, preserving a defined line, till it extends over the whole membrane as far as the cornea. No part can be said to be more vascular than another, as the whole seems equally injected, and no space unoccupied. The disease is often thus far advanced before the attention of the patient is so much excited as to make him complain; a certain degree of stiffness being sometimes the only sensation which accompanies it. The first and chief uneasiness in this stage of the disease is described as arising from the feeling of sand or dirt rolling in the eye. This sensation is not constant, as it comes on suddenly and as suddenly departs, confirming to the patient the idea of something extraneous being lodged in the eye. I have always observed that its attacks are in the evening, about the time of going to bed, or very early in the morning. Their duration varies; sometimes an attack abates in an hour, and sometimes continues the whole night; those coming on in the evening being always the most severe. This symptom requires particular attention, as its accession is a certain index of the disease being on the increase. From the observations I have already made, its exacerbations and remissions are easily explained. When a vessel on the globe of the eye is first injected and rendered turgid, it excites an uneasy sensation in the conjunctiva of the palpebra, the same as if it moved over a particle of sand or extraneous matter. As the tone of the vessel diminishes, and the lining of the eyelids becomes accustomed to the new feeling, the painful impression ceases. A farther increase of the turgidity of the vessels already distended, or the distention of others, serves to excite afresh this feeling of uneasiness. The time at which I have said that this symptom generally comes on is when the patient is preparing for sleep, because he is then confined to a closer atmosphere; and not only is the eye deprived of the beneficial effects of the open air, but the temperature is farther increased by the closing of the eyelids in the attempts to sleep. The first stage of the disease may be, therefore, characterized by its great and uniform redness, without that pain, tension, or intolerance of light which accompanies most other forms of ocular inflammation. Exactly the reverse of which takes place when inflammation affects the sclerotic coat. From the beginning of the operation of the virus, there is a disposition to puffiness in the cellular texture between the conjunctiva and globe of the eye. This puffiness often suddenly swells out into a state of complete chemosis; and at other times it makes a more gradual approach to the cornea, advancing equally on all sides; the close attachment of the membrane at this part causes the swelling as it were to double over the margin of the cornea. While effusion is thus taking place upon the eye, œdema is likewise going on beneath the integuments of the palpebræ. This effusion ought to be considered as perfectly continuous with the chemosis arising from the internal surface of the conjunctiva, and following its reflection on the eyelids. To the œdema of the palpebræ, there is no other resistance than what the integuments afford; and, therefore, in a short time, it forms a tumour of astonishing magnitude, and the external swelling may by its pressure prevent the chemosis from acquiring the magnitude which would otherwise occur. This enormous tumefaction of the palpebræ is generally consentaneous with the complete formation of the chemosis, which is when it has reached the cornea and surrounds it. In proportion as the integuments of the palpebræ, by yielding to the œdema, swell out, they drag the tarsus to which they are attached inwards, producing inversion of the eyelid, and the integuments of the upper and lower eyelids meet, forming a deep sulcus between them. To examine the eye, it is therefore necessary, first to introduce the finger to the bottom of the sulcus, and then, by separating the swollen eyelids, to bring out the inverted cilia. Unless our treatment have an immediate effect in reducing the external œdema, few cases admit of any very minute examination of the eye itself. With the accession of the external swelling, the discharge, which was before moderate and consisted of pus floating in the watery discharge, now flows in a continued stream of yellow matter, which, diluted with the lacrymal secretion, greatly exceeds in quantity that derived from the most violent attack of gonorrhœa. The clothes, and anything within the reach of contact, soon become embued with the matter, the smallest particle of which is capable of producing infection. Although the tumefaction may be at first farther advanced in one eye than the other, it generally reaches its maximum of height in both about the same time. The patient, reduced to a state of great uneasiness by the irritation of the swelling, and by its confining the discharge, begins now to suffer attacks of excruciating pain in the eye itself. This is chiefly what indicates the mischief going on, and from which the patient must be immediately rescued, in order to save the organ. Here it is enough to observe, that the medical adviser must be careful how he allows himself to be lulled into security by any remission or palliation of this symptom. An occasional sensation, as if needles were thrust into the eye, accompanied with fulness and throbbing of the temples, often precedes the deeper-seated pain. This last is often of an intermitting nature, and a period of excruciating torture is succeeded by an interval of perfect ease. Under the latter form, I have met with it in the greatest number of cases,

and the exacerbation and remission have often occurred with great regularity. Sometimes the pain shifts instantaneously from one eye to the other, and is seldom or never equally severe in both at the same time; and sometimes instead of the eye, it occurs in a circumscribed spot of the head, which the patient describes by saying, he can cover the part with his finger. Sooner or later one of these attacks of pain is terminated by a sensation of rupture of the cornea with a gush of scalding water, succeeded by immediate relief to the eye in which this event has happened, but generally soon followed by an increased violence of the symptoms in the other. This first sensation of rupture is, when the disease is left to improper treatment, often followed by a second and a third; till exhausted by its own violence, the attacks become shorter and less severe; not, however, till after the lapse of many weeks and even months do they altogether cease. During this stage of the disease there is seldom the slightest alteration of the pulse unless the lancet have been freely employed. The patient's general health is little impaired, his appetite continues natural, but sleep almost totally forsakes him. As the pain abates, the external tumefaction subsides also, and a gaping appearance of the eyelids succeeds. This may be termed the third stage of the disease. The ciliæ, which before had been pushed inwards, are now separated, and stand outwards. The previous inversion of the cilia may be explained by comparing the palpebra to a sail bent to a rope; the more the sail is distended, the cord is drawn upwards and inwards. The swelling of the second stage having abated, the eyelids are prevented assuming their natural state, in consequence of the granulated state of the conjunctiva which lines them; and now eversion more or less takes place. This in general proceeds, however, no farther, but between this state and a complete eversion there is every degree of a diseased or granulated state of the inner surface of the palpebra. In some cases it disappears rapidly and of itself; in others it forms an inveterate disease, and, combined with some degree of sclerotic inflammation, becomes the cause of opaque cornea. The pain of the second stage of the disease arises in part from the destructive changes which have commenced in the cornea, aggravated by distention of the eye, consequent upon an augmented quantity of an aqueous humour. The formation of that fluid, I have already hinted, may take place through the medium of the ciliary processes, and the appearance of the cornea gives no reason to suppose that its internal surface partakes of the inflammation, or that the aqueous humour is increased by any morbid effusion. The distention seems entirely owing to an augmented activity in the secreting vessels; and these certainly are situated in the posterior chamber. Neither does there appear any reason to warrant the idea that the ulceration ever proceeds from within outwards. But the distention of the anterior chamber probably favours the escape of the aqueous humour sooner than it would otherwise happen. The swelling and the purulency prevent us from making any very accurate examination to ascertain the progress of the ulcer. The account I have given of it in a former chapter is an analysis of what takes place in ophthalmia. When any large portion of the cornea sloughs, an adventitious and vascular membrane is often produced, which finally forms a staphyloma. In some few cases I have seen the lens and its capsule exposed without any external covering whatever, and for a short time the patient sees every thing with wonderful accuracy; but as soon as the capsule gives way, the lens and more or less of the vitreous humour escape, the eye shrinks, and the cornea contracts into a small horn-coloured speck. This total destruction of the globe of the eye generally insures the safety of the other, and renders it less liable to be affected by future attacks of inflammation. When one eye is lost by staphyloma, and the other remains useful, it is well to do what nature has left undone, and instead of attempting to reduce the sac by puncturing it, at once to lay it open and extract the lens."

The account here given by Dr. Vetch is calculated in an eminent degree to impress on the mind of the student the importance of this disease; he is not, however, to expect to meet with it in this form in daily practice. He will not always have an opportunity of observing the first symptoms of the attack, as the patient seldom presents himself until the complaint is fully established, and he will not often find the symptoms so rapid in progress or violent in degree. The practitioner, in studying an individual case, has before him the vascularity, tumefaction, scalding pain, and purulent discharge in the severest form. His first consideration should be to recal to his memory the dangerous consequences which he is called on to avert, and which constitute the prominent symptoms of the disease. In the first or inflammatory period, he is to recollect that the eye may be lost by sloughing or abscess of the cornea, or by suppuration of the whole eye-ball; in the second stage he has to apprehend the injury or destruction of the cornea from ulceration, or that change of organization of the conjunctiva which proceeds to permanent increased vascularity, and that peculiar condition denominated granular lids. The nature of the pain experienced by the patient should receive particular attention: if it be the characteristic scalding sensation of sand beneath the lids, it is indicative of severe conjunctival inflammation only, but if this be accompanied by intense aching extending to the temples and sides of the head, it is evidence of the extension of the inflammation to the eye-ball itself; the cornea and fibrous selerotic refusing to yield to the distention of inflammatory action, like muscular fasciæ and the coverings of joints under similar circumstances.

As sloughing or abscess of the cornea is the consequence most to be apprehended during the inflammatory period, the practitioner watches with anxiety for any appearance indicative of this evil. It is not perhaps possible

o detect the first change which the cornea ndergoes in this process, but when this trans-parent structure assumes a dirty white opaque ppearance, either wholly or partially, the mis-hief is easily recognized; and when subse-quently the sphacelated portion comes to be ast off by the usual process of ulceration, and exhibits a line of separation between the dead nd living parts, no doubt of the nature of the njury can be entertained. Abscesses in the structure of the cornea are also liable to occur luring the inflammatory period, and have pro-bably been often confounded with the sloughing here described, the distinction being difficult, nd the two destructive consequences some-times being combined, and constituting a con-dition analogous to common anthrax. Abscess of the cornea is peculiar in this respect, that it does not appear to consist of a distinct sac of purulent matter, but merely a deposit in the cellular or laminated structure of the cornea; it consequently does not open at one point and discharge its contents, but breaks into an open ulcer not easily distinguished from the broken surface of a slough. The colour of the opacity of the cornea constitutes the best cri-terion; if the spot be of the usual straw-coloured tint of purulent matter, and not the dull dirty white of dead macerated cornea, abscess, not slough, is the process in progress. Abscess also probably occurs more frequently in circumscribed spots, and seldom extends to the entire circum-ference of the cornea. The secretion of puru-lent matter in the chamber of the aqueous humour is easily distinguished from abscess of the cornea at its commencement, by the puru-lent matter falling down in the aqueous humour between the iris and cornea, and by its surface assuming a horizontal level repeatedly de-scribed under the title of *hypopion*, *onyx*, or *un-guis;* but when the whole chamber is filled with pus, and the cornea consequently presents a uniform yellow appearance, the real nature of the appearance is not so obvious.

Causes.—In every day practice, where the cases are comparatively few, the inquiry into the cause of the complaint is not so important as when numbers of persons collected together are violently attacked; because the occurrence of a few instances of the disease would not jus-tify the adoption of preventative measures by a large community, which are imperatively called for where it rages among smaller numbers more crowded together, as in barracks, schools, and ships. That any cause producing irritation of the conjunctiva,—as strong light, currents of cold air, or the contact of dust blown through the atmosphere,—or any cause usually producing in-flammation of mucous membranes,—as sudden transitions from heat to cold, or peculiar con-ditions of the atmosphere,—is likely to produce purulent ophthalmia can scarcely be denied; but the extent to which these causes operate, or the circumstances under which they become in-fluential, have not been ascertained. The oc-currence of the disease in particular countries, and in barracks, schools, and ships, is notorious; but the real causes of such occurrence have not been satisfactorily determined.

The rapid extension of the disease among the individuals of crowded communities has naturally led to the belief that it is conta-gious, and not only communicated by actual application of the discharge of a diseased eye to a sound one, but even through the medium, whatever it may be, by which diseases notori-ously contagious are transmitted. The dis-cussion respecting the contagious nature of the affection is involved in the same diffi-culties and contradictions which embarrass the inquiry into the nature of contagion in general: sufficient facts, however, have been adduced to justify the separation and re-moval of communities among whom the dis-ease breaks out, and to induce the prudent practitioner to enjoin the greatest attention to the prevention of contamination by actual con-tact of the matter of the disease with the eyes of those not affected by it.

Prognosis.—The prognosis in severe purulent conjunctival inflammation must obviously be most cautious. The patient should be made fully acquainted with the immediate danger of destruction of the organ to be apprehended from sloughing or suppuration, as well as the pros-pect of slow and doubtful recovery in conse-quence of the great alteration or disorganization of the conjunctiva produced by the intense in-flammatory action. In forming his prognosis, the practitioner must of course be guided by the degree of violence of the attack, the habit and constitution of the patient, and the experience he has had as to the modifica-tion of the disease by climate or other circum-stances.

Treatment.—In severe conjunctival inflam-mation the principles inculcated in the com-mencement of this article should not be over-looked. The resources available for arresting the inflammatory action are, as has been ob-served, bleeding general and local, emetic and nauseating medicines, purgatives, diaphoretics, and, according to some, mercury. Locally, astringent, sedative, stimulant, cold or warm applications, and occasionally blisters, scarifi-cation, and other remedies directed to peculiar conditions, must be resorted to. Before the practitioner makes up his mind respecting the value of bleeding in this disease, he should pause to consider the effect of this depletion in arresting inflammation of mucous membranes generally; and having done so, he will proba-bly be prepared to admit that in many cases the lancet is not so valuable a resource as might be expected, or as it is found to be in inflamma-tion of serous membranes or other structures. The advantage of bleeding in croup cannot be denied, but it is to be recollected that this dis-ease is more liable to terminate in effusion of coagulable lymph than in secretion of purulent matter. Catarrhal inflammation of the lining membrane of the nostrils or the trachea and bronchial tubes, and dysentery in the acute form, are treated by bloodletting more with the view of diminishing the febrile symptoms than with the hope of cutting short the local inflam-matory action. Bleeding will not cure con-junctival inflammation, but it is a most valuable

auxiliary means of relief, by reducing the part to a condition in which other remedies become more effectual. The writer has seen the abstraction of blood carried to the greatest extent possible, consistent with the safety of the patient; he has seen repeated bleedings of forty, fifty, and even sixty ounces, and streams flowing from the arm and temporal artery at the same time, without generally beneficial results. More moderate bleedings, suited to the intensity of the symptoms, habits, and constitution of the patient, should, however, form part of the treatment. It is scarcely necessary to say that persons emaciated by want, enervated by drunkenness and debauchery, or debilitated by respiration of impure air, are not fit subjects for a system of depletion; on the contrary, such treatment is most destructive to them, and the very reverse of it is demanded.

The means by which blood should be removed, or the sources from which it should be drawn, deserve consideration. Many prefer opening the temporal artery, from a theoretical notion that by emptying one branch of an artery, those ramifying from the same source have the force of their currents diminished; but it never has been proved that this is actually the case, and it may even be doubted that any advantage is derived from the preference, while much inconvenience, irritation, and heat is produced by the bandage required to secure the wounded vessel. If advantage be derived from a local diminution of the circulating fluid, it may more reasonably be expected from opening the jugular vein; because in this case this vessel cannot, like the temporal artery, be instantly refilled by the heart's action: therefore, when the size of the vein, the formation of the patient, and other circumstances are favourable, this vessel should be selected. Bleeding in the arm, however, from its greater convenience, and the ease with which it may be performed, is generally preferred, and perhaps in the majority of cases without disadvantage to the patient.

The local abstraction of blood by leeches or cupping is the next resource, after the effect of the general depletion has been ascertained; it may be resorted to in the evening if the general bleeding took place in the morning, or, according to the urgency of the symptoms, may be postponed till the following day. Twelve, eighteen, or twenty-four leeches should be applied to the temple or over the cheek-bone, so as to leave an opportunity of stopping the bleeding by pressure should it become necessary. The irritation, inflammation, and tumefaction produced by the application of leeches to the swollen eyelids more than counterbalances the good, if any, derived from emptying the vessels of the inflamed part. The advantage from the bleeding by leeches appears to depend upon the continued trickling of blood, which is perhaps best encouraged by the application of compresses of old linen wrung out of warm water and removed and replaced every ten minutes, or as often as they become soaked with blood. The application of a few leeches to the conjunctiva of the lower lids has latterly been recommended and practised, and may perhaps be resorted to with safety and even advantage in the after stages of the disease; but in a case of violent purulent ophthalmia threatening destruction of the eye, the effect is too inconsiderable to risk any aggravation of the inflammation by the leech-bites.

Local abstraction of blood from the inflamed conjunctiva by scarification has been practised from the most remote periods; the same objection may be made to it as is offered to the application of leeches, that is, the small quantity of blood drawn, and the great extent of injury inflicted. When the chemosis or vascular tumefaction of the conjunctiva is very great, and the membrane projecting between the lids or overlapping the cornea, the writer, in place of merely scarifying or scoring the surface, runs an extracting knife from one end to the other of the tumour, by which the effused serum is allowed to escape, tension is relieved, and generally a considerable quantity of blood discharged. From this practice advantage is frequently derived without any injurious consequence either temporary or permanent.

As it is of the utmost importance that the practitioner should be informed as to the value of bleeding in this disease, the opinions of Dr. Vetch, Mr. Lawrence, and Mr. Guthrie, are here subjoined. Dr. Vetch observes, "A perfect command over the disease depends less on lowering the system than on the temporary cessation of arterial action by the syncope, which it becomes the object of the operation to produce. This practice, besides its efficacy, will accomplish the cure with a much less expenditure of blood than is occasioned by the repeated bleedings generally had recourse to, where this method of rendering one equal to the cure of the complaint has been neglected. Sometimes, before the approach of faintness, the redness of the conjunctiva for the most part disappears; but this is no security against the return of the disease, if the flow of blood be stopped without deliquium animi succeeding." And again, (page 217, Treatise on Diseases of of the Eye,) "Of three thousand cases admitted into the ophthalmia depôt, I am not aware of any one in which the practice of depletion, assisted by the remedies mentioned, did not prove effectual when the patient was received under the first attack of the disease." He then states that twenty-five men only were lost to the service of all those admitted into the ophthalmic depôt; "but an unfortunate feature of this very dreadful complaint is its great tendency to recur, even after the eye has recovered its healthy and natural appearance; and although it be in our power to conquer its present violence, no treatment can prevent relapses from taking place. As long as the lining of the palpebræ continues villous, this accident is liable to recur, with all the severity of the original attack." From this last observation it is to be suspected that numbers of these men were discharged as cured when labouring under pulpy and villous conjunctiva, subsequently proceeding to granular lids and opaque cornea; especially when it is known that thousands were lost to the service

notwithstanding the prevalence of the bleeding practice.

Mr. Lawrence* says, "The first measure is to take blood from the arm, and this in large quantity, so as to produce syncope: you may expect to derive much more benefit from one bleeding of this kind than from the repetition of smaller ones. It may be necessary to repeat the venesection; and if the symptoms should remain urgent, you must not hesitate to do it: you may subsequently take blood by cupping from the temple, and apply numerous leeches about the eye." In his account of gonorrhœal ophthalmia, bleeding is still more strongly recommended.

Mr. Guthrie† states, "It was deemed necessary to abstract blood in large quantities; indeed sixty, eighty, and even one hundred ounces have been drawn. It was often thought necessary to re-leech the eye and blanch the countenance to effect a cure, and I have no doubt that it has been done with success; and the extreme vessels of the conjunctiva have been so drained as to be rendered incapable of going on with the secretion. Those who find fault with this practice in all probability never saw the disease; for it is the most efficient mode of proceeding, and the best when there are no local means employed."

After the requisite depletion by the lancet, the practitioner avails himself of the other resources within his reach. If there be reason to believe that there are crudities in the stomach, with foul tongue and headach, an emetic may be administered with advantage; and when the nausea subsides, the bowels should be freely opened, and the discharge kept up by the administration of suitable medicine at proper intervals. A few grains of calomel at night, followed by repeated doses of the common mixture of infusion of senna and sulphate of magnesia in the course of the following day, may probably answer every purpose. From the advantage derived from nauseating medicines in other forms of inflammation, similar advantage has naturally been expected from its administration in purulent ophthalmia; but in consequence of their not answering the exaggerated expectations of the practitioner, they have not, perhaps, been resorted to to that extent they deserve. The effect may be advantageously secured by the addition of tartar emetic to the purgative mixture, or the same medicine alone in solution may be given after the bowels have been freely opened, in doses sufficient to produce slight nausea, and secretion from the skin encouraged at the same time by confining the patient to bed. Tobacco has been resorted to for the purpose of exciting nausea; but experience has not yet proved that it possesses any superior advantage, while we are less familiar with its effects than with the preparations of antimony. Mercury has been recommended and resorted to for the removal of conjunctival inflammation, but with little success. The opinions of Mr. Lawrence, Beer, Delpech, and others, are unfavourable to the practice. Without accomplishing any valuable object, it reduces the patient to the condition which is most calculated to perpetuate the destructive change in organization of the conjunctiva.

Whatever importance is to be attached to the opinions of English writers on the present subject—respecting the paramount value of bleeding and low living in the treatment of the disease, the Irish practitioner must undoubtedly be circumspect, in this respect, in his treatment of the poor. It may be very well to bleed and otherwise reduce those who have been well fed and have enjoyed all the comforts of life; but the practice is utterly inadmissible in a country where the poor are abandoned to a state of destitution, and, if not absolutely starved, are so ill fed, and clothed, and lodged, that frequently no healthy action can be roused until the constitution be invigorated. In Dublin it is often absolutely necessary to place a patient, a few days after the first attack of purulent ophthalmia, on full diet, consisting of animal food with ale or porter, accompanied by the administration of bark or other tonics.

In the treatment of purulent ophthalmia the management of the patient, with respect to the temperature, ventilation, and lighting of his apartment, should not be overlooked. The practice of immuring a patient in a close room, with windows shut and curtains drawn, and with the addition of an enclosure of curtains round his bed, involving him in a contaminated atmosphere loaded with the excrementitious effluvia of his body, is most pernicious. The close, stinking, crowded, and darkened ward to be found in some hospitals, called the eye-ward, is equally destructive. The author of this article has almost daily opportunities of witnessing the refreshing and salutary effects of what may justly be called a meal of fresh air, on persons subjected to such treatment; and he invariably finds that patients obliged to go out of doors are more easily managed, and escape with less injury, than those confined in the way just mentioned.

With respect to this part of the treatment, Dr. Vetch makes the following observations:—"I entertain so favourable an opinion of the effects of the free exposure to the atmosphere, that although no person can better appreciate the importance of decisive measures in the early stage of the disease, I would in favourable weather risk the delay of a journey on foot or horseback, or in a carriage, or a voyage by sea, provided the eye be freely exposed to the air. Even when the second stage has commenced, by the appearance of a chemosis and purulent secretion, I have never seen any other than the best effects to attend a change of place. Soldiers who have commenced a march with the disease completely formed, though exposed to heat, dust, and fatigue, and not abstaining even from intoxication, are invariably better at the end of the journey than when they set out. The instances of this fact which I could

* Lectures, reported in the Lancet.

† Lectures, reported in the Medical and Surgical Journal.

adduce from my own observation are innumerable; and I am informed by Mr. Murray, surgeon to the forces, that so strongly did he observe the beneficial effects of exposure to the air, when a great number of men affected with the disease was sent, under his care, to the interior of Sicily, that he was induced to march them from one place to another, with a view solely to the good effects he saw resulting from it."

In considering the local treatment of severe purulent ophthalmia, the first and most important point to be determined is the value of powerfully stimulant or astringent applications made directly to the inflamed conjunctiva in the first or inflammatory stage of the disease. The great advantage of strong astringent solutions in arresting the progress of that disorganizing change which follows violent conjunctival inflammation is undeniable; but it requires much circumspection to avoid confounding the advantages derived from astringents in the chronic stage with those derived from similar applications in the acute. The question to be determined is, whether a powerful stimulant or astringent, as ten or twenty grains of nitrate of silver in an ounce of water, or ten grains in a drachm of lard, can be with safety and advantage applied to the surface of the inflamed conjunctiva in the first attack of violent purulent ophthalmia. When a patient presents himself in the first stage of purulent ophthalmia, with severe scalding pain, and with the conjunctiva in a state of chemosis, overlapping the cornea and projecting between the eyelids, few practitioners will feel inclined to soak the eye in a ten grain solution of nitrate of silver, or thrust a portion of the ointment (ten grains to the drachm) between the lids and the swollen and turgid conjunctiva. The most strenuous advocates for the stimulating practice inculcate the necessity of allaying inflammatory action before or during its adoption. Whither incipient purulent ophthalmia of the character now under consideration can be at once cut short or not by the application in question, has not yet been established to the full satisfaction of practitioners. The circumstances under which the experiment may be made to enable the observer to arrive at a just conclusion seldom occur, because he rarely meets a case in its very onset which he can pronounce to be violent purulent ophthalmia, the severe characteristic symptoms not being yet developed. If purulent ophthalmia rages in a regiment, a school, or a ship, and the surgeon, watching narrowly the symptoms of the accession of the disease, applies this stimulating astringent to the surface with decided effect; or if a patient in the hands of a practitioner for the treatment of gonorrhœa presents the symptoms of conjunctival inflammation, and is similarly treated with similar good effects, the question must be determined in the affirmative. Several military surgeons, who have enjoyed the best of opportunities of observing and treating the disease, are decidedly favourable to the practice.

Mr. Lawrence, however, in his book on Venereal Diseases of the Eye, speaks of it with caution and reserve. After quoting the authority of Mr. Melin, Mr. Bacot, Dr. Ridgeway, and Dr. O'Halloran on this subject, he observes, "I have not seen purulent ophthalmia, whether ordinary or gonorrhœal, treated on this plan; nor am I aware that any case of the latter kind is recorded. Destructive or injurious consequences have so frequently resulted under the usual management of this disease, that I should certainly employ the local astringent if I met with a case favourable for the trial; that is, where the affection had not extended beyond the conjunctiva. Bloodletting might be resorted to at the same time. In most cases, however, our aid is not sought until the cornea has become affected; and it is, therefore, too late for the astringent plan." In a note he adds, "Since the statement in the text was written, I have employed the caustic solution in two cases of conjunctival inflammation with the best result. One of these was mild gonorrhœal inflammation. The other was catarrhal inflammation of the membrane, affecting both eyes of a gentleman who had been convalescent from gonorrhœa for a few weeks. As he was a person of robust make and full habit, and the eyes were very red and stiff, I took three pounds of blood from the arm, and purged him freely, with relief of the local symptoms, which were completely removed by a subsequent application of the caustic solution."

The practice here alluded is advocated so strenuously by Mr. Guthrie, that it is desirable to have his opinions conveyed in his own words. The following extract is, therefore, made from his lectures reported in the Medical and Surgical Journal. "In the more formidable affection which runs its course in three or four days, neither the nitrate of silver in solution nor the vinum opii are effective; it requires a more powerful local application. The disease begins externally, and is a local disease of a peculiar character. If we can set up a new action, or alter that which is going on, we check the original affection, according to the principle of John Hunter, that no two diseases or actions go on at one and the same time. Acting on this principle, I took the nitrate of silver in substance, and made it into an ointment. I did not arrive at its exact composition at once, but gradually acquired it by degrees; it was made at various times, of five, six, ten, and twenty grains to the drachm; and after trying all these different preparations, I came to the conclusion that the ten grain ointment was the best. Take half a drachm of the salt, and powder it in a glass mortar, then sift it through a bit of muslin, so that it is reduced to an impalpable powder, for if there are any grains left, they will stick in the cornea, or in the folds of the conjunctiva, and produce a slough. Ten grains of this impalpable powder should then be thoroughly incorporated with a drachm of hog's lard, on a glass slab with an ivory paper cutter; and in order to ensure

proper attention in the preparation of this ointment, I sought for something to mix with it, which would require some time for its incorporation, and selected the liquor plumbi acetatis for this purpose. Fifteen drops are to be duly mixed with the ointment; and as it generally requires some minutes to do this, there is reason to believe that the trituration is complete. There has been, as usual, some dispute concerning this ointment; the first thing said was that it was violent and useless: well, that has been got over. The second stage was to attribute the introduction of it to some other person. The third to alter the composition, and instead of the liquor plumbi acetatis to mix opium, &c. with it. I have no objection to this, if the gentlemen will only leave me the principle, which is all I contend for. I care not if they change all the component parts, or whether they apply it by a brush of the little finger, or the probe. It has been said that it is soon valueless and inert. All I can say is, let those who think so have it applied to their eyes, and they will soon change their opinion, even if it be a year old. Before the ointment is applied in this purulent inflammation, the discharge must be well cleansed out by a solution of alum; then the ointment having been inserted, the lids must be moved freely up and down so that the whole conjunctiva gets its due proportion of ointment, and this is shown by its turning white. If it does not turn white, it has not been sufficiently applied, and will not answer the purpose; if we wish to be quite sure, we turn out the eyelids, and rub the ointment on them; this application gives pain, which lasts for half an hour to an hour, or more; it is not quite so acute as the vinum opii. I had rather that the pain should last an hour or more, as the action going on is more likely to be changed. When I apply this ointment, I generally direct the patient to lose blood, not to the amount of sixty ounces, but to about twenty, and I had rather that he should faint: and I do this because the application will only alter the action in the extreme vessels, and not that which is behind them in the ball itself, and it is therefore necessary to diminish action in them by bleeding. If, however, the inflammation is moderate, I do not bleed at the time, leaving directions that if the patient is not better in the evening, or the next morning, blood should then be taken. Warm narcotic fomentations may be employed to relieve uneasiness, and opium should be given to allay pain and obtain sleep, while a solution of alum, half a drachm to half a pound, should be injected from time to time into the eye to clear it; but should the patient sleep, he must not be disturbed. A mild ointment may be applied to the lids at night, to prevent their adhering together. The next morning the discharge is again to be removed, and the ointment re-applied, for on no account should the action we are desirous of exciting be suffered to cease; the other remedies are likewise to be continued. In addition to these I would give calomel and opium, so as to affect the mouth, and the other more common remedies; and rest and diet should be attended to. When I hear of twenty or thirty persons losing their eyes from this disease, I say that it must always be so, unless they are treated on this principle, bearing in mind that some diseases in certain persons are incurable from the first, and that no one means of cure is applicable to every case. I am certain, however, from experience, that the plan I have recommended is the most generally efficient and certain of any that has hitherto been advised, whilst it is also less injurious to the constitution."

There is much difference of opinion as to the comparative value of cold or warm applications in the acute stage of purulent ophthalmia. Either in ophthalmic or any other local inflammation, the advantage to be expected from cold applications is the reduction of the temperature of the part, and consequent diminution of vascular action; but this object is very rarely obtained, and the real effect of cold in abating inflammation has as yet scarcely been ascertained. The attempt is made in conjunctival inflammation by repeated applications of cloths wrung out of cold water, but these cloths become so speedily of the same temperature as the part, that nothing more is effected than a temporary cooling, followed by perhaps greater heat and vascular re-action. To obtain the advantages to be expected from cold applications, these cloths should be changed by a nurse, sitting at the bedside of the patient, twice in a minute, or a fold of old linen may be laid across the eyes with the ends hanging into cups on each side, and cold water squeezed on with a sponge, or allowed to drop from a vessel contrived for the purpose. In this way the application of cold as a remedy in ophthalmic inflammation, and especially from wounds or other injuries, is undoubtedly of value, although many patients prefer the effects derived from warm moisture. The following objections made by Mr. Travers to cold applications, in his Synopsis of Diseases of the Eye, are perhaps more applicable to their maladministration. "Although the sensation of cold is most agreeable to an organ under acute inflammation at the moment of its application, it is generally followed by increase of heat and pain; and in familiar instances the pulsatile action of the vessels leading to an inflamed part is so increased as to evince its stimulating effect, and the reaction thereby induced. When, however, the acuteness of inflammation has subsided, and the sensibility of the part is in proportion diminished, the effect of cold is only tonic, and has a salutary tendency to restore the balance of the circulation. I therefore decidedly prefer a tepid application in the painfully acute stage of inflammation." With the reservation that cold properly applied is not to be despised, this advice is good for the purposes of general practice.

Warm applications may be made by stupes, poultices, or light compresses, all of which are generally mismanaged, and frequently do more mischief than good, unless particularly attended to by the practitioner himself. The stuping is generally attempted by wringing a flannel cloth

out of a hot decoction of chamomile or poppy-heads, and laying it across the patient's eyes, in which case the steam is dissipated, and little of it comes in contact with the eyes. It is best accomplished by the patient himself, who, sitting up in bed, should receive a small piece of flannel, wrung out of the hot water, from the nurse, and hold it in the hollow of his hands under the eyes, changing it as it ceases to give out steam. Many little contrivances may be made for the purpose with sponge or other materials, but holding the eyes over vessels of hot water, or exposing them to steam extracted from a boiling apparatus contrived for this purpose, is not found advantageous, as the heat applied is generally too great. Whether any benefit be derived from the addition of sedative or other medicinal ingredients to the stupe, remains to be proved: it is not, however, attended with disadvantage, and a medical man of any sagacity will see the necessity of yielding to prejudices for the attainment of objects directed to the relief of his patient. If the practitioner determine to add opium to the stupe, he should give the patient the advantage, whatever it may be, of its efficient application, which is, perhaps, obtained in a neater and more perfect manner by the addition of a drachm of the tincture, or a few grains of the watery extract to a pint of hot water.

Whatever difference of opinion may exist with respect to the extent to which stimulating or astringent applications should be employed in the inflammatory stage of conjunctival inflammation, there is little doubt entertained of the value of astringents in the chronic stage, or that condition of the conjunctiva which may be considered the necessary consequence of the violent inflammation above described. The salts most commonly used for this purpose are acetate of lead, alum, sulphate of copper, sulphate of zinc, corrosive sublimate, and nitrate of silver. Notwithstanding the length of time these salts have been in use, it does not appear that any conclusive experiments have been made to ascertain their comparative value, or the best proportions in which they should be used. The practitioner has little more to guide him in the selection than the vague and uncertain evidence of expressions of confidence in some one or other by different practical writers. The most generally valuable, safe, and efficient, are the acetate of lead, alum, and nitrate of silver, the sulphates of copper and zinc being more stimulating and irritating, with less astringent properties. Weak solutions, however, of sulphate of zinc or copper are unquestionably of value in the slighter vascularity of the conjunctiva following catarrhal ophthalmia, or arising without preceding inflammatory action. Saturated solutions of acetate of lead or alum may be used with the greatest safety, and without producing any such effect as follows the introduction of other salts. Saturated solutions of sulphate of zinc may also be applied to the conjunctiva without any other destructive consequence than a temporary increase of vascularity, pain, and weeping; but a saturated solution of sulphate of copper produces violent inflammation, probably acting chemically, and producing superficial destruction of the surface. Nitrate of silver, in the proportion of ten or fifteen grains to the ounce, appears also to act chemically, causing whiteness of the vascular conjunctiva, but without the irritating and stimulating effects of sulphate of copper. Nitrate of silver, even in the proportion of three or four grains to the ounce, if used for a month or six weeks, will produce an olive-coloured indelible stain of the conjunctiva, and lamentable deformity; or both it and acetate of lead, applied while ulcers of the cornea exist, produce the worst form of opacity by being decomposed by the tears and deposited on the flocculent surface, and there detained until permanently fastened by cicatrization, as has been described by the author of this article in the Dublin Hospital Reports. None of these disadvantages attend the application of the alum solution, and its powerfully astringent qualities are undeniable. The condition of the conjunctiva to which the reader's attention is called with reference to these applications, is that which exists from a fortnight to six weeks after the first attack, when the acute inflammatory symptoms have subsided, and before the membrane has acquired the extreme condition of disorganization denominated granular conjunctiva. At this period there is occasional pain, flow of tears, purulent discharge, and a pulpy villous vascularity of the conjunctiva. In this state a solution of from five to ten grains of nitrate of silver in an ounce of water, or the ointment recommended by Mr. Guthrie, will prove of great advantage; but the practitioner should not allow the praises exclusively bestowed upon it to induce him to discard the saturated solutions of alum or acetate of lead, as he may be assured that they will often be found preferable in practice, although the particular condition in which they are so may not have been ascertained. The effects of the saturated solution of acetate of lead, when such cases, modified by scrofula, are accompanied by vascularity of the conjunctiva covering the cornea, are frequently most remarkable. Dr. Vetch expresses the following opinion respecting the solution of acetate of lead. "The liquor plumbi acetatis in its undiluted state is the application which I can recommend as the most efficacious, and at the same time incapable of doing harm in this, and in every stage of purulent ophthalmia. The sensation it occasions is that of some dust or sand having got into the eye, which lasts from ten to twenty minutes; there is generally a copious lachrymation, and the eye afterwards feels cool, and the sight is clear."

Whichever of these solutions is preferred should be fairly dropped into the eye, after it has been cleansed with sponge and warm water, on awaking in the morning, and the patient should remain quiet with the lids closed for half an hour. This may be repeated in the evening, if not found to produce increase of pain or irritation, and the patient should be allowed a weaker solution to wash the eyes with more frequently in the course of the day. At night the edges of the lids may

be smeared with cream, fresh butter, or some mild ointment. On the continent a compound salt, called the *lapis divinus*, is much used; it is made by heating eight ounces of nitre, alum, and sulphate of copper in a crucible, and, when fluid, adding half an ounce of camphor, and closing the vessel until cold. It is used in the proportion of three or four grains to the ounce, and appears to have the same effects as sulphate of copper.

The application of the vinous tincture of opium was first recommended by Mr. Ware, in his "Remarks on the Ophthalmy." He gives the following account of the method of applying it and its effects: "I would particularly recommend the thebaic tincture of the old London Dispensatory; a medicine composed of opium and warm aromatics, dissolved in mountain wine." "When first applied it causes a sharp pain, accompanied with a copious flow of tears, which continues a few minutes, and gradually abates, after which a greater and remarkable degree of ease generally succeeds. The inflammation is often visibly abated by only one application of this tincture; and many bad cases have been completely cured by it in less than a fortnight, after every other kind of remedy had been used for weeks, and sometimes months, without any success. But this speedy good effect is not to be expected in all cases indiscriminately. In some, the amendment is more slow and gradual, requiring the tincture to be made use of for a much longer time; and a few instances have occurred, in which no relief was at all obtained from its first application. In cases of the latter kind, in which the complaint is generally recent, the eyes appear shining and glossy, and feel exquisite pain from the rays of light. However, notwithstanding these symptoms, the application is sometimes found to succeed; and whether it will or not, can only be determined by making the trial, which is attended with no other inconvenience than the momentary pain it gives. When it is found to produce no good effect, the use of it must be suspended, until evacuations and other proper means have diminished the excessive irritation; after which it may again be applied, and bids equally fair for success, as in those instances in which it never disagreed. If two or three drops of the thebaic tincture are dropped at once on the globe of the eye, the pain they occasion will be considerably greater than if they are placed in the inner angles of the eyelids, and made to glide gradually on the eye, by gently drawing down the lower lid. At the same time that this latter mode of applying the tincture is much less painful than the former, I have found, in a great variety of cases, that it is equally beneficial." Experience has fully established the character here given by Mr. Ware of the vinum opii; it is, however, most applicable in those cases where there is much scalding pain, lachrymation, and intolerance of light.

If the pulpy villous vascularity produced by the inflammation above described be neglected, or be not removed by the applications alluded to, it degenerates, in about six weeks or two months, into a still more destructive condition; the conjunctiva lining the lids acquiring a rough irregular vascular appearance, which, from its resemblance to the granulating surface of a sore, has been named the granular conjunctiva. This condition, if not altered or removed, is followed by red vascularity and opacity of the conjunctiva covering the cornea, and almost total loss of vision. To remove this state of the membrane, the resources of ophthalmic surgery have been nearly exhausted, and frequently without effect. It even unfortunately happens that the destruction or removal of these warty prominences or granulations is not followed by recovery. In fact, the organization of the conjunctiva is destroyed by the severe inflammation, and, if ever restored, requires a great length of time to return to its original condition. These granulations may be removed either by the knife or escharotics, and the question respecting the preference to be given to either method has been the subject of much controversy. They certainly may be shaved off by the dexterous use of a small cimeter-bladed knife, and their removal in this way is accompanied by the advantage of local bleeding, and consequently less subsequent pain, irritation, and inflammation than attends the use of escharotics. The partial use of escharotics, however, is often necessary to complete the removal, as it is impossible to reach all the granulated surface with the knife. The escharotics commonly employed are the nitrate of silver, or sulphate of copper, in substance. The former is preferable, its effect is more decisive, and the inflammation and irritation from its application are less: the latter is, however, preferred by some.

The operation of applying the escharotic must not be carelessly performed. Much mischief has been frequently done by allowing an inexperienced pupil to rub the inside of the lids with a piece of sulphate of copper in a slovenly manner. The upper lid should be everted and the surface dried with a cambric handkerchief; the whole of the granulations should then be repeatedly touched with a pencil of nitrate of silver until the surface becomes of a deep ash colour; it should then be carefully washed with a plentiful stream of water from a syringe, lest any particle of nitrate of silver should adhere undecomposed, and be turned in on the cornea. If the sulphate of copper be used, it will require a more continued application to produce the escharotic effect, and the washing must be performed with equal care. The application of the escharotic must be repeated as often as the granulations are observed to remain after the surface becomes clear from casting off the coat produced by the nitrate of silver.

Ointments are frequently resorted to for the removal of the vascularity and tenderness of the lids produced by purulent ophthalmia, especially where the skin at its meeting with the conjunctiva becomes red and destitute of cuticle, constituting lippitudo, a condition which, it is to be recollected, arises often without pre-

ceding acute inflammation. Where the object is merely to obviate the inconvenience arising from the dryness produced by exposure to the air, or the scalding from contact of the tears, it may be accomplished by the application of a little cream, fresh unsalted butter, or the spermaceti ointment. It is often, however, necessary to combine astringent or stimulating ingredients with the ointment. The ointment of nitrate of mercury, diluted with five or six times its weight of oil or lard, is very commonly used, and frequently with good effect if continued for a few days only. The stimulating effect appears to be salutary as a first and temporary impression, but when persevered in for a length of time, seems to have a contrary result. The ointment of oxyd of zinc is a very safe and efficient astringent application, as is also the mixture known as the ophthalmic ointment of *Janin*, composed of four drachms of lard, two of tutty or impure oxyd of zinc, two of Armenian bole, and one of calomel. These ointments should, however, be made with such a proportion of oil as will give them so soft a consistence that they can be applied with ease to the lids with the point of the finger or a camel-hair pencil; they should also be properly and carefully ground on a flag with a muller, not merely mixed on a tile with a palate knife, and great care taken that the oily ingredient be not rancid or burned. Ointment of acetate of lead, or a mixture of oil or lard, with liquor subacetatis plumbi, is another application frequently employed with advantage. As oily applications are sometimes found not to agree with the surface, the practitioner may find it necessary to combine astringents with some tenacious ingredient of a different description; for this purpose clarified honey may be used, with the addition of alum or Armenian bole finely levigated. Honey alone will often afford relief in the slighter degrees of vascularity following conjunctival inflammation.

In the treatment of purulent ophthalmia the advantages to be derived from blisters should not be overlooked. The extent to which they may prove beneficial in any particular case can perhaps scarcely be ascertained; but as their value generally in contributing to the removal of local inflammation is admitted, it is not reasonable to disregard such a resource. They may be applied at any period of the disease, but they probably are more efficacious after the more acute symptoms have subsided, or before they have set in, and appear most indicated where there is much irritability, intolerance of light, and scalding lachrymation. They should not be applied too near the eye, as in such case the cutaneous inflammation sometimes spreads to the lids and increases the mischief. A patch of the scalp from the temple to the top of the ear should be shaved, and a blister of size sufficient to secure a decided counter-irritating effect, applied and allowed to remain on until the skin is fully inflamed. A scrap of blister behind the ear does not produce sufficient impression to compensate for the annoyance it occasions to the patient.

Gonorrhœal inflammation of the conjunctiva—Mr. Lawrence, from whose valuable work on venereal diseases of the eye it will be necessary to make copious extracts in treating this subject, considers that there are two varieties of gonorrhœal inflammation of the conjunctiva, the acute and mild. The acute gonorrhœal ophthalmia is perhaps to be considered specifically distinct from the common severe purulent ophthalmia, on account of its origin and consequences, rather than from any decided difference in the character and symptoms of the disease. There is the same scalding pain, intense vascular chemosis, profuse purulent discharge, sloughing, abscess, and ulcer of the cornea, and permanent disorganization or granulation of the conjunctiva, observed in the Egyptian and other severe forms of purulent ophthalmia. Mr. Lawrence says, "the local symptoms are not sufficient to establish a distinction between this affection and common purulent inflammation of the most violent kind, and its peculiar nature is indicated by the concomitant circumstances, that is, by the preceding or existing gonorrhœa." He considers, however, that it generally attacks only one eye, while common purulent ophthalmia affects both; that it commences in the conjunctiva of the eyeball oftener than in that of the lids, that the symptoms are more violent, and that its progress is more rapid.

Notwithstanding the similarity of symptoms between the severe purulent and the gonorrhœal ophthalmia, a repetition of the account of those symptoms as they occur in the latter in the words of Mr. Lawrence may not be unacceptable. "There is the greatest degree of vascular congestion, the most intense and general external redness; excessive tumefaction of the conjunctiva; great chemosis, with corresponding swelling of the palpebræ; and profuse yellow discharge. In the first stage of the disease, which is short, the inflammation is confined to the conjunctiva, and is attended with soreness and stiffness, with the sensation of sand or dirt in the eye, and with more or less uneasiness on exposure to light or using the organ. The affection soon extends to the cornea, with severe and agonizing pain in the globe, orbit, and head, augmented to intolerable suffering on exposure to light, and with febrile disturbance of the system of inflammatory character. The danger to the organ is now most serious and imminent; and indeed, when the disease has thus advanced from the mucous membrane to the globe itself, we can hardly expect by any kind of treatment to avert entirely its destructive consequences. The violent inflammation, which causes the yellow puriform discharge from the mucous surface of the conjunctiva, produces effusion into the cellular texture connecting it to the surrounding parts. Hence the general swelling of the membrane, and that more considerable tumefaction on the front of the sclerotic, round the cornea, which is called chemosis. The latter is often so considerable that the swelled conjunctiva overlaps the cornea all round, so as nearly to hide it. Similar effusion takes place

into the cellular texture of the eyelids, enlarging them considerably, more particularly the upper, which hangs over and completely covers the lower. The palpebral swelling is sometimes œdematous, with the integuments but little redder than natural; in other instances it is firmer, with the skin, particularly of the upper eyelid, bright red. The latter state denotes more active inflammation, and greater danger to the organ. The chemosis and the swelling of the lids make it often difficult, and sometimes impossible, to get a clear view of the cornea. Although it is desirable to do this, in reference to prognosis, when we first see the case, we should not persist in our efforts at the risk of augmenting the inflammation or the patient's sufferings. The œdema of the eyelids declines in the progress of the affection, and then one or both of them may become everted, the convex edge of the tarsal cartilage being pushed forwards by the swollen conjunctiva. The inflamed membrane exhales at first a thin whitish mucus in small quantity; as the inflammation proceeds to its full development, the discharge becomes thicker, yellow, and abundant; the yellow tint and the quantity of the exhalation being in proportion to the violence of the inflammation. When the latter is at its height, the discharge closely resembles in its appearance, and in the stain communicated to linen, that which proceeds from the urethra in venereal gonorrhœa. Although the pain is generally most severe both in the eye and in the head, as in other instances where the dense and unyielding texture of the cornea is the seat of inflammation, and although patients often complain of burning pain, of tension, as if the eye would burst, of deep-seated and intense agony, with extension of these distressing and almost intolerable sensations to the brow, forehead, and head generally, there are some instances in which little or no pain is experienced. The symptoms of acute gonorrhœal ophthalmia are not equally violent through the whole course of the affection: it begins with swelling and increased redness of the conjunctiva, and some pain in the organ: then the puriform discharge takes place, with increased uneasiness: and, lastly, the inflammation extends to the cornea, with great aggravation of suffering. Thus the course of the affection may be divided into three stages, of which the limits cannot be marked very accurately. In the first there is vascular distention and swelling of the membrane, with swelling of the lids; the commencement of the second is marked by the occurrence of the puriform discharge, and that of the third by extension of the inflammation to the cornea. The duration of each of these varies in different instances according to the constitution and state of health of the individual, and perhaps still more according to the nature of the treatment adopted. This variety, however, is observed less in the first and second than in the third stage; the two former, and more particularly the first, usually passing off very rapidly."

In gonorrhœal ophthalmia, the immediate destructive effects of the inflammation, sloughing, abscess, and ulceration of the cornea, are more to be apprehended than in common purulent ophthalmia as it now occurs. The appearance of the cornea when about to slough or suppurate has been already described; the process, as it occurs in the present form of inflammation, is described as follows by Mr. Lawrence. "The cornea becomes dull and hazy before it sloughs, or indeed before undergoing any of the changes above enumerated. Its transparency and polish are completely destroyed where it has sloughed; and it is converted into a dirty yellowish or brownish opake surface, which is immediately recognized as deprived of life. At first it looks like a portion of wetted leather; it is soon separated from the living parts, when it has a loose, soft, and ragged appearance. As the lens and capsule which are exposed by this separation are transparent, the patient sometimes recovers for a short period tolerably good vision. After the slough is detached, the chambers of the aqueous humour may be exposed by ulceration; the humour will then escape, the empty coats will collapse, and the globe remains permanently shrunk in the socket. More commonly, although the whole cornea seems to slough, the entire thickness does not separate, and the anterior chamber is not exposed." The slough of the cornea, when it does cast off, leaves an ulcerated surface proportioned to the size of the slough, with or without an opening into the anterior chamber. If the slough or ulcer does not extend through the thickness of the cornea, the consequence is simple opacity or staphyloma; if it does not penetrate into the chamber of aqueous humour, the iris passes through the opening, and the patient suffers from closed, contracted, or irregular pupil in addition to the opacity. But it is not by slough alone that these evils are produced: suppuration or abscess is also liable to occur. It is thus described by Mr. Lawrence: "Suppuration of the cornea may be general or partial: it is usually the former. The cornea first becomes white, and then assumes a yellow colour. The effused substance is not a fluid, nor is it collected into a cavity: it is a thick viscid matter deposited in the texture of the cornea. Ulceration takes place, and exposes an opake yellow substance, which looks like ordinary matter, but it cannot be wiped off." The abscess of the cornea thus opened by progressive suppuration goes on to ulceration, and may extend to the anterior chamber as in the sloughing process, and with similar consequences. The successive changes in the ulcer are thus described. "If the ulcer should be spreading, the inflammation remaining unchecked, its surface is whitish and ragged or flocculent, or of a dirty yellowish cast with surrounding haziness. When the inflammation subsides, it becomes transparent. The commencement of the restorative process is marked by the surface of the excavation assuming a light greyish tint with a jelly-like appearance. A soft semi-opaque substance fills up the breach, when the surface becomes smooth, and the regular figure of the cornea is restored."

The *prognosis* in gonorrhœal ophthalmia must obviously be most cautious, and the pa-

tient should at once be informed respecting the nature of his disease, and the dangers to be apprehended. The first and most destructive consequence to be feared is the sloughing of the cornea; a change of appearance in the eye indicative of such disorganization is therefore to be watched for with great attention. This change is a haziness, or loss of the natural transparency of the cornea, proceeding rapidly to complete dirty white opacity, subsequently becoming total or partial slough, with edges defined by the suppurative process, which separates dead from living parts. The appearance of abscess is later than that of slough, but, when observed even in the slightest degree, should be viewed with nearly equal apprehension, as it is impossible to determine the extent to which it may enlarge either in depth or breadth, while in the state of abscess or that of ulcer. After the more acute period has passed over without either slough or abscess, the appearance of even a small speck of ulceration is also calculated to excite alarm, as it is often most difficult to arrest the progress of this process before it produces irreparable injury of the organ. After the patient is relieved from apprehension respecting these destructive consequences, he should still be taught to understand that his recovery is to be slow and ever doubtful; the change of organization in the conjunctiva, and its conversion into the peculiar granulated condition, with permanent red vascularity of the conjunctiva of the eye-ball and opake cornea, may still prevent recovery; or even without such disorganization, the cure may be greatly retarded by the influence of scrofulous constitution or the local disease. Mr. Lawrence says, "of the fourteen cases which I have related, loss of vision took place in nine from sloughing, suppuration, or opacity of the cornea. In two of these one eye was lost, and the other recovered. Sight was restored in the other five, with partial opacity of the cornea, and anterior adhesion of the iris in three of the number. So short a period intervenes between the commencement and the full development of the complaint, that in many instances irreparable mischief is done to the eye before our assistance is required. If we see the complaint in the first or second stage, we may expect to arrest its progress by active treatment; but success does not invariably attend our efforts. Our prognosis will principally turn on the state of the cornea: if that should possess its natural clearness, the eye may be saved. If it should become hazy and dull, and more particularly if it should have assumed a white nebulous appearance, consequences more or less serious will inevitably ensue. Great swelling of the conjunctiva, more particularly great chemosis, profuse discharge of a yellow colour, and bright redness of the swollen upper eye-lid, are unfavourable circumstances, as indicating a high degree of inflammation. When both eyes are attacked in succession, the disease is less severe in the second, which, therefore, is usually saved. Sometimes, however, the inflammation is equally violent in both."

In investigating the *causes* of gonorrhœal ophthalmia, inquiries highly interesting, even in a general point of view, are suggested. It has been supposed that the specific form of gonorrhœal inflammation existing in the urethra is transferred to the conjunctiva by that obscure and inexplicable transition which is denominated metastasis, respecting which we know little more than the fact of its occurrence. This metastasis never has, and perhaps never can be proved to occur, because there can be little doubt that the contact of gonorrhœal matter with the conjunctiva produces the disease of the eye, and it is impossible to prove positively that such contact does not take place in all cases of gonorrhœal ophthalmia. Every individual affected with gonorrhœa must have the fingers contaminated by the discharge, notwithstanding the most scrupulous cleanliness and care; and the application of the fingers to the eyes for the removal of any irritation there is so habitual, that it becomes an involuntary act, which nothing but continued watchfulness could prevent, and which may occur even during sleep when the patient is unconscious of it. It is true that a person may be so attentive to the prevention of this occurrence, by the utmost precaution and cleanliness, as to render it highly improbable that a particle of matter has been applied to the eye, but the attendant can only say in such case, this is most probably metastasis of gonorrhœa to the eye, but cannot safely assert positively that it is so. While it appears thus impossible to say with certainty that metastasis has occurred, it is equally impossible to prove that it has not; and many facts and arguments may be adduced in favour of the conclusion that this is the mode in which the disease originates.

The disease of gonorrhœa affords other apparent examples of metastasis. The violent inflammation of the testicle produced by suppression of the discharge from the urethra is surely rather of this character than an extension of the mucous inflammation along the lengthened and tortuous tube of the vas deferens. Irritable bladder, produced by the same cause, is also most probably independent of a continuous extension of the specific inflammation along the whole length of the urethra to the lining membrane of that organ; and even sympathetic buboe generally presents characters so different from that which arises from the extension of irritation along the absorbents to the lymphatic glands from simple injury, that it is not unreasonable to attribute it to metastasis. These metastases are of comparatively rare occurrence; so is gonorrhœal ophthalmia, notwithstanding the probability of the frequent application of the matter to the conjunctiva or its vicinity. The occurrence of the disease in one eye without extending to the other, notwithstanding the profuse discharge so likely to come in contact with the unaffected organ, makes it highly probable that the disease depends on a cause different from mere contact of infectious matter. Whatever doubt may be entertained respecting the occurrence of metastasis, evidence sufficient to prove that the disease can be produced by the contact of gonorrhœal matter, both in

the individual labouring under the disease of the urethra as well as others, is on record. Mr. Lawrence, Mr. Wardrop, M. Delpech, Mr. Bacot, and others, state instances in which there could be no doubt of the fact. The writer of this has had this assigned as the cause of the disease by a young man, who, without any leading question or knowledge of the usual production of inflammation of the eye by such a cause, stated circumstantially the fact of gonorrhœal matter having been projected into his eye while retracting the prepuce, which confined a quantity of the discharge. Dr. Vetch details a solitary case in which the experiment was made to determine this matter by an hospital assistant; and where gonorrhœal matter was applied to the conjunctiva with impunity. It does not, however, appear that Dr Vetch himself conducted the experiment; and it is obvious that much confidence could not be reposed in the accuracy of an individual so imprudent and thoughtless as to incur such a risk. While it may be admitted that the contact of gonorrhœal matter to the eye produces conjunctival inflammation, it is by no means proved that it uniformly has this effect. Some individuals may possess this dangerous susceptibility, and others not; and even the same individual may at one time suffer from the contamination, and at another time not. Should it be established by observation that this is the fact, it would be an important illustration of the general question of contagion, proving that a morbid poison directly applied to a circumscribed spot produces effects at one time and on one person, which are not observed on other persons or on different occasions. Upon a candid consideration of this subject, it must be admitted that it is the duty of the practitioner to warn patients labouring under gonorrhœa, of the danger they incur by negligence or inattention, with respect to the precaution necessary to prevent the communication of the disease to the eye.

With respect to the *treatment* of gonorrhœal inflammation, it is scarcely necessary to observe that the plans suggested for the relief of common severe purulent ophthalmia should be carried into effect with the utmost vigour. Mr. Lawrence observes, in alluding to the advantage of depletion, "The only chance of arresting this violent disorder, and preserving the eye from its destructive effects, is afforded by the boldest antiphlogistic treatment, particularly by the freest abstraction of blood, locally and generally. We must bleed largely from the arm, and take blood by cupping on the temples, or by numerous leeches applied round the part; and these measures must be repeated at short intervals, until the vascular congestion is relieved and the attendant pain removed. The other parts of the antiphlogistic treatment must be combined with the free abstraction of blood; but our great reliance must be placed on the latter. I think that as much blood should be taken from the arm as will flow from the vein; and that the evacuation should be repeated as soon as the state of the circulation will allow us to get more." Mr. Bacot and Mr. Wardrop concur in the opinion respecting the value of depletion. Mr. Guthrie, on the contrary, places little confidence in its effects, and relies upon the application of the ointment of nitrate of silver, as administered in severe purulent ophthalmia. He even attributes the loss of the organ in this disease to inordinate bleeding: he says, "The history of all cases of this disease, hitherto recorded, is but a melancholy story of lost eyes. The reason of this loss is, that they all pursued a similar plan of treatment; viz. they invariably bled the patient to a very large quantity; one hundred, one hundred and fifty, and even two hundred ounces, are stated as having been drawn, until the patients were blanched as white as a sheet, or a piece of white wax. This was accompanied by a due proportion of purgatives, emetics, and emollient fomentations, with mild astringent lotions and leeches, until in time the eye or eyes were lost, and the case was brought to a conclusion. As long as I followed this course I fared no better than those around me, but successive failures led me at last, almost in despair, to adopt a very opposite method, which has proved, at least in my hands, much more effective, and will, I trust, in those of others, remove the opprobrium which has been attached to this part of surgery." He then proceeds to describe the mode of application of the ointment of nitrate of silver formerly alluded to, and observes, "I do not mean to say that one application will alter the action and restore the parts to a healthy state, it must be re-applied; neither is the ointment to do every thing; it may and must of course occasionally fail." These conflicting opinions may perhaps be reconciled. Bleeding is undoubtedly a resource of the utmost value and importance in the general treatment of gonorrhœal ophthalmia, and the ointment recommended by Mr. Guthrie is an application also of value. The practitioner will therefore avail himself of both, as circumstances require. Even Mr. Guthrie, relying as he does on the stimulating astringent, recommends moderate bleeding in conjunction with it; and in the application of the nitrate of silver ointment in common severe purulent ophthalmia, enjoins venesection as an accompaniment. It is certain that a coarse, brawny, plethoric, carnivorous man must be freely bled to save his eyes from destruction in this complaint; while a similar practice adopted towards a pallid, languid, feeble individual, would prove at least inefficient, if not injurious. The experienced practitioner will, therefore, proportion his efforts to the resistance, and adjust his treatment to each case according to its symptoms.

It is unnecessary to repeat the observations respecting the treatment of severe purulent ophthalmia, except to remind the reader that they are equally applicable to the form of disease under consideration. It is obvious, however, from the specific character of the gonorrhœal inflammation, that mercury, from its influence on disease at least allied to this, deserves more consideration as a remedy in this than the common form. It is, however, noto-

rious that whatever necessity the practitioner may see for the administration of mercury to correct the mischief to be apprehended from the specific disease, he cannot rely upon it to cut short the inflammation. Mr. Lawrence says, "I have seen both the ordinary purulent and gonorrhœal ophthalmia proceeding apparently unchecked under the full mercurial action." Some practitioners, however, place reliance on this remedy, and some, assuming as a matter of course that it ought to cure the disease, administer it in every instance. The writer of this, considering that mercury is a poison which should not be introduced into the system without absolute necessity, and positive evidence of its beneficial effect in correcting morbid action, feels no inclination to recommend its administration in gonorrhœal ophthalmia.

On the supposition that this disease depends on metastasis, and relying on the unproved assumption that it is accompanied by a suppression of the discharge from the urethra, it has been proposed to reproduce that discharge by irritating or stimulating that passage. This resource has been recommended by the German writers in particular, who have perhaps weakened the confidence reposed in their opinions by practical men in this country, by their proneness to mould practice on preconceived theories and unauthenticated facts, as well as by their reliance on antiquated doctrines, authorities, and nostrums. There is no evidence before the profession to prove, either that the discharge from the urethra ceases with the appearance of the ophthalmia, or that, if it does, its restoration removes the affection of the eye. Mr. Lawrence observes, after quoting the authority of Richter, Scarpa, and Beer, as to the expediency of reproducing the urethral discharge, "In spite of the confidence which one is inclined to repose in the practical knowledge and judgment of those whose advice has just been quoted, I cannot help thinking that the measures in question have been recommended rather on theoretical grounds than from experience. At least these writers do not mention any results of their own practice; nor have I met with any cases in which the employment of such means is mentioned. In none of the instances which have come under my own observation has the gonorrhœal discharge been suppressed, so that the reason for this kind of practice has not existed. Again, when the violence and rapidity of the disease are considered, in contrast with the slowness and uncertain operation of this treatment, we cannot doubt that irreparable injury would be done to the organ during the time lost in such attempts.

Purulent ophthalmia of infants.—This is a most formidable disease; indeed it is probable that the loss of vision from this cause is four times greater than that from all the cases of common purulent and gonorrhœal ophthalmia put together. It is particularly necessary that the young practitioner, especially the accoucheur, should be aware of this, because some writers describe the complaint as trivial, and its treatment as attended with little difficulty. This opinion has probably arisen from the circumstance of the frequent occurrence of a very mild form of conjunctival inflammation in new-born infants, unattended by any destructive consequences, and generally disappearing without medical aid. The disease now under consideration presents all the characters of the severest purulent ophthalmia. The vascularity is enormous, but in consequence of the organization of the parts, and the yielding of the texture of the lids at this early period of life, there is less of chemosis than general tumefaction of the coverings of the eye. The pain, if a judgment may be formed from the extent of the inflammation and the sufferings of the infant, is very great. The purulent discharge is as profuse as in the worst forms of common severe purulent or gonorrhœal ophthalmia. The consequences are equally formidable; and destruction or injury of the organ by slough, abscess, and ulcer of the cornea, prolapse of the iris, staphyloma, or escape of the contents of the eye-ball, equally to be dreaded. There is one consequence, however, most destructive in purulent ophthalmia in adults, not encountered here; this is the permanent alteration in the structure of the conjunctiva, proceeding to red vascularity of the transparent part of the membrane, and granular lids. The escape from this description of disorganization, of such frequent occurrence at more advanced periods of life, arises probably from the high degree of vital energy and active operation of the functions of growth and nutrition existing at this period.

The disease generally commences within the first three days after birth. The eye first appears moister than natural; redness of the lids ensues; a small quantity of purulent matter collects in the inner canthus, the white of the eye is slightly bloodshot; and the child shuns the light and becomes restless and peevish. All these symptoms are speedily aggravated; the vascularity becomes intense, causing tumefaction of the lids externally, and a pulpy villous condition of them internally; but the redness of the conjunctiva over the ball seldom extends to chemosis. The purulent discharge becomes profuse, completely glueing up the lids during sleep, and often accumulating beneath them in such quantity as materially to increase the distress; and when the eyes are drawn asunder, it so completely fills the space between the lids as to prevent the observer from obtaining a view of the cornea: it accumulates with such rapidity, that if completely washed away with a syringe, it is replaced by a fresh secretion in ten minutes or a quarter of an hour. The discharge is usually of the colour of common purulent matter, but is sometimes tinged with blood; or if the child be jaundiced, has a greenish tint. When the infant cries, the tumefaction of the lids increases enormously, and sometimes they become everted, exposing the red vascular surface to the air. This is the period at which the sloughing process takes place; it is well described by Mr. Saunders in his Treatise on Diseases of the Eye published after his death by Dr. Farre. His

words are quoted here because they are obviously those of an accurate observer enjoying ample opportunity of acquiring correct information; and because they are the observations of the man who first applied the sound principles of Hunterian or English surgery to the investigation of ophthalmic diseases. He says, "As the disease advances, the cornea becomes more or less cloudy, and by the extent of this cloudiness the degree of approaching slough is marked: for the whole of the cornea, if the whole become cloudy, will ultimately slough, and the form of the eye be totally destroyed. I do not mean to say that in every instance in which opacity of the cornea is apparent, the cornea is about to pass into a sloughy state; on the contrary, opacity is often the mark of a healthy action, commencing around the breach of the cornea, for the purpose of restoring the part, and ought to be hailed as a happy omen. I am now speaking of a peculiar duskiness of the cornea, which begins during the progressive state of the inflammation, which is antecedent to any loss of substance, but is indeed a sure sign that such loss is about to take place. When this duskiness comes on, supposing only a portion of the cornea about to slough, the extent of it in the space of twenty-four hours becomes definite; in the same space of time it becomes elevated and apparently lessened in extent; a groove or fissure forms between it and the rest of the cornea, portions of it are carried off by the discharge and tears, or sometimes it separates altogether in one mass. I have several times washed out with a syringe these little sloughs entire. But although I am as certain of the fact as the most frequent observation can make me, I am equally sure that most commonly when this disease destroys vision, the destruction is accomplished in a more gradual manner, not by a slough of very considerable extent and through the whole depth of the cornea at once, but by a succession of sloughs. In other words, the ulcer left by the casting off of the dead piece of cornea becomes in turn sloughy, and extends itself by a succession of sloughy surfaces, until the last lamina of the cornea sloughs, or being protruded by the pressure from within, ulcerates, and the aqueous humour escaping, the iris passes through the breach of the cornea. Already the whole surface of the eye has been in an ill-conditioned inflammation; the ulcer, or rather the surface of the cornea, around the protruding iris is indisposed to heal, so that more and more of the iris protrudes; this in turn ulcerates, and the crystalline and vitreous humours all issue at the orifice. That the inflammation itself immediately destroys the parts by sloughing or ulceration is a truth of which I am perfectly convinced."

Mr. Mackenzie, in his treatise on Diseases of the Eye, observes with respect to these opinions of Mr. Saunders, "It is scarcely necessary to spend time in refuting Mr. Saunders's notion of its being an erysipelatous inflammation. His opinion regarding the mode in which the cornea is destroyed in this disease appears of more importance and equally incorrect. He maintains that it is by sloughing, not by suppuration and ulceration, that the destruction of the cornea is effected. The opportunities which I have had of watching the progress of the affection of the cornea have convinced me of the contrary. Onyx or infiltration of pus between the lamellæ of the cornea is the uniform harbinger of destruction; the lamellæ exterior to the pus give way by ulceration; the ulcer spreads and deepens till the cornea is penetrated, and often almost altogether destroyed. Any thing like mortification or sloughing I have never seen. The coming away of the purulent infiltration exposed by ulceration must have given rise to Mr. Saunders's notion of successive slough."

Whether the inflammation be erysipelatous or not may be ascertained when pathologists have determined what the term erysipelatous so applied means. If the cornea ever sloughs in severe inflammation of the conjunctiva, it may be admitted that it does so in this, especially if men of experience agree that such is the case. Mr. Mackenzie is undoubtedly right in stating that the eye is lost in this disease frequently by abscess; and the fact perhaps is, that the two processes are often combined; the dirty ragged ulcer consisting of open abscess with sloughy surface, and being very much of the character of anthrax. Whatever opinion may be entertained respecting the precise nature of the destructive process, the practitioner should never lose sight of the danger to be apprehended from it. It commences during the active period of the inflammation, but continues after it is mitigated, and, if not arrested, terminates in destruction of the organ.

The investigation of the *causes* of purulent ophthalmia in infants is not attended with much difficulty. It may readily be admitted that the exposure of the infant to cold, immediately after its expulsion from the uterus, will probably produce inflammation of this description; and to this cause may reasonably be attributed the frequency of a milder form of conjunctival inflammation at this time of life, which does not assume the violent character of the other. The resemblance between this severe form and Egyptian or gonorrhœal ophthalmia justifies the suspicion that it is of equally distinct specific character, and to be traced to a cause equally peculiar. This cause may be the application of the matter of leucorrhœa or gonorrhœa to the eyes during labour. The extent to which this cause operates, however, has not been fully ascertained, and the proof of its influence exists more upon conjecture and reasonable inference than actual practical evidence. The practitioner knows, from daily observation, that women labouring under leucorrhœa and even gonorrhœa produce children unaffected by this disease; but he should be equally aware that in the majority of cases of purulent ophthalmia the mother labours under one of them. The accoucheur should, therefore, make himself acquainted with the truth as to this matter, and direct

that a sponge and basin of warm water be ready to cleanse the face and eyes of the infant immediately after birth, and if possible before the lids are opened. If it be known that the mother labours under gonorrhœa, the practitioner should watch the approach of inflammatory action in the first three or four days after birth, and immediately resort to those vigorous measures already enumerated to arrest its progress. These precautions may possibly be superfluous, and disregarded or neglected in the common routine of extensive practice; but if one child be preserved from blindness by them in the course of a practitioner's life, it is sufficient return for the trouble.

The *prognosis* in this purulent ophthalmia is a matter of considerable importance to the professional welfare of the practitioner. In consequence of the frequent occurrence of the mild form of the disease, those who have not experienced the destructive effects of the other are liable to overlook its approach, and allow the processes of slough or abscess to proceed without interruption. As soon as the disease has appeared in the virulent form above described, the parents should at once be informed that it is liable to terminate in serious injury or destruction of the organ. Persons of the lower order, unprovided with medical assistance at their confinement, generally allow the disease to proceed without interruption during the period at which any hope could be entertained of averting the destructive consequences. They seldom seek relief until a week or fortnight after the first attack, and then in consequence of not finding the purulent discharge and tumefaction subsiding, as they were led to expect. When an infant, at this period of the complaint, is presented to the practitioner, he should at once satisfy himself whether the cornea be safe from slough, abscess, or ulceration, or, as this is attended with some trouble, if leisure does not permit him to do so, he should inform the parent in plain and intelligible language, that there is danger to be apprehended, and that the child may have its vision impaired or destroyed by opacities of the cornea, which cannot at the moment be perfectly distinguished. If he dismisses the patient without this precaution, or if he makes any application to the eye without explicitly announcing the extent of the injury, the reproach of having blinded the child will be fastened on him by those who, from culpable negligence, ignorant confidence in their own opinions, or sordid love of money, had caused so lamentable a misfortune. If, upon examination in this after period of the disease, the cornea be found perfectly clear and free from ulcer of any kind, the practitioner may entertain sanguine hopes of perfect recovery, but he should not even then give expression to these hopes, as relapse may occur, or some accidental circumstance interfere with the cure. If slough, abscess, or ulcer have not taken place in the first week or ten days, there is every reason, from experience, to expect that no further bad consequence is to be apprehended than the troublesome and distressing vascularity with profuse purulent discharge, which often, especially if not checked by astringents, continues for six weeks or more. It has already been observed that the high degree of vascularity which accompanies this disease does not degenerate into permanent disorganization of the conjunctiva with opaque cornea and granular eyelids; at least this is the result of the experience of the writer of this article: further observation may, however, enable others to correct or modify this assertion.

To the *treatment* of purulent ophthalmia in infants, the principles laid down respecting the other severe forms of conjunctival inflammation are applicable. As soon as the existence of the disease is fully ascertained, a leech should be applied over the cheek-bone at the edge of the orbit, and blood allowed to flow until the effect of the bleeding becomes obvious by the paleness or sickness of the infant. One or two leeches, at most, on each side, is sufficient for this purpose; and as all the effects of general bleeding are produced by the application of leeches at the earlier periods of life, and as the flow of blood does not usually cease spontaneously in infants, on account of the great vascularity of the skin, the medical attendant should not lose sight of his patient until he has secured such arrangements as will prevent the possibility of the child's life being endangered by hemorrhage. It is on this account that the leeches should be applied on the cheek-bone at the edge of the orbit, where, from the resistance of the bone beneath, circumscribed pressure may be made without delay. The bowels should be emptied completely; and for this purpose a grain of calomel, with castor oil or any other purgative to which the practitioner may be partial, may deserve a preference. If it be admitted that the administration of calomel influences the biliary secretion, its use is particularly indicated at this period of life, when the liver performs an office in the animal economy of still greater importance than it does at more advanced periods. If the child continue to suck voraciously, it may be desirable to rid the stomach occasionally of the accumulated milk by the administration of a small quantity of ipecacuanha or other emetic medicine. As soon as the purulent discharge becomes profuse, care must be taken to prevent it from accumulating with the tears beneath the lids, and producing by mechanical distention an increase of the irritation and distress. This accumulation is frequently produced by the eyes becoming sealed up by the evaporation of the fluid part of the discharge which has collected on the outside of the lids. To prevent it, the eyes should be perpetually sponged gently with luke-warm water, and by laying a scrap of old linen squeezed out of warm water over the eyes as the infant lies on its back in bed. The edges of the lids may be touched with a little cream when the child settles for a longer sleep, and when it awakes the lids should be gently drawn open, and the accumulated matter forced out by light pres-

sure and motion of them. Repeated syringing of the eye is unnecessary, and is often injurious by adding to the irritation: the purulent discharge causes no mischief but by its bulk producing distention in the way above stated, and is probably the best, being the most natural, protection of the surface against the contact of the tears. When the practitioner makes his visit, it is however necessary to wash away the discharge completely, in order to obtain a perfect view of the cornea; this may be done with a syringe, for which purpose a neat silver one with a fine orifice should be used; but as this may not be at hand, and as many may not wish to run the risk of spattering the discharge into their own eyes, a more simple and equally efficacious method may be adopted: the infant's head being laid on the knees of the operator while the body is supported by the nurse, the eyes should be well sponged externally, and the lids drawn open and closed repeatedly, so as to extricate the discharge, which should again be removed with the sponge. After the child ceases to cry, a few drops of warm water should be allowed to flow into the eye between the lids out of a large camel-hair pencil, and the lids opened and pressed as before, after which the child should be, if possible, set asleep, and then the eyes being suddenly drawn open, a full view of the cornea may be obtained.

Local applications may be resorted to with two objects,—the alteration of the nature of the inflammatory action altogether, or the diminution and removal of the purulent discharge. For the former object the nitrate of silver is recommended, and it cannot be denied that it may effect it; but it must at the same time be confessed that the practice has not yet been fully submitted to the test of experience. The question for consideration is, whether a practitioner, as soon as he has ascertained beyond doubt the existence of this severe form of inflammation, can with safety, and a fair prospect of advantage, introduce a solution of nitrate of silver of ten grains to the ounce, or an ointment of ten grains to the drachm, between the lids. That this and other astringents may be used with success to put a stop to the purulent discharge, after the first symptoms of inflammatory action have been subdued, cannot be doubted. With this view a five-grain solution of nitrate of silver, or saturated solutions of acetate of lead or alum, may be resorted to: the acetate of lead cannot, however, be employed if slough or ulcer be present. A large drop of saturated solution of alum may be put into the eye once or twice in the twenty-four hours, and the nurse may be allowed a weaker solution of four or five grains to the ounce to use occasionally. Mr. Mackenzie recommends a solution of one grain of corrosive sublimate in an ounce of water as a wash to be freely used.

If slough or abscess has taken place, it does not appear that any other than the plan of treatment above stated can be adopted, or that any local application can be made likely to suspend the progress of either one or the other. Mr. Saunders, reasoning on the fact that bark and other tonics are employed with advantage in gangrene, and that the slough of the cornea is of this character, directed the administration of extract of cinchona in such cases. It does not, however, appear that the cases are analogous, or that the remedy does actually prove of advantage. The slough or abscess is, in the present case, a consequence of intense inflammatory action not followed by any diminution of vital action locally or generally, consequently not requiring remedies intended to invigorate the constitution, or accelerate the functions of circulation and nutrition. The suggestion of Mr. Saunders does not appear to have been much acted upon in general practice. After the slough of the cornea has been cast off, or the abscess completely converted into healthy ulcer, or if the iris be prolapsed and has assumed a red granulating appearance, the greatest service the practitioner can afford his patient is to prevent any injudicious interference with the natural processes of reparation which are in progress.

Scrofulous ophthalmia.—The consideration of what is called scrofulous ophthalmia need not detain the reader long, if it be admitted that there is no inflammatory affection of the eye which displays at its onset such characters as entitle it to be considered specifically distinct. In fact there does not appear to be any such disease strictly speaking, and what is commonly called scrofulous ophthalmia is nothing more than the modification of any of the preceding forms of conjunctival inflammation by that condition of constitution which we denominate scrofulous. There can be no doubt that every one of the preceding forms of inflammation, and indeed every form of inflammation of the eye, is liable to assume the scrofulous character, except the purulent ophthalmia of children, which is not so modified in consequence of the organization of the system at that time of life.

The symptoms considered characteristic of scrofulous ophthalmia do not present themselves for some time after the first attack, and when the inflammatory period has subsided and the chronic stage fairly set in: then it is that the progress to recovery is interrupted; the conjunctiva does not return to its natural condition; light becomes painful; the tears flow copiously; the purulent discharge is diminished; and the continued vascularity causes opacity of, and extension of red vessels to, the conjunctiva of the cornea. To correct this destructive condition, the obvious resource is in those means universally admitted to exercise a salutary influence on the functions of circulation, secretion, and nutrition. They may be summed up in a few words—respiration of a pure atmosphere, warm clothing, generous diet, bark and other tonics, warm salt water-baths, and bathing in the open sea. It is in this condition of the eye that the chronic vascularity may be most effectually removed by the daily application of a saturated solution of acetate of lead, or the aqua lythargyri acetati dropped between the lids night and morning. It is also in this modification of the chronic vascularity, with great in-

tolerance of light and profuse scalding lachrymation, that the vinous tincture of opium affords most relief. Blisterings, which may be resorted to in any of the preceding forms of inflammation, appear particularly serviceable here, and should be repeated as often as they heal, either on the temples at some distance from the eye, or behind the ears. Free exposure of the eyes and face to the air and light is an important part of the treatment, although a part generally neglected or actually interdicted. There can be little doubt that the miserable condition in which neglected or mismanaged children are frequently found, with the face scalded with tears, the head averted, and crying or sneezing on exposure to light, is produced by confinement to a dark close room, and covering the eye with a green shade.

(Arthur Jacob.)

OSSIFICATION.—See Tissues, Adventitious.

OTALGIA AND OTITIS, (from οὖς, *auris*, gen. ὠτὸς, and ἀλγέω, *doleo*.) Ear-ach; pain in the ear. The ear-ach, which on all occasions results from a morbid congestion of some part of the organ of hearing, cannot be intelligibly explained without first considering the affections of which it is a symptom; and as the diseases of the ear have not yet been spoken of in this work, it is proposed to give a concise account of them in the present article.

Until the publication in 1821 of the admirable *Treatise on the Ear*, by M. Itard of Paris, physician to the Royal Institution for the deaf and dumb, the profession was in a deplorable state of ignorance respecting the pathology of this organ; an ignorance which has been lamented by every author who has taken up or happened to allude to the subject. The situation of the organ deep in the skull, the intricacy of its general structure, the minuteness of its various parts, added to the difficulty of tracing them in their bony case, and the supposed obscurity and unmanageable nature of its diseases, have all contributed to deter professional men from bestowing their attention, as well upon the anatomy as upon the pathology of the ear; and the consequence is a deplorable want of knowledge on these subjects. This is the less excusable since the work of Itard affords a very complete and masterly account, not only of the diseases, but of the anatomy and physiology of the organ. Itard, indeed, whose treatise cannot be too highly praised, has done for the organ of hearing what the illustrious Laennec has done for the organs of respiration: and yet so little known in this country are the labours of this author, that in a small volume just now published on "The Organ of Hearing," we do not find the name of Itard quoted. The writer's attention was particularly called to the ear many years since by the occurrence of cases of chronic disease of the tympanum producing a purulent discharge from the external meatus, penetrating the skull, and destroying the individuals by disorganization of the brain. Subsequent experience has only tended to confirm the interesting and important nature of the subject; and it is with some degree of confidence therefore that we invite the members of the profession to study this department of pathology. We can assure them that the path which may appear intricate and impracticable, is so only because it is untrodden and unfrequented.

The diseases of the ear may be conveniently arranged, according to the anatomical division of the organ, into those which are seated respectively in the external, the middle, and the internal parts of the ear.

The diseases of the middle ear are the ordinary cause of otalgia, strictly so called; on which account, as well as because they are the most frequent and formidable, we shall enter upon the consideration of them in the first place.

1. The middle ear comprehends the cavity of the tympanum with its contained chain of ossicula, its proper membrana tympani and its dependencies, the mastoid cells and Eustachian tube; all which parts, lined with a mucous membrane, present an extensive continuous surface, apt to be involved in the affections of the tympanum. Of the five openings leading to and from the tympanum, three are closed, the fenestra ovalis and fenestra rotunda by their proper membranes, the large opening to the external meatus by the membrana tympani; while the other two are open, the one leading to the Eustachian tube, the other to the mastoid cells,—which cells, forming as they do a cul-de-sac, leave the Eustachian tube the only open channel of communication with the tympanum from without. Hence it happens that in inflammation of this cavity, it and the mastoid cells become filled with the usual product of inflammation of a mucous membrane, a muco-purulent effusion, which has no means of exit, because the Eustachian tube, the only channel by which it could escape, is involved in the inflammation and closed by it. In this manner the delicate fabric of the ear is exposed to the pressure and other bad effects resulting from matter confined in a close cavity; and hence arise ulcerative perforation of the membrana tympani, puriform discharge from the meatus externus, destruction of the organ by caries, and eventually cerebral abscess and death.

The inflammation of the cavity of the tympanum, like the inflammations of the other parts of the body, may be intense, or it may be subacute.

a. The subacute internal otitis is an affair of common occurrence, and constitutes the pathological condition of nearly all those cases which pass under the denomination of ear-ach. The patient complains of pain in the ear, perhaps of the head in some degree, accompanied with singing noises and dulness of hearing. There may be a slight impairment of the appetite, which appears to arise rather from the pain than from any febrile movement, the sanguiferous system and the organic functions scarcely sympathizing in this affection. In the corresponding side of the head there is a sus-

ceptibility to the impression of a cold atmosphere, which induces the patient to wrap up the head; with this precaution he is content to bear the pain for several days, when it usually subsides, leaving the sense of hearing less acute for a short period; after which the organ soon recovers itself, and the affair is ended.

b. Very opposite to this are the symptoms, progress, and termination of the acute internal otitis, or intense inflammation of the tympanum. This inflammation is characterized by an intense, acute, unremitting pain, deep-seated in the ear, attended with loud, clanging, metallic noises, the pain affecting the whole head, but in an especial manner the side corresponding with the seat of the inflammation. As the inflammation attains its height, so does the pain in the ear become distracting, and excites nocturnal delirium; and with this dreadful pain is a sense of violent distention, as if the part were on the point of bursting. The pain of the head is proportionably aggravated, and attended with heaviness and weight. The face manifests great anxiety and distress; the constitution sympathizes deeply, but the character of this sympathy is less marked by the high febrile movement which usually accompanies inflammation, than by great general exhaustion, the effect of continued pain. The pulse is frequent, but not remarkable for fulness or strength, nor is there much increase of heat; nevertheless all the organic functions are troubled, and the tongue is furred, the taste vitiated, and the appetite lost.

This state of things having persisted for twenty-four or thirty-six hours, the inflammation begins to decline, the pain to diminish in intensity, and the metallic noises change to a violent hissing; the sense of distention and of bursting continues though in a less degree, but the delirium passes away, and the pain and uneasy sensations of the head gradually subside. The taste and appetite return quickly, and the patient is soon convalescent; though the hissing in the ear and the sense of distention and bursting are troublesome for two or three weeks, and various noises are perceived occasionally for some months. The organ, however, recovers its proper function, but slowly; the patient experiencing an indistinctness of hearing, often of sight, for a considerable period.

Such is the happiest termination of an acute inflammation of the middle ear.

Instead of this termination in resolution, if the violent symptoms, present at the height of the inflammation, do not abate, the sense of distention increases to a most painful degree, the general headach continues urgent, and the delirium manifests itself at times by day as well as at night, and in the course of two or three days matter is observed to discharge from the ear. In this case the cavity of the tympanum has become filled by a puriform fluid, the product of the inflammation, which has effected a passage by ulceration through the membrana tympani, and is discharging itself by this channel.

Should the perforation of the tympanum be large, and the discharge free and copious, then the fever and other urgent symptoms quickly subside, and a chronic puriform discharge, the *otorrhœa purulenta*, is established. Should the perforation be small and the discharge trifling, it proves insufficient to relieve the sufferings of the patient; the distressing signs of matter confined in the middle ear continue; and now it becomes the duty of the practitioner to recommend an operation to enlarge the opening in the membrana tympani. If a free outlet is thus accomplished, complete relief is afforded; the puriform discharge becomes abundant; and, as in the former case, an otorrhœa is established.

The establishment of the purulent otorrhœa is not always preceded by a form of inflammation so acute as that described; it is often brought about gradually by a subacute otitis of a chronic kind, in which case the symptoms are less severe, are more confined to the ear itself, and the perforation of the membrana tympani is slowly effected. This consecutive affection deserves further notice.

Otorrhœa purulenta, a purulent discharge from the external meatus, may arise from some disease of the meatus itself as a porriginous affection of the lining membrane of the tube; in this case the affection is of little importance. The otorrhœa about to be described proceeds from the middle ear, is the result of a suppurative inflammation of the tympanum with perforation of the membrana tympani, and is a very serious complaint. Inflammations of the tympanum having terminated in suppuration, and the matter having worked itself an outlet, it may be reasonably supposed that all diseased action would subside and cease; and such, no doubt, would be the favourable issue, were it not that, from the peculiar conformation of the organ, part of the matter is retained in the cavity of the tympanum and mastoid cells, and thus becomes a cause of extensive mischief.

The opening of the Eustachian tube being situated at the anterior and internal angle of the floor of the tympanum, may appear to offer a natural and depending outlet to the retained matter; but this channel is either closed altogether or much obstructed by its lining membrane having been involved in the inflammation; and although a free outlet may have been formed by the perforation of the membrana tympani, yet some matter is still retained in the cavity and in the mastoid cells. It is retained in the latter because they form a blind irregular cavity; and in the tympanum because of the peculiar form of the meatus externus, which being arched, and having the crown of the arch on a level with the middle of the tympanum, resists rather than favours the spontaneous emptying of the cavity. Under these circumstances the matter lodges in the tympanum as in a well, and gives rise to a train of formidable symptoms which constitute the second stage of the disease.

The perforation of the membrana tympani giving access to the air, the retained matter undergoes decomposition, becomes highly irri-

tating, and induces ulceration of the lining membrane of the tympanum and mastoid cells; the osseous structure is now exposed to the influence of this irritating matter, and a carious disorganization commences. The insidious advance of the caries is indicated by a dull pain seated principally in the region of the middle ear, but diffusing itself over the corresponding side of the head, by the sense of hearing being blunted, and by a dull and rather vacant expression of the countenance.

The disorganization proceeds more rapidly in the mastoid cells than in the tympanum, because of their less compact structure, and is made apparent by the mastoid process becoming tender on pressure, and the integuments puffy and vascular; by-and-bye the perforation of the bone is completed, and an abscess manifests itself behind the ear. The point where the carious perforation happens is usually at the anterior part of the groove which gives origin to the digastric muscle. The abscess does not burst readily, but extends itself upwards behind the ear, the soft parts offering less resistance in this direction; examples, however, occur, in which the abscess directs itself downwards under the sterno-mastoideus when it points low in the neck; it never extends backwards, because of the resistance of the digastric and trachelo-mastoid muscles and of the deep cervical fascia.

The caries of the mastoid cells is not limited to this outward direction, but extends on every side, and next affects the posterior wall of the cells, and perforates the petrous portion of the temporal bone which forms the fossa of the lateral sinus: the bone is here naturally thin, and, when carious, presents a worm-eaten appearance. Through these carious perforations the matter penetrates, and by irritating and detaching the dura mater gives rise to decided cerebral symptoms. The same process sometimes goes on in the roof of the mastoid cells formed by the superior surface of the petrous portion; but the bone being here thicker is less easily perforated. Should the patient still live, the caries will destroy the chain of ossicula in the tympanum, and they will be discharged through the external meatus; eventually the caries will ravage the whole internal ear, destroying the membranes which close the fenestra ovalis and the fenestra rotunda, and disorganizing the vestibule, semicircular canals, and scalæ of the cochlea. In this way all the sinuosities and cavities and bony fabric of the ear are broken down and confounded together, and the interior of the petrous portion and of the mastoid process of the temporal bone presents one large carious excavation.

To such an extent did the disorganization proceed in the case of a child two years and a half old, that the entire labyrinth, consisting of the semicircular canals and cochlea, was discharged by the meatus externus. In this instance the course of the disease was marked by the various stages of inflammation of the internal ear, succeeded by the chronic puriform discharge, by the dislodgement and evacuation of the ossicula of the tympanum, and, lastly, by the coming away of the labyrinth itself through the meatus externus, occupying in the whole a period of several months.*

In the course of the devastation above described, the portia dura becomes also involved, and the disorganization of this nerve gives rise to neuralgic pains, convulsive twitchings, and paralysis of the muscles of the corresponding side of the face.

At the period when, in the progressive caries of the temporal bone, the dura mater becomes exposed to the irritation of the corrupt secretion from the ear, the membrane inflames and suppurates, and becomes detached by the matter burrowing between it and the skull; the patient is then sometimes carried off at once by meningitis, or the destructive process may proceed and induce ulceration of the dura mater and other membranes, and, finally, of the brain itself. The ulceration of the brain may be superficial, or may penetrate deep into its substance and form a suppurating cavity, having the aspect of an abscess, which will in some cases occupy the whole of the middle lobe of the corresponding hemisphere, or the corresponding lobe of the cerebellum.

While the disease is confined to the ear, the sympathetic pain in the head radiating from this organ is the most marked symptom; but as soon as the membranes of the brain become involved the cerebral signs predominate and obscure the original disease. The patient, who probably hitherto has been in the hands of the aurist, is now transferred to the care of the physician, who, finding the signs of cerebral disease marked and decided, will often fail to trace them back to the ear as their origin, and therefore regards the case as an idiopathic cerebral affection. Nor is the error always cleared up by dissection, because the morbid appearances in the brain present a satisfactory cause for the violent symptoms and fatal termination, and the caries of the temporal bone, which is less conspicuous on the cerebral surface, either escapes notice, or is concluded to be the effect of the cerebral disease. This, we are persuaded, is no uncommon case, having ourselves seen it happen to persons much accustomed to morbid dissection.

The slow carious disorganization of the ear may be a work of many years before it reaches the brain, during which period the puriform discharge from the external meatus varies much in quantity, particularly if the Eustachian tube is not altogether closed, the discharge being at one time profuse by the meatus externus, at another taking place by the tube into the throat. This latter effect is manifested by an offensive dirk matter being mixed with the sputa, and which, collecting in the pharynx during sleep, is hawked up in the morning in considerable quantity. At times the discharge is suppressed, as when the patient takes cold in the ear; then otalgia supervenes, with headach and more or less of sympathetic fever,

* This case is detailed more at length in Mr. Tod's work on the "Organ of Hearing," p. 134.

all which signs are relieved by a return of the discharge. Attacks of this nature are frequent.

The gradual disorganization is seldom attended with dangerous symptoms so long as it is confined to the ear; but the moment it has reached the membranes of the brain, pain in the head becomes the prevailing symptom, and is no longer referred to the ear as its cause. If, now, from any accidental cause the otorrhœa is suppressed, the patient experiences an inflammation of the membranes of the brain more or less severe. The more extensive the disorganization, the more severe is the attack and the more dangerous. Some patients survive many such attacks, and die exhausted by long suffering, while others are cut off by the attack which supervenes on the disease first penetrating to the dura mater. In this case dissection will discover traces of inflammation of the detached membrane, with a little pus effused between it and the skull. A sympathetic but fatal inflammation of the membranes of the brain may occur at the period of the formation of the external abscess at the root of the mastoid process, of which we have seen an example.

It is at one of these periods of the supervention of a meningitis that the physician is called in, and his first impression of the complaint, as we have already stated, is apt to favour the idea of an idiopathic inflammation of the brain, the patient and friends directing his attention to the cerebral signs without alluding to the affection of the ear, they themselves not being aware of their connection.

The *diagnosis* in such cases is very important, inasmuch as the bloodletting required to save the patient in the one instance would destroy him in the other.

In the sympathetic inflammation of the membrane of the brain in cases of otorrhœa, there are prominent local signs as regards the head; there is a deep-seated, severe throbbing pain in the middle of one side of the head, with great tenderness of the scalp on the same side, which prevents the patient lying upon it; there is no marked suffusion of the face and conjunctiva; the expression of the eye is rather dull; the delirium is little active, and is complicated with heaviness of the head and some stupor; the fever is not severe in proportion to the local signs, nor is the force of the circulation great, the pulse being rather tight than full, and rather sharp than strong; the fever is moderate in the day, with a marked exacerbation at night.

In the idiopathic inflammation of the membranes of the brain, on the other hand, instead of local pain, there is a sense of constriction over the whole head without tenderness of the scalp; the suffusion of the face and conjunctiva is very marked; the eye vivid, the delirium violent, without heaviness of the head or stupor; the fever runs high, and though it may have exacerbations, it is continually urgent, and the force of the circulation is decided, the pulse being full and strong.

These distinctions cannot fail to strike the physician if he is cautious and circumspect in forming an opinion.

The *cause* of the otorrhœa is invariably an inflammation of the tympanum, which may be excited by a current of air playing upon the side of the head, or may arise, as it more frequently does, from the spreading of inflammation by the sympathy of continuity from the throat along the Eustachian tube. Hence the origin of the disease is often referred to the period when the patient had the small-pox or scarlet-fever. The deafness, which is a common consequence of the scarlet-fever, is produced in this manner.

Treatment.—In speaking of the treatment of the affections of the ear, described in this article, viz., of the otalgia, the otitis interna, the otorrhœa, and of the occasional attacks of inflammation which supervene on the otorrhœa, all which affections are stages of the same disease, we cannot do better than retain the order already adopted, it being the one in which these stages naturally succeed each other.

It is scarcely necessary in this place to advert to the means of relieving the otalgia, or ear-ach, which has been shewn to depend on inflammation of the tympanum, more or less acute; we shall therefore pass on at once to the treatment of the otitis interna, reserving what few remarks we have to offer on the cure of otalgia for the conclusion of this article.

Treatment of the acute internal otitis.—This intense inflammation of the tympanum can be controlled only by very decided antiphlogistic measures, adopted without hesitation or delay, the object being to arrest the inflammation, and, by procuring its resolution, to prevent all those disastrous consequences which accrue from its termination in suppuration.

In detailing the symptoms of this otitis, we stated that the local signs of pain and so on were intense, while the general febrile movement, though fully developed, was not urgent in an equal degree; and as we hold it to be a principle in the treatment of all diseases, that the more the local signs exceed the general the greater will be the relief from local depletion, we shall be guided by this principle in our recommendation of the treatment to be pursued. In place, therefore, of relying chiefly on the abstraction of blood from a vein, we urge the free and repeated application of leeches to the ear affected, premising, however, that one bloodletting should be practised to an extent consistent with the age, sex, constitution, and spare or plethoric habit of the patient. Let blood then be first drawn from the arm or from the external jugular vein, which is preferable, to the amount of ten, fifteen, or twenty ounces, according to the circumstances above mentioned, and, guided by the same circumstances, let it be followed up by leeches applied over the mastoid process of the ear affected, to the number of from six to eighteen. Repeat the application of leeches once in six hours at least; and that time may not be lost, let a blister be placed

on the nape of the neck, which will leave the region of the ear free for the use of more leeches if required. Fomentations can seldom be borne early in this inflammation; they accumulate heat and aggravate the sufferings of the patient; nor is any medicament to be introduced into the external meatus for the same reason. In addition to the abstraction of blood and to the counter-irritation, an active aperient, consisting of calomel and jalap, in the proportion of four grains and ten, or of a dose of calomel quickly followed by a purging draught of ten drachms of infusion of senna and two drachms of tartrate of potash, should be administered; and in the course of four hours give one or two grains of calomel, with a quarter of a grain of tartarized antimony, every two hours through the first day, and every three or four hours through the second, when it will generally be necessary to omit the antimony on account of the exhausted powers of the patient; the calomel to be continued in such quantity and as frequently as the then existing symptoms demand, remembering that, next to the abstraction of blood, our main reliance is to be placed on the mercury to procure the resolution of the inflammation. Opium is not admissible in any form or quantity; it distracts the patient.

If by this treatment the urgent signs should gradually abate and the inflammation pass away, the patient's appetite will quickly return, and a speedy convalescence be established. If, however, the symptoms do not yield to the vigorous treatment adopted, it is to be feared that suppuration of the tympanum will ensue, which will be further indicated by the increase of the sense of bursting of the part, by the throbbing character of pain, the delirium, and general headach. Fomentations and poultices may now be had recourse to; the anti-inflammatory measures should be relinquished; and as soon as the ulcerative perforation of the membrana tympani has been effected, and the matter begins to discharge itself by the external meatus, the powers of the patient should be supported by ammonia, and sleep procured by opium.

If, with the discharge from the meatus, the throbbing pain, sense of distention, &c. do not manifestly and speedily subside, it is to be concluded that the perforation of the membrana tympani is too small to admit of the free exit of the matter, and an operation to enlarge the perforation is at once to be contemplated; and being effected, the sufferings arising from the matter hitherto confined in the cavity of the tympanum will be alleviated, a copious discharge ensured, and an otorrhœa established.

Treatment of the otorrhœa.—In the foregoing part of this article, we have remarked the untractable nature of the chronic puriform discharge from the ear, and that its dangerous tendency depends on the decomposition and retention of the matter in the cavity of the tympanum, that cavity, owing to its peculiar construction, holding the matter as in a well. The indication, therefore, in the treatment is to prevent this lodgment of the irritating matter; and the manifest and only means of accomplishing this end is by cleansing the cavity of the tympanum by the aid of injections. As to the composition of the injections it matters little; warm water or milk-and-water will answer the purpose as well as any thing more medicated. Care must be taken in the first use of the injection, which should be administered without much force until the parts are become habituated to it, otherwise a shock from the syringe might be very distressing to the patient. Should the discharge persist and become chronic, then astringent injections would be very proper. Itard recommends the caustic potass dissolved in rose-water. The sulphate of zinc offers a good remedy, so does the nitrate of silver; the proportions to be weak in the first instance, and increased in strength as circumstances indicate.

Although the injections may not be effectual in restraining or curing the otorrhœa, they have the power to counteract its destructive and dangerous tendency to disorganization, an apposite illustration of which we are able to furnish in the case of an old lady, now near seventy years of age, who has been affected with otorrhœa from both ears, and deafness, since she had the scarlet fever in childhood, and who, by the daily injection of warm water, has preserved the organs from further disorganization, and has escaped the disastrous effects and premature death which a progressive caries inevitably leads to.

Treatment of the attacks of inflammation which occasionally supervene on the chronic otorrhœa.—The violence and danger of these attacks will be proportionate to the extent of the caries of the ear and the disorganization of the membranes of the brain at the period of their occurrence. While they affect the ear only, they need not excite alarm, because they subside in a few days by the application of leeches to the mastoid process, and by mild antiphlogistic measures. But when the disorganization has extended to the dura mater and brain, the inflammation affects these parts in common with the ear, and the symptoms assume a very formidable aspect. Yet it must be remembered that the cause of these attacks is the check given to the discharge either by cold or accidental obstruction, and that, therefore, the symptoms of the cerebral affection are more or less sympathetic, and partake of those of irritation. There is a train of actions set up in the brain depending on a local cause, which cause being done away, the undue actions subside. For this reason every means must be sedulously adopted to encourage a return of the discharge, as fomentations and poultices to the side of the head, and blood-letting must be employed only so far as to restrain the inflammation within limits consistent with life; for if blood is drawn ever so freely, it cannot put an end to the attack, as in an idiopathic meningitis, and it will sink the patient as soon as the discharge returns. In these cases mercury is not required; it is worse

than useless if carried to any extent. In every attack of this nature the practitioner should not neglect to examine the affected side of the head attentively, as such an attack is apt to supervene at the period of the formation of an abscess behind the ear from the carious perforation of the mastoid process. Should an abscess be discovered in this situation, a very free perpendicular incision is to be made, not only down to the process, but through the carious walls of the process itself into the cells, and relief will be immediately afforded to the cerebral symptoms. The writer was once called to a case of this description, which had been viewed and treated as an idiopathic phrenitis, when he discovered a large abscess presenting behind the ear; it was opened, and discharged a quantity of most offensive pus. The patient was relieved, but she sunk from the copious bloodlettings practised under the erroneous diagnosis of cerebral inflammation.

In one case in which a free opening was made into the mastoid cells by incision, as we have advised, a spontaneous cure of the otorrhœa followed.

The administration of injections in the chronic otorrhœa must not be adopted without some precaution; not without first estimating the extent of the carious disorganization; for should this have penetrated the skull, and a fluid be forced into contact with the dura mater, or this being ulcerated, into contact with the brain, a fatal inflammation would be the result. The extent of the disorganization may be determined correctly by the character of the symptoms. While the disease has not extended beyond the ear, the sufferings are referred to this organ by the patient, the pain being deep seated in the ear, and radiating from it over the side of the head; but as soon as the dura mater and brain are involved, the signs of cerebral affection predominate, the complaints now being all referred to the brain. This diagnosis will be a safe guide, and should be borne in mind. The disease being limited to the ear, will be benefited by the use of injections, and further mischief may by them be probably guarded against; but when it has reached the brain, injections are not justifiable.

The treatment of the otalgia does not call for any particular measures further than such as are appropriate to the relief of the inflammation, be it subacute or acute, of which the otalgia is a sign. The remarks it is of consequence here to make are, that the otalgia, or ear-ach, is indicative of an inflammatory congestion of the tympanum, which should not be neglected however trivial it may appear. Though the patient may not estimate the importance of an ear-ach, the practitioner should do so, and not be content until he has removed it by the use of leeches to the mastoid process, by aperients and so forth; not trusting to popular remedies placed in the meatus, but rejecting them; and taking a proper pathological view of the nature of the affection, of the dependence of otalgia on inflammation of the tympanum, he should combat it by appropriate remedies accordingly, and so preserve the patient from impairment of the sense of hearing, or from that disorganization of the ear of which even a very subacute otitis may be the unsuspected forerunner.

(John Burne.)

OVARIA, DISEASES OF THE.

I. *Of the structure and functions of the ovaria.*—In the human subject, after the age of puberty, the ovaria form two oblong flattened bodies, about an inch and a half in length, which are situated on the sides of the uterus in the posterior duplicatures of the broad ligaments. They are placed a little below the fallopian tubes, near the superior angles of the uterus, to which they are fixed by a short ligament. Their surface, except at the inferior margin where the bloodvessels enter, is smooth and convex. In the fœtus at the full period, the ovaria form long, slender bodies of a prismatic form, and are placed above the brim of the pelvis. In advanced life, they become hard and shrivelled, with deep irregular fissures in their surface.

Each ovarium consists of a peritoneal coat, and a dense fibrous or parenchymatous structure. In this latter texture are imbedded from twelve to twenty vesicular bodies of various sizes, which are named, from their supposed discoverer, the Graafian Vesicles, or Ovula Graafiana. They are composed of a fine membrane, which is separable into two layers, and contain within their cavity a clear coagulable fluid.

Branches of the spermatic arteries and veins are distributed to the ovaria, and they are also abundantly supplied by nerves and absorbents.

The remarkable changes produced in the intellectual and physical constitution of women, at the age of puberty, by the development of the ovaria, have been accurately described by Harvey in the following passage: "nec minus notum est, quanta virgini alteratio contingat, increscente primum et tepefacto utero; pubescet nempe, coloratior evadit, mammæ protuberant, pulchrior vultus renidet, splendent oculi, vox canora, incessus, gestus, sermo, omnia decora fiunt."

There are certain facts which seem to prove that it is not to the influence of the uterus, but of the ovaria that we are to attribute all the changes which take place in the female pelvis, in the mammæ and uterine system, at the period of puberty; and it seems not improbable from the following facts, that it is also to certain changes in the Graafian vesicles at the time of menstruation, that all the phenomena of that singular process are to be referred.

The case of a young woman who died at the age of twenty-nine, in whom the ovaria were wanting, was published by Mr. Charles Pears, in the second part of the Transactions of the Royal Society of London for 1805, and the following appearances have been recorded. "Having ceased to grow at ten years of age, she was in stature not more than four feet six inches high. The breadth across the

shoulders was as much as fourteen inches, but her pelvis measured only nine inches from the ossa ilia to the sacrum. Her breasts and nipples never enlarged more than in the male subject. She never menstruated; there was no appearance of hair on the pubis, nor were there any indications of puberty in mind or body at twenty-nine years of age."

In the young woman, whose ovaria were extirpated by Mr. Pott in an operation for inguinal hernia, menstruation ceased, the voice became hoarse, the mammæ shrunk, and hair appeared on the chin and upper lip. Before this period this female was stout, large breasted, and menstruated regularly.*

Mr. Yarrel has shewn that where there is a shrinking and shrivelling of the ovaria from disease in young birds, the hen bird assumes in many instances the plumage of the male. "Thus, in several mules (hen birds with male plumage) the ovarium has been found variously diseased; sometimes the oviducts appear to have been inflamed, and adhesions to have taken place between their opposite sides, so that they become obliterated; at other times the ovaria are shrivelled and of a black colour, and appear as if they had never been in progress to maturity. This black colour also pervades the oviduct, which is smaller than natural, and often impervious in some part. In old birds it might fairly have been alleged that the destruction of the ovarium and the change of plumage followed only the general obliteration induced by age, and that the one was not dependent on the other; but the fact that destruction by disease of the ovarium in the young bird induces a similar change, and the destruction of the oviduct by art being followed by an alteration incomplete indeed, but in many respects resembling the one mentioned, sets the question at rest."†

Dr. Elliotson related to the writer of this article the history of the following interesting case, which came under his notice upwards of ten years ago. "A young woman," he says, "consulted me for amenorrhœa; she had never menstruated, and yet had violent pains every month. I strongly suspected there was some organic disease, and wished to obtain permission to examine, but to this she would not consent, and did not return to me for a considerable period. She informed me when she again consulted me, that she had been married for a year, but had never menstruated. I then thought I must have been wrong, and that there was no organic cause. I asked if she was happy with her husband, and from her answer concluded that sexual intercourse went on. The husband afterwards came to me and stated that he had not encountered any impediment to connexion, but that he gave her violent pain at the time. I afterwards was permitted to examine, and then found there was no vagina; the part on opening the labia being as flat as the palm of my hand. She had most excruciating pains in the pelvis every month; there was every symptom of menstruation except the discharge. At my desire she was examined by Mr. Henry Cline, who plunged a lancet between the labia, but found nothing. She went on with these monthly pains, which she had experienced ever since puberty, and her life was rendered utterly wretched. I begged Mr. Cline to make another attempt, and he put in a bistoury as far as he dared go, but found nothing. Every sort of examination was afterwards made, and no uterus could be discovered. She remained several years in this situation, when her husband died, and she has married again. Though there was no uterus, it was evident from the appearance of the mammæ and other circumstances, that the ovaria had been fully developed."

Through the kindness of Mr. Girdwood, of Paddington, we had an opportunity in 1831 of seeing a case in many respects similar to the preceding, in which there appeared to be a deficiency of the uterus, and an effort at menstruation every monthly period. The patient was twenty-five years of age, and had been married two years, though she had never menstruated. Every month there was great pain in the region of the pelvis, which lasted for several days and then went off, without any menstrual discharge taking place. The mammæ and external sexual organs were fully developed. On examination at the posterior part of the vagina, the finger readily passed into a short cul-de-sac about an inch and a half in length. From ocular inspection, it was evident that this cul-de-sac did not reach the meatus urinarius, but between them was a narrow opening which admitted the catheter, and which could be passed up four or five inches. This canal was gradually dilated so as to admit the finger the whole length, but not the slightest trace of a body like the uterus existed at its upper extremity.

Mr. Cæsar Hawkins has related to us the case of a woman who had the vagina and uterus completely obstructed after parturition, and in whom there was a monthly effort at menstruation, though no menstrual fluid was secreted. No swelling of the abdomen took place; and though incisions were made through the vagina into the uterus, no fluid escaped.

In Beck's Medical Jurisprudence, somewhat similar cases are referred to.

On the 11th of March, 1831, we examined the body of a young woman who died during menstruation from inflammation of the median basilic vein. The left ovarium was larger than the right, and at one point a small circular opening with thin irregular edges was observed in the peritoneal coat, which led to a cavity of no great depth in the ovarium. Around the opening, to an extent of three or four lines, the surface of the ovarium was of a bright red colour, and considerably elevated above the surrounding part of the peritoneal

* Pott's Works, vol. ii. p. 210.

† Dr. Seymour's Illustrations of Diseases of the Ovaria, 8vo. 1830. p. 36.

coat. On cutting into the ovarium, its substance around the opening and depression was vascular, and several Graafian vesicles of different sizes were observed. The right ovarium was in the ordinary state. Both fallopian tubes were intensely red and swollen, and their cavities were filled with menstrual fluid. The lining membrane of the uterus was coated with the same fluid, and the parietes were soft and vascular. The size of the uterus was not increased.

In the autumn of the same year a woman, under twenty years of age, died suddenly from acute inflammation of the lungs while menstruating. The body was examined by Mr. John Prout, and the uterine organs were brought to us for inspection. A red, soft, elevated portion of the right ovarium was also here observed, and at one part the peritoneal coat to a small extent had been removed. The edges of the opening were extremely thin and irregular, and in the substance of the ovarium under the opening was an enlarged Graafian vesicle, filled with transparent fluid. Numerous small bloodvessels were seen running along the peritoneal coat of the ovary to the opening. When the substance of the ovarium was laid open, several vesicles of various sizes, and at different depths, were found imbedded in it. The left ovarium presented a natural appearance. The free extremities of the fallopian tubes were gorged with blood. Their cavities were filled with a red coloured fluid. The uterus was not enlarged, but the parietes were gorged with blood, and the lining membrane of the fundus was coated with menstrual fluid. A small coagulum of blood likewise adhered to the upper part of the uterus.

On the 2d of July, 1832, Sir Astley Cooper, to whom the writer had mentioned these cases, sent him the ovarium of a woman who died from cholera while menstruating. The ovarium was much larger than natural, and at one point there was a small irregular aperture in its peritoneal coat, through which a portion of a slender coagulum of blood was suspended. On cutting into the substance of the ovarium, it was found to be occupied by three small cavities or cysts, one of which was filled with a clear ropy fluid, another with semi-fluid blood, and the third, which communicated with the opening in the peritoneal coat of the ovarium, with a firm coagulum.

On the 18th of November, 1832, the uterine organs were removed by Messrs. Girdwood and Webster, from the body of a young woman who had died suddenly the preceding day when the catamenia were flowing. Both ovaria were remarkably large, and both fallopian tubes were red and turgid. The peritoneal coat of the left ovarium was perforated at that extremity which was nearest to the uterus by a circular opening, around which aperture for several lines the surface of the ovarium was elevated and of a bright scarlet colour, like extravasated injection. The margin of this opening was thin and smooth, and did not appear to have been produced by laceration. Its centre was slightly depressed below the level of the edges, but there was scarcely the appearance of a cavity beneath. The right ovarium was much larger than the left; and when cut into, a cavity or cyst was found which was filled with half coagulated blood. The peritoneal coat of this ovarium was entire.

The uterus was large, and when cut into, the parietes appeared to contain an unusual quantity of blood. The inner membrane was of a bright red colour, and coated with a thin layer of catamenial fluid. Both fallopian tubes were red and turgid, and the interior of the left was filled with menstrual fluid, but nothing in the form of a Graafian vesicle could be detected in the tube. The appearances now described have been accurately represented in a drawing made from the parts within two hours after they came into the author's possession.

In a paper by Mr. Cruikshanks, published in 1797, there is an account of similar appearances having been observed by him in a young woman who had died at the monthly period. "I have also," he says, "in my possession the uterus and ovaria of a young woman who died with the menses upon her. The external membranes of the ovary were burst at one place, from whence I suspect an ovum escaped, descended through the tube to the uterus, and was washed off by the menstrual blood."

Dr. Power has likewise conjectured that an ovum escaping from the ovarium at every monthly period is the cause of menstruation, which he has defined to be "an imperfect or disappointed action of the uterus in the formation of the membrane (decidua), which is requisite for its connexion with the impregnated ovum."* This hypothesis does not appear to have been formed from actual observations on the ovaria during menstruation, as Dr. Power has made no allusion to these in his work, and does not state that he has ever examined the body of any individual who died with the menses upon her. That an ovum, by which is usually meant an embryo enveloped in membranes, does not pass from the ovarium during menstruation, is evident from the fact that an ovum is never formed but as a consequence of impregnation, and that conception does not take place at the menstrual period. The facts which have now been related render it, however, extremely probable that all the phenomena of menstruation depend upon or are connected with some peculiar changes in the Graafian vesicles, in consequence of which an opening is formed in their peritoneal and proper coats. Whether an entire vesicle, or only the fluid it contains, escapes through this opening at the period of menstruation, further observations may hereafter determine. There is no proof whatever that an ovum passes along

* An Essay on the Periodical Discharge of the Human Female, by J. Power, M.D. 1832.

the fallopian tube into the uterus during menstruation, and it is not clearly established that this takes place even subsequent to conception.

Menstruation probably does not take place during infancy because the ovaria are not then developed, and it is absent during pregnancy and lactation because at these periods they are in a quiescent state. After the age of forty-six the catamenia cease, because the parenchymatous structure of the ovaria has partially disappeared, and the Graafian vesicles have degenerated into thick opaque cysts.

In many cases of disordered menstruation, chlorosis, and hysteria, which we have observed, the symptoms have been clearly referable to certain morbid states of the uterine appendages, and decided benefit has resulted from the application of those local remedies which were employed with the view of subduing the irritation, congestion, or inflammation which appeared to be present in these parts of the uterine system.

II. DISEASES OF THE OVARIA.

1. *Inflammation and its consequences.*—In the unimpregnated state the ovaria are not very subject to those severe attacks of inflammation which produce an alteration in their structure. In most cases of puerperal fever the peritoneal and parenchymatous textures of the ovaria become inflamed, and not unfrequently their structure becomes completely disorganized. In the article PUERPERAL FEVER in this work, a full account has been given of these morbid changes, and of the varied symptoms to which they give rise during life. The adhesions between the ovaria and fallopian tubes which are so frequently met with in examining the bodies of women of different ages and conditions of life, prove that slight attacks of inflammation of the peritoneal coat of the ovaria are not of rare occurrence, and that their presence is seldom discovered during life. Abscess of the ovarium from chronic inflammation of the parenchymatous structure, though a rare disease, does sometimes occur, as the following cases will shew.

A woman, æt. 17, of the lowest and most unfortunate class of females, was a patient of Guy's Hospital, under the care of Dr. Bright, in the autumn of 1823. She was greatly emaciated, had a very quick and feeble pulse, a shining red tongue, and constant watchfulness. She suffered from constant and irresistible diarrhœa, and for many successive days vomited both food and medicine: the catamenia were absent. After having been in the hospital about two months, she suddenly complained of most acute pain over the abdomen, and in a few hours expired. On opening the abdomen death appeared to have been produced by the effusion of a large quantity of pus into the peritoneal cavity, which escaped from an abscess in the right ovarium, which abscess appeared to arise from suppuration in the substance of the viscus, similar in every respect to phlegmonous abscess in any part of the body, and not connected with any cyst, or change or addition of structure the product of morbid growth.* A woman, whose case has been recorded by Dr. Taylor of Philadelphia, had an abdominal tumour, which was considered to be an encysted dropsy of the ovary. On inspecting the body after death, the tumour, which occupied the whole abdominal cavity and weighed seventeen pounds, was found to be formed by one of the ovaries, but in no respect did it resemble ovarian dropsy, being a large cyst, containing twenty pints of pus.†

2. *Cysts and tumours of the ovaria.*—There are perhaps no organs in the human body in which cysts containing a fluid are so frequently found developed as in the appendages of the uterus, and particularly in the ovaria. These sacs or cysts, which have not unfrequently been confounded with hydatids, constitute the disease termed encysted or ovarian dropsy; and it scarcely admits of a doubt, from the progressive enlargement observed in the Graafian vesicles, that these cysts often originate in a morbid distention of these bodies. In other cases ovarian dropsy arises from the development of a solitary serous cyst in the neighbourhood of the uterus, in the folds of the broad ligaments, or connected with the ovaria, if not imbedded in their substance. The whole substance of the ovarium is converted into a large bag containing a fluid, or into a congeries of cysts of different sizes, which have no communication with each other. These cysts, which differ considerably in the density of their coats, contain fluids which vary in colour and consistence. In some it is serous, mixed with a slimy ropy fluid, like jelly; in others it is a purulent fluid, or dark-coloured like coffee grounds, and in two instances observed by us the matter contained in these cysts resembled custard or soft cheese. A small ovarian cyst contained a thick dark-brown fluid like treacle, which did not become decomposed by exposure.

Dr. Hodgkin has recently investigated the structure and mode of formation of some of the more complicated varieties of ovarian cysts and tumours. He has given the following description of the compound serous cyst, which is often complicated with malignant disease of the ovaria.

"In this form we observe on the interior surface of the principal cyst elevations, more or less rounded and of various sizes, projecting into the interior of the cavity, and covered by a membrane which is continuous with the lining of the principal sac.

"On making an incision into these tumours, we find they also consist of cysts of a secondary order, filled by a secretion, often serous, but almost as frequently mucous. It is not, however, merely by this secretion that these cysts are filled. On looking more minutely into them, we shall generally find that from one or more points on the interior of these cysts there grows a cluster of other or lectiary cysts, upon which is reflected the lining membrane of the

* Dr. Seymour's Illustrations, p. 41.

† North American Med. and Surg. Journ. 1826.

cyst in which they are contained. Cysts of the secondary order not unfrequently afford as complete specimens of a reflected serous membrane as either the pericardium or tunica vaginalis, the lining membrane of the containing cyst corresponding to the reflected portion, as that covering the contained bunch of cysts does to the close portion.

"The proportion which the contained cysts bear to the cavity of the membrane reflected over them is extremely various. Sometimes the fluid, especially when it is of a serous character, nearly fills the containing cyst, whilst the bunch of cysts is of very considerable size. At other times the superior cyst is almost entirely filled by those of the inferior order, in which case we may generally find that the nodulose or tuberose elevations, which we may have observed on the exterior of the containing cyst, are occasioned by the unequal development of the contained cysts; for those which have grown most rapidly and have attained the largest size, forcibly dilating that part of the cyst which is reflected over them, produce a kind of hernia at that part. It sometimes happens that the distention occasioned by the growth of the contained cysts is sufficient not only to disturb the even surface of the containing cyst, but actually to produce a rupture, which admits both of the escape of its fluid contents and of the unrepressed growth of the secondary or tertiary cysts, which took their origin from its internal surface."*

Dr. Hodgkin endeavours to explain the formation of the different heterologe deposits or accidental structures on the same principles. Ovarian cysts are not unfrequently combined with a great enlargement of the organ, by which it becomes converted into a whitish, hard, cartilaginous mass, like the fibrous tumour of the uterus. These diseases are indeed not unfrequently present in the same individual, and they commence and run their course in the same manner. Portions of these fibrous tumours of the ovaria are sometimes converted into calcareous concretions like those of the uterus, or a process of softening commences in different parts, in consequence of which the fibrous structure is completely destroyed, and large irregular cavities are formed, containing a dark-coloured gelatinous fluid. Dr. Seymour in his valuable work has described ovarian tumours of the above description under the term scirrhus of the ovaria, though they are not of a malignant nature, and have no tendency to degenerate into cancer. "In the museum of the College of Physicians there is a preparation," Dr. Seymour observes, p. 59, "which has received the sanction of Dr. Baillie as a specimen of this rare disease. It is a section of a scirrhous ovarium, (resembling more a section of scirrhous testicle than the ordinary appearance of the ovarium under this disease,) which was in various parts beginning to soften, the substance breaking down into thick brown fetid fluid. This preparation was taken from a patient who died of cancer of the stomach' and Dr. Baillie says in his Catalogue is the same disease. It does not appear whether any distinguishing symptoms either of the locality of the disease or its peculiar nature existed during life."

The following example of this disease of the ovarium, which Dr. Seymour considers to be extremely rare, and the history of which he has recorded in his work, came under our notice several years ago.

At Blandford Mews on the 9th of August, 1828, we opened the body of a woman upwards of seventy years of age, who had died after long suffering from a tumour in the hypogastrium with ascites. An induration had been first perceived in the abdomen, between the navel and right ilium, nine years before, after she had suffered considerably for some months from sense of weight and dull pain in this situation. The size of the tumour gradually increased, and some years before death, (the belly being greatly distended with fluid,) the operation of paracentesis abdominis was performed by Mr. Blagden, and several pints of water were drawn off. In the course of the succeeding years the operation was frequently repeated; but the quantity of fluid evacuated gradually diminished, whilst the large indurated moveable mass came to occupy the whole of the lower part of the abdomen. She sank gradually from the interruption to the circulation caused by the tumour. On opening the abdomen, there was found attached to the fundus uteri, on the right side, an ovarian tumour weighing seven pounds, of a dense and fibrous structure. Several large cysts, containing a fluid varying in colour and consistence, adhered to the upper surface of the tumour. The peritoneum, in contact with its anterior surface, was converted into a cartilaginous substance, about a quarter of an inch in thickness. In the proper tissue of the uterus, at its fundus, was observed a fibro-cartilaginous tumour about the size of a large orange. In other respects the uterus was healthy.

The affections of the ovaria which have now been described do not partake of the nature of cancer, and have no disposition to degenerate into a malignant form. The injurious effects upon the system which they produce result entirely from the pressure and irritation which they excite in the abdominal and pelvic viscera, and some of the remote organs of the body. The cysts may descend between the bladder and rectum, and becoming firmly fixed by adhesions in this situation, interrupt the evacuation of the urine and fæces. In a case which lately came under our observation in the Saint Marylebone Infirmary, an ovarian cyst having become firmly impacted between the bladder and rectum, produced all the symptoms of stricture of the rectum. In a lady now under our care, the presence of an ovarian or uterine tumour in the pelvis, which presses upon the neck of the bladder, renders it impossible for the bladder to be emptied without the introduction of the catheter. The effects of

* Med. Chir. Trans. vol. xv. p. 282.

these tumours in impeding the progress of the child through the pelvis during labour have been fully described by Dr. Park and Dr. Merriman in the third and tenth volumes of the Medico-Chirurgical Transactions.

When the ovarian cysts remain at the brim of the pelvis, in the progress of their enlargement they gradually produce all the usual consequences of interrupted circulation in the pelvic viscera and lower extremities. Attacks of inflammation occasionally take place in their capsules, by which they contract adhesions with the surrounding organs, and pus is poured out into their cavities. After a time effusions of dropsical fluid take place into the peritoneal sac, and sooner or later the patient dies exhausted from the long-continued pressure and irritation of the abdominal and other viscera.

Encysted dropsy of the ovarium can generally be distinguished from ascites by the following symptoms. The tumour commences on one side of the abdomen, its surface is unequal, and its fluctuation, if felt at all, is very obscure. The health is at first but little impaired, and the thirst, scanty urine, and other symptoms which characterize general dropsy, are wanting. The catamenia are usually extremely irregular or altogether wanting. When both ovaria are diseased, Dr. Seymour states that the menses are always absent. Great difference is observed with respect to the progress of the disease in different individuals; in some it would appear to become stationary, or altogether cease to extend; while in others it goes on much more quickly to a fatal termination. In some cases, if we are to credit the histories which have been given by authors, recovery has taken place from a fright, blows, or from sudden exertion. Dr. Mead relates a case where eighteen pints of water escaped by a rupture of the sac through the umbilicus; Dr. Blundell relates that a lady afflicted with ovarian dropsy, falling from a carriage, struck her belly against a stone, and that a considerable discharge of urine occurred: she recovered, married, and dying subsequently of retroversion of the uterus, the cyst of her former complaint was found to have burst, and its contents effused into the abdominal cavity to have been absorbed.

Cysts containing a fatty matter intermixed with hair and teeth have frequently been met with either in the substance of one of the ovaria, or adhering to them by a narrow neck. They have been found before the age of puberty, and consequently do not arise from impregnation. In Ruysch's Museum was a tumour of teeth and hair which he found in a man's stomach. A little under the right kidney of a dead gelding, Mr. Colman met with a cyst containing fatty matter, hair, and teeth: and Mr. Brodie found a jaw, with full-grown teeth, in the bladder. Dr. Gordon met with a tumour in the thorax of a woman, which was considered during life to be aneurismal, but on examination after death appeared to be composed chiefly of the debris of a fœtus, which was situated in the anterior mediastinum, and adhered strongly to the sternum. It contained a sebaceous matter mixed with hairs, and a portion of a bone which appeared to be the superior maxillary bone. We are inclined to consider all these singular productions as wholly unconnected with conception in the bodies of the individuals in whom they have been found, and to view them as examples of that species of monstrosity which has been so fully described by Ollivier and Breschet, under the term *Diplogénèses par pénétration*.

Dr. Baillie states that the hairs are most of them loose in the fatty substance, but many of them also adhere to the inside of the capsule. Andral describes these hairs as sometimes intimately mixed up with the fatty matter, at other times as isolated from one another, or re-united into inextricable tufts. Their two extremities are usually alike, and in all the cases which he has examined there has been no bulb.*

Meckel, however, observed their bulbs in one of the cases which he examined, where the hairs were short and isolated, and were almost implanted into the walls of the sac which formed the envelopment of the tumour. He relates also from Tuniati, a case where the hairs had a white oval extremity covered by a fine skin, which was confined to the bulb, and was separated from it by an oleaginous fluid.†

These hairs differ greatly in length and colour; some are only a few lines in length, some several inches; others have been seen which measured two feet three inches. Andral states that these hairs have not always a colour analogous to that of the hair of the individual in whom they are found. A negress had a cyst with cartilaginous walls in the mesentery. This contained a sebaceous matter, in the midst of which were numerous hairs, of a colour entirely different from the woolly black locks of the African woman. They were smooth, soft to the touch, white or red, and some of a silvery hue, like those of an infant of the European race.

In almost all the cases where teeth have been found, they have been implanted into the fragments of bony or cartilaginous matter, and have resembled the rudiments of maxillary bones and alveolæ. Meckel thinks that these accidental teeth are produced like ordinary teeth in capsules filled with a gelatinous fluid.

The presence of these tumours in the ovaria has sometimes given rise to serious obstacles to the delivery of the child in parturition, and to fatal inflammation after labour. The following example of this termination of the disease has been recorded by Dr. Seymour at page 8: "A woman about thirty years of age, some weeks after delivery, having been admitted into St. George's Hospital under the late Dr. Young with symptoms of enteritis, which speedily proved fatal, the inferior portion of the small intestines was found inflamed, which inflammation appeared to have been excited by the presence of a tumour of the

* Précis d'Anatomie Pathologique, tom. iii. p. 710.

† Mémoire sur les poils et les dents, &c. par F. Meckel dans le Journal Complementaire cahier, 15 & 65.

size of a large cricket-ball, which had become attached by a narrow neck to the left ovarium. Its proper coat was of a fibrous texture, and of a purple colour, and inclosed a mass of sebaceous matter, penetrated throughout with long fine hair; after removing which, a full-grown incisor tooth was found attached to the fibrous coat."

Treatment of ovarian cysts and tumours.—Bloodletting, mercury, iodine, diuretics, emetics, long-continued friction or percussion, and a variety of other remedies have all been employed in encysted dropsy of the ovaria, and in most cases without the slightest benefit. Though the progress of the disease cannot be arrested by these means, yet the uneasy sensations produced by it admit of considerable alleviation. Inflammation of the cyst, and irritation of the bowels from its pressure, which often arise, may both be mitigated by the occasional application of leeches to the abdomen by fomentations, and the use of cathartics and anodynes. When the distention becomes great, recourse must be had to the trocar, and by a repetition of the operation of tapping, the life of the patient may be prolonged, and considerable ease and comfort may be thus obtained under a complaint which sooner or later must terminate unfavourably. On the practice of extirpating the ovaria when diseased, it is not necessary to offer any observations, as it has been abandoned by all who have made themselves acquainted with the pathology of these organs. Several years ago, an eminent accoucheur of this metropolis made an incision through the abdominal parietes of a young woman who had a moveable tumour in the belly, which he considered to be ovarian, and which he thought it possible to extirpate, as Mr. Lizars had done in similar cases with success. On laying open the abdomen, a large fibro-cartilaginous tumour presented itself, which was attached to the fundus uteri by a thick peduncle. A ligature was applied round this, and the tumour cut off; but death soon followed in consequence of gangrene taking place in that portion of the bowel which had come in contact with the cut surface. The impossibility of distinguishing ovarian from uterine tumours, where the operation is wholly unjustifiable, was strikingly illustrated by this case.

3. *Malignant diseases of the ovaria.*—Sometimes the ovarium is affected with encephaloid disease, or it is converted into a large irregular-shaped mass of cysts and tumours, the section of which presents all the characters of hematoid fungus. This fatal affection usually runs its course with great rapidity, and soon after its commencement the constitution of the patient is much more affected than in the organic diseases of the ovaria which have already been described.

M. Andral has accurately described the changes of structure produced in the ovaria by these malignant diseases. "Sometimes," he observes, "these masses are formed of fibrous, cartilaginous, or osseous tissue; in other cases they are almost entirely composed of encephaloid matter. The walls of the cysts are thick, and their cavities gradually enlarge until a tumour is formed, which fills not only the epigastrium, but the whole abdominal cavity. The outer surface of the tumour is unequal; in some points a fluctuation can be felt, while in others it has a hardness and density equal to bone."*

Dr. Seymour has also described this affection of the ovaria, and has pointed out the connexion which often exists between it and cancerous and fungoid diseases in other parts of the body, as the pylorus, lymphatic glands, and even bony and muscular parts. This malignant disease, he remarks, may be recognized during life by the want of nutrition and broken health of the patient; the unevenness and rapid growth of the tumour, the simultaneous enlargement of glands in other parts of the body, and the occasional occurrence of lancinating pains in the part. The latter symptom is not constant. The pulse is quick and feeble, and as the disease proceeds there is hectic fever, and often aphthæ in the mouth, with an inexpressible sense of debility.†

This disease occurs even at an early period of life, and it appears to be excited in some instances by pregnancy, or to be called into activity by the process of impregnation. In the body of a young woman under twenty years of age, Dr. Carswell found on dissection an ovarian tumour of a malignant nature, as large as the gravid uterus at the full period. About five years ago we examined with Dr. Merriman and Mr. Prout the body of a woman about thirty years of age who had died from malignant disease of the right ovarium a few days after parturition. In the fourth month of pregnancy she began to suffer from a constant sense of uneasiness in the hypogastrium, irritability of stomach; the countenance became sallow, and the constitutional powers greatly reduced. The abdomen, not long after, began rapidly to enlarge, and before the end of the seventh month it had attained the size it usually acquires at the full period of pregnancy. An enormous cyst, which contained a dark-coloured gelatinous fluid, was found on dissection adhering to the right ovarium, and within this cyst were observed a number of tumours of different sizes and shades of colour, which when opened presented the true encephaloid or hematoid fungous character.

An interesting case of a similar description, in which the tumour at first offered an impediment to labour, and the performance of the cæsarean operation was contemplated, has recently been recorded by Mr. Hewlett of Harrow, in the seventeenth volume of the Medical and Chirurgical Transactions.

Scrofulous and tubercular disease of the ovaria is very rarely met with. It is the least common of all the morbid alterations of structure to which the human ovaria are liable.

(Robert Lee.)

* Andral, Précis d'Anatomie Pathologique, tom. iii. p. 708.

† Diseases of the Ovaria, p. 61.

PALPITATION. Palpitation may be defined to be an increase in either the force or the frequency of the heart's contractions, or of both, whereby they become not only sensible, but sometimes very troublesome to the patient. They may vary in force, from a scarcely perceptible degree to a violence which amounts to convulsion. Not unfrequently the sound of the beats is audible to the patient, especially when lying on his side; and in this position, the second as well as the first sound may occasionally be distinguished.

As palpitation is, under all circumstances, dependent on over excitement of the nerves of the heart, the phenomenon is always essentially the same. The varieties which it presents arise merely from differences in the causes, and from the different routes which these causes pursue in order to arrive at, and convey their stimulus to the heart. Thus the blood conveys the stimulus *directly;* and this it does in three ways; first, by arriving in excess, as from violent exercise, plethora, &c.; secondly, by gorging the heart, in consequence of its transmission being impeded by a disease of the organ, or an obstacle in some other part of the circulation; thirdly, by being of too stimulant a nature, in consequence of the diet being exciting. The nerves, on the contrary, convey the stimulus to the cardiac plexus *indirectly*, as is the case in emotions of the mind, in dyspepsia, in hysteria, &c. The nerves and the blood may also convey the stimulus conjointly, as happens in fever, and in all other cases in which morbid nervous irritability co-exists with an organic affection, or a state of the blood leading to palpitation.

We have now to take a more particular view of palpitation in connection with its several causes; and we shall first glance at the causes of a physical or organic nature, and those dependent on states of the blood; and subsequently dwell at more length on nervous palpitation.

I. *Palpitation connected with physical causes.*—Of these causes, some are inherent in the heart itself, and others are exterior to it. The causes inherent in the heart fall under the following heads:—

1. Hypertrophy, and hypertrophy with dilatation. In these affections palpitation consists in an increase both of the force and the frequency of the heart's action, the physical characters of the impulse and sounds being merely an exaggeration of those which the heart presents during a state of calm. (See Hypertrophy and Hypertrophy with Dilatation.)

2. Dilatation with attenuation. Palpitation in this case consists in an increase of the frequency, but often not of the strength of the beats, though the patient may experience the *sensation* of an increased impulse. Palpitation of this kind is more obstinate than any other. Laennec cites an instance in which it lasted eight days, the pulse constantly beating 160 to 180 in the minute.

3. Disease of the valves. Palpitation from this cause varies in its characters according to the nature, situation, and extent of the valvular affection, and according to the presence or absence of hypertrophy, dilatation, or both. (See Valves, Diseases of the.) Obstructions in the arterial system fall under this head.

4. Pericarditis, carditis, and inflammation of the internal membrane. In these, palpitation is either strong and bounding, or feeble, irregular, and unequal—differences which depend on circumstances explained in the articles on the above subjects.

5. Adhesion of the pericardium. Palpitation from this cause is violent, and of an abrupt, jogging, or tumbling character. (See Pericardium, Adhesion of.)

The physical causes of palpitation exterior to the heart are as follows:—

1. Acceleration of the circulation by muscular efforts. This is the most simple cause of palpitation, and it is strictly physiological. There is an increase both of the force and the frequency of the beats. Closely allied to this is the next: viz.—

2. Plethora. It gives rise to palpitation by preternaturally distending and stimulating the heart. The palpitation which sometimes exists during the first three or four months of pregnancy is partly attributable to plethora, resulting from the suppressed catamenia, and partly to the nervous disturbance which attends so important a change in the system as that of utero-gestation.

3. Anæmia, whether from loss of blood, or from an insufficient quantity being made by the patient. In this case the blood is always attenuated and impoverished, containing more serum and less fibrine than natural. Hence it moves with greater facility in the vessels, and probably, therefore, arrives at the heart either in redundant quantity or with morbid velocity, thus constituting a physical cause of palpitation. A highly irritable state of the nervous system generally accompanies anæmia, and is partly the cause of the palpitation. Hence we shall revert to this subject in treating of nervous palpitation.

4. Convulsive, epileptic, and hysteric fits. These cause palpitation partly by occasioning too rapid a flow of blood to the heart, and partly by a participation of the organ itself in the spasmodic action.

5. Obesity. This causes palpitation in a threefold way; *a*, by the plethora with which it is usually accompanied; *b*, by the weight and inelasticity of the thoracic and abdominal parietes, whence the free expansion of the ribs and descent of the diaphragm are prevented; *c*, by the unusual resistance offered to the heart's propulsive action in consequence of the extended sphere of the circulation and the pressure of the adipose tissue on the capillaries.

6. Obstructions in the lungs; namely, hydrothorax, empyema, pneumothorax, hepatization, extensive bronchitis affecting the minute tubes, &c. These cause palpitation (so far as it is independent of a concomitant febrile movement) by obstructing the passage of blood through the lungs; whence the heart becomes gorged and preternaturally stimulated. Obstructions de-

veloped slowly, as tubercles, encephaloid tumours, aneurisms of the aorta, &c., commonly occasion little and sometimes no palpitation. For this there are two reasons: 1st, that the mass of blood is diminished by the concomitant emaciation; 2dly, that supplementary respiration is established in the pervious portions of lung, which not unfrequently become hypertrophous.

7. Asthmatic bronchial constriction. This causes palpitation by preventing the expansion of the lungs, and consequently impeding the circulation through them.

8. Acute laryngitis. According to our observation in a considerable number of cases, this affection causes palpitation in an eminent degree. We ascribe it to the same cause as in the preceding case, 7. In the last stage the palpitation ceases; for the engorgement of the heart becomes so excessive that the organ struggles and flutters rather than palpitates, and the patient, if not immediately relieved, speedily dies of asphyxia.

9. Abdominal infarction: namely, from enlarged liver or spleen, morbid growths, ascites, ovarian dropsy, advanced utero-gestation, &c. These occasion palpitation, principally by preventing the free descent of the diaphragm, and thus obstructing the circulation through the lungs, but partly also by compressing the aorta, and opposing the passage of the blood through it.

Amongst the causes of abdominal infarction is to be ranged tight-lacing. We were consulted by a military officer, who had brought on constant palpitation and slight hypertrophy by the habitual use of the dumb-bells while tightly girthed round the waist.

II. *Palpitation from causes operating purely through the nervous system.*—There are few affections which excite more alarm and anxiety in the mind of the patient than this. He fancies himself doomed to become a martyr to organic disease of the heart, of the horrors of which he has an exaggerated idea; and it is the more difficult to divest him of this impression, because the nervous state which gives rise to his complaint, imparts a fanciful, gloomy, and desponding tone to his imagination. Members of the medical profession are more apt than others to give way to these feelings; partly from their apprehensions being more keen, and partly from an impression too widely prevalent, that there is difficulty in distinguishing nervous from organic palpitation, and, consequently, that the patient must remain in a state of anxious uncertainty. It may be said for the consolation of such, that the diagnosis presents no difficulty, if to general signs is added a knowledge of those afforded by auscultation and percussion.

Nervous palpitation is dependent on dyspepsia, hypochondriasis, hysteria, chlorosis, gout, mental excitement, or a naturally irritable nervous temperament; and it presents different degrees, aspects, and habitudes, according as it depends on one or other of these causes. We shall describe its most common forms, and briefly advert to the connection between them and their causes.

1. The first and slightest degree is characterised by a tumbling or rolling motion of the heart, with a momentary feeling of fulness, tightness, and oppression. It is referable to an intermission of the heart's action, producing congestion; for the removal of which the succeeding beat is inordinately violent. This form occurs principally in dyspepsia, and it may result from so slight a degree of it, that the patient is not conscious of being an invalid. Slight acidity or flatulence, for instance, is sufficient for its production.

Dyspeptics do not in general experience a more aggravated form of palpitation, unless they are of a nervous temperament.

2. In the next degree there is a series of quick, weak, fluttering, irregular beats, with slight anxiety, acceleration of the respiration, and a quivering sensation in the epigastrium: this may last from a few minutes to half an hour or an hour, and occur only at distant and irregular intervals, or several times a day, especially when the patient is startled. It is apt to supervene at bed-time, keeping the patient wakeful and restless during a considerable part of the night.

This form presents itself in nervous and hypochondriacal dyspepsia, in hysteria, and in individuals who, either from disease or mental excitement, have fallen into a state of high nervous irritability. Amongst the latter class are to be ranked literary and scientific men, and hard students in general. This form occasionally, though rarely, occurs without any other apparent origin than a very slight degree of indigestion, the patient being otherwise strong and healthy.

Individuals, especially females, with naturally small or thin hearts,—a class characterised by a delicate frame and a languid, feeble, circulation, are predisposed to the variety of palpitation under consideration.

3. The next degree amounts to perfect palpitation, consisting in increased impulse, sound and frequency of the beats, sometimes accompanied with irregularity of action, and generally with more or less anxiety, dyspnœa, and even orthopnœa. The attack may be only occasional, or may occur several times a day, or may even last with little intermission for several days together. This form is rare in pure dyspepsia, but is of common occurrence in dyspepsia complicated with hypochondriasis, or engrafted on a nervous temperament. It manifests itself principally, however, in hysterical subjects, and those remarkable for great nervous mobility and irritability. In a lady of the latter class, we have seen it exist in an exquisite degree, being excited by the slightest causes. A word, a look, an idea, a movement, the most frugal meal, the most gentle stimulant, even a glass of water, sufficed to induce a violent fit, attended with heat and flushing; and she frequently passed a great part of the night in a state of the most distressing orthopnœa. The heart and lungs were sound, and she was restored to health by bitters, tonics, cold bathing,

sea air, and a nutritious but unstimulating diet.

There are many individuals without any definite ailment, yet calling themselves *delicate* or *not strong*, who, after a full meal, after any unusual fatigue, or any extraordinary mental excitement, became languid, listless, restless, sometimes drowsy, with heat, acceleration of the pulse and respiration, and a more or less extensive arterial throbbing. This is generally connected with slight palpitation; so slight, indeed, that the patient is seldom conscious of it. The symptoms usually subside after a little repose, especially a tranquil sleep.

Sometimes a slight degree of palpitation subsists without intermission for years, especially in young persons of a constitution at once plethoric and nervous, and more particularly in females about the period of puberty.

We above adverted to palpitation from anæmia, whether occasioned by loss of blood or by defective sanguification. In this the blood is always in a thin and impoverished condition, from a deficiency of fibrine and an excess of serum, and the nervous system is generally in a highly irritable state. The variety is highly important, as it comprises a great number of cases, and requires a peculiar mode of treatment.

When the palpitation results from loss of blood, the phenomenon is denominated *reaction*. If the hemorrhage has been restricted to a brief period, as a few hours or days, the patient soon recovers; but if it has been protracted, as is often the case from piles, chronic dysentery, menorrhagia, polypus, or cancer of the uterus, &c. the case is much more obstinate and intractable; for not only is the state of anæmia fully established, in consequence of the system being reduced to a condition which renders it incapable of reproducing good blood; but, by the impoverished state of the fluids, a train of nervous symptoms is engendered, which greatly exasperates the malady. Under these circumstances we have repeatedly seen palpitation last almost without intermission for many weeks and even months, but gradually yield to tonic medicines, diet, and regimen.

Anæmia arising simply from defective sanguification, as in chlorosis, of the male as well as the female, places the patient in circumstances very similar to those last described; and the palpitation is of the nature above noticed as the third degree. Here, also, we have seen it last, with little intermission, for several weeks and even months. In a medical gentleman, the heart bounded violently 120 to 150 times per minute for upwards of four months. Bleeding exasperated the affection, and the blood drawn was very serous, and so deficient in fibrine as scarcely to form a coagulum.

This state of the blood, in connection with palpitation and arterial throbbing, constitutes, in our opinion, an important feature in the pathology of purpura hemorrhagica; for in several well characterized cases which we have seen, and in others which have been communicated to us, the conditions alluded to existed in an eminent degree.

Nervous palpitation may give rise to hypertrophy, (see Hypertrophy, *exciting causes;*) but it is surprising how long the heart will in most cases resist this affection; and when the palpitation is subdued, how soon it will recover itself after undergoing slight enlargement. According to our observation it rarely requires less than a year, and sometimes several, of very constant palpitation, to produce confirmed hypertrophy.

Every variety of nervous palpitation may be attended with arterial throbbing; and the throbbing may be either universal, or limited to a particular part, even to individual arteries, especially the aorta and carotids. Hence, nervous palpitation is, in general, more audible to the patient than *organic*, the sound appearing to rush through his ears, especially when he reposes on his side in bed, since each arterial throb causes a rustling movement of his pillow.

The contraction of the heart in nervous palpitation is less remarkable for force than for an abrupt, bounding, and jerking character, and on this the arterial throbbing is mainly dependent; since the vessels receive the jerk communicated to the blood by the impulse of the heart.*

Diagnosis of nervous palpitation. 1. *General signs.*—Nervous palpitation may be discriminated from organic by the presence of some or all of the following signs, viz. by its not being excited, but, on the contrary, relieved by corporeal exercise of such a nature as would certainly disturb the action of a diseased heart; by its disposition to supervene while the patient is at rest, especially at the commencement of the night when he lies wakeful in bed; by a fluttering in the epigastrium; by the general prevalence of nervous symptoms; by the affection being aggravated when the nervous symptoms undergo an exacerbation, by the pulse and the action of the heart being natural during the intervals between the attacks; and by the intervals being long when the general health is good. Nervous palpitation, in short, is *intermittent*, its causes being only occasional; whereas organic palpitation deserves the epithet of *continued*, its causes being constant.

To the above category of diagnostic signs, some add, as characteristic of nervous palpitation, an increase of it after meals, or when the stomach is loaded or deranged, and an amelioration produced by dyspeptic remedies; but as the stomach produces the same effects when there is disease of the heart, these signs are not pathognomonic of nervous palpitation. To this point we would particularly direct the attention of practitioners; because many, in forming their diagnosis of the affections in

* Treatise on Diseases of the Heart, by Dr. Hope, page 74 to 78.

question, regard the dyspeptic signs as paramount in value to all others.

Though nervous palpitation is often attended with various familiar nervous affections of the head, as pain, or sensations of heat or cold confined to particular parts and coming and going suddenly, temporary vertigo, tinnitus, and confusion of the sight, not increased by lying down or stooping; it is not, when purely nervous, accompanied with genuine signs of cerebral determination or congestion: there is no universal throbbing headach, with weight and tension, increased by stooping or the recumbent position; no stunning sounds and pains in the head on suddenly lying down or rising up; no permanent somnolency, apoplectic stupor, or regular apoplectic fits, as in hypertrophy, &c.

2. *Physical signs.*—"In nervous palpitation," says Laennec, "the first impression which the application of the stethoscope to the region of the heart produces on the ear, shows at once that this organ has not great dimensions. The sound, although clear, is not loud over a great extent; and the shock, even when it at first appears strong, has little real impulsive force, for it does not sensibly elevate the head of the observer. This last sign appears to me the most important and the most certain of all when we add to it the *frequency* of the pulsations, which is always greater than in the natural state. Most commonly it is from eighty-four to ninety-six per minute." This is a very accurate description of nervous action of the heart. The impulse is analogous to that which occurs in reaction from loss of blood, and which we have elsewhere denominated *jerking*. It may be added that, in nervous palpitation, though the sounds are increased, they are not materially altered in quality, the first sound being, as in the healthy state, longer and more suppressed than the second.

The physical signs of nervous palpitation will be rendered more apparent by being contrasted with those of organic. We shall, therefore, summarily recapitulate the latter.

In *dilatation*, dulness on percussion over an increased extent indicates that the organ is enlarged; further evidence of which is derived from the dulness, and the impulse being situated lower down than natural. The first sound is short, smart, and clear, resembling, and in dilatation with attenuation becoming identical with, the second. Both sounds are louder than in an equal, and often than in a greater, degree of nervous palpitation.

In *hypertrophy with dilatation*, the dulness on percussion is increased over a still greater extent, and the dulness and impulse are also lower down than natural. Both sounds are very loud, and the first is shortened, though less so than in pure dilatation. The impulse is a smart, violent blow, possessing much more force than in nervous palpitation, and very frequently raising the head of the auscultator.

In *simple hypertrophy*, the impulse is a slow, gradual, and powerful heaving, very sensibly elevating the head. Both sounds are diminished, and in extreme cases almost suppressed. These characters are so different from those of nervous palpitation, that it is only by inattention that the two affections can be confounded.

In *disease of the valves* there is a *permanent* bellows, sawing, or rasping murmur; whereas murmur in nervous palpitation is only occasional, and of a soft character. If the valvular contraction be great, the action of the heart is irregular. Irregularity also occurs in nervous palpitation, but it is not accompanied by those symptoms of an embarrassed circulation which invariably attend valvular disease, and in too palpable a form to be mistaken. Should hypertrophy, dilatation, or both, coexist with valvular disease, their signs, as above-described, will likewise be present.

The pulse in nervous palpitation is materially different from that in organic disease. In the former it is jerking, but has little fulness, strength, and incompressibility. In dilatation it is full and soft; in hypertrophy with dilatation, it is full, strong, and sustained; and in simple hypertrophy, though less full, it is strong, sustained, and even hard. In valvular disease it presents different characters according to the situation and degree of the lesion, (see VALVES, DISEASES OF, *general signs*,) but the presence of other signs of the valvular affection will enable the practitioner to distinguish the pulse from that of nervous palpitation.

To the physical signs of nervous palpitation, may, in many instances, be added an intermittent bellows and sawing murmur of the heart and sometimes of the arteries, which we have elsewhere attributed to the morbid velocity with which the blood is propelled by the sudden and as it were spasmodic contraction of the heart.* The murmur occurs whenever the action of the organ is excited; and in some instances the slightest causes suffice to produce the effect, as a momentary mental emotion, a change of posture, (from the recumbent to the erect for instance,) a constrained position, a meal, flatus in the stomach, &c. We have often found the phenomenon to subsist for a few seconds or minutes only, that is, so long as the exciting cause continued in operation. The patient, if asked whether he is conscious of palpitation, replies in the affirmative; yet the pulse may not be strong—it may even be small and weak; but it will be sharp or jerking. It is the velocity, therefore, and not the power of the heart's contraction which causes the murmur.

III. *Palpitation from physical and nervous causes.*—Nothing is more common than a conjunction of nervous with organic affections of the heart; and these are the cases which present the greatest difficulty in diagnosis, as the one masks the other, and it is not easy for the inexperienced practitioner to assign to each the share which it holds in the production of the symptoms. He will best qualify himself for this task by acquiring a sound knowledge of the two classes of affections separately. Hence

* Treatise on the Diseases of the Heart, by Dr. Hope, p. 76.

it is unnecessary to enlarge on this subject. We have elsewhere given cases illustrating the combination.*

Treatment of palpitation.— Palpitation being only a symptom, the treatment must be mainly directed to the primary affections. To advert to it here in all its details would be a superfluous repetition, as it is discussed at large in the several articles devoted to the primary affections. Palpitation from organic disease of the heart is so intimately connected with the disease itself, that abstract observations on treatment would convey no definite information; and we therefore refer the reader wholly to the various articles on that subject—to which he will find a guide in the general article HEART, DISEASES OF. The treatment for nervous pulsation of the aorta is noticed at the conclusion of the article AORTA, ANEURISM OF. In the articles HYSTERIA, CHLOROSIS, and especially INDIGESTION, he will find ample information on the subjects to which they respectively refer. Here, therefore, we shall merely direct our attention to a few points, which, though embraced in a general plan of treatment for the primary affection, are not discussed with so specific a reference to palpitation as the practitioner might probably wish.

1. *Palpitation from plethora.*—This is to be treated in the first instance by a free use of the lancet, and by two or three calomel and colocynth purges at bed-time, worked off by a draught consisting of equal parts of infus. gentian. and infus. sennæ c. with tinct. sennæ 3i. and potassæ tartrat. 3i. ad ii. or any other purgative neutral salt. This draught should be repeated every morning for a week or ten days, until the force of the palpitation has in a great measure subsided. The subsequent part of the treatment is principally of a prophylactic nature, the indication being to prevent the regeneration of too much and too rich blood. The patient should abstain from animal food on alternate days, and should always take it in limited quantity. His diet should consist principally of farinaceous articles and vegetables, and his beverage should be toast and water. As few things are more conducive to plethora than an excessive indulgence in sleep, he would do well to restrict himself, for a time at least, to six or seven hours in the twenty-four or even less. While the palpitation exists, it is dangerous to take violent corporeal exercise, as hypertrophy might be induced; but when the symptom ceases to be provoked by exertion, an active life is eminently serviceable. We have thought it necessary to insist on the present subject, as we have found plethora to be a frequent cause of hypertrophy, especially in those who, while plethoric and subject to palpitation, are compelled by their position in society to lead a laborious life. Such is the case with a large class of female servants in the country. The luxurious and indolent, when plethoric, suffer in a scarcely less degree.

Palpitation during early utero-gestation.—Should this be evidently connected with plethora, it will readily yield to a moderate abstraction of blood, a few gentle saline aperients, a spare, unstimulating diet, and a cool air with good ventilation.

Dyspeptic palpitation.—As the palpitation generally supervenes at the moment when there is a morbid stimulus in the stomach, whether this result from ill-digested food, as is usually the case in atonic dyspepsia, or from the irritation of almost any ingesta in the inflammatory species, it is evident that a judicious regulation of the diet will constitute one of the most important features in the treatment. To the article INDIGESTION the reader has already been referred. He will there find an able account of the medical treatment adapted to all the circumstances of the complaint. So long as palpitation exists in connection with symptoms obviously demanding the exhibition of medicines, as, for instance, inflammatory irritation of the mucous membrane, complete torpor of all the alimentary functions, and with various others, it is vain to expect a cessation of the palpitation until these symptoms have been relieved. But palpitation not unfrequently remains after all urgent symptoms have been removed, and the patient scarcely looks upon himself in the light of an invalid. Often have we seen it form the most delicate test of the slightest dietetic indiscretion. Here, then, it is that diet and regimen are of the first importance: they must complete what medicine began.

They are to be adapted to the nature of each case, and to vary with the variations of its circumstances. In *atonic* gastric dyspepsia the patient should follow the rules judiciously laid down in INDIGESTION, p. 620 et seq.

At p. 622 is also an excellent account of the means to be employed in order to restore the harmonious action of the bowels with the stomach, of restoring or increasing the activity of the excretory organs, and of restoring the tone or improving the innervation of the stomach. Under the latter head the subjects of mineral waters, bathing, friction, clothing, are fully discussed.

In *inflammatory* gastric dyspepsia, not only the medical, but the dietetic and regiminal treatment is very different. Both will be found in the same article, p. 629, so ably laid down as to supersede the necessity for further remark.

Palpitation from anæmia.—When this results from a sudden loss of blood in a healthy individual, little more is requisite for its cure than patience, as the symptom subsides in proportion as blood of the natural consistence is regenerated, which takes place in the course of ten days or a fortnight, and sometimes considerably earlier.

When the anæmia results from protracted or repeated hemorrhage, or from inadequate sanguification, as in chlorotic females, persevering medical treatment is in general necessary. The palpitation, and its usual concomitants, headach and arterial throbbing, are invariably exasperated by further detraction of blood, to which some resort from a mistaken view of the nature

* Treatise, &c. p. 493.

and cause of the headach. More and richer blood must be made, and the remedies best calculated to effect this object are the preparations of iron, with aloes; the latter being useful not only as a bitter tonic, but by its aperient operation to counteract the too stimulant effect of the chalybeate. We have seldom been disappointed by the pills of Dr. Abercrombie, consisting of two grains of sulphate of iron, two of aloes, and five of the compound cinnamon powder in two pills, taken at dinner, and, if necessary, at bed-time also, the quantity of aloes being diminished if it should act more than once, or gently twice a day. Should these pills create nausea, as sometimes happens, an excellent substitute is to be found in the decoct. aloes comp. ℥ß ad ℥i (just sufficient to move the bowels gently once a day) at bed-time, with a drachm of the vinum ferri thrice a day.

The carbonate of iron in doses of from one to three drachms thrice a day, and two grains of the pil. aloes cum myrr. and pil. galbani comp. respectively at bed time, is likewise an efficacious plan of treatment. Under the use of all these remedies we have seen patients speedily recover from the most unpromising circumstances. The remedies are to be assisted by a nutritious animal diet, much fresh air and gentle exercise, and by the use of the flesh-brush, salt-water sponging, and even shower-bath.

Before the medicines begin to take effect, the patient is often importunate for some palliative to relieve the urgency of the palpitation. We have found this object best effected by the hydrocyanic acid (*m* i. ad vi.); the acetate of morphia (gr. 1-3); or by the following draught: tinct. hyoscyami ℥ß, sp. ætheris nitrici ℥ß, mist. camph. ℥x. syrupi aurant. ℥i. Fiat haustus. Each remedy may be administered once, twice, or thrice a day, according to the necessity.

Nervous palpitation.—Individuals in whom palpitation is referable to a highly irritable nervous temperament, cannot, in general, bear the stimulus of chalybeates in the first instance, though they eventually prove of the greatest advantage. With such, it is best to commence with the lightest bitters, and pass progressively to bark and mineral acids, and thence to metallic tonics. Of these sulphate of zinc is one of the least stimulant, and a grain, with extract of gentian, in a pill twice or thrice a day, will often agree as well even as bitters. In the cases in question, however, medicines are of far less importance, in the first instance, than reginimal tonics: viz. a bracing air by the sea-side, sea-bathing, the shower-bath, or salt-water friction, a regular, nutritious, but unstimulating diet, and a tranquil cheerful mind. After preliminary measures of this kind for a few weeks, chalybeates, especially in the form of mineral waters, will in general prove singularly beneficial.

(J. Hope.)

PANCREAS, DISEASES OF THE.—By the ancient writers on medicine, the use and the importance of the pancreas were, it is to be presumed, little thought of; for the venerable father of our art has not even named an organ concerning whose office such a variety of opinions were advanced in after ages. Of these opinions a short yet lucid account has been given by De Graaf.* Up to the period when the pancreatic duct was discovered by Wirsangus, the notion most generally adopted seems to have been this,—that the office of the pancreas was to afford support to the vessels, and to serve as a cushion or bolster to the stomach, to protect the latter, when in a state of repletion, from being pressed and injured by the vertebræ.† In later times, however, it has been clearly ascertained to be an important gland. Its office, we now know, is to secrete a fluid analogous to the saliva, (hence it has, by Haller and other eminent physiologists, been called a salivary gland,) and to transmit by its excretory duct that fluid to the duodenum. The pancreatic juice, mixing with the bile, probably renders it more bland; and by the agency of the pancreatico-bilious fluid, combined with the lymph of the intestines, the food, already converted into chyme in the stomach, is further changed and becomes chyle, the pabulum of the blood, which has emphatically been termed *the life*.

It is worthy of remark that many eminent persons who were ignorant of the true physiology of the pancreas, who were unacquainted with the existence of its peculiar secretion, yet considered it to be the secret source of a variety of important maladies. Thus Schenkius says that the pancreas and mesentery are the seats of innumerable and wonderful diseases;‡ and Fernelius,§ treating of the morbid affections of the same parts, affirms that in them he has generally observed the causes of diarrhœa, dysentery, cachexia, atrophy, languor, slow fevers, &c. Riolanus again supposes the pancreas to be the obscure seat of intermittents, of hypochondriasis, and of other chronic disorders.

Important, however, as the office of this gland is known to be at the present day, we cannot ascribe to it an influence so extensive and so powerful as these old and most respectable writers were disposed to assign to it, at a period when its functions were very imperfectly or not at all understood. The morbid conditions to which the pancreas is subject are in fact not numerous. Dr. Baillie remarks that it is upon the whole less liable to disease than any other important gland in the body.‖ The symptoms of its diseases are moreover obscure, being for the most part such as belong equally to morbid affections of other parts contained within the abdominal cavity. It is, indeed, very seldom that we are able to discover pancreatic disease in the living subject, and rarely do we find, upon examination after death, that this gland has been the only or even the principal seat of disease.

The deviations of the pancreas from the healthy state have been regarded by several

* Tractatus Anatomico-Medicus de Succi Pancreatici Natura et Usu, cap. 2.

† Such was the notion of the celebrated Vesalius.

‡ Exercit. Anatom. lib. i. sect. 2, cap. xxi.

§ Lib. vi. pathol. c. 7.

‖ See his posthumous volume, p. 207.

authors of high reputation as either of very small moment, or as far too obscure to be recognised with any tolerable degree of precision. Of all those whose Genera Morborum are comprised in Cullen's Synopsis, Vogel alone says one word about the pancreas, and he barely notices its inflammation—adding the words, 'notæ deficiunt.' In the comprehensive and valuable work of Dr. Mason Good we meet with nothing respecting the diseases of the gland in question. Yet though the opinion of Dr. Baillie above referred to may be perfectly correct, and though reading and experience may have forced upon us the conviction that the diseases to which the pancreas is liable can hardly be ascertained during life, or, at all events, cannot be ascertained until they have proceeded too far to receive any substantial benefit from medicine, still, in a work like the present, the morbid affections of so important a part must not be passed over in silence. We proceed, therefore, to offer such an account of those morbid affections as the perusal of some of the best authors, conjoined with our own (it must be confessed very limited) observations, enables us to supply.

Inflammation of the pancreas is a disease of rare occurrence, at least it has seldom been described by morbid anatomists. A recent instance, however, of what would appear to have been true inflammation of the gland, has been given in the Medico-Chirurgical Transactions,* upon the high authority of Mr. Lawrence. In the case to which we refer, the pancreas was throughout of a dull red colour, which contrasted very remarkably with the bloodless condition of other parts. It was externally firm to the touch, and upon being cut into felt very firm and crisp; but after having been left for eight-and-forty hours it became soft. Mr. Lawrence does not seem to regard this hardness as a morbid condition of the gland, and for the following reasons:—1st. because persons in whom such a state of the pancreas has been observed have died of other diseases, without a symptom of morbid affection of this particular part having developed itself during life: 2dly, because in these cases the structure of the gland has been in every respect perfectly healthy; and 3dly, because the hardness soon disappears after death. With all respect, however, for the opinion of so experienced a morbid anatomist and so acute an observer as Mr. Lawrence, we cannot altogether coincide with him in his reasoning upon this point—we do not feel satisfied that the induration in question is not a morbid state. The pancreas is by no means the only important organ which may be seriously diseased, and yet during the life of the patient betray no symptom of such disease, and the individual die at last of some other malady. Induration of other organs may be discovered upon dissection—such induration as has been always deemed to be unequivocally morbid—yet it shall disappear not many hours after death. Such we have known to be the case as regards the liver. We have met with at least one example of enormously hypertrophied and indurated liver, where the induration was lost a few hours after its removal from the body. Mr. Lawrence's strongest argument is the otherwise healthy condition of the pancreas; but Dr. Baillie, while he remarks that hardness of this gland is accompanied with little appearance to the eye of its structure being altered, proceeds to observe that he believes this hardness to be the beginning of a process by which the pancreas becomes truly scirrhous. "It very seldom," he says, "in this state shews, in any part, the real scirrhous structure, but I have seen this to be the case, which renders it very probable that the one is the beginning of a change into the other."*

More frequently than with inflammation of the pancreas do we meet with what are usually regarded as its consequences. Examples of abscess and ulceration are to be met with in various authors. In the writings of Tulpius, and Bartholinus,† and Guido Patin, as cited by Dr. Abercrombie,‡ found an immense abscess occupying the whole of the gland. Portal relates several instances of this disease, and one especially deserves notice, in which the pancreas was found in a complete state of suppuration, in a man who died suddenly after two or three attacks of vomiting followed by syncope: he had previously been suffering under a paroxysm of gout from which he was supposed to be recovering.§ Another case has been recorded by Dr. Percival. Dr. Baillie never saw but one case of pancreatic abscess, and that case did not occur in his own practice, but was under the care of the present Dr. Heberden.

Gangrene of the pancreas has been mentioned by Bonetus, Portal, and others.

Remarkable instances of scirrhus of the pancreas are also on record. Riolanus found the gland in such a state, and equalling the liver in size, in the person of Augustine Thuanus. Morgagni‖ relates a case where the pancreas was of unusual magnitude, and universally unequal with round tubercles of considerable size, and itself of almost cartilaginous hardness. Similar examples may be found briefly related by Dr. Abercrombie.¶ Several cases have also occurred to the writer of the present article in which the pancreas *seemed* to be preternaturally hard; but he has met with but one instance where the gland was decidedly and greatly indurated, almost as hard as cartilage. The subject was a young married lady, who, after having for many years suffered from intense pain of head, died with immense effusion in the ventricles of the brain. The abdomen was examined in consequence of her having,

* Vol. xvi. part 2.

* See Morbid Anatomy.

† See also Fabricius (Wm.) cent. 4, obs. 71. Antest Program. to the treatise of Fernelius, "de abditis rerum causis"—De Graaf 'de Succo Pancreatico,' cap. vii. case cited from Highmore.

‡ Pathological and Practical Researches, &c. Pathology of the Pancreas.

§ Portal, vol. v. p. 551 et seq.

‖ Epist. xxx. 10.

¶ See his work above cited.

a short time previous to her death, complained of excessive pain in the epigastric region. No morbid appearance was discovered, excepting the extraordinary induration of pancreas above mentioned.

Cancer of the pancreas has sometimes been noticed. De Graaf* has a striking case from the Miscellanea Curiosa, Med.-Phys. Germanorum. It occurred in the person of a surgeon. The pancreas, which had perforated the diaphragm, was two spans long, and two hands in breadth; it was decayed and putrid—an ulcerated mass resembling cancer. In this case not only was the diaphragm perforated, but the spine was eroded, and the vena cava had given way. The cancerous mass had spread further, and had contaminated both kidneys, rendering them putrid and excessively black.

We are not aware of the existence of a symptom or set of symptoms by which inflammation of the pancreas can be ascertained in the living subject, nor are those which attend ulceration or scirrhus of that gland by any means well defined. The pancreas, says Dr. Pemberton,† is endowed with so small a degree of sensibility that ulceration is found after death, when no pain or other symptom had previously existed which could lead to a suspicion that inflammation was going on. If, however, there be a sense of weight or deep-seated pain in the region of the stomach, or referred to the back, with vomiting‡ of ingesta and of watery fluid; if there be gnawing pain at the boundaries of the thorax and abdomen, urgent thirst, and emaciation,§ and yet no perceptible tumour in the hypochondria, nor other symptom, in addition to those just mentioned, to mark an original disease of the stomach, or concave surface of the liver, or of the gall-bladder or ducts, or of the small intestines, or, we may add, of the kidneys, we may safely conclude that the seat of disease is the pancreas.

When disease has so far advanced that the emaciation is extreme, the indurated gland may be distinctly felt: by placing one hand upon the back and the other upon the stomach, and employing considerable pressure, an expression of pain deep-seated under the hand will in all probability be elicited from the patient.

But, besides the diseases already mentioned, the pancreas is subject to certain other morbid affections. Thus, while tubercle of the gland is mentioned by Morgagni,* a case of tuberculated sarcoma is related in the Medico-Chirurgical Transactions;† Dr. Abercrombie has given several instances of a mixed state of disease—of hypertrophy, with partial induration and partial softening resembling medullary sarcoma.‡ "Many cases," says the latter author, "are on record, of chronic disease of the pancreas, exhibiting the same diversity of symptoms which occurred in the examples now described, and nearly in the following proportion. Of twenty-seven cases, which I find mentioned by various writers, six were fatal with gradual wasting and obscure dyspeptic symptoms, without any urgent symptoms; in eight there was frequent vomiting with more or less pain in the epigastric region; and thirteen were fatal with long-continued pain without vomiting. In some of these the pain extended to the back, and in others it was much increased by taking food. In several there were dropsical symptoms, and in three or four there was jaundice from the tumour compressing the biliary ducts. In the morbid appearances also there was great variety."

Calculous concretions have been found in the pancreas. Instances of this have been given by De Graaf, Portal, Baillie, &c. The calculi in Dr. Baillie's case were found to consist of carbonate of lime.§

The pancreas, it is said, has been entirely wanting; but we doubt the fact; we believe that in the cases adduced some portion of the gland existed. The entire pancreas, as Haller observes, cannot be removed without the duodenum.‖

After what has been said respecting diseases of the pancreas, of the great obscurity of their symptoms, &c. it cannot be expected that any thing very satisfactory can be proposed as to their treatment. To use the words of Dr. Pemberton, "the remedies for a diseased pancreas are as imperfect as the symptoms which mark its derangement." Could we ever be assured that the pancreas is the primary or the principal seat of disease, we should still perhaps be at a loss how to meet the mischief by strictly appropriate remedies, and as, in the present state of our knowledge, we never can decidedly pronounce that the gland in question is the chief seat of disease, our practice must necessarily be vague; it must necessarily be directed to symptoms which belong equally to morbid affections of other organs as well as to those of the pancreas. Pain we must attempt to relieve by leeches, or cupping, or blisters. We must

* Tractatus, &c. cap. vii. See also Bonetus, de vomitu observ. 55.

† Diseases of Abdominal Viscera.

‡ The diseased pancreas may in various ways occasion vomiting; by irritating the contiguous stomach by its hardness or roughness, or by pressing upon it by its preternatural size; or it may compress the duodenum. Or the vomiting may be caused by the secretion of the gland being vitiated by its being deficient, or altogether suppressed. It is said that dogs, whose pancreas has been removed, have died of bilious vomiting.

§ There is an observation of Prosper Alpinus which we must not pass over in silence. Speaking of inflammation of the omentum, mesentery, and *pancreas*, he says, "Necessario prædictarum partium insensibilium phlegmone oppressi in expirando angustiam sentiunt."—*De Medicina Methodica*, lib. vii.

* Epist. xxxiii. art. 28.

† Vol. ix. part ii. p. 342.

‡ Pathological and Practical Researches.

§ See Baillie's Morbid Anatomy; Pemberton on Disease of Abdominal Viscera; Abercrombie.

‖ Utilitatem magnam (pancreatis scilicet) perpetuitas suadet, quâ pancreas in plerisque animalibus reperitur; *neque refutant pauca experimenta, in robusto animali facta, quod particula pancreatis extirpatæ vitale superficit, totum enim pancreas auferri nequit, nisi cum duodeno.*—Haller Visuæ Liniæ Physiologiæ.

endeavour to restrain the efforts to vomit, and we must secure at least one regular evacuation daily. Of the remedies calculated to allay the irritable condition of the stomach which accompanies disease of the pancreas, a great variety might be mentioned: we select the following, simple indeed, but often very useful:—first, a drachm of tincture of senna with five minims of laudanum, to be taken a quarter of an hour before each meal;* secondly, pulv. calumb. et pulv. rhei aa gr. v., sodæ subcarb gr. v., pulv. capsici gr. ß, in any convenient vehicle just before dinner; or gr. v. of the compound rhubarb pill may enable the stomach to retain a portion at least of the food, which would otherwise be rejected altogether. Of the other numerous remedies which are commonly employed in derangement of stomach we need say nothing in this place. They may each prove occasionally useful, but they more generally fail even to palliate the symptoms when the pancreas is in fault.

The bowels may be regulated by mild laxatives. The plan of certain old practitioners is not to be despised. When they met with cases in which pain of stomach or of some neighbouring viscus was chiefly complained of, yet no good evidence existed of actual disease of any particular part, they gave an opiate draught at bed-time, and a common laxative in the morning. This practice was, we believe, at least as useful as any of the more scientific plans which have been adopted in later times. The patients probably lived as long and their days were as comfortable as they have been under modern treatment.

In one word, respecting diseases of the pancreas, we think that, in their earlier stages, when they cannot be exactly ascertained, our practice must be in a great degree empirical; when they have reached that point that they can be pretty accurately ascertained, little or nothing can be effected, nothing probably in the way of cure, little by way of arresting the progress of the disease. Still, however, it is our duty to recommend an alterative course of medicine; at any rate we may palliate the more distressing symptoms; we may, as in various other hopeless maladies, render the closing days of our patients comparatively comfortable.

(H. W. Carter.)

PARALYSIS, from παράλυσις, *debilitas, resolutio nervorum* of Celsus.

At an early period of the history of medicine it was a surmise of Galen that two different states or degrees of nervous influence were requisite to supply sensibility and the motive power to any part of the body; but it was reserved to the present century to enlarge upon this idea, and by careful induction from facts disclosed by minute anatomical investigation, from the results of direct experiment and from the effects of certain pathological conditions, to infer that parts endowed with sensation and voluntary motion are provided with two classes of nerves, the one *sentient*, the other *motive* nerves.

If a part be deprived of the influence of one or both of these classes of nerves, from whatever cause, and to a greater or less degree and extent, that part is reduced to the condition indicated by the term *paralysis*, which we accordingly define as the total loss or diminution of sensation or motion, or of both.

Aretæus was the first of the ancients to employ the word paralysis to any extent, but he limits its signification to denote merely a loss of the power of motion, (κίνησιος μοῦνον ἐνεργείης τέ πάρεσις.) The term occurs only once in the writings of Hippocrates, and then in a letter to Perdiccas—de structurâ hominis. By him, and by many writers after him, apoplexy and paralysis were confounded together, and even by Heberden they have been considered as only different degrees of the same disease.

It is with much justice that Rostan has reprobated the custom of considering the condition of paralysis as a disease in itself, when it undoubtedly should be regarded as a phenomenon belonging to and dependent on a number of different affections; and it is much to be questioned whether such a species as that given by Rochoux,* viz. *idiopathic paralysis*, is at all admissible.

From the definition above given, it is obvious that those parts which are naturally endowed with sensation and the power of motion can alone be deemed susceptible of the paralytic state. We cannot, therefore, apply the term to that condition of a secreting organ when it is incapable of performing its function, as some writers have done when they speak of paralysis of the kidney, liver, or pancreas, &c.

From the definition we may further infer a primary division of paralysis into that of *sensation*, or *anæsthesia* (ἀναισθήσιη), and that of *motion* (ἀκινήσια), each of which may vary in degree, and may be therefore *complete* or *incomplete*.

Although the term *anæsthesia* seems to have originally been applied by Aretæus to denote absence or defect of the sense of touch, there is no reason, from the etymology of the word, why it should not be more extensively applied to signify absence or defect of sensation in general. Adopting this broader signification, then, we place under this head those affections of the senses which are denominated *amaurosis*, *anosmia*, *cophosis* or *dysœcia*, *ageustia*, as the sight, smell, hearing, or taste, may be severally deficient, and finally paralysis of the sense of touch, which is specially denominated by some *anæsthesia*.

For full details respecting *amaurosis* we refer to the article under that head. (See Amaurosis.)

Anosmia (loss of smell) rarely exists as a solitary complaint, except it be occasioned, as we believe it generally is, by an abuse of sternutatories. It is sometimes a congenital defect, an instance of which is mentioned by Dr.

* In the distressing nausea and vomiting attendant upon the early stage of pregnancy, the above is a very excellent remedy.

* Dict. de Médecine, art. Paralysie.

Good, in the person of a young lady. Another instance is known to the writer, in the case of a gentleman, now past the age of fifty.

Tumours compressing the olfactory nerves, organic alterations of their roots, acute affections, or long-continued irritation of the Schneiderian membrane, polypi, disease of the spongy or other bones of the nose, external injuries, may be enumerated as the principal causes of anosmia. Serres alludes to several cases of disease of the roots of the olfactory nerves affecting the sense of smell, and seems to think that alteration of the external root exerts a more powerful influence than that of either of the others.

The cure of this affection is accomplished by the removal of the above-mentioned causes, and is attainable only so far as that object can be effected.

Cophosis *(deafness)* is not an uncommon symptom in fevers, or in acute diseases in which there is disposition to head affection. Disease or compression of the auditory nerve—disease of the petrous bone—obliteration of some of the canals or passages connected with the auditory apparatus—otitis—are among its most usual causes. There are likewise cases of nervous deafness, as Mr. Saunders designates it, dependent on constitutional causes, producing temporary derangement of the functions of the auditory nerve.

If the deafness depend on obstruction, it is of course submitted to surgical treatment; but if it be merely a functional derangement, topical counter-irritation and a general tonic treatment have been generally found successful in the early stage.

Ageustia *(loss of taste)* sometimes accompanies local palsy of the tongue or of the face, and sometimes is produced mechanically by the deposit which covers the sentient surface of the tongue in fevers, exanthemata, &c. preventing the application of the sapid substances to the nervous extremities. It is likewise occasioned, as Dr. Good observes, by the long-continued use of tobacco, whether by smoking or chewing, or of other acrid narcotics. In the Boston Medical and Surgical Journal for May 1832, Dr. Robbins relates the case of a lady in whom the sense of taste on one side of the tongue was impaired by want of exercise. Owing to the presence of a very painful but not unsound tooth on the left side, the whole force of mastication was thrown upon the teeth of the right side. Liquids were from habit successfully passed through the mouth without coming in contact with the left side. After two years' continuance in this state, the painful tooth was extracted, and when the immediate effects of the operation of extraction had subsided, the lady observed that her sense of taste on the left side was considerably impaired in acuteness, and that she failed to perceive the true flavour of whatever was presented to its action.*

This affection, like the preceding, is to be cured by the removal of its exciting cause.

* Vide Lond. Med. Gazette, vol. x. 175.

Anæsthesia *(diminution or absence of the sense of touch or of feeling)* affords much matter of interest to the pathological enquirer. We meet with it most commonly as a precursor of paralysis of motion, either in a minor degree, a condition of numbness, or in that of total insensibility; frequently it accompanies paralysis of motion, and rarely follows it.* It more frequently precedes paralysis of motion of the lower than of the upper limbs. Sometimes it is co-existent with paralysis of motion of the opposite side, as in a case by Cullen, of a gentleman who had loss of motion without loss of sense of one arm, and loss of sense with perfect motion of the other.†

Several cases of *complete* loss of feeling are now on record. In these cases the patients are insensible to injuries of the severest kind,—wounds with sharp instruments, burns, &c. and are constantly liable to accidents of this description, the skin having lost its protecting sensibility. Dr. Good quotes a case in which the anæsthesia had its seat in the right arm; in this case the occurrence of a phlegmon on the affected arm excited no uneasiness, and some time after, when the patient accidentally fractured his arm, he received intimation of the accident merely from the crash which it produced. Dr. Yellowley gives the instance of a man who put his feet into boiling water, and was not aware of the height of the temperature till he perceived a vesication forming on one of his legs: in a similar case by Mr. Earle, the high temperature of some hot grains into which the patient put his legs was first evinced by the formation of large sloughs. We may add that in Dr. Yellowley's case above alluded to, a knife was introduced deep beneath the nail of the thumb without occasioning pain or uneasiness.

When anæsthesia occupies the external integument, in the immediate neighbourhood of any of the orifices at which that membrane becomes continuous with the mucous membranes, the latter are generally similarly affected to a greater or less extent. Thus, in the cases of partial loss of feeling of the face, the conjunctiva of the eye, so acutely sensitive in its healthy condition, can bear pressure or friction, or even pricking with the point of a sharp instrument. The eyeball having thus lost its proper sensibility, the cornea is apt to become inflamed, opaque, ulcerated, and finally destruction of the eye ensues. Hence some physiologists have, with but little show of reason, argued that the nerve supplying sensibility to the conjunctiva is likewise the nerve of sight. The mucous membranes of the nose and mouth likewise participate in the insensibility in these cases. In the nose the membrane is unaffected by pungent substances, as ammonia, &c. although the sense of smell is perfect: the introduction of a feather into the

* In a case reported by Dr. Colles of Dublin in the Appendix to Sir C. Bell's work, loss of feeling followed the cure of a partial paralysis of motion of the face.

† See also Ephem. Natur. Curios. cent. ii. obs. 196.

nostril does not produce any of the usual effects. In the mouth there is equal insensibility of the mucous membrane of the gums, lips, and tongue; the individual will bear even mustard in the mouth without being incommoded: he is insensible of the presence of food in that part of his mouth which is the seat of the disease; so much so that, in a patient in this condition, a portion of food has been known to remain in the mouth till it became putrid. In these cases the sense of taste is generally affected. Mr. Broughton* has related an interesting case, in which the anæsthesia succeeded to the recovery of paralysis of motion of the lower extremities; it occupied the skin of the nates, part of the loins, perineum, penis, and upper part of the thighs. In this case the insensibility extended to a great portion of the genito-urinary mucous membrane; the patient was unconscious of the presence of a catheter in the urethra; erections of the penis and emission of the semen took place likewise without the patient being sensible of them. But the most remarkable and interesting phenomenon connected with the case was the kind of incontinence of urine which was present: "when the bladder was full, the urine overflowed on the slightest irregular movement, and ran out of the penis unconsciously to the patient." A similar case is detailed by Ollivier, in which incontinence of urine was co-existent with anæsthesia of the inner and anterior part of the thighs, and of the penis and scrotum. In these instances we presume that the insensibility of the inner membrane of the bladder is sufficient to account for the incontinence of urine; for how can those muscular fibres, which to a certain extent perform the office of a sphincter to the neck of the bladder, be stimulated to contraction unless the mucous membrane of that viscus be sensible of the presence of the urine?

Anæsthesia is most frequently partial in its extent; we sometimes meet with persons who possess from birth a numbness of one or more fingers. Often the affection begins locally, but increases its extent gradually. Cases are recorded in which the anæsthesia was universal; in others it has been reported to occupy the whole surface, with the exception of a small portion, as in a case by Ollivier, where a patch on the right hip was the only sensible spot on the whole cutaneous surface; and in another quoted by Andral, in which the insensibility extended over the whole body, excepting a small round spot on one of the cheeks.

In partial anæsthesiæ existing on one side of the body, we generally find the insensibility limited with the utmost precision by the median line. These cases vary in extent from half the body to an extremity, part of an extremity, part of the face, &c. It has also been known to occur in numerous round spots, eight or ten in number, the surrounding skin being perfectly natural.† In the anæsthesia of the face we may here mention an invariable consequence; the patient complains that when he puts a glass or cup to his lips, it conveys to him the sensation of its margin being broken; and this circumstance is often the first to direct his attention to the complaint. When there is cutaneous anæsthesia of the extremities, we generally find that the power over the voluntary muscles is impaired; and this we might, *à priori*, expect to follow loss of sensation. A case by Dr. Yellowley confirms this supposition. The patient used to drop glasses, plates, &c. if her attention were directed from them; but so long as she kept her eyes on them, she held them in perfect safety. A precisely similar instance is adduced by Foville,* in proof of the above assertion, as related to him by Sir A. Cooper. A third case we may mention from Dr. Ley.† There was defective sensibility on one side of the body; the patient could hold her child in the arm of that side so long as her attention was directed to it; but if surrounding objects withdrew her from the notice of the state of her arm, the flexors gradually relaxed, and the child was in hazard of falling. The fact is further illustrated by an incident of daily occurrence. When a person, from sitting in an awkward position, produces numbness in his lower extremity by the prolonged pressure on the sciatic nerve, he will find it almost impossible to stand on the benumbed leg alone, and that from the absence of the consciousness that the foot is applied to the ground.

Anæsthesia varies in its mode of access. In some cases the patient's attention is first attracted by the sensation of fine sand intervening between the skin and the object touched; in others there is a feeling compared to the creeping of insects over the skin, and thence named *formication:* both these after a little merge into total insensibility. Often the anæsthesia appears suddenly and without any premonitory symptom.

We cannot always assign a satisfactory cause for the condition which we have been describing. In general, however, it is referable to some change influencing the nerves which supply sensibility to the affected part or parts; in the trunk and extremities, the sensific filaments of the spinal nerves; in the face, the ganglionic portion of the fifth pair. This alteration may exist either in the nervous trunks themselves, or in the nervous centres, where the nerves are connected with them. Thus pressure, wound, or disease of a nerve, is constantly known to affect the sensibility of the parts supplied by it. Several instances are to be found in authors where anæsthesia followed concussion of the spinal marrow: injury or disease of the posterior bundles of the same could produce a like result. Loss of sensibility is often connected, too, with cerebral disease. Local injuries of various kinds will produce anæsthesia; it sometimes has commenced from a cicatrix, or spe-

* Med. and Phys. Journ. 1827.
† Andral's Lecture, Lancet, No. 497.

* Dict. de Méd. et Chirurg. art. *Encephale.*
† Appendix to Bell on the Nerves, No. lxxxv.

ceeded the application of a blister. The sudden or continued exposure to cold is not an unfrequent cause: most of the cases related by Mr. Broughton were plainly attributable to this cause. Mr. Swan gives a case in which anæsthesia of the hand was produced by a violent pressure applied to the wrist; and Roche mentions one, in which the insensibility occupied the integument over the trajet of a ball which entered the body on the right side and ran round beneath the skin till it struck against one of the lumbar vertebræ.

Anæsthesia is likewise often connected with hysteria and hypochondriasis; sometimes it follows parturition, as in the case above quoted from Dr. Ley: it is also sometimes coexistent with mental derangement. We may add, that the condition of the circulation in a limb exerts a marked influence on its sensibility; suspended or retarded circulation removing or diminishing the sense of feeling, as is matter of daily observation.

The duration of anæsthesia is uncertain and variable: sometimes the sensibility will return when least expected; at other times it will resist all treatment. When it is the result of spinal concussion, it may be removed by the treatment generally adopted for that accident; and when produced by cold, the prognosis may also be favourable.

The treatment of this condition is founded more on experiment than on a correct pathology. It chiefly consists in local applications to the affected parts. Frictions with various stimulants; baths of different descriptions, warm or cold; douches; blisters, or epispastics of other forms; electricity; may be enumerated as the chief curative agents. If an organic cause exist, either in one of the nervous centres, or in a trunk of a nerve, it is hardly necessary to observe that primary attention should be directed to ascertain how far that is removable.

We may here briefly allude to the remarkable epidemic which appeared in Paris in the summer and autumn of 1828. The most singular and constant symptom was a numbness, passing into a total insensibility of the skin and subcutaneous tissues on the hands and feet, and sometimes on other parts, of more or less extent. This was in general preceded by some symptoms of gastric or intestinal irritation, which continued often for many days or weeks. The insensibility, which was in general preceded by formication or pricking pains, was uniformly accompanied with an œdematous state of the affected limb; vesications, likewise, formed on it in different places: the skin was sometimes red, sometimes of a dark colour, and the epidermis detached in some places. The insensibility was so great in many cases, that no pain was experienced when pins were passed into the skin. In some cases there was subsultus tendinum; in others the muscles were paralysed; yet according to the report* of M. Genest, from whom we have taken the above statement, the latter condition was not very frequent; but from the statement of Chomel to the Academy (sitting of 26th of August), it appears that considerable weakness of the feet and hands, with impossibility to move them, was a symptom very constant.

No organic lesion of the nervous system could be detected sufficient to account for this remarkable epidemic. From the examinations detailed by Genest, the intestinal mucous membrane seems to have been the seat of several ulcerations. To us there appears much analogy between this epidemic and that which is met with in tropical climates, the beriberi, or the more chronic barbiers.

Paralysis of motion.—The second form of paralysis is that of motion, to which, from its being of so frequent occurrence and so serious in its effects, the term *paralysis* is more especially applied.

Like that of sensation, paralysis of motion is either complete or incomplete. It presents some variety in its mode of invasion: it may come on instantaneously, and without any premonitory symptom; the affected parts becoming suddenly flaccid and powerless, and thrown into a state of complete resolution: at other times the paralysis is preceded by inordinate muscular action, viz. by spasms, attended with a considerable degree of pain, the muscles sometimes remaining in a state of rigidity after the invasion of the paralysis. Lastly, we find paralysis coming on slowly and gradually; the part being at first affected as to its sensibility, then becoming slightly torpid, and at length paralysed: the palsy then spreads on step by step, till it occupies a considerable extent. This is the form to which the term *creeping* palsy has been applied.

There are certain phenomena which constantly succeed to the attack of palsy. Wasting of a limb is an almost invariable consequence of paralysis. This would appear to arise more especially from the atrophy of the muscles, the result of prolonged inactivity; and, in part, from the deranged nutrition, in consequence of the removal of due nervous power. The muscles of a limb, when in a state of complete resolution for any long period, lose their colour, and are diminished in firmness as well as in dimensions; the colouring matter in some cases is completely absorbed, and a yellowish tissue, which however still retains the fibrous and fasciculated character, replaces the original muscle; a change which by some has been described as the conversion of muscle into fat.

The circulation in palsied limbs is said to be more languid than in healthy ones, and the pulsations of the arteries have been stated to be diminished in force and even in frequency. These statements, however, do not appear to have been founded on facts universally or even extensively observed, to say nothing of the sources of fallacy which lie in the way of a conclusive comparison of the relative force of arterial pulsations.

The nerves of palsied limbs do not in general present any obvious change. They have, however, been found increased in size, and of a yellowish colour; but it should be noticed that

* Archives Gén. de Méd. Oct. 1828.

the enlargement might have arisen from the thickening of the neurilemma, or from the infiltration of a fluid, and not from any increase of the medullary substance. We may, moreover, state as the result of the experience of Andral, that he has never found the nerves of paralytic limbs either atrophied or hypertrophied.* Sir C. Bell, however, is of opinion, as Dr. Cooke says, that the nerves of palsied limbs do lose some of their substance. When the nerves of a paralysed limb are diseased, it has been remarked that the wasting is more rapid and more manifest than in the ordinary cases, (see article Atrophy;) and judging from our own observation, we would infer that the atrophy is likewise more rapid when the paralysis is the result of spinal than when caused by cerebral disease. Thus how much more frequently do we observe wasting of the limbs of paraplegics than of those in whom the paralysis is in the form of hemiplegia. Yet we have seen limbs in the state of palsy, and that of some duration, in which there could not be detected any difference from sound limbs. We not unfrequently meet with palsied limbs in an œdematous state, more especially in old persons; we may also remark that the state of paralysis favours the formation of vesications on the affected parts,—an occurrence more commonly noticed in paraplegia.

Much has been written respecting the temperature of paralytic limbs. Does it differ from that of healthy ones? or are they, from the want of nervous power or any other cause, less able to resist the influence of cold? Mr. Earle, by actual thermometric examination of a considerable number of paralysed limbs, found that their temperature was some degrees lower than that of the sound ones, and observes that, wherever nervous energy is impaired, the part loses the power of maintaining a healthy standard temperature, because the integrity of the nervous power is essential to the complete performance of the calorific function.† Observation, however, has frequently shown that paralytic limbs may be of a higher temperature than others. Dr. Abererombie's views on this head place the question in so clear a point of view that we shall transcribe his remarks: "In regard to the temperature of paralytic limbs, I think it is generally supposed that they are colder than the healthy limbs; but this does not appear to be the case. The truth seems to be that they have lost in some degree that remarkable power possessed by the living body, in a healthy state, of preserving a medium temperature, and that, *according to the temperature to which they have been exposed*, paralytic parts become hotter or colder than sound parts which have been exposed to the same temperature. A case has been related to me by a friend, in which a medical man, paying a visit to a paralytic patient, found the paralytic arm so intensely hot that it was painful to touch it. This, upon inquiry, was found to be owing to the application of very hot brau, which the patient had made to the arm by the advice of a neighbour, though he was himself insensible of the change of temperature."*

The sensibility of paralysed limbs is generally more or less impaired; most frequently there is paralysis of sensation incomplete or complete, the latter, however, being very rare. Dr. Cooke states that he "never saw a case of palsy in which sensation was entirely lost; and an eminent physician of great experience asserts that a total loss of feeling in this disease is very rare." Sometimes the sensibility is exalted, and the patient can hardly endure the slightest touch upon the affected limb. Dr. Abercrombie refers to a case in which the sensibility of the arm was so increased that the least breath of cold air excited convulsion. The sensibility may likewise be so altered that the patient will draw erroneous inferences from his sense of touch; thus, cold bodies will feel hot to him, and as in the case related by Dr. Falconer,† the feeling of heat will subside as the body in contact gradually acquires the temperature of the limb.

In general there is but little pain in palsied limbs; Drs. Cooke and Abercrombie, however, speak of patients who suffered extreme pain. We have observed pain accompanying incomplete palsy, and we should say that it is in such cases that pain is to be expected, there being in general a more or less spasmodic condition of the muscles.

The vital and natural functions, says Cooke, are generally but little affected in palsy; sometimes those of respiration and circulation are somewhat impeded, but this is generally towards the close of the patient's life. The bowels are usually more torpid, and less easily brought under the influence of purgative medicines, but the excretions are not diminished. When the paralysis extends to the sphincter, and to the muscular coat of the bladder, the involuntary discharges are apt to lead one to imagine that the excretions are increased in quantity.

Paralytics are in general irritable and peevish, and, if the palsy be of long duration, sometimes become quite imbecile. Dr. Cooke relates a case, however, in which the attack of paralysis produced a remarkable change in the temper of the patient;—"from being of an irascible and irritable disposition, he became perfectly placid, and remained so until his death about two years after." The powers of the mind too are not unfrequently affected, as well antecedently as subsequently to the attack of paralysis. The memory is most frequently affected in these cases: the power of recollecting names, whether of persons or things, as well as the memory of languages, is often lost; the habit of substituting one name for another, and a predilection for particular names, which the patient will apply to all persons and on all occasions, are also among the deranged mental phenomena attendant on these cases. In some

* Andral's Pathol. Anat. by Townsend, vol. ii. p. 797.

† Med. Chir. Trans. vol. vii.

* Abercombie on the Brain, &c. p. 288.

† Mem. Med. Soc. Lond. vol. vii.

instances, paralytics even invent names which are unintelligible to all except those who are in daily attendance on them. The writer remembers the case of an old domestic, rather famous for loquaciousness when in health, in whom some curious defects of verbal memory preceded for a considerable period the paralytic attack which ended her days. She entirely forgot the names of persons, and first lost the recollection of the names of those with whom she was most familiar; yet for some she invented names, which seemed to please her better than the real names of the individuals, as she almost invariably rejected the real names when they were mentioned to her. She had nearly the same defect as to names of things; she often pronounced the first syllable of the name of any thing she wished to ask for, but could get no farther; nor would she be put right. She at length grew irritable and suspicious of even those who ministered to her wants; she husbanded her few articles of property with the greatest care and closest watchfulness; and ultimately she became amaurotic, and the subject of extensive palsy. Such instances are, we believe, by no means rare. Dr. Bright relates one in some respects similar.

Causes of paralysis.—It is to the effect of some alteration in the centres or ultimate ramifications of the cerebro-spinal system that observation has taught us to look for the true cause of most of the paralytic affections met with in practice. There are forms of palsy where no appreciable alteration can be detected in any part of the nervous system. Such are those in which the palsy arises from the impregnation with metallic particles—lead, mercury, and others, for which no satisfactory cause is assignable. Yet even in these cases we are scarcely warranted in denying the existence of organic lesions merely because they are not obvious to our senses. We would here observe that close and unbiassed observation is more called for to promote the elucidation of the class of affections we are now considering than of any other, and we may add that an accurate symptomatology is as essential to this important end as an exact and minute detection of the several morbid appearances of the cerebro-spinal system. It is mainly by a series of pathological facts, well arranged, that we can hope to unravel with certainty the many intricacies connected with that system in its healthy as well as its morbid state. To accumulated experimental and pathological investigations we owe in a great measure the advances made within latter years, and to such we look forward, and not without sanguine hope, for a still farther insight into a class of diseases at once dreadful to the afflicted and perplexing to the practitioner.

Paralysis is said to occur more frequently in men than in women, and generally in persons past the meridian of life; it is a common disorder of old age. Those of a sanguine and what has been called nervous diathesis are most liable to it.

Its exciting causes are such as dispose the brain, spinal marrow, or nerves to diseased action acute or chronic; accidents; and a variety of other causes, both moral and physical. (See Apoplexy and Inflammation of the Brain.) Exposure to the action of particles of mercury, lead, and arsenic, produces a peculiar form of paralysis, the paralysis *venenata* of Cullen.

Paralysis is often co-existent with various nervous diseases—hysteria, epilepsy, mania, hypochondriasis. It also sometimes appears after parturition, and occasionally with phlegmasia dolens.

The duration of paralysis depends so much on its cause, the constitution of the patient, and various other circumstances, that no general statement can be made regarding it.

With respect to the extent of parts affected, we find that paralysis has, to use the words of Heberden, innumerable degrees, from the torpor and debility of a single joint of a finger to a complete apoplexy, in which sense and motion vanish from the body. It may, therefore, be divided into, 1. general paralysis, 2. partial paralysis.

1. *General paralysis.*—When both sides of the body are paralysed, and when, in fact, the whole muscular system is deprived of the power of motion, so that the patient cannot move in any way by an effort of his own, the condition is that of general paralysis. If the four extremities be paralysed, the affection would likewise come under this head. It sometimes happens that one or more of the senses are impaired in addition to the motive power; and not unfrequently the general sensibility of the body is diminished or destroyed.

It is remarkable to what an extent paralysis of motion as well as sensation will affect the body without destroying life. Some interesting cases are recorded in which the palsy was so general as completely to deprive the patient of all means of communication with the surrounding world. One of the most remarkable of these is that related by M. Defermon, in the Bulletin des Sciences Médicales for January 1828. It is defective, however, inasmuch as the examination of the body was not permitted. M. C. L., of a nervous habit, and having lived a dissipated life, was suddenly seized with amaurosis; which being suspected to have had a syphilitic origin, was treated accordingly, without success. Immediately afterwards there came on a remarkable exaltation of all the other senses, but especially of that of touch. His intellect being perfect, he was enabled to continue in the duties of his office in an important financial department. Some years afterward his hearing became dull, and gradually advanced to total deafness; at length general paralysis of sense and motion, except in the tongue and muscles of deglutition and respiration, supervened; the whole body became insensible, and the limbs were successively paralysed, without the least trace of external lesion.

The patient was thus shut out from all means of communication with others; yet his speech and intellects were unimpaired. It

was accidentally discovered that a small patch on the right cheek retained its sensibility; and by tracing letters on this sensible spot, his wife and children were enabled to maintain an intercourse of ideas with him! After some time, however, his strength began to fail, the paralysis extended to the sphincters, and he sank.

Another somewhat similar but more complete case is recorded in the Edinburgh Medical and Surgical Journal for 1828, by Mr. Davies Gilbert, the late distinguished President of the Royal Society.

The young girl, the subject of it, had been born a little before her full time, and at birth was in a state of great weakness. She did not manifest in any way the instinct which usually directs other infants to seek their natural nourishment; she was consequently reared with much difficulty. One of her eyes was much smaller than the other, which seemed to be of the natural size. Some weeks after birth she was seized with violent convulsions, which lasted some time. She continued, however, to grow like other children, but a deficiency of sensation and motion became daily more obvious. She was destitute of the sense of sight and hearing, and a cataract was observed upon the eye, which was of natural dimensions. The sense of taste appeared to be tolerably perfect, as she afforded some feeble sign of satisfaction when sweetmeats were given to her. As to voluntary motions, they were totally defective, and she arrived at her seventeenth year without having ever raised her head, carried her hand to her mouth, or put a foot to the ground. She was quite dumb, and only occasionally uttered a feeble cry, which her attendants regarded as indicating a desire for food. Some time before death her feebleness seemed to increase, and on the day on which she completed her seventeenth year she expired so tranquilly that she was supposed to have fallen asleep. It is positively stated that this girl had shewn some appearances of menstruation, as well as other signs of puberty.

On dissection, the brain appeared perfectly healthy, but on raising it from the cranium it was found that the dura mater lining the basis cranii was deficient, and its place occupied by a thin and semi-transparent membrane, very loose and singularly arranged; the tentorium cerebelli was likewise deficient, so that the posterior lobe of the brain rested immediately upon the upper surface of the cerebellum. All the nerves were perfectly regular.

General paralysis is most commonly the result of apoplexy, and is then accompanied with stertor, coma, and the other symptoms usually attendant on that disease. The continuance of circulation and respiration are the only remaining signs of life, the power of swallowing is impaired or lost, and the excretions pass involuntarily. This condition either gradually increases, the paralysis extending to the muscles of respiration, and the vital powers becoming slowly exhausted; or the coma subsides, consciousness is restored, and the patient is found paralysed in sensation and motion to a greater or less extent; or the paralysis may totally disappear with returning consciousness.

Paralysis from apoplexy is easily detected by the suddenness of its invasion and other concomitant circumstances. (See Apoplexy.) In surgical practice this condition of general palsy is met with not infrequently as a consequence of a severe concussion or compression of the brain.

We observe other cases of general paralysis characterized by a development more or less slow. The tardy progress of these cases distinguishes them sufficiently from those which are the result of apoplexy. Most of them partake of the nature of that described above as *creeping palsy*; there is some variety as to the part first affected; sometimes the eyelid falls, or a hand, or foot, or even a finger or toe become paralysed; sometimes also the tongue: at other times an impaired condition or complete loss of sensibility precedes the paralytic attack; sometimes loss of sight or hearing is the first indication; or a series of cerebral symptoms, for which it is difficult to assign an adequate cause: and this is often succeeded by impaired memory, and deranged mental powers, such as we have already alluded to. These cases generally result from disease, acute or chronic, affecting the brain or its membranes, or from disease of the spinal cord. (See Brain, Inflammation of.)

Injuries of the spinal marrow in man and animals fully authorize the conclusion, that the higher in the spine the seat of injury is, the greater the extent of the consequent paralysis. Hence, then, we may reasonably expect, that in order to produce general paralysis, the spinal disease must be either of considerable extent, or situated at the upper part of the spinal marrow. This statement is confirmed by the cases (several of which are now on record) of rapid death following the separation of the atlas and axis, when a sudden compression is exerted upon the contained portion of the spinal marrow by the odontoid process.

The morbid conditions of the contents of the spinal canal which have been found coexistent with general paralysis, are pretty much the same as those of the brain and its membranes. They may be thus enumerated:— 1. Inflammation of a considerable portion of the cord towards its upper part, the existence of which is generally indicated by ramollissement, suppuration, or abscess. 2. Extensive hardening of the substance of the cord, in which the membranes are more or less implicated. 3. Tubercles, or circumscribed tumours, developed in the spinal marrow. 4. Extensive serous effusion, probably an increase of the natural spinal fluid as described by Majendie. 5. Thickening, or fungoid disease of the dura mater, and ossific growths, either in that membrane, or from the bony parietes of the vertebral canal.

In the present state of our knowledge of spinal diseases, it is not easy to assign any general symptoms which would point unequivocally to the spinal cord as the source of

evil in certain cases of general paralysis. From all that has been collected on the subject, however, we think we are justified in asserting that there are certain phenomena which more frequently, or in a more marked manner, accompany paralysis resulting from spinal, than that which depends on cerebral disease. There is in these cases, generally, a more excited state of muscular action, evinced by spasms, twitchings, or even convulsions, and sometimes a permanent contraction. The sensibility of the surface, too, is often more deranged: thus, formication, tingling, or numbness are very frequently found as the precursors of the form of palsy we are alluding to. We may further remark, that it is in cases of spinal disease that we sometimes see the line drawn with the greatest precision between the motive and sensorial powers; the latter being totally unimpaired, while the former is completely destroyed, —a fact which seems clearly to direct us to the two distinct sources whence experimental physiology would derive these powers. Ollivier seems to think that diminution of temperature is more obvious in palsied limbs from spinal disease; and it would appear from the reports of cases by him and others, that they are more liable to œdema, vesication, sloughing, &c. In fine, the mode of access of paralysis dependent on spinal disease, is for the most part such as has been described as characteristic of the *creeping palsy* of authors.

We occasionally meet with cases of general palsy, well calculated to perplex the pathologist, presenting many indications of spinal disease; and yet, when we come to examine them after death, no lesion whatever is discernible, or at least a very slight one, obviously insufficient to account for the phenomena. We quote such a case from Dr. Abercrombie as a specimen: and it is further worthy of notice, as another instance of palsy almost universal. "A woman, æt. 20, a servant, sprained her back in lifting some heavy article of furniture. Some time after she began to experience weakness of the legs, which gradually increased to perfect paraplegia. After some time the affection extended to the arms, and she then had not a vestige of motion of any of the parts below the head, except a very slight motion of some of the fingers; but the internal functions were all entire, and her speech was distinct, except that in speaking she was sometimes seized with spasmodic twitches of the lips and lower jaw. She lived in that state without any change in the symptoms, her general health continuing good, for about twenty years. In the morning she was taken out of bed and placed in a chair so contrived as to support her in a sitting posture. Her arms were supported on a cross board placed before her; and if by any accident one of them slipped from its support, she had no resource but to call the assistance of some other person to replace it. On one occasion the arm was allowed to hang for two hours, she having been left alone, and it became extensively œdematous. In the same manner, if her head fell forward upon the thorax, it remained in that position until raised by an attendant. Her mind was entire. She died of four days' illness with symptoms of typhous fever. I examined the body," adds Dr. A. "with the utmost care, along with Dr. Pitcairn, and *we could not discover any disease either in the brain or spinal cord.*"*

Cases nearly similar as to the extent of palsy are recorded by Bretonneau and Ollivier, but in which a very slight morbid alteration was discovered. In one, the palsy commenced by loss of motion of the little finger, and rapidly spread to the extremities, the tongue, and partly to the muscles of deglutition. The patient, however, strange to say, retained the power of moving the thumb and two fingers of the right hand. In this case the only obvious morbid change in the nervous centres was, a rust-coloured spot three lines in extent upon the tuber annulare.† In Ollivier's case, a strong sense of pricking in the points of the fingers of the left hand, and toes of the left foot, was the first symptom. This was followed in half an hour by a similar sensation in the same parts on the right side. On the following day there was general paralysis, but the sensibility was not impaired. Respiration and deglutition were considerably affected: the difficulty of respiration increased, and she died the third day. There was only a slight appearance of infiltration of blood in the cellular tissue on the outside of the dura mater of the cord, especially about the lower part.

Now and then cases of general paralysis, apparently dependent on the state of the spinal marrow, are observed to recover. Ollivier has recorded several examples of this kind. The palsy spreads from limb to trunk, commencing in the fingers and toes, and often preceded by tingling or formication, and more or less numbness of the cutaneous surface. The paralysis, although general in extent, is, however, rarely complete; the functions of the rectum and bladder are not at all or but slightly affected, and the intellectual powers are entire. In some cases the palsy is preceded by pains in the dorsal region of the spine, or a sense of fatigue and lassitude and weakness of the spine. It has been observed to follow the stoppage of an habitual evacuation, abuse of sexual intercourse, and the suppression of the lochia in women after parturition. Such cases are supposed by Ollivier, and with much reason, to be occasioned by a temporary congestion of the vascular system of the spine, especially the venous system, so remarkable for its numerous and intricate anastomoses.‡ He conceives that, though the anastomoses are large and numerous, yet the circulation is often deranged and retarded; for, first, these veins are destitute of valves; secondly, he has found in old persons fibrinous clots filling all the venous

* *Abercrombie*, p. 417.

† Revue Médicale, May 1826.

‡ If the reader can have access to the beautiful and accurate plates of Breschet, "Du Système Veineux," he may from them form an adequate conception of the extent and intricacy of the veins of the spine.

ramifications of the spinal marrow, as well as those which accompany its nerves; and, lastly, he considers that respiration exerts a direct influence on this portion of the circulating system, and causes obstacles in it during efforts of various kinds, or strong emotions, or those affections which in a greater or less degree excite the respiratory act.* As a venous congestion, such as we have been alluding to, is not likely to be a permanent morbid appearance, that is to say, might be dissipated under the influence of various causes, either immediately prior or subsequent to dissolution, it is not unreasonable to suppose that some of those cases in which no morbid change was discoverable, may have been attributable to a similar cause.

The general paralysis of lunatics, as described by Esquirol and Calmeil, has been already fully noticed in the articles INFLAMMATION OF THE BRAIN and INSANITY. We may here observe, however, that one of its earliest symptoms, viz. defective articulation, would alone serve to distinguish it from palsy dependent on spinal disease.

It is hardly necessary to advert to the propriety of observing great caution in forming a prognosis of any or all of the forms of general palsy now described. The difficulty of arriving at a certain diagnosis of the proximate cause must necessarily involve the practitioner in considerable doubt.

II. *Partial paralysis.*—Under this head are included those varieties of paralysis in which only a part of the body is engaged; it admits of a threefold division—1. local paralysis; 2. hemiplegia; 3. paraplegia.

1. *Local paralysis.*—This division comprises all those palsies which have their seat in parts of small extent. Local palsies are most frequently met with as precursors of a more extended condition; yet we sometimes find them localized as well in cause as in extent. In the former case they should be regarded with great suspicion, and should excite a vigilance on the part of the practitioner to counteract as far as possible the threatened danger; hence the importance of distinguishing accurately between local palsies under these different circumstances.

We shall notice local paralysis under the following heads: 1. paralysis of the eyelids; 2. paralysis of the face; 3. paralysis of a limb or part of a limb; 4. paralysis of particular sets of muscles, or of single muscles.

Paralysis of the eyelids.—Two forms of palsy are found to affect the eyelids, which, as engaging antagonist muscles, are totally opposite in their effects. In the one the eye remains totally or partially closed (*ptosis, blepharoptosis*); in the other the eyelids are permanently open, the patient having lost in a greater or less degree the power of closing them. (*Lagophthalmia.*)

Ptosis has been so named from its chief and most conspicuous phenomenon, viz., the drooping or fall of the upper eyelid; it occasionally comes under the care of the surgeon as arising from a relaxation and extension of the common integuments of the lid and consequent folds of the skin, by which the energy of the *levator palpebræ superioris* muscle is somewhat but not very considerably diminished.* But that form which we are about to notice is dependent essentially on palsy of the muscle above-named, owing to some affection of the nerve which supplies it. It has been named *blepharoplegia* by the Germans, the patient being unable by any voluntary effort to raise the upperlid, although the power of closing the lids remains entire. It is therefore the object of the practitioner to ascertain in the first place whether this condition of the eyelid be merely produced by the mechanical cause above alluded to, and, secondly, if it be connected with a deranged state of any of the muscles of the eyelid. To decide the first question we would adopt the proposal of Scarpa. "If," he observes, "the atony or complete paralysis of the elevator muscle of the eyelid have had any share in producing the relaxation of it, it may be known by making a transverse fold of the integuments with the fingers or forceps near the superior arch of the orbit. For if this muscle have not lost its power of contraction, when it is relieved as it were from the superincumbent weight of the integuments, the patient is able to raise the eyelid and open his eye sufficiently; if otherwise, the eye remains half closed."† Such a proceeding, it is obvious, must at once determine the state of the *levator palpebræ* muscle; but it should be remembered that a spasmodic state of the *orbicularis palpebrarum* muscle may likewise produce the appearance of fallen lid. The want of permanence of this affection, the occasional power of raising the lid, and the degree of resistance which is always made by the spasmodic state of the orbicular muscle to any attempt to open the lids, will in general be found sufficient to indicate the precise nature of the affection.

Secondly, the practitioner should direct his attention to the motions of the eye-ball. It rarely happens that the fallen lid is a solitary affection; in general, and when it does not depend on either of the causes above named, we find a paralysis of most of the muscles of the eye complicated with it. The patient, it will be observed, has no control over the voluntary motions of the eye-ball; when told to look to the ground he is unable so to do, and the same inability is manifested when directed to look upwards or inwards. If the eyelids be forcibly opened and held apart, and the patient be desired to endeavour to close them, the eye-ball is seen to turn upwards when he makes the effort. Sometimes the power of looking outwards is retained, and in some instances a strabismus in that direction is present.

A moment's reflection will shew that symp-

* *Ollivier*, De la Moelle Epinière, vol. ii.

* Weller's Manual of Diseases of the Eye, by Monteath, vol. ii. p. 97.

† *Scarpa*, by Briggs, p. 127.

oms such as we have now detailed can only be produced by a palsied state of the third nerve. The muscles supplied by the nerve are paralysed, and the eye-ball exhibits motion in only two directions. One of these is abduction, performed by the external rectus which is supplied by the sixth nerve; the other is to be regarded as an involuntary action, instinctively co-existent with the effort to close the eyelids: it is that by which the eye is turned upwards, and, according to Sir C. Bell, is caused by the combined action of the obliqui,* although in such a case as we are now considering, it is difficult to conceive how the inferior oblique muscle can be exempt from that paralysis into which all the other muscles supplied by the third nerve had fallen.

Ptosis, attended with such an imperfection of the motions of the eye-ball, is to be regarded in general as a formidable affection; it is very frequently indicative of cerebral disease, and therefore is often witnessed as a precursor or accompaniment to hemiplegia. Sometimes it is merely the result of local compression of the nerve by a tumour within the orbit. There are occasionally present symptoms indicating more extensive disease, the sensibility of the eye being destroyed, as well as of the integuments supplied by the ophthalmic portion of the fifth nerves, or even of the whole side of the face. Such a case was that related by Mr. Shaw in the twelfth volume of the Medico-Chirurgical Transactions.

If the affection which we have thus briefly noticed be dependent on cerebral disease, the treatment must be directed accordingly; it is obvious that when it is caused by a tumour in the orbit, it is almost completely beyond the control of medicine. Cases may occur in which the propriety of a surgical operation may become a question: we shall only remark on the necessity of observing due caution, lest by converting a closed state of the eyelids into a permanently open one, we thereby endanger the safety of the eye-ball, from its unavoidable exposure to irritating particles.

The second form of palsy of the eyelid is that in which the patient is unable to wink or close the lids. It has been denominated *lagophthalmia, vue de lièvre, oculus leporinus*, from the vulgar notion that the hare sleeps with its eyes open. In these cases the eye remains permanently open, even during sleep, the orbicularis palpebrarum muscle being paralysed. The eye-ball projects to an unusual degree from the socket, owing to the absence of the accustomed resistance from the lids, and if the patient be directed to attempt to close the lids, the eye-ball is instinctively turned up with the effort so as nearly to conceal the cornea; nor is he conscious of that action. As winking can only be performed by drawing down the lid with the hand, free access is allowed for particles of dust, &c. to the surface of the eye, which, being likewise constantly exposed to the air, is necessarily subjected to much irritation and consequent inflammation.

This form of local palsy is chiefly worthy of attention from the contrast afforded by it to that last described; it is unquestionably dependent on disease of the portio dura nerve, and therefore is for the most part only a symptom of a paralytic affection which comes under our next head.

Paralysis of the face.—The muscles of the face receive their nervous supply from the fifth, as well as from the portio dura of the seventh, pair of nerves. Of these, as is now pretty generally admitted, in conformity with Sir C. Bell's views, the former is a compound nerve, conveying sensibility as well as the power of voluntary motion; the latter directs the actions of the muscles in relation to the respiratory act. We have already alluded to the loss of sensibility of the face; it remains to notice these two distinct forms of partial palsy of the face, according as the motive portion of the fifth or the portio dura is the nerve affected.

Reasoning *à priori*, it is quite obvious that palsy of the fifth must produce a set of phenomena very distinct from those resulting from palsy of the portio dura. All voluntary power not only over the features, but also over the motions of the jaw, must be lost on the side affected; whilst, if the latter nerve be in a state of integrity, those motions of the facial muscles which are in accordance with the act of respiration are unimpaired. Mastication is impeded not only by the imperfection of the grinding motions of the jaw, but also from the loss of power in those muscles which place the morsel under the operation of the teeth; "in chewing the action is only on the *sound* side of the head; the masseter and temporal muscles of the *affected* side do not rise or bulge out as in their natural actions, while there remains a perfect command over the features through the operation of the portio dura."* The distortion of the countenance is not very great; the jaw hangs on the affected side, and the angle of the mouth is depressed, that of the other side appearing to be slightly raised; the distortion is moreover either removed or greatly diminished when the patient laughs or smiles, an effect which all excited states of the act of respiration tend to produce. The condition of the face now described is that most commonly seen in hemiplegia; it is rarely met with unconnected with a more extensive palsy, and when it does occur, the sensibility of the face and eye-ball, nostrils and tongue, is very generally impaired or destroyed. The disease of the fifth nerve may be seated either within the cranium immediately in connexion with its ganglion, or there may be cerebral disease.

In those cases where the portio dura is the seat of disease, there is no evidence of the existence of palsy till those actions are called for, to the performance of which the palsied muscles ought to contribute. So long as the patient

* See Appendix to Bell on the Nerves, p. xxxix. et seq.

* Bell on the Nerves, p. 106, 4to edition.

remains quiet, without speaking or smiling, nothing remarkable is observable in the countenance; but when any of the actions of excited respiration, laughing, sneezing, coughing, crying, &c. are produced by the sound muscles, the marked deformity of the countenance becomes apparent. The mouth is drawn to the sound side; and it may be observed in general that the disorder of the features is directly as the intensity of the respiratory act: thus laughing produces greater deformity than smiling. The affected cheek remains motionless, while, to use the expressive words of Mr. Shaw, the face on the other side "seems convulsed with laughter." The patient cannot snuff up with the nostril of the paralysed side; blowing or whistling is imperfectly performed, or failed in altogether. On further examination it will be found that voluntary motion still exists in the muscles of the face and jaw, varying, however, in degree in each, according as the voluntary action of the muscle is more or less connected with respiration. Thus mastication is perfect; here the buccinator performs its office fully as a muscle of mastication, and in one striking case related by Mr. Shaw the child even preferred chewing her food with the affected side. The voluntary action of the muscles influencing the motions of the mouth are not so distinct as those of the muscles of the jaws. Although, when an attempt is made to whistle, it proves completely ineffectual, yet the patient can "purse up" the mouth so as to hold a whistle or a pencil by the action of the orbicularis oris muscle. A slight power remains of elevating the angle of the mouth, and an analogous power can be exerted over the muscles of the forehead.

It is in the cases to which we are now alluding that we meet with that condition of the eyelids termed *lagophthalmia*, and it generally forms one of the most painful and distressing features of the case, in consequence of the constant irritation to which the eye is exposed. Articulation is sometimes affected in this form of local palsy; the patient learns from experience that by supporting the paralysed cheek with his hand the defect can be in some degree remedied. It is clearly important to distinguish between defective articulation arising from this cause, and that from palsy of the muscles, of the tongue, or larynx. The wasting of the paralysed muscles is equally conspicuous in this as in other forms of palsy, and in cases of old standing gives such a peculiar appearance to the countenance, as could hardly fail to direct an experienced observer to the true nature of the complaint. Mr. Shaw, in relating the particulars of a case, writes thus: "There is a remarkable wasting of all those muscles of the face which are subservient to respiration and expression. His cheek is so thin that when he speaks it flaps about as if it were only skin, and the corrugator supercilii and occipito-frontalis, which are principally muscles of expression, are so wasted that we might at first sight suppose they had been removed by operation, and that now the bones were only covered by skin."*

Several opportunities have now occurred of ascertaining the cause of the palsied state of the portio dura. In many instances it has been suddenly produced by the influence of cold; the affection, as resulting from that cause, was long known under the name of *blight*. An inflamed state of the parotid gland, a tumour in the neighbourhood of the stylo-mastoid foramen, or an ulcer over the course of the nerve, have been found severally to cut off the nervous supply. Wounds of the portio dura, whether from accident or the surgeon's knife; disease of the petrous bone, engaging the aqueduct of Fallopius; inflammation of the internal ear: or a tumour compressing the nerve at its entrance into the internal auditory foramen, may likewise be reckoned among the causes. In fine, this form of palsy may have its origin in disease of the brain.

The symptoms above detailed are such as arise from a palsied state of either the fifth or seventh nerve, the other being perfectly free from any disease. Symptoms, however, so exclusively denoting an affection of a particular nerve of the face, are not frequently to be met with, and then only at a short period after the invasion of the palsy; for if the disease be of any continuance, the palsy is apt to spread, as it were, to the unaffected nerves. This is more especially the case when the portio dura is primarily affected, the slight degree of voluntary power over the muscles of expression gradually disappearing, but not from those of mastication. When the fifth nerve is the primary seat of disease, the branches of the portio dura retain their integrity for a much longer period, and in some instances do not exhibit any mark of disease; but in many cases, where the palsy has been of long duration, the extent of the disorder of the countenance can hardly be accounted for, except on the supposition that the disease has extended to the filaments of the portio dura. We think that a careful observation of the countenances of individuals who have been hemiplegic for some time, will sufficiently confirm this statement.

It is rare to meet with palsy of both nerves at the same time.† When such is the case, there must obviously be a modification in the symptoms dependent on the complete resolution of the muscles of mastication as well as of expression. The characteristics of the countenance of the hemiplegic will be conjoined with the strangely disordered expression resulting from the diseased portio dura.

In the treatment of local palsies of the face, especial attention should be directed to ascertain the state of the brain. If there be reason to suspect that the origin of the complaint is there, of course the treatment will be directed to that quarter. If otitis, or

* Med. Chir. Trans. vol. xii.

† See a case by Dr. Abercrombie, in which the fifth nerve was paralysed on one side of the face, and the portio dura on the other, occasioned by a tubercle in the brain. On the Brain, p. 178.

ic pressure of a tumour externally, be the ause, then the proper remedies to subdue he inflammation in the one case, and to pro- iote the absorption of the tumour in the ther, must be had recourse to. External timulants, blistering, directing the steam of oiling water to the face, local bleeding, vill be found useful, but especially in the ases which have been caused by cold. The pplication of strychnine to a blistered surface as proved successful in some cases; the ighth, fourth, or half a grain may be applied n the dressings. We may here observe that he acetous preparation of cantharides, rubbed n to the part with a camel-hair pencil, will e found a very convenient and cleanly mode f producing vesication on the face in these ases. Electro-puncture has been practised with great success by Pichonniere in several ases of this kind; the needles having been sunk in the vicinity of the branches of the liseased nerve.*

Paralysis of a limb or part of a limb.—In children, palsy of a single limb (generally an upper limb) is not uncommon; sometimes dependent on a deranged and loaded state of the bowels, sometimes on disease of the brain, and occasionally from congenital deficiencies in that organ: in such cases, if the child grow up, we see, to use the expression of Sir C. Bell, the limb of a child as it were unnaturally joined to the body of an adult.†

A peculiar form of palsy of the upper extremity is described by Dr. Healy, in the third volume of the Dublin Hospital Reports. "The affection alluded to attacks persons of all ages, males and females being equally liable to it. Prior to the attack, the patient generally enjoyed good health; consequently he is not a little surprised, on awaking from a long and sound sleep, to discover total loss of power of one hand; and, what is remarkable, he generally describes the loss of power as extending to the middle of the fore-arm: in some few cases it extends to the elbow, and is accompanied with a great sense of numbness. The fingers are so completely paralysed that the patient is deprived of their use: great dejection of spirits attends the complaint." No cause could in general be assigned for these symptoms, unless the pressure upon the nerves occasioned by lying with the head resting on the arm; an opinion confirmed by the fact that in many the palsy succeeded to sleeping in a chair in that position. Dr. Healy further remarks, that "this affection has invariably yielded to electricity."

Dr. Darwall has described a species of paralysis affecting the upper extremity, most of the individuals attacked having been in the habit of lifting heavy weights. In some of the cases the palsy at first occupied the muscles connecting the humerus to the scapula, especially the deltoid, which was wasted; there was, therefore, inability to raise the arm, but the power of flexing the fore-arm remained. After some little time, total paralysis of the upper extremities gradually supervened. In one case of this kind, the patient continued for eight years without any use whatever of his upper extremities. In some of the cases the paralysis did not descend below the muscles of the shoulder. Considerable pain in the deltoid muscle generally preceded the paralysis, and one or two of the cases yielded readily to treatment in that stage. Dr. Darwall considers this affection as "one primarily engaging the nerves supplying the elevating muscles; and that they may have been injured by the straining necessary in raising or carrying heavy weights."*

A case in some degree analogous to those last alluded to is recorded by Dr. Abercrombie; it is that of a young lad aged 14, who had nearly lost the muscular power of the upper part of both his arms, accompanied by a most remarkable diminution of substance of the principal muscles. The deltoid and biceps were reduced to the appearance of mere membranes, and the muscles of the scapula were found nearly in the same state: the affection came on gradually, without any sign of spinal or cerebral disorder.

Local palsy seated in either extremity, or part of an extremity, is mostly, as all the other forms of local palsy, found as the first step or stage to a more extended affection. In such cases there is frequently some indication to direct the practitioner to the true source of the complaint. It is not uncommon to meet with instances where palsy affects only a few of the muscles of an extremity. The muscles affected are, as Sir C. Bell† observes, generally those which are naturally combined in action; although those muscles be in different parts of the extremity, and are supplied by different nerves as they are by different arteries; of which an obvious example may be taken from the case of paralysis of the short muscles of the ball of the thumb, in which the palsy also extends to those muscles of the thumb which lie on the fore-arm. Sometimes all the extensor muscles will lose their power, while the flexors preserve it. This seems to be the case in a patient alluded to by Dr. Bright. She had no power of extending her hands; they were precisely in the condition of the "drop hand" from the paralysis caused by lead. She could carry her child between her fore-arms and arms. Sir C. Bell has found the action necessary for writing gone, or the motions so irregular as to make the letters be written zigzag, whilst the power of strongly moving the arm or fencing remained.

It may be asked, what is the condition of the nerves in these cases of local palsy? Some

* Pichonniere sur la Paralysie partielle de la Face. Paris, 1830.

† See a case by Rostan, "Sur le Ramollissement du Cerveau," obs. 1. p. 256. Also cases by Cazauvieilh in his memoir "sur l'Agénésie cerebrale," Archives Gén. de Médecine, 1827.

* Lond. Med. Gazette, vol. vii. p. 201.

† On the Nervous System; Appendix, p. clx. The reader will find in the appendix to this work a valuable and highly interesting collection of facts connected with all the varieties of local palsy.

instances have presented symptoms in the commencement indicating an inflammatory state of the nerve or its neurilemma, which has been further confirmed by the success which has followed local depletion and other antiphlogistic remedies in such cases. It is not rare to see a palsied and atrophied state of the lower extremity succeed to inflammation of the sciatic nerve. In a case by Shaw, palsy of the extensors of the fingers and thumb succeeded to tight bandaging after a dislocation of the shoulder, and was evidently caused by inflammation of the musculo-spiral nerve.* Dr. Bright has given a case in which complete paralysis of the fore-arm resulted from the pressure on the nerves produced by a badly united fracture. Paralysis from pressure on a nerve in various ways is common. Dr. Abercrombie mentions a case of paralysis of the fore-arms and hands of both sides, induced by pressure in consequence of leaning for a long time upon a bar of wood, while the person was stooping forward in his anxiety to witness some public exhibition.

There are cases of local palsy affecting the extremities, or parts of them, in which the state of the circulation in the limb seems a more probable cause of the attack than any primary disorder of the nerves: such are those cases detailed by Dr. Storer, Dr. Abercrombie, and others. The sudden accession of considerable pain in the part is the first symptom; this is succeeded, after a variable interval, by paralysis. The cessation of pulsation in the principal arteries of the limb, with the coldness and numbness which attend the palsy, seem strongly to point to the arterial system as primarily diseased. In Dr. Abercrombie's case, post-mortem examination proved that the arterial system was extensively ossified; and in many places the arteries were obstructed by firm coagula. Drs. Graves and Stokes have also given a case of paralysis of one lower extremity from marked disease of the common iliac, femoral, and profunda arteries of the same side, those vessels being completely plugged up by a dark clot, which likewise extended into many of their ramifications.† There are paralytic states of the extremities connected with rheumatism and gout, for an account of which we refer to the articles on those diseases.

Paralysis of sets of muscles or single muscles.—The muscles concerned in the act of deglutition are sometimes affected with paralysis, but in general towards the close of an old paralytic affection of great extent. Some few cases, however, are recorded in which these muscles were alone paralysed. A well known case of this kind is that described by Mr. Hunter.‡ The patient had laboured under a train of nervous symptoms for some time; one morning he awoke with a sense of choking, a numbness of the right side, together with a paralysis of the muscles of deglutition, which deprived him of the power of swallowing. The palsy did not extend; and this patient owed his cure to the judicious employment of an elastic tube introduced into the œsophagus, by which food and medicines were administered, thus obviating the effects of the palsy. Hysterical palsy sometimes assumes this form, giving rise to dysphagia. The muscles of the larynx may be likewise palsied, giving rise to a species of aphonia: this likewise frequently takes place in hysterical cases. Palsy of the tongue, as a solitary affection, is of very rare occurrence. Sometimes one half of it is paralysed in consequence of pressure on the ninth nerve upon that side; as in a case related by Dupuytren in his Leçons Orales, in which a hydatid compressed this nerve, producing paralysis and atrophy of the same side of the tongue.

Single muscles are frequently the seat of paralysis, in general occasioned by pressure upon the nerve which supplies the muscle. The palsy of the deltoid from pressure on the circumflex nerve by the dislocated head of the humerus, is a case familiar to every surgeon. Palsy of the sterno-mastoid muscle may give rise to all the characters of wry neck. Paralysis of the serratus magnus anticus muscle from pressure on or injury of the posterior thoracic nerve (external respiratory of Bell) gives rise to a remarkable set of phenomena, with which, as liable to lead him to mistake the complaint for something more serious, the practitioner ought to be acquainted. Two cases of this affection are on record; one by Gendrin, the other by Velpeau. In Gendrin's case, there was a marked deformity produced by a tumour seated at the superior dorsal region of one side, and which was evidently formed by the posterior edge of the scapula pushed firmly backwards; it appeared without any assignable cause in the course of a few days. The power of drawing the scapula forwards, and elevating the prominence of the shoulder, was lost; and when both rhomboid muscles were made to act fully, and to approximate the scapulæ posteriorly, the tumour disappeared completely. This case had been mistaken by two medical men for distorted spine. The patient recovered after a few weeks, under the successive application of blisters.* In Velpeau's case the palsy was caused by violence inflicted on the nerve in its passage along the inner wall of the axilla.†

Many forms of strabismus are occasioned by a palsy of one or more of the muscles of the eye-ball; the sound muscles thus obtaining a predominance of action.

The internal muscles, those of organic life, are sometimes palsied. The circular coat of the intestines is no doubt frequently the seat of paralysis; an opinion which would seem to be confirmed by the frequent occurrence of paralysis of the sphincter ani.

Paralysis of the bladder, from prolonged

* Med. Chir. Trans. vol. xii. p. 132.

† Dublin Hospital Reports, vol. v. p. 1.

‡ Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. i.

* See Gendrin's French translation of Dr. Abercrombie's work on the Brain, p. 646.

† *Velpeau*, Anat. Chirurg. vol. i. p. 303.

over-distention, frequently comes under the surgeon's care. In such cases, as well as in that connected with paraplegia, there is *retention* of urine. *Incontinence* of urine is in some cases, in old persons especially, to be regarded as dependent on a paralysed condition of the fibres which act as a sphincter to the neck of the bladder.*

Treatment.—The treatment of the last two classes of local palsy should be conducted on similar principles to those laid down in speaking of paralysis of the face. Of course the palsied states of the bladder will require a distinct plan of treatment, chiefly surgical. Paralytic limbs may be benefited by local treatment, to which we shall refer more at large in another part of this article.

2. *Hemiplegia*, (ἥμισυ, *dimidium*, and πλήσσω, *percutio*,) *semisideratio*. The term is applied to denote paralysis existing only on one side of the body, and affecting not less than the upper and lower extremities. Some have employed it in alluding to paralysis occupying the upper and lower extremities of opposite sides; but that form of palsy may, with less risk of confusion, be denominated *crossed or tranverse paralysis* (paralysie croisée).

Hemiplegia is by far the most frequent species of palsy met with in practice; and it has been stated, upon the authority of Sir Gilbert Blane's comparative observations, that it occurs more frequently on the left than on the right side; the proportion being as three to two.† In general the paralysis affects the side of the face as well as the extremities; the angle of the mouth is drawn to the sound side, and more or less upwards; the tongue is frequently half paralysed, as is rendered evident on its protrusion, when it presents a curve, the convexity of which is towards the affected side, sometimes it is only sluggish as it were, the patient not having the full power of protrusion. The muscles of deglutition are frequently more or less engaged. The mode of progression of a patient labouring under hemiplegia is remarkable. He is said to "drag the leg," the paralysed lower extremity being moved along, or perhaps propelled, by the inclination of the trunk to the sound side; the foot is generally pointed outwards, and when the limb is raised it falls as it were by its proper gravity, presenting that remarkable pointing of the foot which cannot fail to have attracted the attention of any who may have observed a hemiplegic patient walking. The arm of the affected side generally is adducted to the trunk, and the fore-arm appears slightly flexed upon the arm, the wrist and fingers being likewise in a slight state of flexion.

Considerable variation is observable in the manner in which hemiplegia appears. The symptoms which precede or accompany its invasion claim much attention from the practitioner, as being his chief guides in the formation of a correct prognosis, as well as in the application of a suitable treatment.

1. Hemiplegia is the most common form which paralysis assumes from effusion of blood within the cranium. When the coma of the apoplectic seizure is removed, and consciousness is restored, the patient is generally observed to be hemiplegic.

2. Hemiplegia sometimes appears suddenly without previous indication, and with or without stupor: in such cases it is most frequently a precursor of apoplexy.*

3. A third variety is that in which symptoms, more or less painful in their character, precede the paralytic attack: pain in the head, with fever of variable duration and intensity; more or less disorder of the intellectual powers; spasmodic twitchings of the muscles; muscular stiffness; convulsions, ending in hemiplegia, with considerable pain in the paralysed limbs.

4. Another form occurs chiefly in persons past the meridian of life. The patient is observed to be morose, heavy, and drowsy; his digestion is disordered; memory and intellect are impaired; there is loss of one or more senses, usually sight or hearing; then sudden loss of speech, difficulty of protruding the tongue, followed by paralysis of half of it; distortion of the face; complete hemiplegia.

5. A train of symptoms of an anomalous, and to the physician a perplexing character, sometimes precede the hemiplegia; viz. headach, nervous excitability, deranged functions, with a number of uneasy sensations referable to various causes. The patient continues to complain; nor is the obscurity of his condition removed till paralysis begins to develop itself either by suddenly attacking one half of the body, or by creeping on from some remote part. It is with such cases as these that we occasionally observe symptoms resembling chorea, or fits of an epileptic character. The writer has lately seen a child in whom there is an incomplete hemiplegia, the lower extremity being completely paralysed, the upper partially so: there is also a convulsive action of the flexor muscles in the fore-arm, and a convulsive protrusion of the tongue, taking place almost every two minutes; there is slight ptosis of the eyelid, but the features are regular. The case of the celebrated M. de Saussure is one somewhat in point.†

6. Hemiplegia is occasionally met with at some period after the receipt of an injury of the head. We remember such a case in the person of a gentleman about forty years of age, who about two years previously had been severely wounded on the head by highwaymen. The hemiplegia, which came on gradually, and was on the side opposite to that on which the injury had been inflicted, was complete, and resisted every kind of treatment. The case proved fatal, but the body was not examined after death.

* *Boyer*, Maladies Chirurgicales, vol. ix. p. 274.
† See also Dict. des Sc. Méd. art. *Paralysie*.

* Abercrombie, p. 14.
† See Med. Chir. Trans. vol. vii.

The morbid states of the brain with which hemiplegia in the above-mentioned varieties is connected have already been sufficiently dwelt upon in the article INFLAMMATION OF THE BRAIN. In fact, there is no diseased condition of either the brain or its membranes with which this form of palsy has not been found co-existent. With a few exceptions, not altogether to be fully relied upon,* the disease has been found on that side of the brain opposite to the seat of the paralysis. That this should be the case, anatomy would lead us to expect; the interlacement or decussation of the fibres of the anterior columns of the spinal marrow *(corpora pyramidalia)* at their summits being now generally admitted, and easily demonstrated. According to the views of Foville and others, we should likewise expect to find the optic thalami and corpora striata, or some of the fibrous radiations which pass through these bodies, the seat of disease in hemiplegia. And in point of fact we must admit, that in the generality of cases of this description, those bodies, or some portion of the cerebral hemisphere, present a morbid alteration of structure variable in extent as well as in degree. Cases, however, it must likewise be admitted, do occur, in which only one of the bodies above-mentioned is the seat of disease, or in which no appreciable alteration can be detected in the hemisphere. Such occurrences can hardly be deemed as decidedly to militate against the theory of Foville, &c., inasmuch as our ignorance of the mechanism of cerebral action, whether healthy or morbid, is alone sufficient to render them anomalous to us. They should, however, increase our caution in receiving speculations upon the uses ascribed to the different portions of the brain, and should excite us to increased accuracy of detail and minuteness of enquiry upon these points of pathological anatomy.

Hemiplegia may be induced by disease of the upper part of the spinal marrow, the morbid alteration being on the same side with the paralysis. Such cases are rare, however; for it is seldom that disease would be exactly limited to a lateral half of the marrow. In general, when they do occur, the hemiplegia is only a precursor of the general paralysis above described. Dr. Bright,† Ollivier, and Velpeau‡ give cases of this description; and in the Edinburgh Medical and Surgical Journal for April 1825, a case is related where hemiplegia resulted from concussion of the spine, accompanied with complete anæsthesia of the other side of the body. The paralysis of motion did not extend.§

Cazauvieilh has published two interesting memoirs on *congenital* paralysis, by which he would signify that which appears at birth, or a short time after it. To the cerebral alteration on which the paralysis depends he has given the name "*agénésie cérébrale*," denoting a defect of development or of growth in the brain or any of its parts. In the majority of the cases detailed in these memoirs, the paralysis was in the form of hemiplegia, the limbs were greatly wasted, stunted in growth, and with many in a state of permanent flexion. The upper extremities were generally more altered than the lower; in many cases they were bent and contracted, the elbow, wrist, and fingers being flexed. Among the muscles of the lower limbs, those of the calf of the leg chiefly presented the phenomenon of contraction, and thereby kept the foot permanently extended. The paralysis was complete in only a small number of cases. The organic defects were as follow: a depression on one side of the cranium indicated a corresponding want of development of the subjacent cerebral hemisphere,—a deficiency further proved by the flattened, non-developed appearance of its convolutions, the difference of size from the hemisphere of the other side, the less capacity of the ventricle, as well as a slight diminution in the dimensions of the corpus striatum and optic thalamus. The cases observed by Cazauvieilh were mostly in persons who had arrived at an advanced age.*

Intermittent hemiplegia.—A form of hemiplegia, which may be denominated *intermittent*, has been alluded to by Sauvages, Morgagni, and Cullen. Sauvages, by whom the species has been particularly noticed, describes it as coming on every day, and after some hours receding, with an accession of quotidian fever; and he gives a minute account of a case of this kind. The case described by Morgagni was that of a woman aged forty, who, after severe and long-continued headach, became completely hemiplegic; when thus affected, she was likewise seized with the same kind of palsy *on the healthy side* every day towards the evening, which went entirely off as the morning came on. After this disorder had attacked her seven or eight times at nearly the same hour, she died of pneumonia. There was no examination of the body.†

A case of this description is recorded by Dr. Elliotson.‡ The patient, forty-eight years of age, had been in the East and West Indies, and had had fever at Bombay and at Batavia, and had suffered from dysentery and diarrhœa. For two years and a half previous to his admission into St. Thomas's Hospital he had been subject to paroxysms, which threw him into the condition of a perfect hemiplegic; totally losing the power of his arm, and "dragging his leg in a semicircular way, as patients

* See the cases of Bayle, Revue Médicale, 1825; one by Bright, (Reports on Diseases of the Brain,) which the author himself admits to be a "doubtful exception;" and Morgagni, lib. i. epist. ii. § 16. The most complete exception with which we are acquainted is one mentioned by Cazauvieilh, Archives Gén. de Médecine, May 1827, p. 15-16.

† Op. cit.

‡ Archives Gén. de Méd. June 1825.

§ See also a case by Portal, Anat. Méd. tom. iv. p. 116.

* See Archives Gén. de Méd. for May and July 1827.

† See Cooke on Palsy, p. 20.

‡ London Medical Gazette, vol. vii. p. 486.

sually do when labouring under hemiplegia." The paroxysm began at ten o'clock on every hird or fourth morning, and lasted in its full orce from three to four hours; "but although t lasted only that time, he was not perfectly lear from it the whole day." The man had a ickly aguish look, and very much the appearance of one who had suffered from a hot climate. Under the supposition that the patient's complaint arose from malaria, he was reated with large doses of sulphate of quinine, ive grains every sixth hour, afterwards increased o ten grains. The effect of the medicine was decided improvement in the general health, and a considerable increase in the intervals between the paroxysms. It does not appear that a perfect cure was effected.

Prognosis.—We believe it is quite consonant with the results of general experience to state, that hemiplegia connected with an apoplectic condition of the encephalon is that which is most likely to recover. That the effused blood may be absorbed and leave nothing to indicate the situation it occupied but a small cavity, is now abundantly proved. But in cases where there is no effused blood, it is obvious that less difficulty exists to restore the brain to its healthy condition, and in these cases accordingly we frequently find the paralysis yield readily and even quickly to treatment. When the effusion has taken place, we sometimes see the disappearance of the palsy and the absorption of the coagulum to proceed *pari passu*; but such an event does not occur so frequently as we might, *à priori*, be led to expect. It sometimes even happens that the coagulum has been completely absorbed, and yet the paralysis continues in no degree diminished. The writer has in his possession a portion of brain of a girl twenty-two years of age, who had been hemiplegic after apoplexy, and continued so, without any recurrence of apoplexy, till her death, one-half of the body being *completely* paralysed. The brain was healthy, with the exception of a small cavity not exceeding four or five lines in diameter, situated about the centre of the left hemisphere lined with a brownish-coloured membrane, and containing a serous fluid of a similar colour. In fact, it would seem as if, after a certain period, the cerebral lesion and the palsy lost their relation to each other as cause and effect, and the latter continues as it were independent of the condition which originally gave rise to it.

Treatment of hemiplegia.—The treatment of hemiplegia varies according to the time which has elapsed since its accession. If the patient be seen immediately after the appearance of paralysis, the practitioner must look accurately to the condition of the nervous system, directing his remedies to that which appears to be the seat of the disease. These remedies, though few, are, when appropriately applied, powerful, and in the diversity of lesions which give rise to the affection under consideration, require the exercise of much judgement and discrimination in order to their successful employment.

The principle of treatment, then, in this early stage of hemiplegia, will depend on the precise nature of its cause, on the general condition of the patient, his age, and previous state. Bleeding, purging, and other antiphlogistic remedies may be adopted where there is decided evidence of plethora, inflammatory or apoplectic. How far these measures may be carried with safety or advantage, the circumstances of each particular case can alone decide; in general, however, it will be found necessary to employ them to some extent, so as to produce a decided effect upon the system of the patient. When all inflammatory symptoms have been reduced, a mild mercurial treatment has often proved extremely useful. Does it in apoplexy promote the absorption of the coagulum? Dr. Prichard observes, respecting the use of mercury in hemiplegia, "that those patients in whom a slight degree of ptyalism has been produced, have almost uniformly appeared to him to derive material benefit from it, and their recovery has been more complete than that of others in whose cases the same remedy has either not been used or has not been administered to the same extent."

Due attention must of course be paid to regimen. Abstinence from all stimulating elements, solid or fluid, must be rigidly observed in the great majority of cases. In a more advanced stage of hemiplegia, where the urgency of the brain symptoms appears to be either diminished or removed, and where the palsy is the object chiefly worthy of attention, the physician has in view a twofold object,—to prevent a recurrence of head symptoms, and, secondly, to alleviate the condition of the limbs. The former end is to be attained more by avoiding what has a known injurious tendency than by adopting any particular plan of treatment; this, however, is not to be neglected, as a proper regimen does much towards maintaining a uniform state of the general system: we may add that in this stage especial benefit will be derived from allowing the patient to enjoy air and exercise as much as he is able to bear. Change of air and scene are unequivocally of decided advantage, and a visit to some watering-place is often made in this stage of the complaint with marked benefit. Mental serenity and a freedom from the cares of business are indispensable.

To alleviate the condition of the paralysed limbs, the treatment may be applied to the seat of the original disease as well as to the limbs themselves. Thus, with a view to act upon the seat of the primary disease, we have recourse to counter-irritation in the vicinity, or, as some prefer it, more remotely. For this end we employ setons, issues, blisters, tartar-emetic ointment, or tartar emetic in powder sprinkled on the dressings applied to a blistered surface; frictions with liniments containing various irritating substances, among which we may mention the croton oil as being an extremely severe irritant. Dr. Prichard highly extols the practice of inserting a large issue in the scalp in cases of this kind; he advises an incision to be made completely through the scalp for four or five inches over the sagittal suture, and the

edges of the wound to be separated by a row of peas.*

The treatment of the paralytic limbs consists in the application of stimulating applications, with the idea that a stimulus applied to the sentient extremities of the cutaneous nerves may have the effect of rousing from their state of torpor the more deeply-seated trunks. Of these external stimulants we may enumerate the following: dry friction with the hand or by the flesh-brush, a remedy much approved by Dr. Cooke; warm baths; stimulating liniments prepared of the concentrated acids or the caustic alkalies combined with oil or lard; brine, or a strong solution of sea-salt; terebinthinate applications; sinapisms; blisters. Dr. Cullen has found the use of liquid styrax, in the proportion of one part to two of the old black basilicon, remarkably serviceable in paralytic cases. The application of cold has been recommended, and we have known it beneficial when applied daily in the form of a shower-bath. Some more simple stimulants than those now enumerated have been employed, such as, tickling the parts with a feather, which, according to the statement of Mr. Wardrop, proved beneficial in a case of eighteen months standing, which recovered in two months. Stinging with nettles was employed by Celsus, and Graefe is said to use the *dolichos pruriens* as an external stimulant applied to the surface, and maintained in apposition with it by means of a bandage. It produces some degree of cutaneous inflammation, but requires frequent renewal.

Among the external stimuli we may mention electricity: the efficacy of this agent in many paralytic cases does not want proof. Lightning has been known to cure paralysis: we extract an anecdote exhibiting this effect of the electric fluid from one of the numbers of the Medico-Chirurgical Review: a vessel on the Atlantic was struck several times with lightning, insomuch that many of the crew were strongly electrified. Among the passengers was a man who had been paralysed in both his inferior limbs for three years. At the time of the electric discharge he lay on his bed, but soon after perceived the return of power to his limbs, and was enabled to rise with perfect use of them. The cure in this case was permanent. A case is related in the Haerlem Transactions, in which a hemiplegic patient recovered the use of his side after a hundred strokes from the *gymnotus electricus*, or electric eel.

Though it must be admitted that electricity is occasionally a successful remedy in palsy, still it has by no means equalled the anticipations at first entertained respecting it. Its failure may be very well ascribed to a cause which is equally calculated to impair the power of all stimulants over palsied nerves. "Applied in a certain manner," says Dr. Cooke, "electricity is a most powerful stimulant to the nervous system; but as it is also a stimulus to the sanguiferous system, it has often been hurtful in those palsies which depend upon a compression of the brain, and especially when it has been so employed as to act upon the vessels of the head." Great circumspection must be observed, lest in the use of electricity we excite the circulation to such a point as to increase the evil we seek to remedy. Applied as a topical remedy, it will be less apt to produce mischief, and for this purpose the method of *electro-puncture*, already alluded to under the head of Local Palsy, may be resorted to with advantage. The facility afforded of gradually increasing the force of the shock by the employment of the galvanic apparatus, renders galvanism a more safe and suitable agent than electricity; and according to the conclusions of Dr. Bardsley from comparative observations, its efficacy is superior to that of electricity.

But there is a class of internal stimulants which, having a tendency to excite the nervous system so as often to produce convulsive action, have been employed in paralytic cases. Among these we may mention rhus toxicodendron, strychnine, brucine.

The rhus toxicodendron *(poison sumach)* was first introduced by Dr. Alderson of Hull. A powder from the leaves is given in doses of half a grain three times a day, and its quantity increased to two, three, or four grains, carefully watching its effects. Its most common effect is a twitching or convulsive motion, or a sense of tingling or pricking in the paralytic part. The medicine, like all of this class, does not seem much to be relied upon.

Strychnine and brucine, the former the active principle of the nux vomica, the latter extracted from the bark of the false angustura, *(brucia anti-dysenterica,)* are both remedies of the same class, powerful excitants of the nervous system. Strychnine, however, is much more potent than brucine. Andral ascertained by comparative trials that six grains of brucine were equal in their effects to one grain of impure, or a quarter of a grain of the pure strychnine; he therefore considers the former a safer medicine than the latter. Both, however, are dangerous and uncertain; dangerous, from the risk of increasing cerebral irritation, an effect which we have frequently seen; and uncertain, inasmuch as some persons appear more susceptible of their effects than others. Thus, in one individual one-twelfth of a grain of strychnine produced severe symptoms; and in another the dose was raised to a grain without inconvenience. Andral comes to the conclusion that in cases where, as if from habit, the paralysis continues after the effusion has been absorbed, the limbs will be improved under the use of strychnine or brucine; that when the brain is still in a disordered state, these medicines have the effect of exciting inflammatory action; but that, in those forms of palsy not dependent on disease of the nervous centres, they are advantageous, as, for instance, in the lead palsy, or that from rheumatism.* Strychnine may be administered in doses of one-twelfth or one-eighth of a grain, gradually and cautiously increased. Brucine may be given in half-grain doses.

* Lond. Med. Gazette, vol. vii. p. 427.

* Journal de Physiologie, 1823.

The following observations, from Dr. Abercrombie, respecting the administration of stimulants, are well worthy of attention: "All the remedies of this class must be used with considerable degree of caution; and perhaps the use of them may be more safe, and may be carried on with a greater degree of activity, if the general system at the same time be kept in a very low state by spare living and occasional evacuations. This, I imagine, is always to be considered as an essential part of the treatment, and I cannot agree with some respectable writers, who hold that the diet in paralytic cases ought to be nourishing and restorative. With this precaution I think it probable that there are many cases of paralysis in which stimulants may be employed with much benefit."

Iodine, in various forms, has been of late years employed in the treatment of palsy. The result of Dr. Manson's* trials of this medicine are not very encouraging. In scrofulous constitutions, where the paralysis seems immediately dependent on some local development of scrofula, it may be tried with more hope of success than in any other form.

A sudden excitement of the nervous system has been known to carry off the palsy. Thus, a violent fit of mental emotion, anger, fright, have had this effect. The sudden supervention of a fever has likewise removed it: hence Dr. Good recommends as a remedy, in some instances of paralysis, a journey into the hundreds of Essex, or some other marshy district!

Several cases are on record of the spontaneous cure of hemiplegia as it were by the mere remedial energy of nature.†

3. *Paraplegia.* It is of importance, for reasons which will presently appear, to decide what is the established acceptation of this term among medical writers. The principal modern writers, as Sauvages, Cullen, Swediaur, Good,‡ Baillie, Cooke, and Rostan, employ the term paraplegia to denote that species of palsy in which the lower half of the body on both sides is paralysed. Much confusion existed among the older writers as to the sense in which they used this term; Hippocrates signifying by it any palsy which was the consequence of apoplexy; Aretæus denoted by it a partial palsy in any situation; Boerhaave and Van Swieten a palsy of all the parts below the neck. Mr. Earle has infringed upon the unanimity of modern writers by endeavouring to revive the definition of Boerhaave and his commentator; for what reason we are at a loss to understand, inasmuch as the etymology§ of the word affords us but little guidance.

We have preferred adhering to the definition of Cullen and others,‖ as that which is almost universally adopted, and, moreover, because that degree of palsy which Mr. Earle employs the term paraplegia to denote, appears to us to come more appropriately under our division of *general paralysis*. When paraplegia is perfect, there is complete loss of the power of motion in the lower limbs, with paralysis of the bladder, rectum, and sphincters; there is also in general a considerable degree of impaired sensation, more, as we have already had occasion to remark, than in any of the other forms of paralysis of motion. Very frequently we find paraplegics more or less affected with spasmodic action in some particular muscles of the lower limbs; sometimes this is confined to the flexor muscles, and we occasionally see a permanent state of flexion of the thighs on the trunk, and the legs on the thighs; sometimes, on the other hand, the extensors are thus spasmodically affected, as in the case of a young man which occurred to the writer, in which there was no power of flexing the lower limbs; but if at the request of the patient they were placed in the state of flexion, (for when in that condition they were more free from uneasiness,) after the lapse of a short interval they were, by short and successive twitchings of the extensor muscles, gradually brought back to the state of extension.

In general there is, along with the palsy of the limbs, paralysis of the bladder and of the sphincters; the former shews itself sometimes by incontinence of urine, but more frequently by retention. All ages are liable to paraplegia, but it occurs more frequently in adults and old persons, and, according to Dr. Baillie, in males than in females.

In the mode of access of paraplegia there is less variety than in that of hemiplegia. The first symptom is generally a derangement of sensation, a sense of numbness in the lower limbs, with impaired power of motion. The weakness of the limbs is further indicated by the patient evincing a tendency to trip when walking, being tired after but a little exertion in that way; complaining of a sense of weight and some degree of pain in the feet and extending up the legs. "The want of power of motion in the limbs, and the inability to preserve the due balance of the body very much increase, and the person cannot walk without the assistance of one or two sticks, or the aid of some other person, who more or less supports him."* The paralysis of the bladder and sphincter next appears, and now the patient is obliged to confine himself to his bed; there is a great tendency to sloughing of the nates, or of any part on which there is prolonged pressure; in some cases a communication has been produced between the rectum and bladder, thus affording the patient a relief from retention by converting it into incontinence of urine. The secretion of the kidneys seems a good deal affected in this complaint; the urine seems prone to calculous deposit, a remark which we believe originated with Dupuytren, who observed that catheters left in the bladders of paraplegics became more quickly

* Researches on Iodine, &c.

† See Abercrombie, p. 306 et seq.

‡ See their Nosological Systems.

§ Παρὰ, vitiose, and πλήσσω, percutio.

‖ "But there is another form of paralysis called paraplegia, in which the lower half of the body is more or less impaired in its nervous power."—*Baillie.*

* *Baillie*, Trans. Coll. Phys. vol. vi.

encrusted with calculous matter. Sometimes there is a remarkable degree of flatulency of the abdomen, amounting even to tympanitis. The uterus is likewise found to be incapable of its contractions in cases of paraplegia. This fact was observed by M. Brachet of Lyons, who had a patient who became pregnant during the existence of the paraplegia: it was necessary to effect delivery by the forceps. It may be stated that the same physician found, by experiments on animals, that injury to the lumbar portion of the spinal marrow destroyed the contractile power of the uterus.

This form of palsy may depend on disease of the brain or of its membranes, or of the spinal cord or its membranes, or disease of the vertebræ or the uniting ligaments. It was not very long ago supposed that paraplegia resulted only from spinal disease, and Dr. Baillie was the first to call the attention of the profession to its dependence on diseased brain, the spinal cord being perfectly healthy. If diseased brain can produce a palsy of one lower limb, as in hemiplegia, why should not a more extensive or differently situated disease produce palsy of both lower limbs? Were the views of Foville regarding the influence of the corpora striata over the lower extremities established, it is obvious that the effect of simultaneous disease in both would be the production of paraplegia. It must be confessed, however, that the general symptoms of paraplegic palsy chiefly resemble those resulting from spinal disease: the tendency to spasm, the frequent impairment of cutaneous sensibility, the absence, in many instances, of any of those symptoms which so often precede or accompany cerebral disease, are so many circumstances connected with paraplegia which favour the above opinion. Admitting, however, the possibility of the production of paraplegia by cerebral disease alone, we cannot but consider that, as a practical question, it is still *sub judice*, and that chiefly from the too frequent neglect of examining the spinal marrow. Thus we read reports of cases of this affection where post-mortem inspection discloses marked disease of the brain; but from no examination of the spinal marrow having taken place, we can arrive at no satisfactory conclusion. A case of this kind is reported in Dr. Abercrombie's work. The patient was a boy, seven years of age, and before death was blind, epileptic, and paraplegic. Examination after death discovered a firm white tumour, the size of a large bean, lying over the junction of the optic nerves. There was extensive effusion to the amount of twelve ounces in the ventricles, and both hemispheres of the cerebellum were diseased; the left being much indurated, the right reduced to a mass of unhealthy scrofulous suppuration. The spine was not examined.* Who could venture, in the true spirit of philosophy, to state to what cause the paraplegia was attributable in this case?

Perhaps the greatest difficulty which the practitioner has to encounter in the consideration of a case of paraplegia, is to determine the precise seat of the lesion which gives rise to it. In some cases there are unequivocal signs of spinal disease, such as great tenderness on percussion over a particular portion of the spine; alteration of the form of the spine; projection of one or more vertebræ. Mr. Copeland has adopted a very simple and obviously useful expedient in obscure cases to ascertain the locality of spinal irritation; he takes a sponge dipped in water as hot as can be borne, and passes it down the whole length of the spine; and if there be any irritation confined to a particular spot, the patient will evince it by expressing pain, and wincing as the sponge passes over that region.

The habit of the patient, his previous mode of life, as well as the symptoms immediately preceding the attack of paralysis, will assist the practitioner to discover whether any cerebral affection is complicated with the spinal disease; thus in some instances, as Mr. Earle remarks, there is an impaired state of some of the external senses, accompanied with vertigo, a sense of weight on the head, and a general disturbance of the cerebral functions; in some there is likewise derangement of one or more of the mental faculties. In such cases there can be little doubt of at least *the complication* of cerebral disorder. "But," as Mr. Earle adds, "it is in slighter and more chronic cases that it is often difficult to form a correct opinion; yet to establish a correct diagnosis in such cases is of the utmost importance, both with respect to the probable termination of the case and with reference to the proper treatment to be adopted, that we may not subject the individuals to useless suffering from the application of caustic issues and setons to the spine, and the disappointment which would follow." To obviate this difficulty, Mr. Earle has proposed an expedient which we shall give in his own words: "It is well known that when a nerve is stimulated or injured in any part of its course, the painful sensation is referred by the percipient mind to the sentient extremity of such nerve; the familiar instance of the pain referred to the extremity of an amputated limb may be adduced in proof of this. The exact reverse of this takes place when there is a partial paralysis arising from morbid affection of the cerebral organs. Here the centre of the sensorial functions being impaired, it appears to be incapable of transmitting its influence to the extreme parts of the body; in such cases, if the nerves supplying the limbs be irritated, *they will convey the impression of such injury only part of the distance down the limb, about as far as the*

* *Abercrombie*, p. 182. In a case by Mr. Earle the lower part of the spinal marrow was not examined, yet it is headed "Paraplegia from Disease of Brain."—Med. Chir. Trans. v. xiii. p. 530.

* See an interesting paper on paraplegia in the Med. and Phys. Journal for June 1827, by Dr. Burder, who considers that those cases of paraplegia which are coincident with cerebral lesion, are caused by the increased *spinal* effusion consequent on that lesion.

commencement of the paralytic affection. I have repeatedly examined cases of paraplegia from affection of the spine, and in no one instance have met with the same phenomenon, which I have therefore been induced to consider as diagnostic of the paralytic affection being dependent on disease of the brain or its membranes; which opinion has in several instances been confirmed by examinations after death, in which both brain and spinal marrow have been carefully investigated." It is hardly necessary to mention that paraplegia is a frequent result of concussion and other spinal injuries.

Treatment of paraplegia.—As topical remedies are chiefly applicable in this form of palsy, it must be obvious of what importance it is to ascertain to what region they may be most advantageously applied. Cupping and leeching are, in the generality of cases, primarily indicated. Counter-irritation by blisters, issues, setons, moxas, &c. may then be had recourse to. Purgatives are to be administered as they may appear necessary, and Dr. Baillie's mode of treatment is well calculated to be serviceable; he directed a grain of calomel, or five grains of the pilula hydrargyri, with one grain of dried squills, to be taken every night for many weeks; these were followed by purgatives.

The same treatment of the palsied limbs may be adopted here as that alluded to under the head of hemiplegia. The palsy of the bladder will require the introduction of the catheter, and we would merely allude to the necessity of using pressure above the pelvis to ensure the complete expulsion of the urine.

Certain mineral poisons, viz. mercury, lead, and arsenic, give rise, when received to a great extent into the system, to a form of palsy which Cullen has denominated *venenata*. The palsy resulting from mercury and lead has already been so fully treated of that we think it needless to allude further to it here. (See Diseases of Artisans and Colica Pictonum.)

Palsy has, in some cases, followed the use of arsenic, chiefly where it had been taken or administered as a poison. In some of the cases related by Orfila, the palsy was not extensive, and appeared a short time before death. In a young man whose case is related in the Medical and Physical Journal, there was paralysis of the four extremities, which continued for some time, and ultimately proved fatal.

Paralysis agitans.—The peculiar affection thus denominated by Mr. Parkinson is the *scelotyrbe festinans* of Sauvages, and from the peculiarity of the patient's gait has been called by Dr. Good synclonus ballismus, (*βαλλίζω, tripudio.*)

Mr. Parkinson's description of the disease is the best we possess; we therefore subjoin it. "So imperceptible is the approach of this malady, that the precise period of its commencement is seldom recollected by the patient. A slight sense of weakness with a proneness to trembling, sometimes in the head, but most commonly in the hands or arms, are the first symptoms noticed. These affections gradually increase, and at the period perhaps of twelve months from their first being observed, the patient, particularly while walking, bends himself forward. Soon after this his legs suffers similar agitations and loss of power with the hands and arms. As the disease advances, the limbs become less and less capable of executing the dictates of the will, while the unhappy sufferer seldom experiences even a few minutes' suspension of the tremulous agitation; and should it be stopped in one limb by a sudden change of posture, it soon makes its appearance in another. Walking, as it diverts his attention from unpleasant reflections, is a mode of exercise to which the patient is in general very partial. Of this temporary mitigation of suffering, however, he is now deprived. When he attempts to advance, he is thrown on the toes and forepart of his feet, and impelled unwillingly to adopt a running pace, being in danger of falling on his face at every step. In the more advanced stage of the disease, the tremulous motions of the limbs occur during sleep, and augment in violence till they awake the patient in much agitation and alarm. The power of conveying the food to the mouth is impeded, so that he must be fed by others. The torpid bowels require stimulating medicines to excite them into action. Mechanical aid is often necessary to remove the fæces from the rectum. The trunk is permanently bowed; muscular power diminished; mastication and deglutition are difficult, and the saliva constantly dribbles from the mouth. The agitation now becomes more vehement and constant; and when exhausted nature seizes a small portion of sleep, its violence is such as to shake the whole room. The chin is almost immoveably bent down upon the sternum; the power of articulation is lost; the urine and fæces are discharged involuntarily, and coma with slight delirium closes the scene."*

But few cases of this disease are recorded: it possesses many points of similarity to chorea, or to the palsy from mercury, which has been better termed *tremblement mercuriel.* It is therefore to be distingished from these diseases as well as from the trembling which succeeds the abuse of spirituous liquors; that which proceeds from the immoderate use of tea or coffee; or that which appears to be dependent on old age. In these cases the agitation ceases if the trembling limb be supported, and none of its muscles called into action; whereas, in the real shaking palsy, the reverse takes place; the agitation continues in full force whilst the limb is at rest and unemployed, and even is sometimes diminished by calling the muscles into employment. To this we may add the peculiarity of gait evinced here; "*the patient, when he attempts to walk, being impelled unwillingly to adopt a running pace*"—a symptom which we would be disposed to consider as pathognomonic.

All is conjecture respecting the anatomical condition of the nervous centres in this disease: the symptoms, however, seem strongly to fa-

* Parkinson's Essay on the Shaking Palsy. London, 1817.

vour the opinion of Mr. Parkinson, that there is spinal disease, and in the cervical portion of the spinal marrow.

The treatment consists in the adoption of the same measures which are applicable in all forms of palsy dependent on spinal diseases.

(R. B. Todd.)

PARAPLEGIA.—See Paralysis.

PAROTITIS, (from παρωτὶς, the parotid gland,) inflammation of the parotid gland, *mumps*. Inflammation of the parotid gland is an occurrence which may be the effect of the common causes of inflammation generally, in healthy persons, as of exposure to cold or local injury; or it may be secondary, and consequent to a cachectic state of the body or already existing disease, as in strumous subjects, and as it takes place occasionally in a subacute form at the termination of fevers, to which it has sometimes appeared to be critical. Parotitis is now and then observed to follow the inflammatory eruptive diseases, as measles, small-pox, and scarlatina; and occasionally to come on as if from the absorption of acrid matter from disease of the surrounding parts, as eruptions or excoriations. Lastly, parotitis presents itself as a peculiar and probably a specific disease, characterised by the duration of its inflammatory stage, and originating from no manifest exciting cause, except contagion. As it occurs under all but the last mentioned circumstances, the affection corresponds to the *parotis* of some of the ancient writers, and to the *phlegmone parotidæa* of Mason Good: the exception constitutes the *empresma parotitis* of the same nosologist, and the cynanche parotidæa of Cullen its more general nosological appellation at the present period.

Parotitis, from whatever cause it may arise, is characterised by tumefaction of the parotid gland, recognizable by the eye and hand of the examiner, together with local pain increased by and rendering difficult the natural movements of the lower jaw, and giving rise to febrile symptoms more or less severe. The modifications of it which seem to arise from various causes, and *not* from contagion, we shall refer to under the term simple parotitis; that which has the more peculiar character, commonly known by the name of cynanche parotidæa, we propose to treat of afterwards, under that name, as a distinct disease.

1. *Simple parotitis* presents, in most of its circumstances, phenomena similar to those of inflammation in other parts which have the same relative approximation to the surface of the body, namely, local pain, tumefaction, and increased heat, and, as it advances, redness of the superjacent integuments; added to these, there is occasionally a sense of throbbing about the parts, with headach and other cerebral disturbance, and occasionally even difficulty of respiration and deglutition. The degree of fever which accompanies it is proportionate to the extent of the local affection and the irritability of the subject. At an uncertain period, simple parotitis terminates in resolution, with subsidence of the febrile symptoms, or goes on to suppuration or abscess and ulceration, and may even end, although it very rarely does so, in gangrene and death.

Parotitis is often so transient and little distressing to the patient as to yield to the mere promotion of warmth of the part by covering it with flannel or any other additional wrapper; and it may be well to remark here that warm applications to the angle of the jaw, in all inflammatory swellings of the parotid gland, contribute much more to the mitigation of pain and other consequent symptoms than the cold epithems usually found to give relief in inflammation of other parts. When parotitis is more severe, detraction of blood from the region of the inflamed gland will be further necessary; to be followed up by constitutional treatment of the antiphlogistic kind, proportioned to the general effects of the local disease. If, nevertheless, suppuration should not be prevented, an early outlet should be made for the contents of the abscess, and the treatment of this and every other stage of the disease pursued on the principles laid down in the article Inflammation.

The subacute inflammation of the parotid gland, which is occasionally found in complication with scrofula and other diseases, is in fact a manifestation of them, and pertains to their discussion in other parts of this work. When consequent to acute or eruptive fevers, the primary inflammatory stage is rarely if ever to be recognised, and an abscess of the gland proclaims that it has existed. An early evacuation of the contained pus will be the direct medium of relief, and the treatment of debility consequent to such diseases, of which it is generally an indication, the method to be pursued for the further restoration of health.

When parotitis is a consequence of any particular state or disease of the adjacent parts, the removal of its cause must be the first object of attention. Leeches, however, applied to the region of the enlarged gland will give relief, and their repeated use may be necessary to counteract the continued operation of an irritant, the removal of which perhaps cannot be immediately effected.

2. *Cynanche parotidæa* is that species of parotitis commonly known in this country by the name of *mumps;* in Scotland called *branks;* and in France *oreillons* and *ourles*. It is almost universally admitted to be contagious; it is often endemic, and sometimes epidemic. It commences with the local symptoms already mentioned as common to parotitis in general, but the tumefaction, which is at first distinct, soon extends to the maxillary glands, (if the latter be not synchronously affected,) over a considerable part of the throat; the disease is frequently developed in the glands of both sides, but sometimes only of one; febrile symptoms, varying in degree, but usually slight, are also present, and increase as the swelling advances, until about the fourth day, when both the local and constitutional disorder begin to subside; and within as many, or sometimes a few more, they entirely disappear. As the

tumefaction diminishes, it not unfrequently happens that the testicles in the male sex, and the mammary glands in females, begin to increase in size, become hard and somewhat painful, but in this country soon again recover their former state. Experience has proved that this local determination is a favourable omen, for its non-occurrence as well as its expulsion have been frequently succeeded by inflammation of some other organ, generally the brain or its membranes, and even death has been the unfortunate issue.

In cynanche parotidæa the inflammation of the gland rarely if ever terminates in suppuration, but almost always manifests a tendency to resolution, on or about the fourth day of its progress.

When the inflammation has been confined to the glands on one side, the translation above noticed has generally also been evinced in the corresponding testis or breast.

A large majority of persons have passed through life without ever having suffered from this disease, and it is not common to find that it has been experienced a second time. We are not aware that its prevalence is peculiar to either sex, but children are generally the subjects of it, and more frequently those of a strumous diathesis: in such subjects, an occasional and apparently consequential occurrence is a more decided development of struma in the glands which have been the seat of vascular excitement. At sea, it has occasionally happened that cynanche parotidæa has attacked a number of sailors in the same vessel, when the cause of its first appearance has not been very evident; for although, besides contagion, exposure to cold and humidity have been commonly considered its exciting causes, it has occasionally arisen without any evident reason to suspect that it has been the effect of either.

Treatment.—Common observation has taught that cynanche parotidæa might in most instances be safely allowed to proceed without other care than that of guarding against exposure to cold of the general surface of the body, but particularly of the local swelling; by the abstinence from food and drink of a stimulating quality, with the occasional exhibition of gentle laxatives, purgatives having sometimes appeared to occasion a metastasis of the inflammation to another organ. To promote local warmth, the usual application of flannel round the neck and jaws is congenial alike to the feelings of the patient, and calculated to counteract the proneness to metastasis of the inflammatory action. When one or both of the mammary glands or testes are only slightly affected, a continuation of the same plan of treatment will generally be found adequate in aid of the natural actions of the body; but if the inflammation should be excessive, either in the original or consecutive stage of the disease, the antiphlogistic line of treatment must be more rigidly adhered to; topical detraction of blood by leeches, or, when the testis is the organ requiring relief, by several small punctures, with a lancet, of the superficial vessels of the scrotum, must be adopted, and even general bloodletting in further relief of the system. The depleting plan should be extended to the more active saline aperients, and to diaphoretic and diuretic medicines of the same class with antimonials, to be selected and varied on the general principles of therapeutics, according to the particular exigencies of the individual subject of the disease.

The well-established fact in pathology, of the tendency to metastasis of inflammation from its original seat to some other organ in cynanche parotidæa, renders it an important axiom that cold applications, whether to the parotid, maxillary, or mammary glands, or to the testes, should be carefully avoided, at least whilst the progressive steps evince the peculiar character of this disease. The secondary as well as original inflammation, when confined to these glands, will be soonest relieved by hot fomentations and the continued application of flannel: when leeches have been applied, as before advised, the same object will be further promoted by enveloping the part in a bread-and-water poultice, which should be renewed at intervals of six hours. Observance of the horizontal posture, the warmth of bed, and a suspending bandage, when the testis is enlarged and painful, will also be important auxiliaries. If, unfortunately, a metastasis should occur, and the brain or its membranes (which under such circumstances is most common), or any other structure become the seat of the vicarious inflammation, the new form of disease must be the immediate object of attention, requiring precisely the same treatment as if it were wholly unconnected with its precursor, whilst at the same time an attempt should be made to divert the inflammatory action to the organ from which it has receded, by the immediate application to the latter of hot fomentations, and subsequently by local irritants: blisters have been usually recommended for this purpose, but as the probabilities of success (at all events very slight), it is reasonable to suppose, would diminish in proportion to the length of time from which the inflammation had left the particular organ, a sinapism, we conceive, on account of its quicker action, would be preferable.

In advanced life, Dr. Mason Good observes, cynanche parotidæa is apt to run into a chronic form, accompanied with symptoms formidable in their nature. This is more especially apt to take place, he adds, in females when menstruation is on the point of ceasing, and the general action of the system labours under some disturbance. The tumour should, if possible, be carried off by leeches and cooling repellents, as he further advises, urging as a reason that if it proceed to suppuration, which it tends to, though very slowly, the ulcer rarely heals, usually degenerating into a foul offensive sore that sinks deeper and spreads wider, resisting all medical treatment, and at length destroying the patient. Vomits, frequently repeated, he continues, have in this case been found highly serviceable, and those of the antimonial preparations rather than ipecacuanha, from their maintaining a longer action, and determining more effectually to the surface, or rather to the excernents generally.

(*William Kerr.*)

PELLAGRA, or PELAGRA.—This is the name of a disease in which a morbid condition of the skin is a prominent symptom, very prevalent amongst, if not exclusively peculiar to, the peasantry of the northern states of Italy: the word pellagra is obviously a compound from the Latin *pellis*, the skin, and *agria*, "scabies fera," signifying an inveterate eruption.

The earliest account given of pellagra is from the pen of Francis Frapolli, a physician of Milan, and was published in the year 1771; since which period it has been the subject of a great deal of discussion and controversy amongst the Italian practitioners and medical writers. Of our own countrymen, Dr. Holland (so far as we have been able to ascertain) is the first whose description of the disease was founded on personal observation; and excepting a recent sketch of its prominent features by Dr. James Johnson, his paper is the only one in our literature to which the desirable distinction of originality can be attached: it has not, however, escaped the attention of Parr and Hooper,* and has been noticed by Good under the title of Elephantiasis Italica, and by Alibert under that of Ichthyosis Pellagra. Dr. Holland has expressed himself decidedly of opinion that it should be classed among the impetigines, but has remarked its resemblance to an inveterate degree of psoriasis or lepra vulgaris, admitting also that it has some affinity to ichthyosis.

General observation has determined that there is considerable variability in the symptoms of pellagra, and that they are often complicated with other forms of disease; a fact which, with the circumstances of the protracted period of its entire development as well as of its intermitting appearance and remissions, may in a great measure account for the conflicting opinions concerning its nature and history. The poor are almost exclusively its victims; and of these chiefly the peasantry and such as are occupied in agriculture. In the ordinary form of its occurrence, according to Dr. Holland,† it first appears as a local disease of the skin, preceded, however, occasionally by languor, debility, and other indications of a general cachectic state of the body. The local symptoms very generally show themselves, in the first instance, early in the spring, at the period when the mid-day heat is rapidly increasing, and when the peasants are most actively engaged in their labours in the fields. The patient perceives on the back of his hands, on his feet, and sometimes, but more rarely, on other parts of the body exposed to the sun, certain red spots or blotches, which gradually extend themselves, with a slight elevation of the cuticle, and a shining surface not unlike that of lepra in its early stage. The colour of this eruption is a somewhat more obscure and dusky red than that of erysipelas: it is attended with no other uneasy sensation than a slight pricking or itching, and some tension in the part. After a short continuance in this state, small tubercles are frequently observed to arise on the inflamed surface; the skin almost always becomes dry and scaly, forming rough patches, which are excoriated and divided by furrows and rhagades. Desquamation gradually takes place, which, though it leaves behind a shining unhealthy surface in the parts affected, yet in the first year of the disease is rarely followed by a repetition of the appearances just described. Towards the close of summer, or occasionally still earlier, the skin has resumed its natural appearance; and but that the further progress of the disease is familiar to every inhabitant of the country, the patient might be led to flatter himself that the evil was gone by, and that there was no particular reason to dread its recurrence.

With this local affection are connected, even in the first period of the disease, certain general symptoms, important inasmuch as they indicate the constitutional nature of the malady; namely, debility of the whole body; vague and irregular pains of the trunk and limbs, but especially following the track of the spine and dorsal muscles; headach, with occasional vertigo; irregular appetite, and general depression of spirits. The bowels are for the most part lax, and usually continue so in the further course of the disease. There are no febrile symptoms, and in females the menstruation is generally continued without irregularity.

The remission which the patient obtains during the autumn and winter of the first year is almost universally followed by a recurrence of his symptoms, in the ensuing spring, under a more severe form, and with much greater disorder of the constitution. The cutaneous disorder returns and spreads itself more extensively, but, as before, affecting chiefly the hands, neck, feet, and other exposed parts of the body. The skin becomes callous and deeply furrowed; and large rhagades show themselves, especially among the articulations of the fingers. The debility is greatly increased, frequently depriving the patient of all power of pursuing his active labours, and rendering him peculiarly susceptible of all changes of temperature. Partial sweats break out without any obvious cause. All the nervous symptoms of the first year are renewed in a more severe degree; there is a general tendency to cramp and spasmodic affections; the mind begins to suffer under the disorder, and the feeling of anxiety and despondence is very strongly marked. The *libido inexplebilis*, mentioned by some writers as one of the characteristic symptoms of pellagra, did not come under Dr. Holland's notice, and he is disposed to believe that it has been so considered from the credulity common upon this topic, or to a desire of associating the disease more closely with the leprosy as described by ancient writers. The other symptoms already noticed make progress as the heat of summer advances, and with greatest rapidity in those patients who are much exposed to the sun. As in the preceding year, they begin to decline towards the middle or end of autumn, but the remission, as well of the local affection as of the general

* Medical Dictionaries.

† See his valuable paper on the subject, published in the eighth volume of the London Medico-Chirurgical Transactions.

disorder, is much less complete than before, and the patient continues to suffer during the winter from the debility and other effects consequent upon the disease.

In the third year, every symptom is renewed at an earlier period, and in an aggravated degree. The constitutional malady shows itself under a variety of forms, some of the symptoms having a considerable analogy to those of scorbutus; all of them indicating a general cachexy, and more particularly a lesion of all the voluntary functions. The debility now becomes extreme; the patient is scarcely able to support himself; and the limbs, besides their feebleness, are affected with pains, which still further impede the power of motion. The diarrhœa continues, and tends of course to augment the patient's weakness. Frequently a dysenteric state comes on in the latter stages. The breath is generally fetid, and the odour of the perspiration often extremely offensive. The appetite and digestion are irregular, yet on the whole perhaps less affected than most of the other functions. Dropsical effusions are now apt to supervene,—occasionally ascites, but more commonly anasarca. Vertigo, *tinnitus aurium*, and double vision are almost universally concomitants of this stage of the disorder, and all the senses become exceedingly impaired. Some spasmodic affections are very general, and these not unfrequently of an epileptic character.

Connected with these latter symptoms is the effect which the pellagra produces upon the minds of the sufferers, which effect forms one of the most striking circumstances in the history of the disease. The anxiety, watchfulness, and moral depression of the patient are rapidly augmented. The unhappy objects seem under the influence of an invincible despondency; they seek to be alone; scarcely answer the questions put to them, and often shed tears without any obvious cause. Their intellectual faculties and senses become alike impaired, and the progress of the disease, where it does not carry them off from debility and exhaustion of the vital powers, generally leaves them incurable idiots, or produces maniacal affections, which terminate eventually in the same state. "In demonstration of this tendency of the disease, I may mention the fact," says Dr. Holland, "that at the time I visited the Lunatic Hospital at Milan, there were nearly five hundred patients of both sexes confined there, of which number more than one-third were pellagrosi, people brought thither by the termination of their disorder either in idiocy or mania. Even this statement gives little adequate idea of the nature of its ravages. The public hospitals of the country are far from sufficient to receive the vast number of persons affected with the pellagra; and the greater proportion perish in their own habitations, or linger, wretched spectacles of fatuity and decay. Where debility, as generally happens, is the cause of death, it manifests itself in the latter stage with the usual concomitants of colliquative diarrhœa, spasmodic affections, and coma, and produces a degree of emaciation scarcely to be surpassed in any other disease."

"Though, for the sake of brevity," continues Dr. Holland, "I have described this train of symptoms as going on from the third year, I may remark that the pellagra is generally of longer duration, and that other intermissions usually occur in its progress, giving the patient a certain relief in the degree of his sufferings, though little hope as to the issue of the disease. In some instances the cutaneous affection forms the principal indication of the complaint for several successive years, being renewed every spring, and disappearing again every autumn. In other cases, where it has been found possible to remove the patient to a new situation and mode of life, the disease is still further arrested in its progress. It rarely happens, however, that these means can be practically adopted, and the constitutional malady is generally so far established in the third or fourth year, that little hope remains of benefiting the patient either by medicine or change in the mode of life."

To enumerate all the symptoms which the Italian writers have attached to pellagra would in fact involve a description of several diseases with which it is complicated; it appears, however, that such complications are characteristic of this peculiar malady, and equally so their occurrence under several varieties of form. At different periods, in the same individuals, the morbid condition of the skin has exhibited the appearance of erysipelas, lepra, psoriasis, elephantiasis, and ichthyosis, and of such as are usually termed constitutional disorders, in which it appears to merge: scorbutus, tetanus in its varied forms, chorea, epilepsy, convulsions, dropsies, melancholia, mania, and marasmus, form a condensed list. "It is on this account," Dr. Johnson has observed, "that we see written over the beds in the Milan Hospital the various diseases to which pellagra forms the adjective, as atrophia pellagrina, phthisis pellagrina, hydrops pellagrinus, paralysis pellagrina, mania pellagrina, &c."* Jansen, one of the most esteemed authors on this subject, states that the cutaneous affection sometimes disappears, but without any mitigation in the other symptoms, and that a person accustomed to see this disease would at once recognize it by the peculiar odour of the perspiration the patients are often bedewed with, compared by him to the smell of mouldy bread. In the advanced stage the victim of pellagra (the *mal de misère*, as it has been emphatically called by Vaccari,) experiences in an extreme degree the effects of irritation in all the mucous surfaces, whilst at the same time the sensibility of the nervous system seems to be infinitely increased. The whole mouth becomes painful, tense, and phlogosed; the palate cleft: the gums swelled, fungous, and bloody; the tongue dry and blackish, and covered with a muddy coating; the teeth blacken and fall out; aphthous ulcer-

* Change of Air, or the Pursuit of Health, by James Johnson, M.D. p. 75.

ations are not uncommon, and the saliva, which is extremely salt, is frequently secreted in such a quantity, particularly in the morning, as to constitute complete ptyalism: the voice is sometimes so changed as not to be recognizable, and, as may readily be imagined, the thirst is excessive; the latter, however, is the only constant and invariable one of this group of symptoms. As the disease proceeds, diarrhœa becomes uncontrollable, and prior to the fatal issue the emaciation is excessive; but sometimes the patient is said to have the appearance of a mummy. Nervous sensations of a very distressing and peculiar kind also accompany the latter stage; they have been described as a sense of burning heat of the head and spine, radiating to the other parts of the body, and extending particularly to the palms of the hands and to the soles of the feet; occasionally as if an electric spark or flash of fire issued from the brain, and darted through the eyes, ears, and nostrils: all kinds of imagined noises distract the unhappy sufferer; saws, grindstones, mills, hammers, bells, the chirping of birds, and buzz of insects at one time or another appear to assail his ears; and thus deprived of sleep or rest, in the summit of despair, it not unfrequently happens that suicide is resorted to,—an act which (as if the means were indicated by some physical association) is often accomplished by drowning, so often as to have induced Strambio to distinguish this particular hallucination by the title of hydromania.*

The consideration of pellagra has been encumbered with a variety of discordant and trivial distinctions. Frapolli, for instance, has divided it into the incipient, the confirmed, and the mutable; Gherrardini into slight, severe, and desperate; Soler into the dry and moist, from some supposed difference in the disorder, according as it appears in dry and elevated situations, or on the flat and moist surface of the plains; and Titius into the latent and manifest, in conformity with the presence or absence of the eruption, the latter being a peculiarity in the manifestation of the disease, but attested by Italian authorities of respectability, amongst whom are Cevri and Zanetti.

It appears that the knowledge of the nature of pellagra has been as yet but little extended by pathological investigation. "In some patients," says Dr. Holland, "the liver, in others the spleen, has been found enlarged and indurated; marks of disease are also occasionally seen in the intestines and mesenteric glands, but these appearances are by no means constant, and may more reasonably be considered as effects than causes of the disease."

Dr. Johnson, in his notice of some cases of mania pellagrina, collected from the great hospital at Milan by M. Brierre de Boimont, who visited Italy in 1830, has included the following remarks on the pathology of the disease by that writer: "there is a collection of yellowish serum between the membranes and in the cavities of the brain; congestion of the vessels of the pia mater, plexus choroides, and of the cerebral substance; suppuration and hardening of the brain itself; inflammation of the spinal chord and of its membranes; accumulation of serum in the pleural cavities; inflammation and abscesses of the lungs; ulcers of the trachea; dropsy of the pericardium and of the abdomen; chronic peritonitis; ulceration of the stomach and intestines; hypertrophy, tubercles, and scirrhus of the liver, &c."*

The period at which pellagra first made its appearance is a point that has been much disputed by the Italian and German physicians, without any satisfactory conclusion. According to Moscati, a Milanese of great repute in science, and some other writers, it has not been known in Lombardy more than between sixty and seventy years. Alhoni, who has attempted to estimate the various opinions on the subject, dates its rise in the year 1715, though the attention of the Milanese physicians was not drawn to it until 1740. Strambi, who was appointed by Joseph II. the director of an hospital established at Lagnano, near Milan, for the reception of pellagrosi, had the best opportunities of gaining information on the subject. In his treatises on the pellagra published in three successive years, from 1784 to 1787, he mentions the fact of his having seen many pellagrosi in the hospital, who gave him distinct assurances of their fathers and grandfathers having had the disorder, and from some particular instances he thinks himself entitled to believe that the pellagra must have been known in Lombardy sixty or seventy years before the time when he wrote. Frapolli contends also for its antiquity, but it may be questioned whether his opinion does not rest on the mere analogy of a name, it having been formed from the circumstance of a minute in the journal of the Milan Hospital, dated the 6th of March, 1578, which provides for the reception of patients attacked with the disease known at that time under the name of *pellarella*.

The pellagra, as an endemic disease, prevails chiefly in the provinces of Lombardy, lying between the Alps and the Po. This country may be briefly described as a vast surface of alluvial plain, little elevated above the sea; but rising on its northern side into chains of hills, which intermediately connect it with the Swiss and Tyrolese Alps. From the long, narrow, and profound lakes among these hills the numerous rivers issue, which, flowing southwards to the Po, and giving their waters into a number of artificial channels for the purpose of irrigation, maintain that extraordinary fertility of soil for which the plains of Lombardy have long been celebrated. The principal objects of cultivation on these plains, besides the vineyards extensively spread over their surface, are maize, rice, and millet. In some districts, and particularly between the rivers Adda and Tireino, the pastures are extensive, and yield a considerable produce of milk, from which the Parmesan cheeses are made. The hilly country,

* Dict. des Sciences Méd. art. *Pellagra*.

* Medico-Chirurgical Review, Jan. 1833.

ust noticed, on the northern side of Lombardy, s less productive, and cultivated on a more imited scale. The valleys, however, intervening among these hills, are of great fertility, yield a considerable quantity of grain, and much wine rom the numerous vineyards to which they give shelter.

The district which appears to have suffered most from the ravages of the pellagra is that which formerly constituted the duchy of Milan, and particularly the Alta Milanese, or that portion of country lying up towards the hills between the Lago Maggiore and the Lago di Como. It was in this part of Lombardy that the disease first became an object of medical attention; and some time elapsed before it was described as appearing in the Venetian provinces, and near the shores of the Adriatic sea.*

The propagation of pellagra has by some been referred to contagion; facts and authority, however, preponderate greatly against this opinion. Its hereditary tendency is proved by its frequent appearance at the earliest period of life, as attested by Dr. Lacco of Milan, who, in the capacity of Director of the Vaccine Establishment, has had the best opportunities of observation. It has, moreover, been generally remarked that the disease is continued in succession through families. Conflicting accounts are given of the sex in which it most prevails, but there is ample reason to conclude that the discrepancy has arisen from the occupations of the men and women in different districts being reversed, and not from any physical peculiarities in the conformation of either.

In reference to the remote causes, the most important facts in evidence undoubtedly are, the limited period during which the disease appears to have existed in the country, its being confined almost exclusively to the lower classes, and its rare appearance in the towns or cities of Lombardy. The climate is obviously not the cause concerned; since this, as far as it is known, has been unchanged for a much longer period than that which includes the history of pellagra; or had it been changed, it would have affected alike both the higher and lower classes of the population. The same objection may be made to the opinion that any circumstances of mere locality are concerned in producing the disease. It may possibly be true that the plains of Lombardy are more frequently and irregularly flooded than formerly, and that the general surface is more marshy and unwholesome; but this does little to explain the causes of a disorder which is chiefly prevalent in the higher lands, where such changes have not equally taken place.

The point, then, to which we are almost necessarily conducted, is the mode of life and subsistence among the peasantry: this, it appears, is as wretched as the soil is productive; an evil which has been progressively increasing for more than the last half century, and is probably the result of devastation from repeated wars, political changes, and the consequent heavy taxes and imposts, combined with a decaying commerce, and bad arrangement between the landlords and cultivators of the soil.

The ordinary diet of these people consists chiefly of maize prepared in different ways, of rice, millet, beans, and some other articles of vegetable food. Their bread, which is principally made from maize, is for the most part of bad quality, ill fermented, and not unfrequently deficient in salt. Animal food rarely forms a part of their diet; and though living on a soil which produces wine, their poverty almost precludes the use of it, even when sickness and debility render it most needful. The same condition of poverty is evident in their clothing, in their habitations, and in the want of all the minor necessaries and comforts of life. By several of the Italian physicians the common use of maize has been considered a specific cause of this peculiar disorder. Dr. Holland controverts this opinion by the results of his personal observation with regard to the peasantry in the northern parts of Greece, who, though subsisting chiefly on the same kind of grain, are wholly free from the disease, as is also observed in the south-western parts of Europe, where the same diet is as generally in use among the lower classes; and, with the exception of a disease occurring in the Asturias, (the elephantiasis Asturiensis of Mason Good,) Dr. Holland further states that he does not know of its existence in Spain or Portugal, where the maize is very extensively used. Rice has also been supposed to be specifically productive of the disease, but it must be acknowledged that facts by no means warrant the supposition. One circumstance which seems to deserve a prominent place in the consideration of this part of the subject is the first appearance of the symptoms in the spring of the year, their partial disappearance in the autumn, their renewal in the ensuing spring, and the continuance of this alteration for successive years, whenever the disease is protracted thus long without reaching its latter stages. This chain of phenomena has led Albera, Frapolli, and other Italian writers, to refer the origin of the disease to the frequent exposure of various parts of the body to the action of the sun's heat, which, it seems probable, is an exciting cause of the cutaneous and some other of the symptoms; but that it is not the fons et origo mali is proved by the circumstance of the peasantry of other parts of Italy and of tropical countries being subjected to more intense exposure of the same kind without corresponding results. That such insolation, moreover, is not the only exciting cause, has been proved by the fact adduced by Strambi, that the cutaneous eruption may be prevented by avoiding exposure to the sun, whilst the other symptoms proceed in their usual course. There is also reason to expect that the incipient stage of the disease would, if induced by this cause, be common when the sun's heat was most intense, a circumstance contrary to common observation; and it may be presumed, as suggested by Dr. Holland, that the increased labours of the peasantry in the early part of the spring, being speedily followed by the develop-

* Medico-Chirurg. Transactions, vol. viii. p. 320.

ment of the symptoms, must have some influence on their production at this particular period. Perhaps, also, adds the same observer, the periodical returns of the pellagra, during its early stages, depend in part on the natural periodical changes of the body itself, independently of the external causes just alluded to.

It must be acknowledged that the chain of connection between the causes of pellagra and its specific symptoms has not hitherto been distinctly traced; but we know from universal experience that identity of disease has a common origin in a prevailing insufficiency of food, or in the use of such as is depraved or innutritious in its quality: we know, moreover, that the combined evils, already detailed, in the moral and physical condition of the people who become subjects of pellagra, have at all times been observed in connection with the prevalence of analogous disorders, which have been variously described under the comprehensive name of leprosy. It is further evident that the end of the several processes subservient to alimentation demands a sufficient and suitable supply of aliment, and in defect of either, the immediate wants of the system, as well as the imperfect actions of the various organs, become evident by the train of phenomena constituting the symptoms of disease. Added to and aggravating these in pellagra, we have the direct action of an irritant (the sun's heat), which, besides the local effect, and its direct consequences upon the nervous system, must, by impeding the important function of the cutaneous secernents, reflect their uneliminated material through the medium of the circulation over the whole body, and thereby help to generate its universal disorder. When we further consider the diversity of modifying influences, the mutability of their nature, and their relative operation, we cannot be surprised at the diversified appearances, nor at the endless discussions on the identity of diseases of this nature, arising no doubt from the unwarrantable habit of endeavouring always to limit to the arbitrary signification of a name circumstances confessedly Protean in their nature, and which have a very distant analogy to the distinct and circumscribed characters proper to objects of natural science, the classifications of which have been the models of nosological imitation.

The treatment of pellagra, like that of other endemic diseases which have their origin in the privation of the necessaries and comforts of life, has been infinitely diversified, and, according to general acknowledgement, unsuccessful. The patients on their admission into the hospital (we quote Dr. Holland,) are immediately allowed a nutritious diet, and, unless contra-indicated by some local affection, wine and tonic medicines are given with the same view. A decoction of the lichen Islandicus is in common use in the hospital of Milan, as a part of this plan of diet. The warm bath is very generally employed at the same time; a favourite remedy among the peasantry, probably in consequence of its comparative cheapness, but esteemed also by most of the medical practitioners who are concerned in treating the disease. Diaphoretics, and especially antimonials, are in considerable use, under the idea of correcting the state of the skin, and getting rid of the morbid humours through this channel. Depletion by bloodletting is very rarely employed except where some local inflammation happens to occur, or in the mania which sometimes supervenes upon the disease. Attention is of course paid to the bowels in correcting the diarrhœa, and bringing them as far as possible to a natural state.

Besides these means, a long list of medicines, commonly termed antiscorbutics, are in popular use; but having mentioned the various preparations of cinchona, sarsaparilla, guaiacum, sassafras, cantharides, terebinthina, and mercurials, it would be superfluous to enumerate the thousand remedies for this hitherto untractable and fatal disease.

From the preceding detail it is evident that the labour of physicians in the treatment of pellagra must continue in its result to resemble that of Sisyphus, until a decided amelioration can be effected in the moral and physical condition of that unfortunate class of persons in whom it is found to occur; and all former experience of diseases analogous in their nature justifies us in asserting that when, and not till when, it ceases to be the opprobrium patriæ, will it cease also to appear to be the opprobrium medicorum.

(William Kerr.)

PEMPHIGUS, from πέμφιξ, *a bleb*, or *blister*. This disease belongs to the order *Bullæ* of cutaneous diseases. Under the present heading we shall include both pemphigus and pompholyx, as we consider the latter as merely a variety of the former.

Previously to the time of Willan, nosologists made a distinction between these diseases, describing pemphigus as an idiopathic eruptive fever *(febris pemphigodes)*, running through a certain fixed course like measles or scarlatina, and pompholyx as differing from it, in not being accompanied by fever; and this view is still supported by some writers on skin diseases. An additional line of demarcation was supposed to be found in the local characters of the eruptions; pemphigus being supposed to present bullæ with inflamed edges, and pompholyx to consist of bullæ without inflammation or redness around them. These distinctions will not bear examination. The fever which sometimes precedes or accompanies the bullæ of pemphigus, makes no approach to the regularity of the fevers of measles or scarlatina, but is, on the contrary, very irregular in its nature and duration. It may be a short inflammatory fever, or of a low typhoid type, or it may assume the characters of an intermittent. The period of the fever at which the eruption of bullæ appears, is equally uncertain. The bullæ may appear almost simultaneously with the accession of febrile symptoms, or on the second day of fever, as in the case related by Seliger, and referred to by Dr. Willan; or on the second accession of an

attack of intermittent fever, as in the case related by Dr. Winterbottom; or on the fourth day of low typhoid fever, as in the case related by Dr. Dickson in the first volume of the Transactions of the Royal Irish Academy. The bullæ may be still more irregular in their eruption, coming out in successive crops at uncertain periods of a continued fever, and, lastly, may appear either as sympathetic with or as a crisis of internal visceral disease. These irregularities of the type of the fever, and of the coming out of the eruption, are sufficient to convince us that pemphigus has no claim to the title of an idiopathic eruptive fever. The further supposed distinction between it and pompholyx, of the bullæ of pemphigus having a red inflamed edge, and those of pompholyx not possessing this character, will prove equally invalid; for this character is merely accidental. The bullæ will possess or will be deficient in this character according to the time at which they are examined. In almost every instance a distinct circular erythematous patch upon the skin precedes the formation of each bulla. If the bullæ be examined before having attained a sufficient size to occupy the entire of the erythematous patch, there will then be seen around its circumference a red inflamed edge formed by the outer margin of the erythematous patch not yet occupied by the bullæ; but if not examined until a later period, or if even examined at a very early period, when (as in pemphigus solitarius) the growth of the bulla is very rapid, then the entire of the precursive erythematous patch will be covered by the bulla, and there will be no surrounding blush or tumefaction; or, in other words, the disease will be the pompholyx of some authors. These are our reasons for considering pompholyx as merely a variety of pemphigus.

Pemphigus may be defined "an affection of the skin, consisting of the eruption of one or more bullæ containing serous fluid, and terminating either in thin scales, in superficial excoriations, or in ulceration."

The immediate pathology of pemphigus is an effusion of serous fluid from the surface of the rete mucosum, which first detaches portions of the cuticle, and then distends them into bullæ. In most instances there are erythematous patches upon the skin preceding the appearance of the bullæ. Between these the skin preserves its natural appearance, or seems very slightly swollen. If the finger be passed over the surface, each erythematous patch gives a sensation, arising from the local congestion, of being a little firmer and more elevated than the surrounding surface; but there is no marked increase of thickness or hardness of cutaneous or cellular tissue, such as is found in the commencement of pustular diseases. The bullæ first appear on the centres of the erythematous patches; and around each bulla there may or may not be a red margin according as the bulla occupies only the central portion, or has spread over the whole of the inflamed base from which it has arisen. The skin between the bullæ continues to preserve its natural appearance and colour. The bullæ always commence as such, and never as papulæ or pustulæ; in the commencement they are translucid, either colourless or of a pale fawn or slightly bluish cast; and as they continue to grow, they assume a hemispherical shape, and present different sizes from that of a split pea to a size sufficient to contain a tea-cupful of fluid. The fluid contained in the bullæ consists principally of albumen; it readily coagulates by heat into an almost solid mass, and sometimes, although rarely, the albumen of a bulla is in such quantity as to coagulate spontaneously and form a layer lining the distended cuticle. The fluid of the bullæ is usually bland and devoid of smell, but, in some varieties of the disease to be afterwards noted, gives out a most disagreeable fetor, and seems to acquire acrid properties. When the bullæ are fully formed they become opaque, and sometimes, from a trifling admixture of purulent matter, present a yellowish, or greenish yellow shade. Arrived at this stage, they may terminate in various ways. In mild cases the smaller sized bullæ, after having reached their greatest degree of development and tension, begin to wither; the cuticle wrinkles; and the albuminous portion of the effused fluid, together with the detached cuticle, dries into a thin brownish scab, which, falling off, exposes a red patch formed of the inflamed true skin, with its thin new cuticle. The larger sized bullæ burst either spontaneously or through accident; and the broken cuticle, lying flat upon the inflamed surface, now dries away into a scale, which separating, exposes, as before, the red base on which the bulla arose. For a short time after the larger bullæ are opened, the inflamed excoriated surface continues to secrete a fluid similar to that originally effused. In weakly constitutions, after the bullæ have burst, the inflamed surface of the true skin, instead of furnishing a new cuticle, takes on the action of secreting pus; and if the pus or scab formed of it be removed, then presents the appearance of an indolent ulcer. In more severe forms of the disease, the fluid of the bullæ is thin and ichorous, forms no crust, and when discharged by the bursting of the cuticle, exposes an unhealthy-looking flabby ulcer; the tissue around softens, and the ulcer continues to spread as a gangrenous ulcer, engaging in its destructive progress all the surrounding tissues without distinction.

No portion of the cutaneous surface is exempt from the invasion of pemphigus. It may confine itself to a part, or may spread itself over the entire surface; but the parts on which the eruption most frequently appears are the limbs, particularly the lower limbs and the skin of the abdomen. The bullæ also make their appearance on the mucous membrane of the mouth and of the vagina. One variety of the disease (pemphigus gangrenosus) has a tendency to attack in preference the skin behind the ears and the folds of the thighs.

Pemphigus may make its appearance as an idiopathic disease, or as sympathetic of some internal visceral irritation; or its bullæ may occur during the course of other diseases, more

especially those of the skin, principally erysipelas, herpes, prurigo, scabies, and varicella. It is asserted by some writers that the bullæ of pemphigus are occasionally found on the mucous membrane of the stomach and intestines. Rayer admits the occasional existence of bullæ on the mucous membrane of the mouth, but denies their existence in the stomach and intestines. Of their occasional existence in the mouth there cannot be a doubt. In the case related by Dr. Dickson, and already referred to, the patient, a delicate woman, twenty-three years old, felt on the third day of low fever a tingling pain and smarting in the tongue and inside of the mouth. On the next, the fourth day, a pellucid bulla appeared on the tongue one inch long, and half an inch broad, turgid, with faintly yellowish serous fluid, and a smaller one on the inside of the left cheek. The sensation felt was as if these bullæ were full of scalding water. On the fifth day, bullæ appeared over the body; and on the ninth day the bullæ of the mouth left behind them an excoriated and acutely sensible surface.

In the abdominal viscera the changes observed most frequently in fatal cases of pemphigus are redness, softening, and ulcerations, the ordinary effects of gastro-enteritis. Biett states that the internal derangement which he has observed most constant in pemphigus is the fat liver.

Diagnosis.—Vesicles, or bullæ, are sometimes found in erysipelas which bear a close resemblance to pemphigus; but they are at once distinguished by the whole surface of the skin on which the vesications appear in erysipelas being tense, shining and red. The vesicles of herpes somewhat resemble the bullæ of pemphigus; but exclusively of being much smaller and irregular in form, they are always clustered upon a red inflamed surface; while the bullæ of pemphigus are scattered, the skin between them preserving its natural appearance. The extremely small size and immense numbers of the vesicles of miliary eruption furnish us with a well-marked line of distinction between it and pemphigus. Varicella, or chicken-pox, when fully developed, presents vesicles, which, however, are easily distinguished from the bullæ of pemphigus by being pretty equally diffused over the entire body, and by all being of nearly one size, and much smaller than the bullæ of pemphigus.

Rupia has some characters in common with pemphigus, and belongs to the same order; but in rupia the bullæ are generally fewer in number, smaller, less tense, and more flattened than in pemphigus, and the contained fluid quickly becomes sanious or purulent. The cutaneous tissue around the bullæ of rupia is more deeply inflamed; and the bullæ, after having reached their full growth, instead of forming thin crusts or excoriations as in pemphigus, are followed by thick prominent scales, which, when removed, expose deeply-eating ulcerations.

These are the only diseases which can be confounded with pemphigus. The characters distinguishing pemphigus from all other affections of the skin are so marked, that it is quite unnecessary to point them out.

Prognosis.—It may be laid down as a general rule that the more acutely pemphigus sets in, the less dangerous it is; and as it shews a tendency to become chronic or occur in weakly constitutions, or is accompanied by a fever of a low typhoid type, the more unfavourable is its prognosis.

Causes.—Whatever acts directly as a stimulant to the skin, or indirectly injures its function through the medium of the constitution, or of the mucous tissue of the digestive organs, may be an exciting cause of this disease, viz. exposure to the direct and burning rays of the sun, or the application of any irritating substances. Among mowers in Ireland, a local form of pemphigus attacks the skin over the ancles, and is a very troublesome complaint. It is by the men themselves attributed to the seeds of the cow parsnip (*heracleum sphondilium.*) The bites of some serpents, the prolonged impression of cold or damp upon the surface previously over-heated, excess in the use of spirituous liquors or heating spices, depression of mind, marsh residence, debility however induced, are also in the list of exciting or of predisposing causes. The disease has supervened on the suppression of the lochia, of the menstrual discharge, of hemorrhoids, and of diarrhœa.

The bullæ of pemphigus occasionally accompany epidemic diseases, such as scarlatina; and from this complication has arisen the description of pemphigus Helvetieus as an epidemic given by Laughans. There is, however, no authentic description of simple pemphigus prevailing as an epidemic.

Pemphigus is a disease of all climates and seasons; but one variety, pemphigus gangrenosus, is generally confined to certain districts as an endemic disease: we shall have occasion to speak more at large on this form of it. Cullen, in his "Synopsis," characterises pemphigus as a contagious disease; but at the same time observes that he has only followed Sauvages, and that he has no knowledge of the disease from personal observation. Experiment is unfavourable to the supposition of the disease being contagious. Husson inoculated five children with fluid taken from the bullæ of pemphigus, and the disease was not in any instance transmitted.* Martin confirmed these by similar experiments.†

The varieties of pemphigus may be considered with most practical advantage under the heads of *acute pemphigus*, *chronic pemphigus*, and *gangrenous pemphigus*.

1. *Acute pemphigus.*—This variety is preceded by febrile symptoms of very uncertain characters. There is generally a premonitory shivering fit very well marked, and in some cases there are two or more shivering fits so distinct, that the attack at first sight appears

* Recherches Historiques et Médicales sur la Vaccine.

† Journal de Médecine, Chirurgie, et Pharmacie, vol. ii. p. 225.

) be intermittent fever. In other cases, after fit of shivering, there are the symptoms of ontinued fever—thirst, loss of appetite, coated ongue, and dry hot skin; and after these have ontinued usually from one to four days, the urface about to become the seat of the erup- on, generally the skin of the abdomen and ower extremities, in a few cases of the whole ody, is affected by a sensation of tingling eat, and circular red patches of various sizes ome out, irregularly scattered over the surface; heir colour will not disappear under pressure, nd within twenty-four hours of their appear- nce bullæ arise on these patches and rapidly ncrease, until each bulla occupies the entire r nearly the entire of the inflamed plane on hich it has arisen. Some of the bullæ, al- hough rarely, become confluent. The bullæ aving arrived at their full size, usually within he period of two or three days from their first ppearance, become turgid, burst, and discharge heir contents, leaving the surface of the true kin now exposed, red, excoriated, and painful. The pain is like the sensation produced by burn or scald, and is not felt until the true kin is exposed by the bursting of the bullæ. The exposed cutis is, however, soon covered vy a thin crust formed by the old cuticle, the emnant of the contained fluid, and a secretion f similar fluid, which continues for a short me from the inflamed surface. The thin scab us formed, after a few days drops off, and xhibits the true skin covered with a new uticle, and of a dark red colour. This colour emains for an uncertain time. The febrile ymptoms which ushered in the disease usually bate on the appearance of the eruption, and ontinue in a mild degree until the healing of he broken bullæ. In a very great majority f cases the termination of the attack is a narked crisis, either by diarrhœa or a copious eposition from the urine.

The duration of acute pemphigus is very ncertain. It never runs its course in less than week, and is seldom prolonged beyond a nonth. When gastro-intestinal irritation is superadded, the symptoms are aggravated, and n such cases the mucous membrane of the nouth may present bullæ resembling those pon the surface, but, from being constantly athed in moisture, not forming scales. There s a form of acute pemphigus, in which, after eat, itching, and redness of a part, a single ulla arises, (pompholyx solitarius of Bate- an,) and after becoming enlarged to a size ufficient to hold a tea-cupful of fluid, bursts, nd is, perhaps, succeeded by another follow- ng the same course. In this variety, if a ulla burst before it has attained its full size, t may heal in the centre, and the circumference f the bulla continuing to increase will pro- luce the appearance of the whole cuticle of the art peeling off.

Treatment.—The treatment of acute pem- higus, when it exists as an idiopathic affection, s very simple; the febrile symptoms not ge- erally running so high as to demand very ctive treatment. Mild purgative and diuretic nedicine and cool drinks are generally all that are required. If the disease be complicated by gastro-intestinal irritation or inflammation, or be sympathetic with the disease of any im- portant internal organ, the cutaneous affection becomes of secondary importance; the internal disease demands all our care. Warm-baths or any heating application to the skin are im- proper in acute pemphigus. It is recom- mended in some works to open the bullæ as soon as they are formed. This is not judicious practice. The distress of the patient is com- paratively little before the bullæ have burst; but after this there is, as we have already noticed, a most painful sensation of burning produced by the exposure of the raw surface of the true skin. The febrile excitement is thus increased, and we shall both hurry and prolong the pain and fever if we unnecessarily puncture the bullæ. We can apply to the excoriated surface no dressing so mild as its own albuminous secretion, and can protect the excoriated skin from the irritation of exposure by no covering so effectually as by its own cuticle. When the bullæ have burst either spontaneously or by accident, and the exco- riated surface is scalding and painful, the de- nuded part should be covered with the mildest dressing, with slips of gold-beater's leaf or the delicate membrane which lines the interior of an egg-shell. When the bullæ are wither- ing, and cicatrization is taking place, and after the fever has subsided, it becomes necessary to support the strength of the system and aid it in its curative efforts by the exhibition of tonics, of which the best is cinchona or sul- phate of quinine. Sometimes the fever which ushers in acute pemphigus presents almost from its very onset a low typhoid type; and while intestinal irritation is allayed by the mildest purgatives, the patient's strength re- quires to be supported by light broths, and, according to the symptoms, by wine and bark.

2. *Chronic pemphigus.*—This variety of the disease is generally met with in old persons or in debilitated constitutions, is sometimes idiopathic, but more often sympathetic, with internal visceral disease; in the latter, of course, the more serious. It is the *pompholyx diutinus* of Bateman, *dartre phlycténoide confluente* of Alibert. This is a very obstinate and dis- tressing form of skin disease, and there is scarcely any limit to its duration. After pre- monitory symptoms of lassitude, headach, &c. bullæ appear on different parts of the body. These heal, and are succeeded by others, which, as the patient's strength becomes weaker, shew a disposition to ulcerate. There is intolerable pain and burning from the exposure of the denuded cutis, and irritative fever sets in. A crisis may now take place either by diarrhœa or by a copious deposition from the urine; the bullæ dry up and heal, the symptoms of irritative fever disappear, and the patient be- lieves there is a perfect cure; but after a short interval the disease again shews itself. There is less disposition in the bullæ of each suc- cessive eruption to heal; the constitutional irritation produced by the numerous excoriated

surfaces prevents rest, destroys appetite, and finally wears out the patient by exhaustion; or the constant irritation aggravates to such a degree some internal lesion, otherwise of little consequence, that a new train of symptoms sets in, the pemphigus disappears before some more formidable affection, and the patient dies of internal visceral disease. The bullæ of chronic are always larger than those of acute pemphigus, and, as already observed, are more generally sympathetic with some internal disease of function or of structure than an idiopathic affection of the skin. Persons advanced in life are most subject to chronic pemphigus, and whatever debilitates the constitution, as mental depression, or bad or insufficient food, or injures the functions of the skin, as a residence in cold damp situations, may tend to bring forth the disease; and in cases where the previous debility has been very great, the bullæ not only ulcerate, but the surface on which they have arisen sloughs around the bullæ to a considerable extent.

Treatment.—As this disease is so frequently a symptomatic affection, the treatment is in general complex, and must in such circumstances be directed as much to internal visceral disease as to the external skin affection. For the treatment of the rheumatic, gouty, or visceral derangements which may be combined with chronic pemphigus, we of course refer our reader to the various heads under which those derangements are considered. Internal irritation (if any) being allayed by appropriate means, the patient who is the subject of chronic pemphigus is then to be put upon a full and nourishing but not stimulating diet, and tonics combined with diuretics, as sulphate of quinine with compound infusion of juniper, or bitters with alkalies, are to be administered. Locality has often much influence over this disease, and hence, if the ordinary measures above recommended are not successful, change of air should be enjoined, and the change should always be to a dry air and a high situation. The bullæ should not be opened by art, for the same reasons as given for not opening the bullæ of acute pemphigus. If the bullæ burst and leave indolent ulcerations, these are to be stimulated with powdered bark or burnt alum, or touched, if necessary, with solid nitrate of silver. Warm-baths generally aggravate this disease when present, but are very useful as preventives by preserving the skin in the exercise of its healthy functions.

Before we proceed to the third variety, gangrenous pemphigus, it is necessary to mention a form of pemphigus which does not perhaps strictly come under any of the heads we have named. For practical utility we have described two forms of pemphigus, as acute and chronic; but here, as in most diseases, this line of distinction is more arbitrary than real, the two forms running into one another by imperceptible gradations: perhaps the term subacute, borrowed from the French, would be the best name for the variety of pemphigus to which we now allude, and which forms the connecting link between the acute and chronic forms. This variety of pemphigus corresponds with acute pemphigus in being accompanied with fever, but agrees with chronic pemphigus in presenting, not simultaneous, but successive eruptions of bullæ. It is called by French writers "pemphigus aigu successif." The accessions of febrile symptoms are irregular, and with each accession a new crop of bullæ appears on the skin, the whole attack usually running its course within a few weeks. The treatment is merely a modification of that recommended for acute pemphigus, with this addition, that as the fever which precedes the eruption takes on an intermittent form, the early exhibition of bark is called for.

3. *Gangrenous (or infantile) pemphigus.*—(Pemphigus infantilis of Willan, rupia escharotica of Bateman and Biett.) Bateman and Biett place this disease under the head *rupia*, but improperly, for the fluid of the bullæ in this disease is a thin sanious ichor, neither forming thick crusts, nor turning purulent, which are the distinguishing characters of rupia. This form of pemphigus is exclusively confined to children, and very rarely attacks them after the age of five years. In many parts of Ireland this singular disease prevails to a great extent, principally among the children of the poor, and appears to be in some situations an endemic disease, but from time to time breaking out as an epidemic, attended with great mortality. This latter circumstance has probably originated the belief in the contagious nature of the disease, very generally entertained by the people of the districts where the disease is prevalent. There are, however, no satisfactory proofs in support of this opinion. Dr. Macbride, in his "Methodical Introduction to the Theory and Practice of Medicine," notices an outbreak of this disease. "In the county of Wicklow, about twenty miles from Dublin, a disease of this kind (as the author has been informed) appeared in the year 1766, but attacked only children, many of whom were carried off until the cortex was thought of as a remedy, and found equally efficacious as in the malignant sore throat." It is singular that in the same county the disease is still prevalent. It is known in different parts of Ireland under the various popular names of "white blisters," "burnt holes," "eating hive," &c. No systematic work on diseases of the skin contains either full or accurate information on this singular form of pemphigus. To Dr. Whitley Stokes we are indebted for our knowledge of its symptoms and treatment, and we cannot give that information in better words than his own.

"The approach of this disorder is sometimes, though rarely, denoted by a livid suffusion like that of erysipelas slightly elevated. This was both observed by Dr. M'Donnel of Belfast, and by Dr. Spear, in the county of Monaghan, at a time when the disease prevailed there epidemically. It more frequently happens, however, that the complaint comes on in perfect health. One or more vesicles

appear mostly larger than the best distinct small pox; these increase for two or three days, burst and discharge a thin fluid having a disagrecable smell, limpid in most cases, sometimes whitish, and sometimes yellowish, the latter less dangerous; usually the weaker the child's constitution is, the thinner is the matter. Before or after breaking, the vesicles run together, the sores become painful, with loss of substance and a thin fetid ichorous discharge; the edges of the ulcer are undermined, and it spreads quickly. The more usual seats of the disease are behind the ears, sometimes on the hands or feet, on the private parts (seldom on the arm-pit), the breasts, folds of the thighs, lower belly, on the inside of the mouth or lips. The disease however, it is said, seldom passes from the inside to the outside of the mouth. In the progress of the disorder, the ulcers enlarge rapidly, with remarkable fetor, very great discharge, and livid edges. If the sores are behind the ears, they destroy the connexion of the posterior cartilage with the cranium; they spread to the meatus auditorius; to the eyes, the sight of which seemed in a few cases to have been destroyed one or two days before death; and they sometimes extend to the vertex. The constitutional disturbance that accompanies this disease seems principally the effect of irritation. When the vesicles burst, the child begins to grow peevish and fretful, pale, loses its appetite, and the flesh becomes remarkably flabby. The periods of this disorder are not very regular; but it often happens about the eighth day that the pulse sinks, the lividity spreads over the whole sore, the fetor and discharge increase greatly. The smell is so strong as often to be perceivable at a distance from the bed. The discharge in one case where the ulcers affected the arm-pits and breasts, was such that the linen was completely loaded several times a day. Death takes place about the tenth or twelfth day, often preceded by convulsions, sometimes by extreme debility. Patients are apt to relapse soon after the sores are skinned over. The causes of this malady are rather obscure. It seems exclusively confined to children. Dr. M'Donnel saw twenty cases before the year 1795; all the patients were under four years old. Dr. Spear observed that it was confined to children from the age of three months to that of five years; but it has been observed near Dublin in children of nine years old. It attacks the finest children in preference; the children of the poor more frequently than those of the affluent; and those who live in damp situations seem more peculiarly subject to it than others. The disease is more prevalent in summer than in winter. It appears to be infectious, though obscurely so in general; but in the year 1800, Dr. Spear observed it to spread epidemically. It has been said that the disease oftener affects the younger from the older than the reverse. It would be interesting to determine whether it attacks the same person twice; it certainly is apt to return after apparent recovery. Children, as is well known, are subject to excoriations behind the ears which sometimes produce formidable sores; these may possibly, in a few cases, resemble the disease we speak of, in its advanced stages; but in a great majority of cases these excoriations are far less rapid and dangerous than the complaint in question. On the other hand, the swine-pock (varicella) resembles this disease in its first stage; but the fever rarely precedes the eruption in white blisters, and pustules of varicella dry readily.

"This is a disorder of great danger, but of various progress in different individuals. It often happens that a fatal change takes place about the eleventh day. The unfavourable signs are, the rapidity with which the sores spread; the blackness, first at the edges, after some time spreading over the whole; the quantity and fetor of the discharge; its colour, the paler being the most dangerous.

"It has been alledged by empirical practitioners in this disease, that after the blackness had covered the whole sore, death was certain; but I have observed the blackness to go off, although it had spread over the whole surface of the sores. When this appearance abates, livid streaks generally remain for a day or two. When a favourable change is effected in bad cases, the diminution of the fetor and discharge were the first signs of the abatement of the malady; appetite was afterwards restored."*

Dr. M'Adam, in a paper on this disease in the same journal (vol. i. p. 307) states that the discharge from the vesicles is acrid, and that he has seen erosions produced on the breast by fluid which fell accidentally from the vesicles. This disease was very fatal and very unmanageable in all its stages. Dr. Willan says, speaking of pemphigus infantilis, that treatment was attended with little success. All ordinary modes of treating the disease having failed, Dr. Stokes was led to search after a traditionary empirical cure of which he had heard a favourable report. He carefully watched over some cases treated by a person who professed to possess the secret of curing the disease, and having satisfied himself that the treatment was successful, he made himself acquainted with its details. The principal application was a compound green ointment composed of a great number of herbs, some active and some inert. From one plant, "scrophularia nodosa" *(great figwort)* occurring in several receipts which Dr. Stokes procured, he was led to fix upon a simpler ointment made from this plant alone; the following are his directions for treatment. "When the parts adjoining the sores are swelled, and strongly suffused with a dusky redness, or if the sores have been previously dressed by any dry powder, I apply a poultice of porter and oatmeal. The carrot poultice in fermentation, if it can be procured without any delay, would perhaps be useful. After about eight hours, the poultice should be removed, and the parts affected

* Dublin Medical and Physical Essays, vol. i. p. 146. 1807. On an Eruptive Disease of Children, by Whitley Stokes, M.D. S.F.T.C.D., Professor of the Practice of Medicine.

very gently wiped with a roll of lint or soft rag; then the scrophularia ointment should be applied. It should be as highly saturated with green vegetable matter as possible. For this purpose the plant should be taken fresh, the smaller leaves selected, and stewed a considerable time with as small a quantity of unsalted butter as will be sufficient to prevent the leaves from being scorched. If well prepared, it is of a full grass-green colour; but after keeping it becomes the colour of box leaves, especially at the surface; yet I apprehend it preserves its efficacy, in a great degree, for many months. When applied, it should be melted and suffered to cool to the consistence of honey; it should be applied by a soft feather, with the utmost gentleness, to the whole surface of the sore. Through the whole of the treatment, the greatest gentleness should be used. If the ear is strongly drawn open, the parts affected are made to bleed, which produces many inconveniences, and retards the progress of the cure. After smearing the ulcer with the ointment, it should be dressed with the same ointment, with the addition of one-eighth part of wax. This last ointment should be spread on lint folded to the dry side, and cut so as to fit behind the ear; the whole should be secured by a broad bandage, drawn under the chin, and fastened over the top of the head. This dressing, in very severe cases, should be repeated every fourth or sixth hour; but as the fetor abates, larger intervals may be allowed. I do not pretend that this treatment will always succeed; but perhaps, of four such cases as may occur to any practitioner, not excluding the most hopeless, it will succeed in three on an average: and if we could accurately ascertain the mortality which takes place when other methods are used, we should consider this proportion of success as very satisfactory." This ointment is now introduced into the Dublin Pharmacopœia, and is found a most useful application, not alone in the disease here noticed, but in many other affections of the skin and scalp. Dr. M'Adam, in the paper already alluded to, speaks favourably of the internal exhibition of cinchona in this disease, and of the external application of strong ung. hydrargyri nitratis.

(D. J. Corrigan.)

PERCUSSION. See AUSCULTATION, and CHEST, EXPLORATION OF THE.

PERFORATION OF THE HOLLOW VISCERA.—This term is generally employed to designate a solution of continuity in consequence of disease of the walls of a hollow organ. The term *spontaneous perforation* has likewise been applied to those perforations which occur without having been preceded by any perceptible modification of function, local or general.

Perforation is far from being a rare occurrence in several organs of the body, and has been observed to take place under various circumstances in most of them. The relative order of its frequency may be stated as follows: the organs of respiration; digestive organs; organs of generation in the female; vascular system; urinary organs; hollow bones; the eye and the ear.

Perforation of the parietes of the three great cavities is occasionally observed, and perhaps more frequently in those of the abdomen and head than in those of the chest.

When perforation takes place in any of these parts, a preternatural communication is established between two or more natural cavities; between these and an accidental cavity formed in consequence of ulceration, mortification, or the accumulation of pus, blood, or other fluids in the solid viscera; and between one or both of these and the external surface of the body. Hence it follows that perforation may give rise to the effusion of a natural or accidental fluid into a serous or mucous cavity, or on the external surface of the body, and which, consequently, may be either retained or rejected.

Perforation may, however, occur without a communication being established between the perforated organ and a natural or accidental cavity. This is accomplished in two ways; 1st, by the union of a neighbouring organ with that which is perforated previous to the occurrence of this lesion; 2dly, by the formation of a false membrane between which and the surface of the perforated organ an organic union had previously been established.

Examples of these two modes in which a preternatural communication from perforation is prevented from taking place between two or more hollow organs, or between these and accidental cavities, are often met with in the abdominal and thoracic viscera. One, two, or more portions of the small intestine are found more or less firmly united over ulcerations of greater or less extent which occupy in depth the whole of the coats of these portions of intestine. A portion of the epiploon has been found adhering to the surface of the intestine or gall-bladder, and covering perforations of these organs; and the liver, spleen, pancreas, mesentery, transverse arch of the colon, and diaphragm, furnish striking examples of the means which nature employs to supply the loss of substance occasioned by several diseases, of all the coats of the stomach, and to prevent a communication from taking place between the cavity of this organ and that of the abdomen and thorax. Similar examples are met with in the lungs when these organs are the seat of tubercular excavations. The walls of these excavations, particularly when they occupy the upper lobes of the lungs, are often found to be formed in great part by those of the chest, the pleura pulmonalis and costalis over the excavation being intimately united by immediate contact, or by means of dense cellular or *cellulo-fibrous* tissue.

The second mode of prevention of a preternatural communication from perforation, viz. the formation of a cellular or serous membrane, is much less common than the former. The presence of this accidental serous or cellular membrane may be confined to that portion only of the walls of the organ in which the perforation exists, or it may extend over the

reater part or even the whole of the serous urface of the affected organ. It is almost lways of a limited extent on the peritoneum hen it forms a barrier to the escape of the ontents of the intestines into the cavity of the bdomen, and more or less extensive on the leura when it accomplishes a similar purpose, amely, when it prevents air, pus, or other uids contained in the lungs, from passing into ie cavity of the chest.

Perforation has been found to occur in consequence of ulceration, mortification, inflammatory softening, and chemical dissolution. Among these organic lesions, those which give se most frequently to perforation are ulceration and mortification, because of these diseases ccurring in almost every organ of the body. Inflammatory softening and chemical dissolution being, on the contrary, met with only in ertain organs, are much less frequently the auses of perforation.

We shall now take a general view of perfotion as it occurs in the different organs of the ody in consequence of one or more of the sions we have named, and shall confine ourelves to the description of its anatomical chacters, and such other circumstances as may ppear necessary to illustrate this part of its athology, as the symptoms and treatment will e given in the history of those diseases by hich perforation is preceded or followed, and which we shall occasionally refer.

I. *Perforation of the digestive organs.*— his lesion most frequently occurs in that porion of the digestive tube situated beneath the aphragm, and more frequently in the intesnes than in the stomach. In both it may cur either during life or after death. In the rmer case it is the consequence of ulceration mortification; in the latter it depends on the resence of an acid, formed most frequently in e stomach during the process of digestion. It curs besides in the stomach in consequence the introduction of irritant and acid poisons. We are not disposed to believe, and we think at facts are wanting to prove, that perforation the stomach or intestines takes place in conquence of inflammatory softening of the walls these organs; but as the facts on which we und this opinion will be given in detail in e article Softening, we shall not enter at esent upon the investigation of the numerous d important questions which this subject volves.

11. Perforation of the superior portion of the gestive tube is occasionally observed to take ace in consequence of several of the diseases which it is subject, as well as from some hers which occur in some of the neighbouring gans. In the œsophagus it is occasioned rhaps most frequently by cancer, formed ther in the walls of this tube or in the cellular sue external to it. In this case the walls of is muscular tube may be destroyed within a nited extent without any communication ing formed between it and any neighbouring vity; or, if the disease extends to the trachea pleura forming the mediastinum, a commucation may be formed between the cavities of both and that of the œsophagus, through which a portion of the food and drink of the patient may pass, and give rise to the most distressing symptoms. It is indeed owing to this circumstance alone that we are enabled to detect the existence of such a communication, at least between the trachea and œsophagus.

The upper part of the œsophagus behind the larynx is sometimes the seat of ulcers, which, extending to the cellular tissue situated between it and the latter, form collections of pus which impede mechanically, to a certain degree, respiration and deglutition. The inferior portion of the œsophagus has several times been found perforated, particularly in children, in consequence, we believe, of the chemical action of the gastric acid after death.

Aneurisms of the aorta occasionally produce perforation of the œsophagus, into which the blood is effused in greater or less quantity, so that the patient may live only a few hours, or several days, after the occurrence of the accident. In some cases there is no difficulty of swallowing from compression of the œsophagus, so that the progress of the aneurism in that direction is not suspected till the perforation takes place. In others, this termination of the disease may be predicted from the obstacle opposed to the passage of the food or drink.

Perforation of the velum and palate is generally observed to take place in consequence of ulceration or necrosis, and in those persons who have taken large quantities of mercury for the cure of venereal diseases.

Perforation of the stomach occurs in consequence of ulceration and mortification of a limited portion of its walls. The ulcer which is found to have produced the perforation generally bears the characters of having been produced by chronic inflammation, that is to say, its edges are hard and thickened, although sometimes neither of these states, particularly the latter, are present. The extent of the perforation compared with that of the ulcer is always small, and its border, which is formed by the peritoneum, is generally smooth. Perforation arising from this cause is met with in general at the small curvature or pyloric portion of the stomach, rarely at the great curvature, and perhaps never at the fundus.

Perforation of the stomach from cancer may be mentioned at present, as this disease gives rise to perforation not only from the softening of the tissue of which it is composed, but also from the ulcerative process which accompanies its latter stage. Perforation of the stomach from cancer occurs, however, most frequently on account of the softening or sloughing of the cancerous tissue when it occupies all the coats of the stomach, and on this account the solution of continuity produced by these changes is larger than that occasioned by any other cause during life, except when it follows the operation of corrosive poisons.

Perforation from cancer may occur in any portion of the stomach, but is most frequently met with at the pyloric portion and at the small curvature.

It is rare that perforation from this cause is

followed by a communication between the cavity of the stomach and that of the abdomen, on account, as we have before stated, of some of the neighbouring organs becoming united to the stomach before the perforation is completed. This very circumstance, however, which prevents the establishment of a preternatural communication between the stomach and the cavity of the abdomen, gives rise, at some future period, to those complicated cases of perforation in which a direct communication is formed between two or more of the abdominal organs, or between these and the contained viscera of a neighbouring cavity, or the external surface of the body. Examples of these three modes of communication are met with as the consequence of perforation of the stomach. Thus, it is not rare to find the walls of the transverse arch of the colon perforated where they had before occluded a perforation of the stomach, and a communication established between the respective cavities of these organs.

In the same manner is occlusion of a perforation of the stomach by the diaphragm followed by perforation of the latter, from which the ulcerative or sloughing process by which this lesion had been produced, extends to the inferior lobe of the lung, which had become united to the diaphragm. In this manner a portion of the lung is destroyed, several of the bronchi are laid open, and a communication formed between these tubes and the cavity of the stomach, and consequently between the latter and the external surface of the body. Lastly, it sometimes happens that the cavity of the stomach communicates with the external surface of the body, from the successive perforation of the walls of this organ and of those of the abdomen.

In all the examples of perforation of the stomach to which we have alluded, this lesion is represented as having taken place from within outwards. It may, however, occur in the opposite direction, or, as is said, from without inwards. Examples of this kind of perforation are rarely met with, except in cases of cancerous tumours situated in the left lobe of the liver, the mesentery, or mesenteric and lymphatic glands, and in scrofulous enlargement of the latter glands.

Mortification, so far as we are aware, has not been known to give rise to perforation of the stomach, unless when it has been produced by the presence of an accidental tissue, such as that of cancer, as in the cases to which we have alluded, or when it follows the violent operation of powerfully irritant or corrosive poisons, directly applied to the walls of this organ. In this latter case the vitality and, to a certain extent, the organization of that portion of the stomach to which the poison has been applied, are destroyed. The portion thus circumstanced sloughs, and the cavity of the stomach, if adhesion has not taken place between this organ and a neighbouring one, is laid open, and its contents pass into that of the abdomen. The solution of continuity thus produced may vary from the fourth of an inch to two or three inches in diameter, and has mostly a round form. Its edges are seldom irregular, and should they happen to be so, they are not thicker than the walls of the stomach, unless blood or serosity has been effused into the cellular tunic; the density of the tissues of which they are formed is seldom or only partially increased, and never so diminished that they assume a gelatinous consistence. The colour which they present is either that produced by an accumulation of blood in the capillaries, or by the effusion of this fluid into the cellular tissue which enters into their composition, or by the chemical action of the poison either on the blood or on the tissues which form the boundaries of the perforation. In the former case the edges are more or less red, or vascular, or both; in the latter they possess either a yellowish or orange tinge, or various shades of brown, amounting to black, as if they were painted with bistre, or dusted over with charcoal-powder or soot. Irritating poisons may produce the former appearances, but not the latter, which we believe are the effects of those poisons only which possess acid properties, as the nitric, muriatic, sulphuric, and oxalic.

The *post-mortem* appearances of perforation of the stomach from the introduction of acid poisons, in particular, into this organ, still require to be investigated with greater care than hitherto has been done, and particularly by means of a series of experiments on living animals, before we can affix to them that diagnostic importance of which they seem susceptible, or refer to them with confidence as medico-legal evidence in cases of poisoning. Perhaps even in the present state of our knowledge on this subject, may the toxicologist derive more assistance from the study of the *post-mortem* appearances of perforation of the stomach from acid poisons than is generally believed. But in order to do so, he must be intimately acquainted with those of all the other forms of perforation, particularly that produced by the gastric acid after death. We shall give a general sketch of the physical and chemical effects of this acid on the stomach, and endeavour to point out the means by which they may be distinguished from those produced during life by the acid or irritant poisons which have given rise to perforation.

Perforation of the stomach in consequence of the chemical action of the *gastric acid* takes place almost always in the most depending part of this organ, viz. the fundus. In those cases in which it has been met with in other parts of the stomach, accidental circumstances have concurred which afforded a satisfactory explanation of this difference as to its seat. The size of the perforation is generally large, often occupies the whole of the fundus, and sometimes a part of the body of the stomach. Its form is almost always irregular; its edges are thin, ragged, more frequently fringed or filamentous. The tissues of which it is composed are soft, pulpy, gelatinous, and more or less transparent; either perfectly pale, of a milky hue, or streaked with lines or stripes of

a pale yellow, orange, brown, or black colour. These colours are always most marked in, or limited to, the mucous and submucous tissues, the muscular and serous coats which form the fringed edges of the perforation being quite pale. It is of the greatest importance to observe that these colours are always accompanied with softening of the mucous and submucous coats to a greater or less extent beyond the perforation; or, if these coats have been destroyed, the muscular is found similarly altered. If the bloodvessels, whether the capillaries or larger branches, were filled with blood at death, this fluid, wherever the coats of the stomach are softened, presents either the brown or black colour of chocolate or soot, and assumes of course the form and distribution of the vessels in which it is contained. Such is always the chemical effect of the gastric acid on the blood after death, and therefore we arrive at the important conclusion that redness, whether arising from the effusion of blood or vascularity, is incompatible with perforation from this natural chemical agent.

From these, the most remarkable of the *post-mortem* appearances which accompany perforation of the stomach from the gastric acid and acid poisons, it appears to us that such evidence may be obtained as will enable us to distinguish perforation produced by the former from that produced by the latter.

The pulpy, thin, transparent, pale, fringed edges of the perforation from the gastric acid; its situation in the fundus of the stomach; the presence of softening of the coats of this organ beyond the perforation, accompanied with discoloration of the blood only where this softening exists, and the entire absence of redness under any form in the same situation, are characters which we do not believe belong to any other form of perforation. Were it necessary to seek for still stronger evidence in favour of this opinion, we would refer to the histories of the cases of the individuals in whom these appearances have been found after death, to the results of our own experience on this subject in animals, and in particular to that strong collateral evidence by which it is supported, viz., the entire absence of all the anatomical characters of peritonitis, such as redness, increased vascularity, coagulable lymph, or adhesions in the neighbourhood of the perforation, and in general of effusion of the contents of the stomach,—consequences which may be said to follow invariably, and to a greater or less extent, perforation of the stomach from the acid poisons, or indeed any other pathological agent.

If we are correct in our estimate of the distinctive characters of this kind of perforation, it follows that this lesion cannot be confounded with any other, however similar to it, but produced by a different agent. The analogy which exists between the former kind of perforation and that produced by acid poisons depends, as we have already said, on the acid property of these poisons, and because, therefore, of the same kind of discoloration being present in both cases. The difficulty thus created is, however, not such as it has been represented; nay, we believe that the embarrassment of the toxicologist has arisen from his not being acquainted with those *post-mortem* appearances which we have endeavoured to shew are so peculiarly characteristic of the chemical action of the gastric acid. We may observe besides, that the local characters of perforation from acid poisons are in several respects very different from those of perforation from the gastric acid, as will be seen by comparing the description which we have given of them with those which accompany perforation from the gastric acid, particularly as regards the situation of the former, the character of its edges, and the redness of the tissues surrounding it, to which we may add effusion of the contents of the stomach, and peritonitis.

Perforation from cancer or chronic ulceration never can be confounded with that from the gastric acid.

Perforation in consequence of an ulcer of the stomach from common inflammation, neither acute nor chronic, cannot, perhaps, be distinguished from perforation produced by irritant and even acid poisons. But as facts appear to be wanting on this part of the subject, we must leave it in its present state of uncertainty without any further comment.

2. *Perforation of the intestines* takes place most frequently in consequence of ulceration; and in the great majority of cases in the inferior portion of the ileum, in the situation of the *glandulæ agminatæ*, or glands of *Peyer*. It may occur also in the points of the small and large intestines occupied by the *glandulæ solitariæ*, as well as in those of both intestines in which no follicles exist. The ulceration which preceded the perforation may have been either acute or chronic, but is far more frequently of the latter kind, and may have given no signs whatever during life of its existence. The ulcerated portion of the intestine is found either pale or presenting various degrees of redness and vascularity, and is accompanied with similar states of the surrounding mucous membranes. The changes in the thickness and consistence of this portion of the intestine present considerable variety, and vary with the degree and duration of the inflammation by which they have been occasioned. The perforation is sometimes not larger than to admit a common-sized probe; at other times so large as to admit the point of the fore-finger, or even of the thumb. Its edges are generally smooth, and more frequently circular than of an irregular shape, and are formed by the peritoneal coat, except in some rare cases, in which the ulceration has destroyed to the same extent the other coats of the intestine. Perforation of the small intestines may occur in one, two, or three of the glands of Peyer in the same individual, and in either case it almost always gives rise to a communication between the cavity of the intestine and that of the abdomen, followed by an effusion of the contents of the intestine, and peritonitis.

Perforation from ulceration may take place in the rectum, caput cœcum coli, duodenum,

and indeed throughout the whole of the large and small intestines, where the mesentery separates to be reflected over them, without giving rise to much effusion or a communication with the cavity of the peritoneum. But this variety of perforation is chiefly met with in the rectum and caput cœcum, and is no doubt sometimes the cause of the abscesses which not unfrequently form in the cellular tissue in the situation of these portions of the intestinal tube.

In the intestines, as in all organs covered by a serous membrane, perforation from ulceration is always preceded by *sloughing* of this membrane. When the ulcerative process has destroyed the sub-serous cellular tissue, and consequently the vessels which supplied it with the materials of its nutrition, it soon dies, and is separated in the form of a pale or grey-coloured slough, or tinged with the colouring matter of the bile or fæces, and without the odour of gangrene.

Perforation from mortification of all the coats of the intestines, is, perhaps, never met with unless in some cases of intus-susception and strangulated hernia. In the former case, the fæcal matter passes into the cavity of the peritoneum; in the latter a similar consequence may follow, but much more frequently adhesion takes place between the intestine, before it perforates, and the walls of the abdomen, when the perforation of both takes place, and a communication is established between the cavity of the intestine and the external surface of the body, or what is called an *artificial anus* is formed.

We are not aware that there is a single example of recovery from peritonitis produced by perforation of the intestines. The patient may survive the accident only a few hours, and seldom survives more than two or three days, the length of time depending chiefly on the previous state of the patient and the quantity of the fæcal matter effused, although some cases have occurred in which the quantity of this matter was so small that it could hardly be detected either by its presence or odour, while the symptoms were violent, and the disease proved rapidly fatal. See Fever, and Peritonitis *from perforation of the serous membrane.*

Perforation of the intestine from poisons has not, so far as we know, been observed. There are, however, several examples of its having been produced by the gastric acid after death, but which have been regarded by some pathologists as the consequence of disease,—an opinion, the accuracy of which will be particularly examined in the article Softening.

Perforation of the intestines from without inwards is occasioned by the same diseases as those mentioned as giving rise to this variety of perforation of the stomach. Tubercles and abscesses, are, however, the most frequent causes of it in the intestines. We have seen the former perforate the intestine in a number of points, without any traces of inflammation of the mucous membrane around the perforation, and without a communication being formed between the cavity of the intestine and that of the peritoneum. The abscesses which perforate the intestines are retro-peritoneal, and most frequently those situated in the loose cellular tissue situated in the ilio-cæcal region. The coats of the intestines, generally the cœcum or commencement of the colon, are gradually destroyed by ulceration, and a quantity of pus in proportion to the size of the abscess is evacuated by the anus.

The preternatural communications which are found to take place between the intestines and neighbouring organs, in consequence of perforation of the former, we have already alluded to generally, and they are by no means so frequent as when they are occasioned by perforation of the latter. Sometimes portions of the small intestines are found united together, and communicating with each other by means of several perforations, through which the liquid fæces pass in greater or less quantity, and examples have been met with in which the passage thus formed was lined with an accidental mucous tissue. In the cases of preternatural communications of this kind which we have seen, the perforated intestines were included in a common accidental serous envelope, the evidence of peritonitis having existed at some remote period; and the coats of the intestine more or less destroyed by tubercular ulceration commencing in the glands of Peyer. We do not believe that the peritonitis in such cases was the consequence of the effusion of fæcal matter from perforation of the intestine. We believe, on the contrary, that it is produced before the perforation of the serous membrane is accomplished, so that the coagulable lymph which is thrown out becomes organized and united with a neighbouring portion of intestine. Afterwards the ulceration proceeds, and the preternatural communications we have described are effected.

Another variety of preternatural communication of the small intestines, and which takes place in a manner similar to the former, is that in which there exists cellular adhesions between the perforated portion of intestine and the walls of the abdomen. The effused fæcal matter is prevented by the presence of this tissue from passing into the cavity of the peritoneum. In this tissue it collects in greater or less quantity, and as the abdominal parietes with which it is in contact are more susceptible to its stimulating effects than the former, they become inflamed, ulcerate, and are perforated, and a communication is established between the intestine and the surface of the body, through which the fæcal matter escapes. Andral mentions a case of this kind. Besides the fæcal matter there escaped an ascaris lombricoides, and several of these worms were found, after the death of the patient, contained in the cavity formed in the accidental cellular tissue which united the perforated intestine with the perforated walls of the abdomen.

Although it is said that worms perforate the intestines, we have never seen a case of perforation which could in any way dispose us to attribute it to such a cause. Were such a case

o happen, it could only be in consequence of nflammation and ulceration excited by these nimals; and yet we have found them very umerous, in one instance amounting to thouands, without the slightest trace of inflammaon of the mucous membrane.

There are a few examples of the walls of the bdomen being perforated in consequence of rge collections of purulent fluid in its cavity; nd we may mention here that perforation of ne diaphragm may take place in cases in which similar collections are formed in the avity of the pleura.

3. Perforation of the walls of the liver, which orm the boundaries of an abscess situated in is organ, and of the gall-bladder, may with ropriety be noticed in this place. Perforation f the former, with effusion of the contents of ne abscess into the cavity of the abdomen, is y no means common, because of adhesion aking place, previous to the occurrence of this ccident, between the peritoneum covering ne abscess, and that of the stomach, colon, alls of the abdomen, or diaphragm. Under nese circumstances, however, the perforation ay afterwards extend to the hollow organs we ave named, and establish a communication etween them and the cavity of the abscess, by eans of which its contents are evacuated by omiting or by stool. A communication beween the abscess and the external surface of ne abdominal parietes where they cover the bscess, is more common than the former. When the diaphragm adheres to the abscess, nd is perforated, three consequences may follow:—the contents of the abscess may pass nto the cavity of the chest; into the bronchi, om a portion of the lung which had adhered o the diaphragm having been destroyed by lceration or sloughing; or into the cavity of the hest and bronchi at the same time. We have een only one case of the last variety of perforaion of abscess of the liver, or, more correctly peaking, of a purulent cyst containing a great umber of hydatids. Although these vesicular nimals have sometimes been expectorated in ases of this kind, such did not happen in the ase to which we allude. The communication etween the bronchi and cyst took place first, ollowed by a yellow-coloured expectoration, which, because of the existence of the cyst in he liver having previously been detected, was upposed to be owing to the passage of the bile nto the bronchi from perforation. Soon afterward, symptoms of pleurisy manifested themelves, accompanied with those of effusion and neumothorax, the real nature of which was not nderstood till after death. Only one opening vas found in the diaphragm, where it covered a yst from six to seven inches in diameter, conaining a yellow, puriform fluid and hydatids. This opening, sufficiently large to admit the ore-finger, communicated with an excavation ormed in the inferior lobe of the lung, which dhered but slightly to the diaphragm. In the ottom of this excavation there were several penings, some of them, which were small, communicating with the bronchi, others larger, eading into the cavity of the pleura. This cavity contained a quantity of air, yellow scropurulent fluid, and a great number of large and small hydatids. The lung was considerably compressed, and the pleura covered with recent coagulable lymph.

Perforation of the gall-bladder occurs rarely except when biliary concretions, of considerable size, are lodged within it. In such cases the preternatural communication generally takes place between this organ and the ascending or transverse portion of the colon, through which these concretions pass into this intestine, and are voided by stool. A similar mode of transmission is afforded them when they are enclosed in the ductus communis choledochus. Their transit from either of these situations into the intestine may be accompanied with violent paroxysms of pain, or no pain at all; a difference which is not easily explained. In one case, in which the pain was extremely severe, and which terminated fatally, we found the duodenum perforated in four or five points near the pylorus, and communicating with the gall-bladder, which contained two large concretions. In two other cases, on the contrary, from the history of which we could not learn that the patients had ever suffered from any of those symptoms attributed to the passage of gall-stones, and who died of diseases unconnected with any derangement of the hepatic organs, we found in one of them a communication existing between the gall-bladder and the colon, in which a concretion was lodged and projecting into the latter, the mucous membrane and other coats of this intestine being quite healthy. In the other case there existed a similar communication, presenting the character of a fistulous passage (for it was lined with a mucous membrane), about half an inch in length, into which a small probe only could be passed. The gall-bladder was empty and greatly atrophiated in both cases, the natural consequence of the cessation of its function. Perforation of the gall-bladder from ulceration is not common. The only case worth noticing which has come under our observation, was one in which double perforation took place from ulceration of the walls of this organ. One of the perforations was situated towards the free surface of the gall-bladder, and was prevented from communicating with the cavity of the abdomen by the adhesion of a portion of the epiploon: the other was formed where this organ is in contact with the liver, so that the bile was effused between them, and had formed for itself a cavity of considerable size, covered superiorly only by the peritoneum, which rose above the surface of the liver. On this account it could be felt through the parietes of the abdomen, accompanied with the sensation of fluctuation, circumstances which led the physician to diagnosticate the existence of an abscess of the liver. Caustic potash was applied preparatory to laying it open, but the patient died two days after, before this plan of treatment could be carried into effect.

II. *Perforation of the respiratory organs.*—As perforation of the bronchi and pleura will be described in the articles PLEURISY and

Pneumothorax, and as a description of it produced by mortification has already been given under that head, we shall only mention a few facts, with regard chiefly to the comparative frequency of its occurrence in the tubercular diseases to which the lungs and some of the neighbouring organs are subject.

The presence of tuberculous matter in the lungs is by far the most frequent cause of perforation of the pleura or bronchi, both of which it destroys within a limited extent, by means of the ulceration or mortification which its presence occasions. It is only when situated beneath the pleura that the tuberculous matter gives rise to a communication between the cavity of this membrane and the bronchi, or when a tubercular excavation occupies the same situation. The escape of the air into the cavity of the pleura is not always the consequence of perforation of this membrane and of the bronchi. We have already stated that the opening in the former is sometimes closed by adhesion of the pleura, and by accidental serous or cellular tissue, which consequently prevents the air or other fluids from passing into the cavity of the chest. It is in this way that perforation of the thorax takes place, and that a communication is established between the surface of the body and the bronchi, through which the air enters and escapes. But should the perforation take place in the mediastinum and bronchi, the inspired air is effused into the cellular tissue included within the former, whence it passes to that of the neck, face, and chest, and may produce extensive and distressing subcutaneous emphysema.

Perforation of the bronchi without perforation of the pleura is a much more frequent occurrence than the former, in whatever part of the lung the tuberculous matter may have been deposited. In this case the bronchi may be simply perforated, or perforated and communicating with a tubercular excavation. Perforation of the bronchi is not an unfrequent consequence of the accumulation of tuberculous matter in the bronchial glands, or the presence of cretaceous matter in these bodies. The former occurs in young persons, and especially in children: the latter sometimes in middle-aged persons, but most frequently in those advanced in life.

This kind of perforation may sometimes be detected during life, from the presence of considerable masses of tuberculous matter or concretions in the sputa. Perforation of the bronchi from the latter cause undergoes sometimes a cure, from obliteration or cicatrization, after the entire evacuation of the concretions.

The most fatal kind of perforation of the bronchi is that which is accompanied by perforation of a large branch of the pulmonary artery. This complication takes place in two ways:—first, a large bronchus, most frequently the first or second branch of the trachea, and a corresponding branch of the pulmonary artery, are perforated by a tuberculated bronchial gland situated between them. In this case a direct communication is formed between the blood-vessel and bronchus, and the hemorrhage which ensues is so great and rapid, that the blood is thrown forth as if vomited, sometimes by the nose as well as the mouth, and may terminate fatally in from ten to twenty minutes; secondly, a tubercular excavation with which several bronchi communicate, extends in the direction of the pulmonary artery or one of its principal branches to which it adheres. The corresponding portions of the walls of the artery and those of the excavation ulcerate or slough, and hemorrhage takes place, first into the excavation, and afterwards into the bronchi. It is on account of this indirect communication between the perforated vessel and bronchi that hemorrhage in cases of this kind is generally small at first, diminishes and increases at irregular intervals, and sometimes continues for several days.

Perforation of the pleura from abscess, and the effusion of blood under the pleura in pulmonary apoplexy, is not common. In the cases which we have seen of the latter kind, the pleura appeared to have sloughed because of its having been separated from the cellular tissue by the effused blood.

Chronic pleurisy with effusion sometimes terminates in perforation of the walls of the chest or diaphragm; and there are examples of fluid making its way into the bronchi, whence it was expectorated, and the disease terminating favourably.

For perforation of the bronchi and trachea from aneurism, see Aneurism of the Aorta.

III. *Perforation of the organs of generation.*—Perforation of these organs in the female, after the middle period of life, is very common, and, in the great majority of cases, in consequence of cancer. Cancer of the uterus and vagina may give rise to perforation of the walls of both, and a communication be established between them and the following organs: between them and the bladder, or rectum separately, or between them and both of these organs at the same time. Hence the urine, fæcal matter, or both, may be passed in greater or less quantity by the vagina, and sometimes the latter makes its way also into the bladder.

Perforation of the posterior walls of the neck of the uterus or upper portion of the vagina, is not unfrequently followed by perforation of the peritoneum, and as the progress of the disease upwards is generally accompanied with sloughing of the cellular tissue behind this membrane and the neck of the uterus, a putrid sanies is poured into the cavity of the former, which gives rise to peritonitis, rarely less violent than that which is occasioned by the presence of fæcal matter. Perforation of the peritoneum is sometimes arrested by the adhesion of a portion of small intestine, which may either remain entire, or afterwards become perforated. The latter is the more frequent occurrence.

Caries and necrosis of the bones of the sacrum may give rise to perforation of the upper part of the vagina, from the ulceration and sloughing of the cellular tissue situated between them extending to the latter organ. Such a case may readily be confounded with perforation from cancer.

Perforation of the ovaries and Fallopian tubes seldom occurs. We have met with it in one of the latter, between which and the rectum there existed a communication, through which a purulent fluid, the contents of the tube, escaped, and was passed by the anus. In another case, in which the left ovary was transformed into a purulent cyst, similar consequences followed. Both patients died of other and complicated disease of the uterus. In another case, a communication existed between the left Fallopian tube and ovary. The ovary formed a cyst as large as the two fists; the Fallopian tube was from an inch to two inches in diameter, and both were filled with a sero-purulent fluid, none of which, however, appeared to have passed into the cavity of the uterus. For further information on this subject, see Diseases of the Uterus and Ovaries.

IV. *Perforation of the urinary organs.*—1. Perforation of the bladder occurs most frequently in the female, and from the extension of cancer of the uterus, to which we have already alluded. It is also occasioned by ulceration or sloughing in consequence of pressure during pregnancy or delivery; chiefly in deformity of the bones of the pelvis, or from the improper use of instruments when employed to extract the fœtus.

In the male it is more often occasioned by the catheter left in the bladder in cases of paralysis of this organ, and in stricture of the urethra in old men, than by any other cause. The perforation is generally the consequence of sloughing of the walls of the bladder which were in contact with the point of the catheter.

2. Perforation of the walls of the kidneys seldom occurs. When it happens, the loose cellular tissue with which these organs are so abundantly surrounded, becomes the seat of abscess. In one case of this kind which we examined, a small abscess was situated between the kidney and descending colon, and communicated with the cavity of this intestine. In another, an abscess containing several pints of pus, and situated between the kidney, descending colon, and lateral walls of the abdomen, likewise communicated with this intestine. The quantity of pus passed by stool in the latter case was considerable. The substance of the kidney was almost entirely occupied with tuberculous matter, as well as the infundibula and pelvis. In the former, the pelvis of the kidney contained a large calculus, and its substance was converted into a firm uniformly grey tissue. Both cases terminated fatally. The patient, a female, in whom the former case occurred, was about twenty years of age; the other was a man above fifty.

V. *Perforation of the organs of circulation.*—Perforation of these organs may be considered as it occurs in the heart, arteries, and veins. The occurrence of this lesion in the arteries is infinitely more frequent than in the heart or veins, owing obviously to their being subject to diseases which rarely affect the latter, as well as to the impulse of the blood, and the distension occasioned by this fluid propelled into them by the heart: thus, perforation of the arteries, in the great majority of cases, takes place in consequence of the deposition of a substance resembling bone, chalk, or putty, which often destroys their walls, or deprives them of their elasticity. In the first case, the internal and middle coats may be perforated without their having undergone any previous change of capacity, so that the cellular coat, being brought in contact with the blood, is pushed outwards by this fluid, and forms what is termed *circumscribed false aneurism*. In the second case, the internal and middle coats being deprived of their elasticity by the presence of one or other of these substances we have named while yet in a fluid state, yield to the continued impulse of the blood, and ultimately form a sac or pouch of various dimensions, occupying either a portion or the whole of the circumference of the artery, and which, under these circumstances, constitutes what are commonly called *circumscribed* and *diffuse true aneurism*. Perforation of the dilated coats of the artery takes place at a subsequent period, first in the internal and middle, and afterwards in the cellular. In whichever of these ways the aneurism is produced, perforation of the cellular or outer coat of the sac may take place under the two following circumstances;—first, when the surface of the aneurism is free from adhesion with a neighbouring organ, as sometimes happens when it is lodged in the thorax or abdomen, when the blood is poured into the serous cavity of either of these parts of the body; secondly, after the aneurism has become united with a neighbouring hollow organ, or the walls of the cavity in which it is contained, when, after the perforation of either of these, the blood is effused either directly on the surface of the body, or escapes by one of the natural passages, for example, the œsophagus or trachea.

Perforation of the arteries (we speak of the larger branches or trunks) is not unfrequently the consequence of ulceration proceeding from without inwards. When this happens, the ulceration may take place originally in the walls of the artery which becomes perforated; or in a portion of an organ in the immediate vicinity of an artery, to which it afterwards extends, producing a solution of continuity of its walls. We have already given examples of perforation of the former kind in the case of tuberculated bronchial glands; and examples of the latter are met with in several organs, and particularly in the stomach in some cases of chronic ulcers, in which one of the coronary arteries or a large branch happens to traverse the bottom of such an ulcer, and becomes perforated by the ulcerative process.

When cancer produces perforation of an artery, it is, in general, owing to the walls of the vessel having been destroyed by the extension of this disease to them than by ulceration. The same is the case in perforation of veins from a similar cause. These vessels are not so often perforated by ulceration as the arteries, and the hemorrhage is seldom great unless they are considerably dilated, as in hemorrhoids; or their walls much thickened and united with

indurated cellular tissue, which prevents them from collapsing, as sometimes happens in the case of chronic ulcers of the inferior extremities, accompanied with varicose dilatation of the veins. In a case of this kind which we had occasion to examine, the hemorrhage which followed the perforation of the vein was so great that the patient, a man about forty years of age, expired in little more than ten minutes.

There are a considerable number of examples of perforation, more commonly termed *rupture*, of the heart. The portion of this organ the most subject to this lesion is the inferior and middle portion of the left ventricle. Sometimes softening or ulceration, at other times atrophy of the muscular substance in the situation of the perforation, are the lesions which are found to precede the occurrence of this accident; at the same time, the walls of the ventricle are, in general, more or less hypertrophiated.

There may be one, two, or three perforations which traverse the walls of the ventricle either perpendicularly or obliquely. In the latter case the hemorrhage which ensues does not, it is said, prove so suddenly fatal as in the former case. It does not appear that the *quantity* of blood effused bears a necessary relation to the length of time that supervenes before death takes place.

We have no certain evidence to show that perforation of the heart is curable, although Rostan relates a case in which he conceived he saw the cicatrix of a perforation of the left ventricle in a patient, who was supposed to have presented the symptoms of this lesion some time before her death, which was occasioned by a second perforation.

Perforation of the valves of the heart is seldom observed except in those of the aorta, and in the cases which we have seen, it appeared to be the consequence of the presence of osseous or cretaceous matter deposited in their substance or between their laminæ.

VI. *Perforation of hollow bones* occurs in cancerous affections of their walls, and when pus or hydatids are contained within them. The latter generally produce perforation by exciting inflammation and caries of the bone; the former, by the gradual transformation of a portion or the whole circumference of the bone into a lardaceous or cerebriform substance. In this case, fracture more frequently takes place than perforation of the bone.

VII. *Perforation of the eye.*—The cornea is that part of the eye which is most frequently perforated. It may be in consequence of ulceration or sloughing, accompanied or not by similar diseased states of the other tunics of the eye; by an accumulation of pus, or the presence of malignant tumours proceeding from within outwards. (See Ophthalmia.)

VIII. *Perforation of the ear.*—Perforation of the membrane of the tympanum is not very rare in severe cases of inflammation of the internal ear terminating in suppuration. The solution of continuity of the membrane, which follows the accumulation of the pus in the cavity of the tympanum, may be the consequence of ulceration or sloughing, favoured by the mechanical distention to which it is at the same time subjected. So soon as the perforation is completed, a sudden and copious discharge of puriform fluid makes its appearance, and which, if there has been no discharge before from the external orifice of the ear, may be regarded as a certain sign of its coming from the cavity of the tympanum in consequence of perforation of its membrane.

The effects of perforation of the tympanum on the function of hearing depend on the size and situation of the artificial opening, and the degree of integrity of the *ossicula* with which this membrane is connected. Suppurative inflammation of the bony structures of the internal ear may produce in a similar manner perforation of the *membrana tympani*, as well as accidental products developed in the same situation.

(R. Carswell.)

PERICARDITIS and CARDITIS.—I. Or Pericarditis.—The anatomical characters of acute inflammation of the pericardium are, 1, preternatural redness of the membrane; 2, coagulable lymph adhering to its surface; and 3, fluid effused within its cavity. These characters we shall treat of in succession, and at some length; for as the anatomical characters are the key to the symptoms, the latter cannot be understood, and, consequently, so rapid and fatal a malady cannot be treated with the promptitude and decision essential to the safety of the patient, unless the nature of the former and their intimate connexion with the symptoms are thoroughly known to the practitioner.

1. *Preternatural redness of the pericardium.*—The redness very seldom pervades the whole of the inflamed portion. It presents itself sometimes in numerous small scarlet specks, with a natural colour of the intervening membrane, sometimes in spots of greater or less magnitude formed by the agglomeration of the specks, and sometimes in patches of considerable extent. Even these, however, have, almost without exception, a dotted or mottled character. In some cases, according to Laennec, though the inflammation, judging of it by the thickness of the false membranes, had been very severe, scarcely any redness exists. Vascular injection of an arborescent and sometimes stellated appearance, accompanies redness, and is generally proportionate to it in degree. Occasionally, however, the redness is uniform, like a stain.

The pericardium is very rarely, if ever, thickened; that which is often regarded as thickening being nothing more than superimposed and intimately adherent false membrane.

When acute pericarditis degenerates into chronic, the redness loses its brilliancy, sometimes becoming very deep and of a brownish colour, and sometimes acquiring a cinnamon hue. Beneath a layer of lymph of this colour, we have seen the surface of the heart of a bluish-white appearance, like the spots so frequently found on this organ.

Redness alone does not afford conclusive

vidence of pericarditis, as all serous as well as mucous membranes are liable to vascular injection from various causes independent of inflammation. To afford such evidence, therefore, the redness must be conjoined with an effusion of lymph or sero-purulent fluid.

2. *Coagulable lymph adhering to the surface of the pericardium.*—The inflamed pericardium secretes serum and lymph conjointly, and in a fluid state, from the same vessels. Soon after the secretion has taken place, the lymph concretes, while the serum remains fluid. The former, when recent, is of a pale straw-colour, and of a soft tender consistence, becoming firmer and more tenacious as it grows older. Though occasionally deposited in detached lumps and specks, it generally forms continuous layers, sometimes covering a portion only, but more commonly the whole, or nearly the whole, of the pericardium. The thickness of the deposition may vary from a line to an inch; but from a line and a half to three lines is its ordinary mean. Its adherent surface is smooth; the opposite or free is rough and singularly figured. It is sometimes pitted with small depressions at tolerably regular intervals, presenting the aspect of a fine reticulation, or of the section of a sponge. This occurs principally where the layer is thin: where it is thick, the surface is distributed into more spacious cells, often as large as a pea, and separated by coarser partitions. The partitions are sometimes irregular, being higher and thicker in one part than another, in which case the effect is exactly that produced by separating two flat plates between the surfaces of which a layer of soft butter has been spread. At other times the partitions are very regular; in which case the appearance, as Corvisart observes, is analogous to that of the second stomach of a calf. Occasionally they are very thick and rounded, and then they have an appearance somewhat similar to that of a congeries of small earth-worms. Not unfrequently they are shaggy and flocculent, hanging in shreds like tow. Sometimes no cells are apparent, but the lymph is arranged in transverse, and, as it were, plaited wrinkles, like undulations of sand on the sea-shore. When lymph becomes old, and not adherent, it acquires a deeper hue, varying from cinnamon to an intense brown-red or mahogany colour. When of the latter colour, it usually secretes bloody fluid.

Now, what is the object which nature proposed to herself in the effusion of lymph? Unquestionably to effect reparation—the object for which the effusion is designed in whatever part of the system it takes place. But how, it may be inquired, can it effect reparation in the pericardium? By causing adhesion. Supposing that the inflammatory process does not terminate by resolution—by the complete absorption of both lymph and serum, the most desirable termination which remains is adhesion; for should this not take place, the lymph becomes a secreting surface, which effuses more and more lymph and serum, until in a short time the cavity is completely distended, and the action of the heart so embarrassed that a fatal termination speedily ensues. But, should adhesion of the opposite surfaces take place, by which further effusion is prevented, life may be prolonged for a considerable period, even for years; though, as will presently be explained, the adhesion, so far from being a perfect reparation, gives rise to another form of organic disease, which eventually proves destructive to the patient.

Adhesion takes place in some cases and not in others,—a circumstance which has been attributed to a difference in the quality of the lymph, dependent on the greater or less energy of the inflammation, in consequence of which it possesses different degrees of aptitude for adhesion. This explanation, though perhaps not unsound, is scarcely applicable to the pericardium; for here the union or non-union depends mainly on the absence or presence of fluid in the cavity: the best lymph, equally with the worst, being incapable of uniting when interposed fluid prevents the apposition of the opposite surface. Hence it is that the upper part of the pericardium, where it is reflected from the great vessels, often adheres when the lower part does not: and for the same reason it is that, when the whole of the peritoneum is covered with lymph, the intestines adhere to each other, but their adhesion with the walls of the abdomen is prevented by the interposition of fluid.

Hence the immense importance in pericarditis, of prompt and energetic treatment in the first instance, in order, if resolution cannot be effected, to cause absorption of the fluid, and thus afford the opportunity for adhesion. Temporising indecision is inadmissible; for unless one or other of these terminations be induced, the patient inevitably dies.

Such is the object of adhesion: we have now to describe the process. When the fluid has been sufficiently absorbed, the depositions of lymph on the opposite surfaces of the pericardium come in contact, thicken, blend, and gradually become organized by vessels presenting themselves under the successive appearances of blood-stains, straggling lines, and, lastly, of uniform pinkish vascularity, susceptible of injection from the pericardium. The depositions are thus converted into perfect cellular tissue, by which the contiguous parts are more or less firmly, closely, and extensively agglutinated. When adhesion is of recent standing, the lymph is generally thick, and separable by mere tearing into two layers, one adhering to each fold of the pericardium. In proportion as the disease is older, the false membrane is thinner and firmer, consisting, in cases that date several years back, of the finest layer of dense cellular tissue. In some, even this is not perceptible, the folds of the pericardium having become amalgamated—apparently without the intervention of any membrane,—so as with difficulty to be separable, even by the scalpel. It is in such cases that pathologists have sometimes erroneously supposed the heart to be destitute of a pericardium.

In some rather protracted cases, generally of at least two or three months' duration, where,

though adhesion has been established, inflammation has either recurred or never been completely subdued, an additional interstitial deposition of lymph takes place, which has been known to thicken the adventitious mass to the extent of an inch and upwards. In this case it sometimes possesses a laminated texture, the layers of which are progressively redder in proportion as they are nearer the heart; and sometimes it exhibits different degrees of consistence in different parts, one being almost liquid and purulent, while another has the density of tubercular induration.* Such cases are ordinarily fatal at no very remote period.

But adhesions are not always universal; in cases of partial pericarditis they are restricted to the portions inflamed; and when these portions are limited, the adhesions are not close or intimate; for as the gliding motion of the heart within the pericardium is not prevented, it stretches the adherent lymph, and converts it into long loose bands of cellular tissue. But when the portions inflamed are extensive, partial adhesions are sometimes close and firm, and the intervening parts of the pericardium may be healthy and in contact. Instances occasionally occur of adhesions being partial though the inflammation had been universal; and the parts not united are overspread with lymph and separated by purulent fluid, thus constituting a series of small, detached abscesses around the heart.

Cases of partial pericarditis (exclusive of white spots, of which we shall presently speak) are very rare in proportion to those of general, scarcely amounting, according to Laennec, to one in ten.† They almost always terminate in recovery, and the adhesions, if loose and long, seldom lead to enlargement of the heart.

Partial pericarditis sometimes leaves no other vestiges than opake white or milky spots, which are a well-known appearance on the surface of the heart. They vary in extent from a few lines to two or three inches in diameter; their thickness is about that of the nail: they consist of condensed cellular tissue, and with a little care they may generally be detached without injury to the pericardium beneath. This membrane is commonly somewhat injected, though not thickened.

Sometimes lymph is converted into small, roundish, soft granulations, like concrete albumen, with which the pericardium is more or less extensively studded.

3. *Fluid effused within the cavity of the pericardium.*—It has been stated that serum is effused conjointly with lymph, from the vessels of the inflamed pericardium. This fluid is sometimes transparent, and either of a faint yellow more or less tinged with green, like that of the interior of a lemon, or of a pale fawn colour; at other times it is less transparent, but very seldom milky or opake from containing particles, filaments, or flakes of imperfectly concrete albumen. Its quantity, though variable, is in general considerable at the commencement, that is, within the first two, three, or four days of the disease,—not unfrequently amounting to more than a pint. Corvisart once found four. It is speedily diminished, however, by absorption, when the first violence of the inflammation begins to subside; and after the lapse of a few days it is, in the majority of cases, not more abundant than the concomitant exudation of lymph. Sometimes, indeed, even in very acute inflammation, the absorption is so complete that no serum whatever is found, while a copious exudation of thick concrete lymph fills and agglutinates the whole cavity.

Should complete absorption of both the fluid and lymph not take place, nor yet adhesion of the pericardium be established, the fluid presently assumes a very different character. For it is no longer secreted by the pericardium, but by the lymph itself, which, when organized, becomes a secreting surface; and its secretion, though at first consisting of clear serum, gradually becomes more and more turbid, milky, and opake, until it eventually assumes the character of pus. Rarely, however, is perfect pus found in the pericardium; probably because the patient dies from irritation before the suppurative process is fully established. Not unfrequently the fluid is bloody, and the lymph of a red colour. This is attributable to the tenderness of all newly organized structures, in consequence of which they are apt to become congested and to effuse blood when subjected to any unusual irritation or excitement. The excitement in the present instance most probably consists in inflammation of the adventitious membrane, either renewed, or never wholly suspended.

Compression exercised by fluid, and even by great accumulations of lymph, sometimes reduces the volume of the heart, and renders it atrophous.

Such are the anatomical characters of acute pericarditis, both in its early and its advanced stages. It remains to make a few remarks on that form of pericarditis which appears, from the mildness of the inflammatory symptoms, to have been chronic from the first. Its anatomical characters do not differ very materially from those exhibited by the advanced stages of the acute form. The inflammation always pervades the whole of the cavity; the redness is deeper and duller than in the acute affection; the albuminous false membranes are, in many cases, totally deficient, and when present, they are thin, soft, and fragile, as if wasted by suppuration: finally, there is always a more or less abundant effusion of turbid, milky, and sometimes completely puriform fluid. *Intimate* adhesions of the pericardium to the heart may follow the absorption of this fluid; but M. Laennec does not appear to be borne out either by facts or by analogy, when he supposes that chronic pericarditis alone is the cause of intimate adhesion, and that the acute affection only gives rise to loose adhesion by more or less elongated bands. According to our experience, the latter is the more frequent cause of intimate adhesion.

* *Latham*, Lond. Med. Gaz. vol. iii. p. 5.
† De l'Auscult. Med. tom. iii. p. 655.

The muscular substance of the heart is, in general, not affected by pericarditis; but sometimes it is rendered redder or paler, browner or yellower, harder, softer, or more lacerable, than natural. These changes result from inflammation propagated from the pericardium to the muscular substance. They will be more fully considered in the article CARDITIS.

In scrofulous and phthisical individuals, tubercles are sometimes developed in the false membranes of pericarditis, and according to Laennec, they may cause the acute to pass into the chronic state, as frequently happens in the case of pleuritic and peritoneal false membranes.

Signs and diagnosis of pericarditis.

General signs.—There is no inflammatory affection of which the diagnosis has been considered more difficult than pericarditis. Laennec states that he has often, on dissection, discovered the disease in a severe form, when nothing had afforded a suspicion of its existence; and, on the other hand, that he has frequently witnessed all its signs without finding a vestige of the malady. Dr. Latham mentions two cases of what appeared to be and was treated as marked inflammation of the brain; yet this organ was found perfectly sound, and the heart affected with intense pericarditis.* Andral relates a similar case.† It is proper to keep these difficulties prominently in view, in order that practitioners may be better prepared to contend with them. But it must be added that such cases as those of Latham and Andral are extremely rare; and that, with the improvements in diagnosis introduced by modern research, the disease may, we feel assured from numerous post-mortem examinations, be nearly always detected. We shall first enumerate the symptoms, and then endeavour to point out the causes of their obscurity, the means of rendering them available, and the diagnosis from other inflammatory affections.

The symptoms are as follow: acute inflammatory fever; a pungent, burning, lancinating pain in the region of the heart, shooting to the left scapula, shoulder, and upper arm, but rarely descending below the elbow, or even quite to it. The pain is increased by full inspiration, by stretching the left side, and especially by pressure between the præcordial ribs, and by forcing the epigastrium upwards underneath the left hypochondrium. When the inflammation is only subacute, the pain is more or less dull, and does not lancinate. The next symptoms are, inability of lying on the left side, and sometimes in any position but one, which is most commonly on the back; dry cough; hurried respiration; palpitation of the heart, the impulse of which is sometimes violent, bounding and regular, though its beats may at the same time be unequal in strength; at other times it is feeble, fluttering, and irregular; pulse always frequent, and generally, at the onset, full, hard, jerking, and often with a thrill. Sometimes it maintains these characters throughout, but more commonly it becomes, after a few days, weaker than accords with the strength of the heart's action, and in the worst cases, small, feeble, intermittent, irregular, and unequal. Occasionally it possesses the latter characters from the commencement; whenever they exist, they are accompanied by dyspnœa; a constrained position, deviation from which induces a feeling of suffocation; extreme anxiety; a peculiar drawn or contracted appearance of the features, occasionally with the sardonic grin; faintness, constant jactitation, insupportable distress and alarm, cold perspiration, and, finally, from obstruction of the circulation, by intumescence and lividity of the face and extremities.*

One cause of the obscurity of the above symptoms would, at first sight, appear to consist in their diversified, incongruous, and variable nature. The pulse, for instance, displays, at one time or other, almost every kind of character; the disease, though the inflammation be equally intense, is sometimes very supportable, —at others, agonizing; in one case it terminates fatally in two or three days, in another it lasts as many weeks.

Now, in reality, these diversities, while they do not render the symptoms less pathognomonic of the disease in general, as will presently be shown, are invaluable indications in another point of view—they denote the nature and progress of the anatomical changes of structure, and, in correspondence, the progress and exact state of the malady. For it is ascertained by experience that a difference in the quality and quantity of the effusion imparts a totally different aspect to the symptoms. Thus, when, either from the effusion consisting principally of concrete lymph, or from the simultaneously secreted serum being absorbed, universal adhesion of the pericardium promptly takes place, preventing all further fluid effusion, the action of the heart maintains throughout much the same vigour and regularity as it manifested at the onset of the malady, and the pulse exhibits corresponding characters of strength, hardness, and regularity. Under these circumstances also, the position is less constrained, and less pain is produced by an unfavourable one; in consequence, perhaps, of the heart being curbed by the adhesion, and thus prevented from impinging with the same degree of violence against the thoracic walls. Finally, as the force and rhythm of the heart's action, and consequently the circulation, are adequately maintained, the life of the patient will be prolonged probably for weeks, even though the inflammation remain unsubdued, and he will sink at last apparently from mere exhaustion by the effects of protracted irritation.

But should there be a copious serous effusion, the heart's action is mechanically embarrassed by the compression that the fluid occasions,—a compression which is the more considerable because the pericardium, deprived

* Lond. Med. Gaz. vol. iii. p. 209.

† Clinique Médicale, vol. iii. p. 444.

* We have seen extensive œdema of the feet supervene during the last twelve hours of life.

of its distensibility by inflammation, is incapable of yielding as the fluid accumulates. Hence the organ, unable to transmit its contents, becomes congested: it flutters, intermits, beats feebly, irregularly, and unequally. The pulse has corresponding characters, and is sometimes scarcely perceptible. Hence supervene faintness, dyspnœa, anxiety, coldness, lividity, a sense of suffocation on the slightest deviation from a certain position, with all the other symptoms indicative of an obstructed circulation. If this state be not expeditiously relieved by remedies, the patient dies in the space of a few days or even hours.

Should the fluid be copious from the first, this series of symptoms will make its appearance equally early; but, in general, two or three days elapse before the accumulation becomes considerable; in which case the former series will exist during this period, and will then be suddenly replaced by the latter. In a few instances we have found the latter exist when the quantity of fluid was inconsiderable, but that of lymph enormous. We conceive, therefore, that an enormous accumulation of lymph has the same effect as fluid in embarrassing the action of the heart. We have also found the worst class of symptoms occasioned by a less quantity of fluid in some cases than in others,—a difference which probably depends in some instances on diversities in the nervous irritability; but in others we suspect that it is connected with the co-existence of carditis; for when the affection has been thus complicated, we have known the feeble, fluttering action of the heart and all its concomitant train of unfavourable symptoms, occur, though the effusion within the pericardium was inconsiderable. The peculiar expression of the features is occasioned by the sympathy subsisting between the respiratory nerves of the face and those of the heart.

Such are the causes of the symptoms. It will now be apparent that their variability is calculated to enlighten rather than to perplex the practitioner; and that, whatever aspect they assume, they would still be abundantly sufficient, did no other difficulties interfere, to render the disease one of easy diagnosis. But unfortunately there are other difficulties. Some of these consist in the absence or mildness of certain of the most important symptoms.

When pain in the immediate situation of the heart, increased by pressure in the interspaces between the ribs, or upwards under the left hypochondrium, is accompanied by increased action of the organ and by fever, there can scarcely be a doubt of the existence of pericarditis. But sometimes, though rarely, pain is totally absent; in which case the practitioner must carefully employ pressure, as above directed; and if, notwithstanding, no pain be felt by the patient, he must carefully turn his attention to the remaining symptoms. Should the pulse be feeble, faltering, intermittent, unequal, &c., without any apparent adequate cause, (and it is well known to practical men that such a pulse rarely if ever exists in ordinary cases without a discoverable cause,) this sign,* especially if attended with the usually concomitant signs of an obstructed circulation, affords evidence of the strongest description.

But there may be neither pain nor an unsteady pulse. In this case, should the action of the heart be violent, and of a remarkably bounding or jerking nature, without any manifest cause,—especially organic disease of the organ; and should it be accompanied by a greater degree of fever and anxiety than can be accounted for by any other existing complaint; finally, should it be attended with the stethoscopic signs presently to be described, the physician will seldom be wrong in diagnosticating pericarditis. The presumption is still stronger if, when the symptoms supervene, the patient is affected with acute or subacute rheumatism,—an affection which, whether severe or mild, whether in its early or its latter stages, is beyond comparison the most frequent cause of pericarditis.

It was an opinion of Corvisart that the most acute cases were the most obscure, because, says he, "the attack is abrupt, the progress rapid, and the termination always sudden." This obscurity was felt by that acute observer because he was not acquainted with any signs of the disease on which he could depend but the feeble, unsteady pulse, the anxiety, dyspnœa, lividity, and other symptoms dependent on obstruction of the circulation,—symptoms which did not always show themselves early enough to afford him data for the diagnosis before the case was hopeless. At present, however, when we are in possession of so many signs, the same obscurity does not exist. We have seldom experienced, nor have we seen other physicians experience, much difficulty in recognising the acute pericarditis to which Corvisart refers. The most obscure cases are those mentioned by Latham and Andral, in which an inflammation of the brain or any other organ diverts the attention from the heart, and the delirium of the patient renders it impossible to obtain information from himself. Still, when apprised that such cases exist, we should think it perhaps not impossible to provide against them. If, for instance, it were the general practice (one which we invariably pursue) to place the hand on the præcordial region as well as on the pulse in every severe inflammatory or febrile affection, in the same way that we daily feel the abdomen in cases of fever, even though the patient make no complaint of it, we should seldom fail to find an inordinately increased impulse or some other anomaly in the action of the heart, which would lead us to make a regular and probably successful investigation for pericarditis. For there can be little doubt that the symptoms, in the cases alluded to, are in reality not absent, but merely masked by others of predominant severity. Such an investigation is especially necessary in young children, who cannot explain their sensations, and seldom give indications of the existence even of acute pain.

* On it alone we have seen M. Chomel found a successful diagnosis in the last stage of a typhous fever, when the symptoms were extremely complex.

The only remaining cause of obscurity is, flammation of some of the thoracic viscera, rticularly the pleura, the pain of which may seated over the heart. Pleurisy may be tected by ægophony, extensive dulness on rcussion, and diminished or absent respiratory murmur. Peripneumony may, in addition its ordinary symptoms, be recognised by the epitous rhonchus, deficient respiratory murur, and dulness on percussion; finally, bronitis may be known by the mucous, sibilous, d sonorous rhonchi. Should none of these gns be present, the negative evidence thus obined fixes the disease on the heart; but should ey be present, the diagnosis of the pericarditis ust be made by a general comparison and utious consideration of all the symptoms. this case, should the affection of the heart be verlooked, the error is not one of the most erious kind, as the treatment for pleuritis or eripneumony is well adapted for pericarditis.

In a disease the treatment of which requires much decision and promptitude in the practioner as pericarditis, it is necessary for him to e thoroughly conversant, not only with the ymptoms of deterioration, but also with those of melioration. To these, therefore, we shall advert before proceeding to the physical signs.

If the worst symptoms decline, namely, the eeble, fluttering, unsteady pulse, the feeling of intness and suffocation, and the constrained osition to which that feeling confines the atient, we may be tolerably sure that the fluid, n which these symptoms commonly depend, is ecreasing by absorption. But, notwithstanding, should pain, violent impulse, fever, and nxiety continue, the inflammation is in progress, and is adding to the accumulation of ymph, if not also of fluid. Should, however, ne pain, instead of being fixed and pungent, become a diffuse uneasiness; should the anxiety decrease, and the peculiar vehemence of the eart's action gradually degenerate into the beat f a merely accelerated circulation, the inflamnation may be presumed to be on the decline; ut it is not until all these symptoms have ompletely ceased that it can safely be said o have terminated.

Still, lymph and adhesion of the pericarlium may remain, rendering the reparation imerfect; and such we may consider to be the ase so long as, with every advantage of perfect ranquillity and abstinence, the motions and sounds of the heart do not completely regain heir natural standard. Even though this be egained, nothing is more common than a recurrence of palpitation and other symptoms of liscased heart when the patient resumes his ccustomed avocations. It is not, therefore, until, very gradually returning to corporeal exercise, he finds himself, after an adequate trial, perfectly capable of his wonted exertions, that he cure can be pronounced complete.*

Physical signs.—The impulse of the heart is greatly increased,—not only heaving the thoracic walls vigorously, but being remarkable for its abrupt or jerking character; whence it often shakes the whole anterior chest Some beats are generally stronger than others, even when the action is regular. The pulse or rather throb of the arteries, often perceptible over the whole body, is of a corresponding nature, each undulation of the blood shooting with instantaneous velocity under the finger, as if through a lax or imperfectly filled tube, and constituting what is called a bounding, or, more expressively, a jerking pulse,—the pulse that we feel during reaction after uterine or other excessive hemorrhage. Very frequently it is accompanied with a distinct thrill. Sometimes it is stronger and more voluminous, at others smaller and weaker; yet in the latter case it still retains the same jerking character.

When the action of the heart becomes feeble and faltering, the impulse of the organ of course sustains a corresponding change; but, notwithstanding, the jerk accompanies any isolated contraction that happens to be strong.

An impulse and pulse of the jerking description denote an inordinately abrupt, and as it were spasmodic contraction of the heart, probably attributable to an increase of irritability resulting from the inflammation. It is this peculiarity in the beat which distinguishes it from the beat of a merely accelerated circulation, a distinction perfectly familiar to practical men. The peculiarity subsists not only during the continuance of inflammation, but so long as the action of the heart remains quick after the inflammation has apparently subsided,—a period which generally occupies several weeks, and, if adhesion of the pericardium has taken place, frequently as many months. We have known it exceed half a year. In very protracted cases it is probable that the irritability of the heart is kept up either by an occasional recurrence of inflammatory action, or by the unnatural circumstances in which the organ is placed by adhesion, or, finally, by a softened state of the muscular substance, the result of carditis.

The sounds.—The sound of the ventricular systole is not only unusually sonorous, but is accompanied with a bellows murmur. This sign was first noticed by Dr. Latham, who pointed it out to us at St. Bartholomew's Hospital in 1826. Since that time we have never found it absent *when the heart presented the increased jerking impulse* above described. Dr. Latham restricts his observation to rheumatic pericarditis: to ourselves the phenomenon has appeared to exist equally in every form of the disease. When the action of the heart has been feeble and faltering, we have found the murmur absent; but when, in the same case, the action has, either previously or subsequently, been strong and jerking, the murmur has existed. The reason of this will be obvious from the explanation which will presently be offered. The murmur sometimes continues after the heart appears to have resumed its natural action and the patient to be well; but so long as it

* See an excellent paper by Dr. Latham, Lond. Med. Gaz. vol. iii. p. 213, to whom the profession in general, and ourselves in particular, are greatly indebted for his researches on this subject.

remains, as remarked by Dr. Latham,* "his return to the habits and exertions of health will bring back palpitation and other symptoms, which bespeak the certainty of mischief still abiding in the heart."

Not the ventricular systole only, but occasionally, though by no means always, its diastole likewise is attended with the bellows murmur; and we have found this supersede and as it were annihilate the natural second sound more completely in pericarditis, than, we think, in any other affection of the heart. Sometimes, in short, it is a pure whizzing, as prolonged as, and almost continued into, the first sound. Three cases at present under our care present this character.

What is the proximate cause and what the mechanism of these preternatural murmurs? That of the ventricular systole we are inclined to attribute, mainly at least, to the increased velocity with which the blood is propelled in consequence of the morbidly abrupt contraction of the heart,—an explanation which appears to us to be rendered probable by the following considerations: 1. by repeated abstractions of blood, in animals, at intervals of a day or two, we have produced at pleasure the rapid, throbbing, jerking, and thrilling action of the heart and arteries, and, in strict concomitance with it, the bellows murmur; 2. the murmur takes place in nervous palpitation when the action of the heart and arteries is of the nature described; 3. the loudness of the murmur observes a very accurate ratio to the violence of the throbbing, and it subsides when the throbbing ceases, unless there remain an organic lesion, presently to be described, which generates it on a different principle.

But though we attribute the murmur of the ventricular systole *mainly* to the cause described, we believe that it may, in some instances, originate partly in another cause: namely, constriction of the arterial orifices consequent on inflammation of the lining membrane. For, as this membrane is more liable to inflammation where it constitutes the valves than elsewhere, it is consistent with analogy to suppose that, by its intumescence and loss of elasticity, the orifices will undergo the constriction alluded to.

The murmur accompanying the second sound we are inclined to attribute perhaps entirely to the same constriction, affecting the auriculo-ventricular orifices. This we infer, because we have not found it produced in any appreciable degree by abrupt, jerking action of the heart in reaction from loss of blood, and in nervous palpitation; and because, when we have noticed it in pericarditis, we have invariably found it connected with a more or less thickened and opaque state of the valves—a state which, though perhaps scarcely amounting in every instance to an obstruction when it was examined in the dead subject, gives sufficient reason to believe that it might have constituted one during the period of acute inflammation. Should this be found true, the bellows murmur of the second sound renders the prognosis more gloomy; as it bespeaks a more extensive inflammation and the probability of subsequent valvular disease.

Percussion.—When the pericardium contains much fluid, the resonance of the præcordial region becomes dull over a greater extent than natural. The impulse, also, it may be added, is undulatory, and not exactly coincident with the first sound, in consequence of the heart having to displace the fluid interposed between it and the thoracic walls, before it can impinge against the latter. (See HYDROPERICARDIUM.) M. Louis states that he has found a temporary effusion of fluid cause a prominence of the cardiac region. We do not happen to have noticed this, but we think it very probable, especially in young subjects in whom the cartilages are soft.

Signs and diagnosis of chronic pericarditis.

General signs.—The signs of chronic pericarditis are much the same as those of acute, but in a very inferior degree. The fever is more that of hectic or marcor, with occasional exacerbation, when perhaps the inflammation becomes subacute. The anxiety and restlessness, though sometimes great, are comparatively supportable. The position is less constrained, and we have observed that the patient often prefers the sitting posture with the body inclined forwards. The circulation is less embarrassed, and the action of the heart, though often abrupt and jerking, is usually somewhat feeble, except during any temporary exacerbation of inflammatory action. The pulse, also, is sometimes not very unsteady though the pericardium be full of fluid; which we attribute to the elasticity of the membrane not being so far destroyed by the inflammation as to prevent it from gradually undergoing extension, and accommodating itself to its contents, whence compression of the heart by the fluid is in some degree obviated. The patient, we have thought, more frequently complains of a load and fulness, "something which he cannot get down," in the scrobiculus cordis, in chronic than in acute pericarditis.

Chronic pericarditis, especially if such from its commencement, is more obscure than acute. We have, in former years, seen it overlooked more than once. But these cases, when we now revert to them, appear to us to have presented sufficiently characteristic symptoms. The history affords the greatest light. If the patient, previously exempt from disease of the heart, has suddenly become affected with its symptoms, attended by marcor and some degree of fever, within a period seldom extending beyond a few months, and which he often dates from a blow or fall on the breast, a rheumatic fever, or an inflammation with pain in the præcordial region, chronic pericarditis may be strongly presumed; and if these symptoms coincide with the physical signs of fluid in the pericardium, the existence of the malady may be regarded as almost certain.

Physical signs.—The impulse and pulse have much the same general characters as in

* Lond. Med. Gaz. vol. iii. p. 214.

ute pericarditis, except that, as the heart's tion is less vigorous, they are not so strong.* ne signs of fluid in the pericardium are the me; namely, the extensive dulness on rcussion and the undulatory impulse.

auses, prognosis, and treatment of pericarditis.

Causes of pericarditis.—The most frequent uses are blows or excessive pressure on the præcordial region, inflammation propagated om the lungs or pleura, and, far above all, eumatism. From this cause, children and oung persons suffer much oftener than others. he remaining causes are those of inflammation general, viz. cold, febrile excitement, &c.

Prognosis.—This disease, supposed by Corsart to be necessarily fatal, has, by subsequent xperience, been proved curable,—and completely curable; but as the possibility of effectng a complete cure is limited to a very brief eriod, and as, unless it be complete, the atient almost inevitably dies sooner or later om the consequences, the disease must be egarded as one of the most formidable inident to the human race. Some of these onsequences we shall describe in the next ection under the head of *adhesion of the ericardium.*

Treatment of acute pericarditis.—The antihlogistic treatment, in as energetic a form as ircumstances will allow, should be employed vith the utmost promptitude. The loss of a ew hours at first may be irretrievable; and ence hesitation and indecision may seal the ate of the patient. If the attack be recent, nd the patient's strength will admit, blood hould in the first place be drawn freely and y a large incision from the arm, so as to ring him to the verge of syncope. From ive-and-twenty to forty leeches, according to he strength, should then be applied to the præcordial region, so soon as the faintness rom the venesection disappears, and reaction ommences, which generally happens in the ourse of from ten minutes to an hour or two. Unless the pain be completely subdued by hese measures, the leeching may be repeated wo, three, or more times, according to the strength, at intervals of from eight to twelve hours; or, what is a better rule, so soon as the pulse and action of the heart denote a recommencement of reaction.

It is not, however, in every case that so active a treatment is required: we have seen a single prompt and abundant application of leeches, or a cupping, at once subdue every formidable symptom. When the patient, either from age, a feeble constitution, or the advanced state of the malady, cannot bear extensive depletion, local bleeding is, according to our observation, decidedly preferable to general; but it should be practised effectually, by cupping to twenty ounces or more, or by the application of from twenty-five to thirty or forty leeches. When, from depletion having already been carried to a great extent, or from the advanced stage of the disease, it is not safe to draw much more blood, yet it appears expedient, from the persistence of pain, &c. to draw some, we have generally found that a smaller quantity drawn by cupping, produced more effect than a larger by leeching. The cause of this probably is, that by cupping it is drawn more expeditiously.

While the bleeding is in progress, other means should not be neglected. The intestinal canal, if at all confined, should immediately be evacuated by a purgative enema. Three drachms of senna leaves, and an ounce of sulphate of soda infused in a pint of boiling water and strained, answers the purpose. At the same time, five grains of calomel with five or ten of comp. extr. of colocynth, and two or three of extr. of hyoscyamus, should be given, and, in two hours, be followed by a senna draught.

The strength of the remedies employed must in each case be apportioned to the vigour of the patient's constitution; but the object is the same in all—expeditiously to prostrate the action of the heart, and for a time to keep it prostrate by preventing the re-establishment of reaction. If this object can be accomplished for the first twenty, thirty, or forty hours, the disease frequently does not rally, but remains perfectly under the control of remedies. We feel satisfied that a degree of activity in the first instance, which to some may appear excessive, is an ultimate source of economy to the strength of the patient; for the disease is subdued at once, and the protracted continuance of depletory measures, the most exhausting to the constitution, is rendered unnecessary.

In addition to the above measures, diluent, cooling drinks, as four scruples of supertartrate, or two of nitrate of potass in a quart of water, and flavoured at pleasure, should be allowed in unlimited quantity, in order, by diluting the blood, to render it less stimulant to the heart. Nauseating doses of tartrate of antimony, as one-sixth to one-eighth of a grain, every two hours, may be employed with advantage. The diet should consist wholly of the weakest slops, as barley-water, gruel, weak tea, arrow-root, &c.

But the antiphlogistic treatment alone is not to be relied upon: rarely, if ever, does it, in a severe case, effect a complete cure. The practitioner sees all his resources gradually exhausted, while the disease proceeds with an even, uncontrolled tenor to its fatal termination. Sometimes, indeed, all the other symptoms disappear, but the action of the heart remains stronger than natural; at other times the heart even regains its healthy action, and the cure appears complete: yet in both these cases the palpitation, accompanied with symptoms of organic disease of the heart, recurs when the patient resumes his accustomed oc-

* The sounds will vary according to circumstances. When the action of the heart is jerking, and not wholly devoid of force, the first sound will be attended with a murmur, which, however, is generally very slight. When there is inflammatory constriction of the orifices, a murmur will attend both sounds. Should the heart be dilated, as is frequently the case, the sounds will be increased; and should hypertrophy be conjoined with the dilatation, the impulse will sustain a corresponding augmentation of force.

cupations. The reason of this is very intelligible. Unless the effused lymph, as well as the serum, be absorbed, it causes an adhesion of the pericardium, and thus establishes destructive disease. Now antiphlogistic measures can neither prevent the effusion of lymph, nor with any degree of certainty cause its absorption. Mercury *can* do this, as is visibly displayed in iritis; mercury, therefore, is the sheet-anchor of the practitioner. Dr. Latham is of opinion that its success is restricted to the condition of its producing salivation rapidly. From many observations we are satisfied of the general truth of this remark, and would therefore give the remedy on this principle; but we have seen cases in which cures, not falsified after many months, were effected, though salivation was not produced. The mineral, however, was freely administered, and probably produced its specific effect, though not in an apparent manner. From five to eight grains of calomel, or from ten to fifteen of blue pill, prevented from purging by a grain or a grain and a half of opium, three times a day, commencing after the first bleeding and a purgative, generally produce the effect with sufficient expedition. Inunction may be superadded or partially substituted, if mercury, taken internally, disagree. A manifest abatement of the symptoms generally takes place immediately on the effect of the remedy becoming apparent in the mouth, especially if a free salivation is established within the first thirty or forty hours. It should be maintained for a week or ten days, or even longer, unless the symptoms completely yield before the expiration of this period.

Should pain continue in the advanced stages of the malady, and after the period for applying leeches has passed, blisters may be resorted to, and repeated in quick succession, with great advantage. I have occasionally found a third or a fourth necessary before the pain has been completely removed. In the repetition of blisters, as well as of leeches, cupping, and venesection; and in the selection of one of these remedies in preference to another, much must necessarily be left to the judgment of the practitioner. It is only experience which can teach the exact adaptation of remedies to the circumstances. It must also be left to his discretion whether to give sedatives or not. When the restlessness and nervous irritability was great, we have seen much benefit derived from tinct. hyoscyami, *m*xv. ad xx. with the same quantity of tinct. digitalis, in a draught three or four times a day. Sedative remedies, however, should not be given until the first severity of the inflammation has subsided; nor should they ever be allowed, by producing their poisonous effects, to confuse the symptoms, already sufficiently complex, in the latter stages.

During convalescence it is sufficient to say that a very spare unstimulating diet and extreme tranquillity must be imperatively enjoined until the action of the heart has become perfectly and *permanently* natural.

An individual who has recently been affected with pericarditis is peculiarly liable to a recurrence of it, especially if it has resulted from rheumatism, and if the reparation has been incomplete. In this case, should rheumatism return, it rarely fails to be accompanied with a renovation of the pericarditic symptoms.

This cannot be a subject of surprise; for it is consistent with general analogy that a part recently injured by inflammation is more susceptible than a healthy tissue of inflammatory action; the reason of which probably is, that the vessels of newly organized adventitious structures are more tender and irritable than others. Secondary inflammation, however, has not the same energy and intensity as that of a healthy structure, it yields more promptly to curative measures, and is more completely within the powers of medicine. Hence a first attack of pericarditis is more dangerous than any subsequent one. It is comparatively rare for a patient to die from the direct effect of a recurrent attack; and, what is still more remarkable, he may sustain several without being left in a materially worse condition than after the first.

Much discretion, however, is requisite on the part of the practitioner to bring such recurrent attacks to a favourable termination; and the danger of doing too much is, perhaps, greater than that of doing too little. He must, in particular, be cautious of bleeding too extensively, with the object of reducing the excessive energy of the heart's action; for this energy, he must recollect, is a consequence not of the inflammation only, but partly also of an organic affection of the organ left by the primary attack. Nor is there the same motive for a vigorous employment of mercury; for the heart being already irreparably disorganized, it would be chimerical to entertain the expectation of effecting a *perfect* cure. The object, therefore, should be simply to prevent deterioration by combating the inflammation as it presents itself.

For the accomplishment of this object, a moderate use of bloodletting and mercury suffices; and leeching or cupping on the præcordial region is more efficacious and less exhausting than venesection. Blisters are, in these cases, peculiarly beneficial; and they may be repeated in quick succession as often as they are required and can be borne. When there still remains a little lingering pain, which scarcely authorises vigorous measures, but cannot prudently be left, the most valuable and convenient remedy has appeared to us to be, a plaster composed of a scruple of tartrate of antimony, five scruples of the emplast. picis comp. and one scruple of wax to diminish the tenacity of the adhesion.

In these cases, also, where the sufferings of the patient, though perhaps not severe, are very protracted, and accompanied with much loss of rest, great advantage is derived from a pill of from three to six grains of extr. of hyoscyamus at bed-time, and moderate doses of tincture of digitalis during the day, the specific poisonous effect of the latter remedy

eing obviated by omitting it for a couple of ays after every three or four.

Chronic pericarditis.—When pericarditis is ssentially chronic, and the cavity appears to ontain fluid, counter-irritant remedies are the ost suitable. After what has already been id, it will be sufficient merely to mention listers, either in succession or kept open with avine cerate, the tartrate of antimony and itch plaster, and likewise issues and setons. he last remedy, however, generally creates so uch irritation as to do more injury by deriorating the general health, than good by s local effect. Mercury to a moderate extent ay, if discreetly employed, be advantageous y promoting absorption; but in general the atient is too much reduced by constitutional ritation to admit of more than the mildest tion of this remedy.

The diet may in chronic cases be more utritious, comprising light animal food and oths.

II. Carditis.—Inflammation of the muscur substance of the heart may be, 1. universal, . partial.

1. Of universal carditis with effusion of pus enerally throughout the muscular tissue, there not to our knowledge more than a single stance on record, and that occurred to Dr. atham. "The whole heart," says he, "was eeply tinged with dark-coloured blood, and s substance softened; and here and there, pon the section of both ventricles, innuerable small points of pus oozed from among e muscular fibres. This was the result of a ost rapid and acute inflammation, in which eath took place after an illness of only two ays."* Laennec, never having met with or eard of a case of this kind, and considering a effusion of pus the only unquestionable gn of carditis, says, "there does not perhaps xist a single incontestible and well described xample of *general* inflammation of the heart ther acute or chronic."† Independent of the bove instance, however, there are probably any others, which, though not attended with ffusion of pus, will come under the denomiation of universal carditis; for few will concur ith this distinguished writer in excluding om the proofs of carditis softening and indu ation, with increased or diminished colour of e organ. These are results of inflammation other muscles, and analogy points out at they have the same origin in the heart, urther evidence is derived from the fact that, cases of pericarditis, the characters in ques on sometimes occupy only a certain depth of e exterior surface of the organ, whence the rsumption is almost positive that they originate in an extension of the inflammation from e pericardium. The cases of this description at are on record are too numerous to be uoted. Several have fallen under our own bservation. In this point of view, then, eneral carditis is not very rare.

As softening and induration are of sufficient importance to demand separate articles, we refer the reader to them for all that remains to be said on general carditis.

We have already stated, when treating of pericarditis, that this affection is greatly aggravated by the coexistence of carditis. As the treatment of the two is the same, it is unnecessary here to enlarge on it.

2. Partial carditis, characterized by the existence of an abscess or ulceration in the walls of the heart, is not very uncommon. Bonetus, in his Sepulchretum, has described a considerable number of cases. Abscesses are more rare than ulcers. The latter occur both on the external and the internal surface of the heart, and are consequent sometimes on inflammation of the membranes of those surfaces, and sometimes on steatomatous deposition in the cellular tissue beneath the lining membrane. The external ulcer is uncommon, but Olaüs Borrichius, Peyer, and Graetz have left perfect descriptions of it. The first says, "Cordis exterior caro, profundè exesa, in lacinias et villos carneos putrescentes abierat." The internal ulcer is more common. Bonetus, Morgagni, and Senac present many cases. We have met with two or three.

An ulcer, whether external or internal, may perforate the heart.

The signs of abscesses and ulcers vary in different subjects, and are not distinguishable from those of other affections. "I know not," says Laennec, "if auscultation will afford any more sure signs, and I avow that I think not."*

Ulceration is the most frequent cause of rupture of the heart,—fortunately a very rare occurrence.

The existence of gangrene of the heart has never been distinctly proved, and the following reasons lead to the belief that its occurrence is perhaps impossible: first, the muscular tissue is one of those least susceptible of it; and, secondly, inflammation of the heart sufficiently intense to occasion it is fatal to the patient before gangrene can take place. The cases on record of reputed gangrene appear to have been nothing more than softening, which incipient putrefaction had rendered more analogous to gangrene

Adhesion of the pericardium.—Pericarditis, both acute and chronic, and especially that originating in rheumatism, frequently terminates in adhesion of the pericardium. Lancisi, Vieussens, Meckel, Senac, and Corvisart are of opinion that, with a complete and intimate adhesion, the patient cannot live in a state of health. We know not how it is that Laennec and Bertin have formed an opposite opinion. The former states that he had opened a great number of subjects so affected who had never *complained* of any derangement in the circulation or respiration; whence he infers that adhesion often does not in any respect interfere with the exercise of those functions. Our experience is entirely opposed to this doctrine.

* Lond. Med. Gaz. vol. iii. p. 118.
† De l'Auscult. t. ii. p. 554.

* De l'Auscult. t. ii. p. 664.

The *complaints* of the patient are, perhaps, not a just criterion, for we have often found the working classes disclaim dyspnœa when labouring under enormous hypertrophy and dilatation, and when that symptom obviously existed in a great degree. Many others, also, especially children, are naturally inattentive to their own sensations, and close interrogation is the only mode of ascertaining that after the attack of pericarditis they became incapable of some exercises, habits, or efforts which they previously accomplished with facility.

We have never examined a case of complete adhesion of the pericardium without finding enlargement of the heart,—generally hypertrophy with dilatation. We have observed that cases of adhesion terminating in enlargement often hurry to their fatal conclusion with more rapidity than almost any other organic affection of the heart; and we have, on the other hand, repeatedly seen patients die from the consequences of an adhesion, the history of which we could trace back eight, ten, or more years; yet such individuals would not unfrequently represent their health to have been perfect during the greater part of that period, and would not admit, until closely interrogated, that they had been more or less "short-winded." Hence we infer that, though adhesion may not for a time create much inconvenience, its effects are ultimately fatal. This refers, of course, to intimate, not to loose adhesion. It appears to us that a tranquil, abstemious life, by which in other forms of organic diseases of the heart existence may sometimes be prolonged to its natural period, cannot be equally availing here; for as the action of the organ itself is a constant struggle, repose is impossible.

How adhesion occasions hypertrophy is easily understood; for the organ must increase its contractile energy, in order to contend against the obstacle which the adhesion, by shackling its movements, presents to the due discharge of its function, and, as explained in the article Hypertrophy, increased action leads to increase of nutrition. The cause of the co-existent dilatation is not less manifest; as the shackled organ transmits its contents with difficulty, in a state of greater congestion than natural, and, as is more fully explained in the article on dilatation, permanent distention is the most effective cause of this affection. When the muscular substance is softened, as frequently happens, dilatation takes place much more readily, in consequence of the deficient elasticity or tone of the heart's parietes.

When adhesion of the pericardium has produced hypertrophy with dilatation, its history identifies itself with that of the latter maladies, of which it renders the symptoms more severe and the progress more rapid. To avoid repetition, therefore, we refer the reader to the article Hypertrophy, and shall, here, only describe the signs which are pathognomonic of adhesion.

These signs have generally been considered very obscure. Dr. Sanders believed that he had discovered one of a positive nature in a dimple or retraction taking place, as he states, during the ventricular systole, in the epigastrium immediately below the left false ribs. We have searched for this attentively in several cases of adhesion, but have not been able to detect it in any degree which could constitute a sign. Laennec, who was equally unsuccessful, thinks that it could not take place unless the stomach, by adhering both to the diaphragm and the abdominal parietes, formed the medium of retraction.

In five or six cases we have remarked one sign, which has not, to our knowledge, been hitherto noticed; namely, the heart, though enlarged, beats as high in the chest as natural, and sometimes occasions a prominence of the cartilages of the left præcordial ribs. We should, indeed, naturally expect that the adhesion would brace up the organ, and that, when enlarged and not able to descend, it must, being bounded behind by the spine, force the walls of the præcordial region forward.

Another sign, and perhaps the most characteristic of all, is an abrupt, jogging, or tumbling motion of the heart, very perceptible in the præcordial region with the cylinder. It is more distinct when the heart is hypertrophous and dilated; and under these circumstances we have found the jogs correspond with the ventricular systole and diastole respectively, that of the diastole being sometimes nearly as strong as the other, and having the character of a receding motion. This jogging motion is distinguished from the undulatory movement of fluid in the pericardium, both by its nature, by the synchronism of the jogs with the sounds, and by the feeling that the heart at each systole comes in immediate contact with the thoracic walls.

A third sign consists in a bellows murmur with the first sound, which we have always found present when the heart is enlarged and acting vigorously. Nor is it, in every case, confined to the heart: we have often heard it in the aorta, and formerly experienced difficulty in discriminating it from the murmur of dilatation of this vessel.* Although, when the heart is dilated, the murmur in question may be occasioned partly by the relative smallness of the orifices, and the greater angles at which the currents meet in them in consequence of the unusually rounded form of the ventricles, as elsewhere explained, it is also, we believe, occasioned in a great measure by the sudden velocity with which the fluid is propelled, as it would not otherwise exist in the aorta.

(J. Hope.)

PERICARDIUM, DROPSY OF. See Hydropericardium.

PERITONITIS, from *περιτονέον*, *peritonæum*.—This is the term now universally used to express an inflammatory state of the serous membrane which lines the interior of the abdo-

* Vide Treatise, by Dr. Hope, p. 63.

inal eavity, and invests all the viseera conined therein.

l Pain, tumefaetion, and tenderness of the bdomen on pressure, are the most prominent mptoms whieh characterize this affection uring life; and increased vaseularity, thickeng, effusions of coagulable lymph, of serum, of is, or blood, are the principal loeal effects oduced by it. These elementary features, companied in general with more or less of rexia, will exist in different degrees and comnations, in every variety of age, sex, or conitution, modified, however, by circumstances rived partly from the nature of the cause, d partly from the eondition of the patient at e time of the attack.

Peritonitis may assume either the aeute or ronic form. It may exist as a sporadie sease, or prevail as an epidemie. It may ther present itself openly, with a numerous oup of well-marked symptoms, or creep on in latent state, with searcely one of its characristic features. It may be limited in its exnt to a small portion of membrane, or spread ver a large surfaee. It may run its eourse neombined with any other affeetion, or be omplicated with various diseases. There is o period of life exempt from its attacks. It ay affect the infant, the adult, and the puereral female: pursuing the same course, and xhibiting similar effects in all, it yet presents vast variety of symptoms in individual cases, rincipally according to the organ whose perioneal covering is the chief seat of the inflamnation.

Pure peritonitis is exclusively confined to he peritoneum, without involving the muscular r mueous tissues of the intestines, and can in nost cases be distinguished by peculiar symoms from inflammatory affections of those issues. Not uncommonly, however, inflammation commencing in one tissue extends to hose contiguous; but this is by no means niformly the case; frequently the very oppoite effeet is induced in this disease, and the ntestinal mucous membranc becomes remarkbly palc, while the peritoneum is aeutely nflame.l.

We shall proeeed, in the first place, to notice the disease as it exists in the acute form in the different periods of life.

I. *Acute peritonitis in the infant.*—This disease may attack the infant during its intrauterine life. Its exciting eauses during this period of existenee are obscure: they may possibly be transmitted from the mother to the infant, or originate from an internal strangulation of the intestines, of which M. Legoues and M. Ducis have seen examples. However difficult it may be to assign a satisfactory eause for its origin, its existence has been unequivocally demonstrated by the post-mortem appearances which infants who have died a few hours after birth have exhibited. In some eases of this kind the usual effects of peritoneal inflammation, adhesions between the intestines, false membranes, and sero-purulent effusions into the abdomen, have been detected—effects which must have been produced during the abode of the infant in utero. Five cases of infants who died a few hours after birth have been detailed by M. Billard, in which the above appearances were found. In one instance the child was emaciated and pale; and old, solid adhesions were discovered in the abdomen, apparently indicating that the disease had existed for some time previous to birth, and had probably become chronie before it terminated fatally. In the other four cases the infants presented nothing unusual in their external appearance.

The eauses which may excite peritonitis during the period of laetation are not very evident. They probably are essentially the same as may operate during adult years. Infants are exposed, to a eertain extent, to similar injurious impressio s from external agents, and their organs are at least equally susceptible of morbid aetions.

Symptoms.—The abdomen of the child presents a tumefied and tense appearance, and is elevated in a point towards the umbilicus. This distention is caused in the early period of the disease by flatus in the intestines: it is accompanied by some dyspnœa, which does not, however, always indicate a pulmonic affection, but is produced by the obstruction whieh the diaphragm suffers in its deseent from the distended abdomen, and the pain which its movements occasion by the friction of the inflamed peritoneal surfaces against each other. There is eonstant abdominal pain, which is much aggravated by pressure. The eountenance exhibits an expression of suffering: the features are contracted, and the little patient cries almost without intermission. Vomiting usually is present, and the bowels are in most eases constipated. There is restlessness, with general debility; hot, dry skin, and frequent, weak pulse; and, if prolonged into the chronic state, the child beeomes emaciated, and dies exhausted.

It is difficult to distinguish this disease from infantile enteritis, with which it is occasionally complicated. In its simple form it is usually attended with more abdominal tenderness on pressure. Constipation generally exists in peritonitis, while diarrhœa is frequently an attendant on inflammation of the mucous membrane. The appearance of the tongue may assist in the diagnosis, being, in the latter affection, generally furred, with red tip and edges and red papillæ, while in simple peritonitis this redness is not generally present. Peritonitis is a mueh less frequent disease during infancy, not being so likely to be indueed by irregularities of diet and the other injurious agents to which children are particularly exposed, and whieh are common exciting causes of enteritis. M. Billard observes that it may be distinguished from pleuritis by the sonorousness of the chest, and from flatulent colic by the pains being remittent in the latter affection, and ceasing on the expulsion of gas.* The prognosis in this disease is generally unfavourable. The post-mortem appearanees do

* Maladies des Enfans, Paris, 1828, p. 449.

not differ from those which the disease presents in adults, and which will be hereafter described.

Children of a scrofulous habit are subject to a form of chronic peritonitis, which deserves distinct notice: it is characterized during life by great tenderness of the abdomen on pressure, with occasional paroxysms of acute pain, at first coming on only once or twice a day, but afterwards becoming more frequent, after which the child appears quite lively, and free from indisposition. At first the pain is limited, but afterwards extends over the whole abdomen, which in the early stages becomes swollen and tense, but afterwards subsides: the pulse is generally about 100, with some strength and fulness, the tongue clean, appetite irregular, but generally good, and frequently voracious; some thirst, the bowels free, the evacuations unusually large in quantity, and peculiar in appearance, consisting generally of a whitish-brown matter, of the consistence of a thin pudding. This state of the bowels may continue for six weeks or two months with progressive emaciation, until diarrhœa, attended with petechiæ, puts a period to the child's life. The head seldom suffers, but cough and dyspnœa occasionally attend. The usual duration of the disease is four or five months, but often the child is not confined to his bed till the last month. Dissection exhibits the mesentery, bowels, and peritoneum lining the parietes, united together into one mass; the peritoneum thickened, and containing large masses of scrofulous matter; the intestinal mucous membrane perforated by ulcerations, which form numerous communications between the different coils of intestine; and the intestines and abdominal cavity containing matter resembling that which was passed during life by stone. The causes of this disease are unknown, and it in general terminates fatally. Dr. Gregory recommends leeches and fomentations during the early stages, afterwards purgatives, mercurial alteratives, tonics, chalybeates, and absorbents. Laudanum affords the only relief from the pain. This disease appears to be a frequent cause of infantile marasmus.*

II. *Acute peritonitis in the adult.*—The causes which predispose to peritonitis in mature years are involved in some obscurity. They probably do not differ essentially from those which predispose to other inflammations. It is observed to be more common during adult years than at other periods of life; in women than in men; and in sanguine and plethoric individuals than in the opposite constitutions. A disposition to local determinations of blood, proved by previous inflammatory attacks and repeated discharges of fluids, is, according to Broussais, a common predisposing cause, and to this may be added cold seasons of the year, residence in damp situations, the abuse of intoxicating liquors, and over-excitement of the passions.

* Medico-Chirurg. Trans. vol. xi. p. 262. Dr. Gregory on Scrofulous Inflammation of the Peritoneum.

The exciting causes may be arranged in three classes—the *mechanical*, the *chemical*, and the *vital*.

The *mechanical* causes include all injuries inflicted on the abdomen by blows, falls, or compression, pressure of the gravid uterus, extra-uterine conceptions, enlarged ovaries, or other morbid growths within the abdomen. Under this class may also be included all wounds of the peritoneum, whether the result of accident, surgical operations, or strangulation arising from hernial protrusions, or invagination of a portion of intestine. M. Broussais considers violent and long-continued corporeal exertions, violent and repeated contractions of the abdominal muscles in vomiting, strictures of the colon or rectum producing unnatural contortions, and friction of the intestines on one another, as causes of peritoneal inflammation.

The *chemical* causes include all extravasations into the peritoneal cavity not quickly absorbed, whether of blood, urine, bile, chyle, or fæces, and perhaps the morbid serous secretions of the membrane itself.

The *vital* causes comprehend all aberrations of healthy actions, transmission of morbid action from a part previously affected to the peritoneum, or extension of inflammation from a contiguous organ or tissue to this membrane.

An aberration of action takes place when certain functions of the system are interrupted, as when the perspiration, the catamenia, or the lochia are suppressed, and peritonitis is induced as a consequence. The remote cause in these cases arises from the operation of cold, moisture, or both combined, applied to the surface, or the drinking of cold liquids when the body is overheated. Transmission of morbid action or metastasis may be ranked among the exciting causes. We see examples of this when the retrocession of rheumatic, arthritic, erysipelatous, or other inflammations, is quickly followed by an inflammation of this membrane. According to M. Broussais, the chill of an intermittent, when the abdominal viscera, and especially the spleen, are suddenly swelled by the centripetal motions of the fluids, may prove an exciting cause of peritonitis, examples of which he has frequently seen during the course of these diseases.

Extension of inflammation from a contiguous texture or organ to the peritoneum, is a very frequent cause of this affection. Thus, when the gastro-intestinal mucous membrane is inflamed, the inflammation may extend itself to the serous envelope of the intestines; or when the uterus or any other of the abdominal viscera are similarly affected, the inflammatory action may be propagated to their peritoneal coverings, and the two diseases may either co-exist, or a revulsion of the phlogosis takes place, the primary affection subsides, and simple peritonitis is established. This subject, however, will be more fully considered when we come to treat of the complications of this disease.

Symptoms of acute peritonitis.—This affection frequently commences by a shivering more or less prolonged, accompanied by a feeling of general indisposition and weariness in the

mbs: at an uncertain period re-action takes lace, and heat of skin more or less pungent, ith headach, constriction at the epigastric egion, and frequent, hard, concentrated pulse, ucceed, attended with a sensation of heat and ain in the abdomen, and tenderness on ressure. This pain soon becomes the prinipal symptom of the disease, and is not unfreuently the first which appears, not being preeded by any general febrile symptoms: it is sually of an acute, tensive, pungent character, nd has been compared by some patients to ne sensation which a cutting instrument or a crew introduced into the affected parts would roduce. It varies much in its permanency, eat, and degree: in some cases the pain comes n in paroxysms, which continue for a short me, and then pass off, leaving in the intervals nly an acute tenderness. "These accessions," ays Abercrombie, "seem to be excited chiefly y flatus moving through the bowels and disending the inflamed part, and the action of a urgative is often followed by a violent aggraation of all the symptoms."* In other intances the pain is permanent, and is confined o a single spot of small extent, in which it ontinues to preserve its intensity during the whole course of the disease: in other cases, gain, the pain shifts from one part of the abomen to another, and sometimes extends early over the whole membrane. The pain iffers much in its degree, and may even ometimes be altogether absent, or only felt on ressure: in other instances it is very severe, nd much increased by the erect posture, or ny motion of the body; hence the patient lies onstantly on the back, and cannot, without an ncrease of suffering, lean to either side, finding ost relief from remaining motionless, with the nees in a slight degree elevated. This position, while it throws the weight of the intestines on ne spine, and therefore removes pressure from ne inflamed membrane, at the same time reaxes the abdominal muscles, and prevents ny stricture on the anterior surface of the inamed parts. The respiration is frequent, mall, and interrupted, and chiefly performed y the thoracic muscles, the depression of the iaphragm producing on the affected parts the ame effect that pressure does on the abdomen; onsequently, full inspiration, coughing, sneezng, vomiting, or the evacuation of the urine or eces, aggravate the pain.

The increased sensibility of the abdomen is ometimes not perceived unless when pressure s made; but in other cases the soreness is so xquisite that the slightest weight on the abdoinal parietes aggravates it to an intolerable egree. The pressure of the bed coverings beomes insupportable, so that it is found neessary to keep them from being in contact with the abdomen by artificial means. This ensibility to pressure is the grand criterion by which we are to judge of the existence and legree of the disease; "and this," it has been bserved, "we are not to estimate solely by the complaint, but by the countenance also of the patient. Even gentle pressure causes a sudden retraction of the lips and expression of pain, as if he were pierced by a sharp instrument. On the other hand, we are not to overrate the tenderness (though it is the surest diagnostic) by the wincing of the patient, especially if very irritable or young, or afraid of being hurt, or if the bowels happen to be uneasy and distended with flatus at the time."*

In addition to pain and tenderness on pressure, tension and tumefaction of the abdomen are constant and characteristic symptoms of peritonitis: those in the early stages arise from a tympanitic distention of the intestines, though at a later period of the affection they may be caused by effusion of fluid into the peritoneal cavity. This swelling, which is equal and regular in general peritonitis, exists in different degrees in different individuals, depending partly on the intensity of the inflammation, and partly on the degree of resistance which is offered by the abdominal parietes. It is considerable with those whose belly is naturally flabby, or when the abdomen has been recently distended, as in females after parturition, and in both sexes after the operation of paracentesis. In individuals, on the contrary, with strong abdominal muscles, and particularly in thin robust men, the abdomen is scarcely at all swelled, sometimes it is evidently retracted, especially in the first days of the attack; in such cases it is very hard, and in general the hardness and tumefaction are in the inverse ratio of each other.†

Along with these symptoms there are frequently present singultus, nausea, and vomiting, the matter ejected being at first the contents of the stomach at the time of the attack, afterwards mucus or bile. The bowels are in general obstinately costive, though occasionally relaxed. The pulse, as the disease advances, is in general very frequent, ranging from 120 to 130 in the minute; it is also very small, as if not only the heart but the artery at the wrist had contracted upon itself; yet if it be accurately examined, it will be found, during the stage of excitement, firmer than natural, almost

* Abercrombie on Diseases of the Stomach, &c. . 151.

* *Dr. Dickson:* see Lond. Med. Chirurg. Rev. Sept. 1820. In order to form an accurate idea of the sensibility of the abdomen, the hand should be laid flat on its centre, and then pressed successively on every part of it, the physician observing at the same time the patient's countenance, which will at once indicate pain if the abdomen be sensible. Care should be taken not to make pressure with the ends of the fingers; for then, by being applied to one point, it becomes considerable, and will excite pain where there may be no disease. Martinet's Pathology, translated by Quain, third edition, p. 68.

In some subjects the thickness of the muscles and parietes of the abdomen renders the pain on pressure scarce perceptible. In such cases M. Broussais directs us to make lateral pressure towards the centre of the abdomen. "Elle (douleur) était plus difficile à supporter quand on la faisait (pression) latéralement en la dirigeant vers le centre. Ce signe est un des meilleurs pour faire découvrir les péritonites obscures." Histoire des Phlegmasies, vol. ii. p. 492.

† *Chomel,* Dict. de Médecine.

feeling like a small whip-cord or harp-string. The tongue is covered with a whitish fur, the urine is scanty and high-coloured, and there is excessive thirst, which the patient fears to gratify in consequence of the vomiting which the introduction of fluids into the stomach often induces.*

The course of acute peritonitis is in general rapid, and marked by a progressive increase of all the above symptoms: the abdominal pain, tenderness, and tumefaction become aggravated, the face more pale, the features contracted, and often covered with a cold sweat,† the pulse more frequent, and the anxiety augmented. The malady may remain stationary for some days with nocturnal paroxysms, either marked by a febrile exacerbation or an aggravation of the local symptoms, and may not terminate fatally till after thirty or forty days; but in most instances it runs a much more rapid course, and in some cases the patient sinks in sixteen to twenty-four hours from the commencement of the attack.

The approach of death is marked by cessation of the pain, by the pulse becoming quicker, smaller, and very weak, feeling like a soft undulating line; by coldness of the extremities, and ultimately of the entire surface of the body. The abdomen becomes more tumid and tense, but in some instances soft and relaxed; the face is sunk, and especially hollow round the orbits; the vomiting is succeeded by regurgitation of the liquid contents of the stomach without any apparent effort; and although the intellectual faculties are often preserved unimpaired to the last moment, sometimes delirium, a comatose state, or in other instances convulsive movements of the head or limbs, precede the fatal termination.

Such is the assemblage of symptoms which acute peritonitis, in its simple and open form, presents: they are not, of course, all present in every individual case, but the greater number of them will be generally found to co-exist in well-marked instances of the disease. Cases, however, occasionally occur in which nearly all the above symptoms are absent. This variety of the affection will be considered under a distinct head.

Acute peritonitis may terminate by resolution; by effusion; by gangrene; or it may assume the chronic form.

Resolution may take place between the fifth and twentieth day. It is indicated by a cessation of pain, fever, and other inflammatory symptoms, a re-establishment of the functions of the neighbouring organs, the capability of turning on the side, and of bearing pressure on the abdomen, disappearance of the nausea and vomiting, and sometimes by the appearance of a critical evacuation, such as diarrhœa, abundant urine, and copious perspiration; by the pulse becoming slow and soft, and by the return of quiet and refreshing sleep.

Effusion is a frequent termination in fatal cases. The fluid effused may be serum, pus, or in some rare instances blood. These fluids may either exist singly or in combination with each other, or with coagulable lymph. The symptoms which denote effusion are diminution of the abdominal pain, with sense of weight and oppression in the affected part, irregular chills, softness of the pulse, paleness of the countenance, and coldness of the extremities.* Effusion may be ascertained to exist in many instances by percussion, which, when made on the abdomen in the early stages of peritonitis, generally elicits a sonorous sound derived from the tympanitic state of the intestines; but, as the effusion increases, this sound becomes progressively more limited and obscure. Fluctuation can also occasionally be felt,† but in general only after the disease has existed some time; for, as Andral observes, during the early periods of the disease, the abdominal effusion, small in quantity, is rather to be discovered by the tension, resistance, and modification of form of the belly, than by the great increase of its volume or the existence of fluctuation.‡ Fluctuation may also be absent, if the effused fluid is contained in a number of distinct abscesses, separated from each other by partitions of false membrane, of which the same pathologist relates an instance.§

It is doubtful, when pus and lymph are effused in any great quantity, if they are ever absorbed, and such cases generally terminate fatally, or pass into the chronic form of the disease. However, M. Gasc asserts that he has known patients recover in whom the purulent matter escaped by the umbilicus;‖ and we have seen cases of ascites consequent on peritonitis cured by the aid of medicine.

Gangrene is a much rarer termination; but M. Gasc observes that, of all serous inflammations, peritonitis, when intense, is most disposed to pass into a state of gangrene. The symptoms indicative of this termination are, sudden cessation of the abdominal pain, smallness of the pulse, which becomes concentrated and intermitting, extreme prostration of strength, Hippocratic countenance, and speedy death. Dr. Abercombie considers this termination rare, and that it is not often found in *post-mortem* examination as a prominent appearance, but when met with is slight and partial, and always accompanied with extensive deposition of false membrane. It more frequently occurs when enteritis co-exists with inflammation of the peritoneum.

* *Armstrong*, Morbid Anatomy of the Bowels, p. 92.

† The French pathologists have given a peculiar term to the expression of the countenance in this disease, "face grippée." Slight contractions of the muscles of the face and principally of the forehead are caused by the force of the abdominal pains, by which the features are discomposed and appear drawn up towards the forehead, which is wrinkled and the nose pointed. See *M. Gasc*, Dict. des Sciences Médicales, article Péritonite. *Roche et Sanson*, Elemens de Pathologie, tom. i. p. 585.

* *M. Gasc*, Dict. des Sciences Médicales.

† For the mode of examining the abdomen, see article ABDOMEN, EXPLORATION OF.

‡ Clinique Médicale, Maladies de l'Abdomen, p. 539.

§ Ibid. p. 598.

‖ Dict. des Sciences Médicales, p. 508.

When acute peritonitis does not prove fatal the course of fifteen or twenty days, it generally subsides into the chronic form. It sometimes, however, continues acute for a much longer period, and has even been protracted, as already mentioned, to thirty or forty days, and proved fatal at the end of that period. The symptoms which indicate this form of the disease will be considered in a separate section.

Diagnosis.—This is frequently attended with considerable difficulty, as the inflammatory affections of the viscera and other parts which the peritoneum covers frequently present nearly similar symptoms as inflammation of this membrane. Neuralgia and rheumatic pains of the adjacent muscles and nerves may also occasionally be mistaken for peritonitis; and colic, the passage of calculi along the biliary ducts or ureters, have been considered by some writers as liable to be confounded with inflammation of the peritoneum.

In gastritis the pain and tenderness on pressure are confined to the region of the stomach; the vomiting in general is more urgent, and is more easily excited by food or drink, and the thirst, with desire of cold liquids, is more intense. The state of the tongue varies in gastritis; but when it does present the thick coat in the centre, and intense redness of tip and edges, it will assist us in the diagnosis, as this appearance is not observed in simple peritonitis. When the peritoneal coat of the stomach is inflamed, the diagnosis will be more difficult, and can only be established by an attentive consideration of the general history and characters of the two diseases which have been already detailed.—See Gastritis.

We have frequent occasion to discriminate between enteritis and peritonitis in practice, and the symptoms are often so very similar that some physicians have thought a diagnosis between them impracticable. Dr. Cullen, after having given peritonitis a distinct place in his nosology, tells us, in his First Lines, that it is difficult to say by what symptoms it may be known, and that when known it does not require any remedies beside those of inflammation in general, and gives this as a reason for passing it over without further description. Dr. Philip Wilson, in his work on Febrile Diseases, asserts, "that peritonitis seldom exists without the inflammation spreading in a greater or less degree to the stomach and intestines, nor does inflammation of the latter frequently exist without extending to the peritoneum. There is hardly room, therefore, for regarding peritonitis as a distinct complaint." Nevertheless, the two diseases are essentially different, as well in the texture affected as in several of their symptoms, and in the *post-mortem* appearances which they present; and they can in many, perhaps in most, instances be discriminated. The treatment of peritonitis ought also, in some degree, to vary from that of enteritis.

John Hunter was fully aware of the distinct nature of these two affections, for he observes, "If the peritoneum which lines the cavity of the abdomen inflames, its inflammation does not affect the parietes of the abdomen; or if the peritoneum covering any of the viscera is inflamed, it does not affect the viscera. Thus the peritoneum shall be universally inflamed, as in the puerperal fever, yet the parietes of the abdomen and the proper coats of the intestines shall not be affected; on the other hand, if the parietes of the abdomen or the proper coats of the intestines are inflamed, the peritoneum shall not be affected."*

The most important diagnostic symptom between peritonitis and enteritis is the sensibility of the abdomen to pressure; in the former, pain is excited by a very slight degree of pressure, which would produce little or no inconvenience in the latter. The action of the diaphragm in full inspiration or coughing does not produce so much suffering in enteritis, nor is it so much aggravated by motion of the body or abdominal muscles. The pain appears much more superficial in peritonitis, and in many instances is not accompanied with sickness or any other disturbance of the intestinal canal. The pain in peritonitis in general is of a more acute character, and is more frequently accompanied with constipation. Enteritis presents some peculiarities according as it affects different portions of intestine, and the presence or absence of which will assist our diagnosis: these have been already fully considered. (See Enteritis.) When the duodenum is inflamed, pain in the situation of that viscus, and occasionally jaundice, are present. In inflammation of the large intestines, there are generally diarrhœa or symptoms of dysentery, neither of which affections are common in simple peritonitis; but when the jejunum or ileum are inflamed, it is more difficult to discriminate; the pain in such cases is in general not so severe as in peritonitis, and is principally in the regions which those intestines occupy.

Rheumatism sometimes, though rarely, affects the abdominal muscles, and may be mistaken for peritonitis, as it presents the same pain on pressure or motion; but the pain in such cases is principally felt at the origin or insertion of the muscles, shooting to the false ribs and the spine of the ileum.† In such cases the skin may be greatly distended, and if the muscles are swelled, the figure of each is often preserved. The existence of these peculiar symptoms, conjoined with the absence of uniform tumefaction, vomiting, or constipation, will probably in most cases enable us to form a correct diagnosis. Neuralgic pains of the abdominal viscera or parietes may simulate peritonitis. Andral observes‡ that rheumatic patients are sometimes attacked with severe acute pains in the abdomen, which vanish more or less suddenly without leaving any trace of a severe affection; and M. Chomel states that in several cases acute pains suddenly occur in the abdomen, often without any appreciable

* On the Blood, &c. p. 244.

† See Parr's Medical Dictionary, vol. ii. p. 21.

‡ Clinique Médicale, tom. iv. p. 539.

cause, and last for ten or twelve hours, with frequent pulse, nausea, and vomiting, and yield to the use of opium.* There is some reason to suspect that these pains may in certain cases originate from irritation of some portion of the spinal cord, or of the ganglionic nerves that are distributed to the different viscera.† Their fugitive characters, the absence of pyrexia or tumefaction, and the general history of the case, may enable us to ascertain their real nature. In doubtful cases we should examine attentively the spinal column, and if any tenderness or pain is evident in a particular spot, it will give an additional probability to our suspicions.

Hysteria frequently simulates peritonitis, and nothing but a careful consideration of the history of the case and watching closely its progress, can enable us to discriminate between them. In hysteric cases, as Dr. Bright well observes, in general some great incongruity of symptoms will be detected: a tenderness of the abdomen, indicating inflammatory action beyond any thing which the pulse or the condition of the tongue would authorize us to infer; a hurry and even labour of respiration, more marked than in the embarrassed breathing of peritoneal inflammation; a sudden subsidence of the symptoms, and their sudden return; a shifting and changing of the tender or painful part, and sometimes the decided intervention of hysteric symptoms and the very frequent accompaniment of some evidence of mental causes, or of irritation and deranged function in the uterus itself,—all these, together with the general aspect of the individual, will frequently be guides and indications to assist us.‡

Colic may be distinguished from peritonitis by the absence of fever, the pain being relieved by pressure, the state of the pulse, and the suddenness of the attack. (See Colic.) There are several other affections which occasionally may present some of the symptoms of peritonitis which would lead us into too long a detail to consider. We have endeavoured to select those only which either occur most frequently or present the greatest difficulty in diagnosis. Inflammation of any of the abdominal viscera, or the passage of calculi through the biliary ducts or ureters, may occasionally resemble peritonitis, though they in general possess sufficiently distinctive characters. (See the different articles that treat of these affections.)

Prognosis.—Peritonitis is always attended with considerable danger, but if subjected to active treatment at an early period there is a fair chance of effecting a cure, especially if the patient is not advanced in years, is of a good unimpaired constitution, and capable of bearing depletion to a considerable degree; or if the inflammation be limited in its extent and uncomplicated in its form, and the symptoms much mitigated by the evacuations employed. A favourable termination is indicated by the gradual diminution of abdominal pain, tension, and tenderness, the pulse becoming fuller, softer, and less frequent; the skin less parched, soft, and moist; the respiration less laborious, and the countenance more open and expressive of ease. An unfavourable result is to be expected when the patient is of advanced age, and of a debilitated or broken-down constitution; when the disease originates from perforation of the stomach or intestines, or rupture of any of the abdominal viscera, or when it succeeds to a wound, a surgical operation, or to parturition; or extends over a large portion of peritoneal surface, or is complicated with an affection of any important organ. The danger is also greater when the inflammation has existed some time before the employment of remedies, and when the symptoms exhibit considerable intensity, and do not yield to the depletions employed.

Complications. — The fever which accompanies peritonitis may present either an inflammatory, typhoid, or gastric character. The former is met with most frequently in robust and vigorous patients; typhoid symptoms for the most part prevail in old persons of debilitated constitutions; and gastric fever will coexist when the gastro-intestinal mucous membrane is in a state of inflammatory excitement. The symptomatic fever may be so modified by the state of the patient at the time of the attack, by the co-existence of other morbid actions, and the prevailing epidemics of the season, as to present a variety of intermediate grades. In some instances peritonitis has been complicated with an intermittent fever, disappearing during the intervals, and re-appearing on the accession of each paroxysm.* In some instances it has assumed a tertian or quartan type;† but such cases are rare. Andral relates an instance of peritonitis supervening on the disappearance of rheumatism; but it is most frequently complicated with affections of the abdominal viscera, especially of the stomach or intestines; the inflammation spreading from the peritoneum to the other contiguous tissues which form their parietes, or pursuing an opposite course, attacking primarily their mucous membrane, and afterwards penetrating to and affecting the peritoneum. It appears sometimes to co-exist with an hepatic affection, and Chomel mentions a form of peritonitis called *bilious*, in which the peculiar symptoms of peritonitis were accompanied with a yellow coating of the tongue, discharges of bile from the stomach and intestines, with a yellowish tinge and pungent heat of skin.‡ M. Broussais observes that the excess of pain is capable of disorganizing the brain by a too impetuous afflux of

* Dict. de Médecine, tom. xvi. p. 330.

† See *Whatton*, On Spinal Irritation, North of England Med. and Surg. Journal, *Dr. Corrigan*, Lancet, and Lond. Med. Chir. Review, July 1831, p. 182. *Teale*, On Neuralgic Diseases.

‡ Bright's Reports of Medical Cases, p. 453.

* *Andral*, Clinique Médicale, tom. iv. p. 571.

† *Roche et Sanson*, Elemens de Pathologie, tom. i. p. 591.

‡ Dict. de Médecine, loc. cit.

ood into its capillaries, and that after much ffering, the delirium, convulsions, and coma : frequently the effect of the disease of the ain itself.*

The lungs and pleura may also be affected nultaneously with the peritoneum, in which se thoracic pain, cough, dyspnœa, and other etoral symptoms will be present. This mplication is not very uncommon. M. ages found traces of inflammation of the eura in forty cases out of two hundred and ty subjects who died of puerperal peritonitis, d whose bodies he examined after death.† e parenchyma of the lungs, or the pericar- um may be also affected, but such cases are e. Other complications may exist which uld lead us into too long a detail to include : trust sufficient has been said to impress on mind of the medical practitioner the im- rtance of directing his attention to the state other organs and textures in cases of inflam- ation of the peritoneum.

III. *Puerperal peritonitis.* — The perito- um is very liable to become inflamed in the erperal state, those portions especially con- ected with the uterine organs. The uterus or appendages are generally the first parts that come affected, and the morbid action spreads contiguity or continuity to the general rface of the peritoneum : it consequently ually exists complicated with an inflamma- y affection of one or more of the textures or gans belonging to the uterine system. This bject has been already fully considered in the ticle Puerperal Fever, to which we refer r details; but puerperal females may be fected with peritonitis in its simple form, hen it presents some peculiarities deserving tention. Its predisposing causes are the gh degree of irritability of the system which ists subsequent to parturition, and more pecially in the peritoneum, from the sudden straction of distention which it undergoes by e contraction of the uterus after the expul- on of the fœtus. M. Chomel observes that e repeated friction to which the peritoneum subjected during labour may account for the imitive development of peritonitis in those ses where it appears without inflammation of e uterus.‡ Dr. Burns remarks that those ho have suffered from uterine hemorrhage ter delivery are most liable to this disease.§ he affection may also be excited by violence ring parturition, by the application of cold, the injudicious use of stimuli. When it curs during the prevalence of puerperal ver, it appears evidently to owe its origin to epidemic cause, and in some instances to be mmunicated by contagion. It may there- re be considered as occurring under two rms, 1. as a sporadic disease, and, 2. as an idemic.‖

1. *Sporadic puerperal peritonitis* sometimes becomes developed a few days after parturition, but occasionally two or three weeks intervene, and in some cases the pulse continues frequent from the time of delivery till the accession of the inflammation. The first symptom that manifests itself is generally pain in the abdomen, which is usually preceded or accompanied by rigors; and Dr. Denman* observes that from the violence and duration of the shivering, we may generally estimate the danger of the succeeding disease.

The abdomen becomes exquisitely painful on pressure, and this symptom is usually accompanied by vomiting, thirst, sharp, small, frequent pulse, and white dry tongue. The symptoms are in fact, generally speaking, the same as those which ordinary peritonitis presents, with some modifications, however, derived from the peculiar state of the affected parts induced by parturition. The pain more especially occupies the hypogastric region, and when it extends to other parts of the abdomen, it still continues most intensely in this situation, indicating that the peritoneal covering of the uterus is principally affected. The abdomen becomes distended more rapidly and to a greater extent than in the other forms of the disease, owing to its not offering so much resistance in consequence of its relaxed state subsequent to delivery; but it does not present quite so much hardness and tension as in ordinary cases. The lochia are diminished or suppressed. The lacteal secretion is either not established or is arrested, and the breasts consequently either do not swell, or collapse after having been swollen. The disease generally runs a short course, and rarely terminates in the chronic state. When it terminates favourably, the abdominal tumefaction subsides as rapidly as it had before augmented; the lochial and lacteal secretions are re-established; the pain abates, and the vomiting ceases; the pulse becomes fuller and slower, and the other signs, indicative of termination by resolution, which have been already described, are exhibited.

The fatal termination is characterized by the increase of abdominal tumefaction, pain, and tenderness, quick irregular pulse, Hippocratic countenance, cold extremities, and sometimes by the sudden cessation of pain, while the other unfavourable symptoms continue. Dr. Gordon has related some cases which terminated by suppuration; in two instances the matter escaped externally by the umbilicus, and in a third by the urethra.

2. *Epidemic puerperal peritonitis* may be considered as a variety of puerperal fever, which has by some been thought to depend in every instance on inflammation of the peritoneum; but it has been already demonstrated that various forms of uterine inflammation may occur in this fever, and give rise to a variety of symptoms, and that these local inflammations may exist independently of each other though they are frequently combined. (See Fever, Puerperal.)

* History of Chronic Phlegmasiæ, translated by ays and Griffith, vol. ii. p. 359.
† Journal Complémentaire, tom. xxxvi. p. 218.
‡ Dict. de Médecine, art. *Peritonite.*
§ Midwifery, p. 526.
‖ See Fever, Puerperal, p. 252.

* Denman's Midwifery, p. 433, 6th edition.

When this fever excites peritoneal inflammation, it is not, according to Dr. Gooch, "one uniform disease, but may occur under different forms; it is sometimes so mild as to be curable by the gentlest aperients, and at other times is very obstinate and fatal. In this latter form it sometimes consists of acute inflammation of the peritoneum with inflammatory fever, which bears and is curable only by early and active depletion; sometimes of inflammation and fever of a low type, in which depletion is useless and even pernicious."* He observes "that in the leading circumstances of the disease there is certainly a great uniformity: it almost always commences a few days after delivery, is marked by pain and tenderness of the belly, and a rapid pulse; and if not cured, terminates fatally within a week, and after death commonly leaves the depositions and effusions of inflammation: thus far it is very uniform, but no further."† He describes the leading symptoms of the epidemic of 1812 (which he witnessed) to be "diffused pain and tenderness, with some swelling of the abdomen, a quick pulse, which was generally at first full and vibrating. Sometimes it was small, but still it was hard and incompressible; the skin was hot, though not so hot as in other fevers; the tongue was white and moist; the milk was suppressed. As the disease advanced, the belly became less painful, but more swelled, and the breathing short; towards the end, the pulse was very frequent and tremulous, and the skin covered with a clammy sweat; even in this state the tongue continued moist and the mind clear, and death took place generally about the fifth day. On opening the abdomen, which was often as large as before delivery, the intestines were found distended with air; the peritoneum was red in various parts, its surface was covered with a coat of lymph; the intestines adhered to one another, and the omentum to the intestines; coagulable lymph was deposited on various surfaces, especially in the depressions between the convolutions of the bowels and on the omentum, on both which parts it often lay in large masses; the cavity of the peritoneum contained several pints of a turbid fluid, apparently serum mixed with lymph. In the uterus the morbid appearances were generally confined to its peritoneal covering, which was coated with lymph, on removing which the membrane itself was found unnaturally red; but in some cases the disease had penetrated deeper into the uterus, the substance of which was sometimes infiltrated with pus, and sometimes contained small abscesses about the size of a nut; the inner surface of the uterus, especially at the fundus, often appeared black and ragged as if gangrenous. The enlargement of the abdomen depended entirely on air in the intestines; when there was no air there was no enlargement, even though the peritoneum contained several pints of fluid."‡ He describes several gradations of this affection, which have been already considered in the article PUERPERAL FEVER.

We have been induced to make this long quotation, in order to demonstrate that puerperal peritonitis, when epidemic, is nearly identical in its symptoms and post-mortem appearance with the common form of the disease. The peculiarities which it presents it possesses in common with the sporadic form, occurring after parturition, from which it only differs in its epidemic and occasionally contagious origin, in its frequent complication with uterine affections, and in being attended in some instances with a fever of a typhoid character. It appears to us that the epidemic form is primarily a fever that excites peritoneal inflammation, which is to be considered as symptomatic of a constitutional affection; and that the sporadic form is an idiopathic inflammation modified by the peculiarities of the puerperal state.

This view accords with Dr. Armstrong's ideas on the nature of this disease. He states that puerperal fever "is a common or specific fever, occurring in the puerperal state, and modified, like almost every other affection, by the condition of the patient at the time of the attack. In general," he further observes, "it is a common fever combined with inflammation of the abdominal and pelvic viscera, but it is sometimes genuine typhous fever occurring in the same state, and then, superadded to the symptoms of peritonitis, are developed, rapidly for the most part, those symptoms by which a fully formed typhus can be recognized."* Dr. S. Cusack, of Dublin, in his paper on puerperal fever,† observes that the low form of puerperal fever which exhibits a typhoid character was sometimes epidemic, and that the seasons which appeared to favour its occurrence are such as give rise to typhous fever, erysipelas, and diseases of a low type." It appears, therefore, to originate from the same causes as epidemic fevers, to exhibit the same constitutional symptoms, with only this peculiarity, that the uterine organs or peritoneum are in every case inflamed, an effect which we might, *a priori*, expect in the event of fever attacking a puerperal female.

IV. *Varieties of peritonitis.*—This disease presents several modifications in addition to those above described, which being attended with some peculiarities with respect to their causes, symptoms, and progress, are deserving of separate consideration. The principal of these are: 1. hemorrhagic peritonitis; 2. erysipelatous peritonitis; 3. peritonitis from intestinal strangulation; 4. latent peritonitis; 5. partial peritonitis; 6. peritonitis from perforation of the intestines; 7. peritonitis from paracentesis of the abdomen.

1. *Hemorrhagic peritonitis.*—This form of the disease is very rare: its predisposing causes appear to be a sanguine temperament, and a constitution liable to hemorrhagies and inflam-

* On Diseases of Females, p. 14, 15.
† P. 33.
‡ P. 39, 40.

* Armstrong's Morbid Anatomy, p. 96.
† Edin. Med. and Surg. Journ. January 1829.

tory affections. If in such persons any itation acts peculiarly on the abdominal se- is membrane, an hemorrhagic action may determined to its vessels, and a sanguineous usion thus take place into the peritoneal vity without any rupture of vessels. The mptoms of this variety are similar to those acute peritonitis. The pain, however, ap- ars to be much more violent, and to be cha- eterised by marked intermissions: the an- ety is greater; it is accompanied with pyrexia, pulse at first strong and inflammatory, which erwards becomes expanded and soft, and ally, at the approach of death, quick and nall. The disease runs a very rapid course, d convulsions with coldness of the extre- ities precede the fatal termination.*

2. *Erysipelatous peritonitis.*—This variety pears to owe its cause to the transference of ysipelatous inflammation from the skin or ucous lining of the throat and fauces to the ritoneum: its symptoms, as described by r. Abercrombie, are "sometimes slight and sidious, but sometimes very severe, and they e chiefly distinguished by the rapidity with hich they run their course, and by a remark- le sinking of the vital powers, which occurs m an early period, and often prevents the loption of any active treatment: a remark- le circumstance in the history of the affection its connection with erysipelas and other dis- ses of an erysipelatous character."†

In one case which he relates, the day after e disappearance of erysipelas from one of e lower extremities, acute pain attacked the gion of the stomach, which, in a short time, oved to the lower part of the abdomen, and ound the umbilicus, with little tenderness on ressure, but accompanied with great anxiety d restlessness: the patient sunk rapidly, and ied twenty-four hours after the attack. Dis- ection discovered a considerable quantity of loody sanies in the abdomen, part of the nall intestines of a dark red and part of a ull leaden colour, and the whole were con- derably distended.

The form in which the throat is primarily ffected seems occasionally to owe its origin to n epidemic cause. Dr. Abercrombie relates at in the spring of 1824 it prevailed as an pidemic in the Merchants' Hospital in Edin- urgh. Its leading features were a slight ery- ipelatous affection of the throat, beginning ith vomiting and slight fever: in some cases e internal fauces were covered with aphthous rusts or swelling of the uvula, and in some cases here were angry ulcerations about the lips, with ponginess of the gums; the larynx was un- ffected in every case, and, excepting in two nstances, which proved fatal by the superven- ion of abdominal inflammation, the symptoms vere mild, and little treatment was necessary. n the two cases referred, to the patients were ttacked with the above symptoms, and, when ecovering, pain and tenderness in the abdomen and serious constitutional disturbance super- vened, and proved rapidly fatal. The two fatal cases render it probable that the erysipelatous action may invade the peritoneum as well as the membrane of the mouth, and that its symptoms and history sufficiently distinguish it from common peritoneal inflammation. The post-mortem appearances were peculiar, consisting of a bloody serum or pus mixed with shreds of flaky matter, but without much or any of that inflammatory or adhesive exudation which forms so prominent a character of peritonitis in its common forms.

3. *Peritonitis from intestinal strangulation.* This form may arise from internal or external strangulation of a portion of intestine. It presents for some time obscure symptoms, the inflammation being at first limited to a small space, and it extends itself gradually from that portion of peritoneum which is strangulated to the rest of the membrane. When the whole peritoneum becomes affected, this variety presents the same general appearance as ordinary peritonitis: it differs, however, not only in the exciting cause, but also in the succession of the phenomena which it presents; in exhibiting some symptoms which accompany it in its whole course; by its termination, and by the mode of treatment which it requires.

In this variety constipation and vomiting are frequently the first symptoms which appear, to which pain succeeds; febrile paroxysms do not, however, develope themselves till after this last symptom, or even later. In the whole course of the malady, the constipation and vomiting, the irregular form of the belly, the parietes of which are elevated in several points above the obstacle, give a peculiar aspect to this variety of peritonitis. It is much more dangerous than ordinary peritonitis, and in treating it we ought to have more in view the removal of the exciting cause which still continues to operate than the management of the inflammation itself.*

4. *Latent peritonitis.*—Nearly all the characteristic symptoms of peritonitis may be absent, and yet the disease exist and be productive of serious effects, and even terminate fatally. This will be most apt to occur in patients of feeble powers and advanced age, in maniacal persons, or in those affected with some severe malady, which may either absorb the attention of the physician, or mask, by its greater intensity, the peculiar symptoms of peritonitis. In such cases it may steal on without pain or any accompanying pyrexia, and the only criteria by which we can judge of its existence, are perhaps the expression of the countenance, and, on a close examination, some degree of tumefaction and tension of the abdomen, and, occasionally, an obscure sensation of pain excited by pressure.

5. *Partial peritonitis.*—This affection may be confined to a small portion of the peritoneum during its whole course. This variety may be caused by a contusion or wound penetrating into the abdomen, or it may succeed to

* Broussais' History of Chronic Phlegmasiæ, y Hays and Griffith, vol. ii. p. 304.

† On the Abdominal Viscera, p. 182.

* *Chomel*, Dict. De Médecine, tom. xvi. p. 326.

a surgical operation, in which the abdominal parietes or viscera are concerned; while in some instances it may arise without any apparent cause. It often commences, without rigors, by a pain in a limited point of the abdomen, augmented by pressure, often accompanied with some tumefaction or hardness in the affected part, and occasionally with febrile symptoms of some intensity; but in general the vomiting and alteration of the countenance, which so frequently attend general peritonitis, are absent. It may, however, become general, and then it will present the same phenomena as the common form of the disease. When it remains circumscribed, it commonly terminates favourably in a short time, the effusion, then small in quantity, being absorbed. In some instances, the inflamed portion becomes the seat of a collection of pus circumscribed by adhesions, which may escape into the stomach or intestines by erosion of their parietes where they have formed an adhesion to those of the abscess. M. Chomel supposes that in most of those cases where, after signs of local peritoneal inflammation, pus is discharged from the stomach or intestines, it owed its origin to this source. Several forms of local peritonitis have been described by authors. Dr. Cullen mentions two, neither of which, however, he ventures to discriminate by any characteristic symptoms.

The peritonitis *omentalis* he tells us affects the omentum, and the peritonitis *mesenterica* the mesentery.* Dr. Mason Good informs us that the omental peritonitis is characterized by a more sensible swelling in the region of the omentum.† The same author describes mesenteric peritonitis as being attended with a pain deeper-seated, and more immediately in the mesenteric region, the external tenderness being less than in the other forms. Frank states that it is accompanied with deep pain in the back and in the umbilical region, that it often terminates in abscess, which may obstruct the bowels by mechanical pressure, or open into the cavity of the abdomen, or into the intestines.‡ Frank also mentions a variety of local peritonitis confined to the lining of the abdominal muscles, which, when limited to the covering of the rectus, sometimes causes the shape of that muscle to be developed, and effusion of lymph or blood into its sheath, with tension, distention, and occasionally speedy gangrene. When, also, the general peritoneal lining of the abdominal muscles is inflamed, the sensibility to pressure will be very great, and if it terminates in suppuration, an immense collection of purulent matter may form between the peritoneum and muscles, simulating ascites. The same author also states, that when the peritoneum covering the bodies of the vertebræ is inflamed, it will give rise to pain in the back, in the situation of the lumbar vertebræ, much increased by the erect position of the body, and resembling in some respects disease of the kidney. When the peritoneal covering of the psoas and iliacus internus is inflamed, pain is felt in the region of those muscles, extending through the groin to the thigh, which cannot be extended without an increase of suffering, but is unattended by any difficulty in passing the urine or fæces. Dr. Abercrombie describes several symptoms of peritonitis which seem to arise from the inflammation having its seat more peculiarly in the serous envelope of certain organs. When the covering of the liver is affected, the case can scarcely be distinguished from acute hepatitis. When it occurs in the neighbourhood of the kidney, Dr. Abercrombie thinks it may give rise to true ischuria renalis, proving fatal by coma and effusion in the brain.

These varieties of peritonitis are interesting in one point of view, as they enable us to explain the predominance of certain symptoms in individual cases, and an attention to them may, in some instances at least, prevent our mistaking affections of the peritoneum for diseases of the organs which it covers, and may also be a useful guide as to the local treatment.

6. *Peritonitis from perforation.*—For an account of this variety, we refer to *Peritonitis from perforation of the serous membrane.*

7. *Peritonitis from paracentesis.*—In this variety the pain is generally first perceived in the point where the puncture was made. The flaccidity of the abdominal parietes, and the rapid tumefaction of the belly which occurs when peritonitis arises from this cause, bear some resemblance to the phenomena which puerperal peritonitis exhibits. This form has almost invariably a fatal termination; in most cases that we have seen, it ran its course in a few days, and was attended with greater prostration of strength, and less of febrile excitement than the common form of the disease.

V. *Chronic peritonitis.*—When acute inflammation of the peritoneum continues beyond the fifteenth or twentieth day, it generally becomes chronic: this species of the disease may, however, arise primarily from the exciting causes we have before enumerated operating on a patient of advanced age or debilitated constitution. Particular occupations which cause pressure on the abdomen, may predispose to or excite this disease, to which may be added cold and moisture, prolonged residence in hospitals, fatigue, unwholesome food, protracted intermittents, and any kind of slow effusion into the cavity of the abdomen.

We shall consider chronic peritonitis under two heads: 1st, *primitive*, without being preceded by symptoms of acute inflammation; 2d, *consecutive*, following as a consequence of acute peritonitis.

1. The primitive form may commence in a slow and almost insensible manner, without presenting any very obvious symptom. There may not be any abdominal pain at its commencement or during its course, and it may

* Synopsis Nosologiæ Methodicæ, tom. ii. p. 109.

† Study of Medicine, 1st edition, vol. ii. p. 371.

‡ *Frank*, De Curandis Hominum Morbis, lib. ii. ord. iv. gen. i.

ly exhibit the appearance of simple ascites: many cases we cannot ascertain with any tainty its presence during life, but when it more open in its characters, they are identical ch the consecutive form, the symptoms of ich vary considerably in the early stages. is in general attended with some abdominal n, which is mostly deep, not very acute, and ely permanent; in many cases the patient ly complains of pain when his abdomen is ssed either by the hand or the action of the rounding muscles, or on a sudden shock of body. There is occasional vomiting and re or less distention of the abdomen, which netimes becomes tympanitic; and in some es indurated spots can be felt, which are der to the touch. Emaciation, irregular wels, either constipation or diarrhœa, or the alternating with the other; increasing dis- tion of the abdomen, and inability to bear n the pressure of the ordinary dress if at tight; various dyspeptic symptoms, and neral debility, mark the progress of the ease. The alvine evacuations are sometimes a pale colour and peculiar fœtor, in other tances of a dark appearance, and sometimes rly natural.*

Dr. Pemberton observes that there is no ssion of the skin of the abdomen as in the ute species; on the contrary, that the skin l abdominal muscles sit loosely upon the itoneum, which gives a sensation to the ch as of a tight bandage underneath, over ich the skin and muscles may be said as it re to slide.†

In some patients the appetite is often pre- ved, and the digestion is but little deranged, which cases we may conclude that the itoneum reflected over the stomach is not y deeply involved in the disease. Broussais ntions the sensation of a ball rolling about the abdomen, and sometimes approaching throat, which he attributes to the agglutination of the intestines, these forming with the ged mesenteric glands a round and mobile ss in the belly, often without any effused id.‡

The general phenomena are very obscure: pulse is often natural except towards eve- ng, when it becomes quick, with increased t of skin, and slight flush on the cheeks, l occasionally some dyspnœa and cough. . Pemberton, however, observes that though pulse is somewhat accelerated, and the ngue, particularly in the morning, slightly vered with a white fur, with considerable rst, he never observed any exacerbation of er in the evening, or any hectic flushes on cheeks: on the contrary, the countenance full of languor, and the face is pale and ughy.

In some forms of the disease, the abdomen comes augmented in volume, yields a dull nd on percussion on a part or the whole of surface, and occasionally presents the sense of fluctuation more or less obscure, with an œdematous swelling limited to the inferior extremities or parietes of the abdomen.* In other forms, the abdomen rather diminishes than augments in volume, and offers an unnatural resistance on pressure, with, occasionally, some degree of projection near the umbilicus, occasioned by the intestines matted together in a mass before the bodies of the vertebræ.

With more or less of these symptoms the disease advances slowly, and sometimes remains stationary for several months, and even may in some cases present some temporary amendment; but it generally terminates fatally, either by the supervention of acute peritonitis or enteritis; or the patient sinks from exhaustion, the result of long-continued irritation or diarrhœa. In some instances ascites precedes the fatal termination, or purulent effusion into the abdominal cavity takes place, which may escape outwardly by the umbilicus or inguinal ring: or the tubercles which have been developed on the peritoneal surface may ulcerate, and form a communication between the intestines and cavity of the peritoneum, with escape of the contents of the former into the sac of the peritoneum, inducing acute peritonitis, which proves rapidly fatal; or disease of the mesenteric glands may be induced, and the patient die in a state of marasmus with hectic symptoms.

The *diagnosis* in this disease is extremely obscure, and is rather to be deduced from a close consideration of the history of each case, the predisposing and exciting causes, and the assemblage of local symptoms, than from any definite rules.

Its *prognosis* in general is unfavourable. M. Broussais, in an early edition of his work, considered it as incurable; afterwards, however, he met with several cases which terminated favourably. Dr. Abercrombie succeeded in curing some cases in individuals whose families had formerly suffered from this affection. Dr. Pemberton states that the symptoms which indicate recovery are an abatement of the pricking pains in the abdomen, and a diminution of the frequency of the pulse to eighty in a minute; but that under these favourable appearances a relapse is always to be dreaded.

Morbid anatomy of peritonitis.—The alterations which the peritoneum presents after death from this disease are essentially the same as are found in cases of inflammation of other serous membranes. The morbid effects are greater or less, according to the intensity and duration of the disease. They are sometimes confined exclusively to the peritoneum, evidencing that this membrane may be partially or generally inflamed, without the subjacent tissues being affected: however, in some of the complicated forms of this disease, morbid lesions of the other intestinal tunics will be occasionally discovered to co-exist with those characteristic of peritonitis.

The following are the effects of inflammation of the peritoneum, as far as they are revealed

* *Abercrombie*, p. 192.

† On Diseases of the Abdominal Viscera.

‡ Lond. Med. Chir. Review, Sept. 1820, p. 170.

* *Chomel*, Dict. de Médecine.

by dissection:—1. increased vascularity and thickening of the peritoneum; 2. effusion of coagulable lymph, either in the form of flocculi, membranes, bands, or masses; 3. effusion, into the peritoneal cavity, of various fluids, serum, pus, or blood, mixed or separate; 4. gangrene; 5. tuberculous formations; 6. granulations on the peritoneal surface; 7. ulceration.

1. *Morbid appearances in acute peritonitis.*—The first effects of a low degree of inflammatory action upon serous membranes appear to be simply an increased deposition of the serous fluid; and in this manner it is probable that a certain state of these membranes, which, if not actually inflammatory, closely borders upon it, is sometimes relieved; the increased quantity of fluid being afterwards absorbed, and the parts recovering their healthy relations.*

When inflammation is fully established, its earliest effect is increased vascularity, which produces at first a slight degree of opacity of the membrane, and red points begin to appear on its surface, which may either occupy a small portion, or cover nearly the whole extent of the peritoneum; the surface of which at this time appears dry and shining, but on touching it an unctuous coating will be detected. Sometimes, instead of the red points, blood-vessels are developed, forming red striæ more or less numerous. As the inflammation advances, the small points become multiplied, coalesce, and form patches of variable extent, and the blood-vessels become more evident and numerous. In a more advanced stage, the redness is rendered more intense, and occupies a larger portion of the membrane; sometimes forming broad surfaces of inflammation, which run like bands along the course of the intestines, and are bounded by the adhesions which different portions of the bowels contract with each other. This redness is frequently arborescent, sometimes intermixed like network. The vascular injection has been supposed by some to exist in the arterial capillaries; but Dr. Armstrong observes, that whatever may be the case during life, it is after death chiefly seated in the venous capillaries; for on a minute inspection the small ramifications of the arteries may be seen empty, traversing the intermediate portion of intestine, like so many transparent lines. The degree of redness is ultimately influenced by the quantity of secretion being greater in those cases where there is least serum and lymph.†

Along with this redness we observe more or less thickening and opacity of the peritoneum; an effect produced not only by the hyperæmia of the inflamed part, but also by the effusion of serum, lymph, or both, into the subserous cellular tissue, which causes some degree of pulpiness, and a facility in separating the serous coat from the subjacent parts. The serous membrane itself is also thickened by the effused fluid penetrating between its laminæ, and separating them more or less from each other, and in some instances a slight degree of emphysema exists, from the disengagement of air in the connecting cellular tissue; but when the inflammation is slight, this thickening is not apparent.

The intestines are much thicker and more massy, as well as the mesentery and the mesocolon; and the omentum sometimes is rendered as thick as a person's hand; effects which arise from the extravasation of coagulable lymph into the cellular substance between the laminæ of peritoneum which forms them.*

Redness and thickening may be considered as the first effect of peritoneal inflammation; but it is accompanied or quickly followed by effusion of serum and lymph, which have been supposed to be separated simultaneously. Dr. Armstrong, however, seems to think that the lymph is first effused; but it would appear that the degree of intensity of the inflammation determines the nature of the effusion. When the inflammation is not very violent, serum seems to be the earliest product of the vessels of the affected part; but if the inflammatory action is very acute, lymph is often thrown out in the first instance. This effusion of lymph may take place a very short time after the commencement of inflammation; it is at first soft and gelatinous, afterwards becomes more consistent, and finally assumes the texture of a membrane of considerable tenacity. It generally soon becomes organized: Andral† observes that in some cases, twenty hours after the commencement of peritonitis, vessels can be traced and injected in this fibrous concretion, which has become a living texture; in other cases, after several months, no trace of organization can be found in these membranous layers. This coagulable lymph may assume various forms; it may either be deposited in a lamina of variable thickness, lining the peritoneal surfaces, agglutinating the intestines to each other, to the abdominal parietes, or to the omentum; or narrow bands of membrane, of variable length, may connect two or more coils of intestine together; or a mass of lymph of a prismatic form may lie between the intestinal convolutions, filling up their interstices, the

* *Abercrombie*, p. 3.

† M. Scoutetten asserts that this redness, when intense, is not owing to the distention of the blood-vessels, but to a sanguine exudation which is formed on the surface of the peritoneum, and which adheres strongly to it; and that the surface is uniformly red, and appears villous. Both causes probably concur to produce the effect.

Bichat, M. Gasc, and others, have asserted that the absence of redness on the peritoneal surface after death may occur in cases where the membrane was inflamed during life. M. Scoutetten, (Archives Générales, tom. iii. p. 501,) however, from some experiments he has performed on living animals, has come to a contrary conclusion: he asserts that the disappearance of redness from an inflamed *external* surface after death is owing to the pressure of the atmosphere, which has but a very modified influence on an *internal* tissue; and that, consequently, the characters of inflammation are very nearly the same in those tissues during life and after death: his experiments are highly ingenious, and would seem to justify the conclusion he has deduced from them, viz. *that an inflammation of an internal membrane will in every case leave increased redness after death.*

* Baillie's Morbid Anatomy.

† Clinique Médicale.

anterior flat surface of which mass corresponds to the parietes of the abdomen, and the two other surfaces, slightly concave, are applied on the two contiguous intestines, and terminate in their interval by a rounded angle. The lymph may also be in the form of flocculi, or small shreds of membrane, floating in a serous fluid, or deposited on the free surface of the peritoneum when little or no fluid is found.

These false membranes are either of a white colour, grey, or sometimes a little reddish; they vary in their thickness from a quarter to two or three lines. When the inflammation has lasted twenty or thirty days, these adhesions acquire a considerable degree of firmness; they are often productive of no inconvenience, but if very numerous, and uniting the coils of intestine very closely together, they may give rise to a modification of the form of the belly, an habitual tension in the abdomen, and more or less disturbance in the digestive functions. Dr. Abercrombie relates some cases where fatal ileus seemed to be induced by the operation of such causes, which appeared to act by deranging the muscular power of the intestinal canal, or by inducing a strangulation of a portion of intestine.

Serous effusion, as we have before observed, may take place very early in this disease;* but in general it is not considerable in quantity until the affection has existed for some time. This, however, is not always the case: in some instances, after thirty-six or forty hours, there is a large quantity of fluid effused; it is generally accumulated in the inferior parts, unless retained in distinct cavities by adhesions. Its colour varies very much: it is sometimes limpid; and that is principally the case when the peritonitis has been partial:† at other times it is whitish, greyish, milky, or yellowish, and occasionally has all the sensible properties of pus. Dr. Abercrombie observes that the opaque milky deposition is commonly connected with alteration of the structure of the membrane, which in such instances presents a soft thickened appearance, resembling a part that had been boiled. The more common appearance of the peritoneum consists of a deposition of false membrane, co-existing either with the milky flocculent fluid, or with pus, or a fluid entirely limpid. In the latter case, the deposition on the surface of the membrane will prevent the re-absorption of the fluid; so that the accumulation which might otherwise have disappeared will thus become a permanent cause of ascites, provided the disease does not prove speedily fatal.‡

* In some cases of peritoneal inflammation the secretion of this membrane is suspended, and it appears dry.

† Bichat observes that, when serous effusions are the consequence of an affection of a viscus, the serosity is limpid, transparent, and probably of the same nature with that which is exhaled in its natural state; but that, on the contrary, when the effusion depends on inflammation of serous membranes, the fluid is almost always altered. (*Roche et Sanson*, Elemens de Pathologie, tom. i. p. 552.)

‡ *Abercrombie*, p. 3.

This effusion is sometimes reddish, evidently from a mixture of the colouring matter of the blood; and in the hemorrhagic variety of peritonitis, large quantities of blood in a coagulated state have been found by M. Broussais in the peritoneal cavity, without any rupture of vessels being detected, accompanied with extensive ecchymoses of the cellular tissue which unites the peritoneum to the contiguous parts.

The quantity of fluid effused in peritonitis varies from a few ounces to several pounds; its consistence is sometimes that of water, without containing any albuminous clots; at other times it equals that of milk or the pus of the cellular tissue, and often contains the flocculi before mentioned.

The peritoneum is seldom found in a state of gangrene in its whole extent; but eschars of variable size, and of a greyish slate-colour or blueish, are formed, which are easily lacerated, and exhale a fetid odour. The surface of these eschars is often covered with a greyish soft matter, little adherent, which appears to be the commencement of decomposition: these eschars sometimes pervade the entire thickness of the intestinal tunics, or the great epiploon, or extend deeply into the abdominal parietes.

There are certain brownish, black, or violet degenerations of the peritoneum which have been mistaken for gangrene, but are only the results of chronic irritation; they are easily distinguished by not being readily torn, by being destitute of the gangrenous odour, and by the great extent to which the peritoneum is discoloured, the entire membrane being sometimes affected. These appearances are a common consequence of chronic peritonitis.

Ulceration very rarely occurs as a consequence of peritonitis; though not unfrequently the peritoneum is perforated in cases where the ulcerative process, commencing in the mucous membrane, erodes the other coats of the intestines: this naturally leads us to consider peritoneal ulcers as of two kinds:—1. *primitive ulcers*, or those which occur primarily in the peritoneum as a direct consequence of inflammation; 2. *consecutive ulcers*, or those which originate in the intestinal mucous membrane.

There are not many cases on record of primitive ulceration of this membrane. M. Scoutetten observes, that if the patient is not exhausted, and continues to live for some time, erosions of the peritoneum, at first slight, become by degrees more and more deep, and are converted into true ulcers, which may extend and destroy all the membrane, and even the subjacent tissues.* In a patient who had suffered from a venereal affection, and had experienced pains in the lumbar region, most severe at night, M. Portal found, on examination of the abdomen after death, several ulcers covered with pus in the peritoneum situated on the anterior of the lumbar vertebræ and of the kidneys. The same author cites Bouet and Paw as having seen subjects in whom the

* Archives Générales, tom. iv. p. 392.

peritoneum appeared eroded to a great extent.* M. Scoutetten observed the diaphragmatic portion of the peritoneum ulcerated in one case to the extent of two inches; and there is a case also mentioned by the same author, in which, after symptoms of peritonitis, the abdominal parietes were perforated at the umbilicus, and a whitish fluid of the consistence of pus escaped from the abdomen. We have before mentioned, in treating of partial peritonitis, that purulent effusions in this form of the disease occasionally escape by an opening into the stomach or intestines; from this we would infer that ulceration of this membrane may occur more frequently than is generally supposed, but there are not many cases of this description on record.

Consecutive ulceration is much more frequent, and will be fully considered in the article *Peritonitis from perforation of the serous membrane.*

2. *Morbid appearances in chronic peritonitis.*—The organic changes which are the consequence of chronic peritonitis are very nearly the same as those which result from the acute form. There are some peculiarities, however, belonging to the chronic species which deserve attention. In chronic peritonitis, the redness, the result of increased vascularity, is of a darker hue, and the larger branches of veins are more considerably dilated.† The peritoneum has acquired a greater thickness, and the inflammation appears to have penetrated to the subjacent membranes and organs. The false membranes are very numerous and firm, and unite many coils of intestine; sometimes they form a kind of envelope which surrounds the great epiploon and the intestines, and sometimes partial pouches are formed by false membrane which contain a quantity of fluid: when these membranes are detached, we find the subjacent peritoneum less red than in acute peritonitis. In some subjects scarcely any liquid is found: in these cases the false membranes are less abundant and less thick; and the intestines are united to each other by the adhesions which the inflammation has caused them to contract, and not by intermediate albuminous layers.‡

In some subjects, on the other hand, a considerable quantity of effusion is found without any false membrane on the peritoneum, which is thickened, reddish, and exhibits a multitude of dilated bloodvessels. The epiploon is red, thick, and fleshy, and sometimes contains between its laminæ transparent vesicles like hydatids, and substances resembling granulations are occasionally seen on its surface.

When the peritonitis has been of several months' duration, it sometimes occurs that the abdominal parietes are not distended by effusion, but are pressed close to the intestines. The epiploon is covered with a crowd of whitish tubercles of variable size, surrounded with bloodvessels more or less developed. These tubercles may also exist on any part of the peritoneal surface: Dr. Armstrong has found them under three modifications, 1. as small miliary points semitransparent and firm; 2. as uniformly opaque bodies of a larger size, and nearly of the colour and consistence of the kernel of the ripe horse-chesnut; and, lastly, as soft white substances, not unlike cut portions of the medullary matter of the brain. The first and second modifications are seated in the subserous cellular tissue, and likewise between the mucous and muscular intestinal coats; but the soft medullary variety appears to be formed in general on the free surface of the serous membrane itself.* Tubercles at first are extremely minute, but they gradually increase in size and number, and sometimes coalesce: they occasionally exceed the size of a large pea. When small, they are of considerable consistence, and adhere with such tenacity to the peritoneum, that they can only be separated by tearing this membrane; but as they increase in magnitude, they become softer, and approach in their appearance to pus, when they can be easily detached. After being softened, they may again become indurated, and are sometimes converted into a calcareous matter. Occasionally, when they have existed for a considerable time, the peritoneum in the intervals between the tubercles becomes of an obscure red colour, or bluish or black, and presents a strong contrast with the white appearance of the tubercles. These bodies may ulcerate and give rise to perforation of the intestines; when tubercles exist, there is generally only a small quantity of fluid in the abdomen, which may be of different shades of colour from a grey to a black. In most instances, where they have been found on the peritoneum, they existed simultaneously in other organs, especially the lungs. If the symptoms which characterize a tuberculous diathesis co-exist with signs of chronic inflammation or irritation of the peritoneum, we may have some reason to suspect a tuberculous state of this membrane.

M. Bayle has described certain bodies which he calls *granulations*, presenting a pisiform white appearance, and being of a hard consistence, not unlike miliary eruptions of the skin; but M. Broussais supposes they are nothing more than a transformation of the exuded matter which passed from a liquid to an organized state.†

Chronic irritation may produce several other morbid changes on the peritoneum or the subserous tissue, the detail of which would include nearly the whole of the morbid anatomy of this membrane. It may become cartilaginous, bony, or scirrhous. The mesenteric glands may become diseased and tuberculous. Broussais has found vesicles resembling hydatids, and extensive lardaceous depositions, in the subserous cellular tissue. This fatty matter

* Anatomie Pathologique, tom. v. p. 126.
† *Armstrong*, p. 76.
‡ *Scoutetten*, Arch. Gén. tom. 4, p. 387.

* Morbid Anatomy, &c.
† History of the Chronic Phlegmasiæ of Broussais, by Hays and Griffith, vol. ii. p. 294.

was not only deposited under the peritoneum, but also between the laminæ of the mesentery and omentum; it was of a white or yellow appearance like tallow, and mixed with a gelatino-albuminous fluid of thinner consistence and darker colour, which gave the whole mass a mottled appearance. He supposes this the result of chronic inflammation of the subserous tissue, but whether those productions are always to be considered the effects of inflammatory action is doubtful. They at all events are not the usual results of this state; and it appears necessary that a peculiar disposition to such formations must pre-exist in the constitution, which may be called into action, and determined to any particular structure or organ by the existence of chronic inflammation or irritation there.

M. Scoutetten* has described a morbid appearance which he considers as peculiar to primitive chronic peritonitis. It consists of a number of greyish spots formed by little points, the number and close propinquity of which determine the intensity of the colour of the spots, which are sometimes brown or even of a black hue. These spots vary in number, and are sometimes only a line, and in other instances an inch, in extent. They are occasionally accompanied with an increased development of vessels. Minute yellowish vesicles are also sometimes seen, and an abundant serous effusion almost constantly co-exists, in general transparent, because the inflammation has not been sufficiently active to change entirely the mode of secretion.

Treatment.—The general principles of treatment which are applicable to other internal inflammations are equally so to this; with some modifications however, arising from the nature of the texture affected, and from its relations to the organs which it covers. We shall first consider the treatment of this disease in the infant, and afterwards in the adult, and lastly speak of the management of chronic peritonitis.

1. *Treatment of infantile peritonitis.*—Our principal remedy in infantile peritonitis is the abstraction of blood, either general or local. In an infant under six months, though general bloodletting may often be required, yet a sufficient quantity can usually be obtained by the application of three or four leeches to the hand or foot, where we can easily controul the hemorrhage, which cannot be done so effectively if the leeches be applied to the abdomen. Applied to the extremities they are nearly as efficacious in removing local inflammation in infants as when applied to the vicinity of the part affected. They seem to produce the same result as a general bloodletting, as the face and lips become pale, the pulse falters, and syncope followed by vomiting occasionally takes place. These effects are apt to be produced when general bloodletting is carried to a considerable extent; and sometimes a state of nervous agitation and general commotion is induced, which, if not speedily removed, may terminate in death. The best remedies in a case of this kind are the horizontal position, cool air, and a drop or two of the tincture of opium.*

Where general bloodletting is practised, from two to three ounces may be abstracted from an infant between six and twenty months old; at two years from three to four ounces; and when the age is above four, about five, six, or eight ounces may be drawn according to circumstances. After the inflammatory action is lowered by the abstraction of blood, advantage will be derived by establishing and keeping up an open state of the bowels, but we should avoid effecting this by irritating medicine. Small doses of calomel alone, or combined with a little of the pulv. corn. ust. cum opio, if the stomach is irritable, followed at intervals by castor-oil or emollient enemata, will in general be found to answer sufficiently well. Fomentations to the abdomen will tend much to relieve the pain, and should be often repeated, and continued for some time; or we may put our little patient for a few minutes in the warm bath. If it is judged necessary to apply counter-irritation to the abdominal surface, warm flannel sprinkled with turpentine appears to us much preferable to blistering, as it produces a sufficient rubefacient effect, without the injurious consequences which blisters often produce on infants. The recommendation of M. Billard, to remove the child from the breast, appears to us questionable. The sudden alteration in diet would be very apt to produce derangement of the stomach or bowels, a complication which would add to the danger of the patient. If the acute symptoms subside, and it seems probable from the continuance of abdominal tumefaction, slight dyspnœa, quick weak pulse, dry tongue, and hot skin, that the affection has passed into the chronic state, we should suspend or be sparing of evacuations: a leech or two to the abdomen may occasionally be necessary. The strength is to be supported by animal broths, arrow-root, &c.; the bowels regulated by calomel in the combinations above recommended, according to circumstances. The warm bath may be occasionally useful; also counter-irritation to the abdominal surface, and in some cases mercurial inunction.

Treatment of peritonitis in the adult.—Acute peritonitis, though generally attended with considerable danger, yet in the greater number of cases admits of a cure by active and early treatment. The following are the indications which we should have in view: 1. to reduce the action of the heart and vascular system; 2. to diminish the hyperæmia of the affected part; 3. to allay local and general nervous irritation; 4. to restore the secretions to a

* Archives Générales, tom. iv. p. 398. We have been much indebted to this author for information on the morbid anatomy of the peritoneum. This essay contains more information on this point than any author we have consulted.

* *Dr. Cuming*, Transactions of the King's and Queen's College of Physicians in Ireland, vol. v. p. 49.

natural state, and to excite the peristaltic action of the bowels; 5. to relieve urgent symptoms. Copious and early bloodletting are the most efficient means we can employ for the reduction of vascular action. This is indeed the principal therapeutic agent in this disease, in which it can be employed to a greater extent than in inflammation of mucous surfaces. Its efficacy is greater according as it is used early, and carried to such an extent as to make a decided impression on the system. The quantity abstracted is to be regulated by our estimate of the capability of the patient's constitution to bear depletion, and not by any arbitrary rule of quantity. We have seen five or six ounces produce as decided an effect on a delicate female as thirty ounces on a robust patient. We should take the blood from a large orifice, and allow the stream to flow either until the pain is relieved, or weakness of the pulse, paleness, and tendency to syncope is induced: the apparent debility which the patient exhibits in the onset of the disease is not to deter us from active depletion. The pulse commonly rises after venesection, and becomes fuller and softer, and the patient feels relieved and lightened, rather than exhausted, by its employment. The advice which Dr. Abercrombie gives on the employment of bloodletting in this disease we have experienced the value of in many cases: viz. "to follow up the first bleeding by small bleedings at short intervals, when the effect of the first begins to subside: in this manner we prolong, as it were, the impression which is made by the first bleeding, and a twofold advantage arises from the practice— namely, that the disease is checked at an early period, and that the quantity of blood lost is, in the end, much smaller than probably would be required under other circumstances: if we allow the patient to lie after the first bleeding ten or twelve hours, or even a shorter period, the effect of it is entirely lost, and a repetition of it, to the extent of twenty ounces, may be required for producing that effect upon the disease, which by a former method might be produced by five. And, besides, the disease has been in the interval gaining ground, its duration is protracted, and the result consequently rendered more uncertain. The inflammation of a vital organ should not be lost sight of for above an hour or two at a time, until the force of it be decidedly broken; and unless this takes place within twenty-four hours, the termination must be considered as doubtful."

The efficacy of bloodletting will depend in a great measure on its early employment, but we are not to abstain from it altogether at even an advanced period of the disease. If we have not been so fortunate as to see our patient in the commencement of the attack, still if the stage of collapse has not been formed, if there is still some pulse and heat of surface, with abdominal pain and tenderness, we may abstract a moderate quantity of blood from the system with a chance of producing a good effect; or in debilitated patients apply leeches: but when the symptoms indicative of sinking are present, it would be obviously improper to take blood either generally or locally, as it would only hasten the fatal termination, and bring undeserved reproach on a valuable remedy.

Having reduced the general vascular action by the lancet, our next object should be to diminish the quantity of blood in the affected part by local bleeding, which will also assist in keeping up the constitutional effect produced by venesection. Gooch* has well observed, "that as long as the pulse is quick, full, and hard, it is in vain to take blood from the affected part; if we could completely empty its gorged capillary vessels, they would be instantly gorged again, whilst the heart and large arteries are injecting them with so much violence. On the other hand, after having reduced the force of the general circulation, the capillary vessels of the part often remain preternaturally injected. This I conclude from the fact that the patient is often not relieved till local bloodletting has been used, and then is relieved immediately."

Having allowed the patient to recover from the faintness produced by the general bleeding, the abdomen should be slightly fomented with warm water, wiped frequently dry, and leeches should be applied in numbers proportioned to the urgency of the symptoms and strength of the patient. They should be especially concentrated over the parts where most pain and tenderness on pressure exists, and after they have fallen off, fomentations with cloths dipped in warm water should be assiduously applied and repeated for some time, which will both encourage the bleeding and soothe the irritation of the inflamed parts. The application of leeches may be repeated several times, as long as any considerable soreness remains.

Either before or during the application of the leeches, and as soon as possible after the vascular action has been reduced by venesection, from five to ten grains of calomel combined with one or two of opium should be administered, which may be repeated in diminished doses every three or four hours. By this combination, the constitutional and local irritation consequent on the inflammation, and which has a tendency to aggravate it, will be allayed by the narcotic, and the secretions, which have been more or less suspended or deranged, will be restored by the mercury, which modifies its action, and determines it to the skin, and is also supposed to equalize the circulation. After the second or third dose of this medicine, the bowels may be opened by mild aperients, aided by enemata: castor oil, in doses of from half an ounce to an ounce in some aromatic water, may be given if the stomach is not irritable. If vomiting is urgent, the Rochelle salts with the supercarbonate of soda, in a state of effervescence with lemon-juice, may be used in repeated doses, so as to produce a moderately laxative effect. Strong purgatives are highly injurious, and even a small dose of castor-oil may exasperate the dis-

* Diseases of Females, p. 45.

case, if used previously to depletion. Having evacuated the bowels, the use of the calomel and opium should be resumed, and continued till the mercury has affected the system. As soon as salivation is established, we have generally found the symptoms become much mitigated, and our experience accords with that of Dr. Gooch, who remarks that whenever the gums were affected in this disease, the patients invariably recovered. The establishment of mercurial action not only assists in subduing the inflammation, but may prevent or remove those effusions of lymph which afterwards form adhesions that are often the source of future mischief.

In addition to these means, the warm bath may occasionally be useful, or repeated fomentations to the abdomen will tend much to relieve the pain and soreness. Counter-irritation, by means of blisters, after local and general bleeding, is generally recommended; but we have not been much in the habit of employing them. While much inflammatory excitement prevails, they would prove injurious, and at any period of the disease their application would deprive us of the most important means we possess of ascertaining the degree of tenderness by pressure. The application of warm flannel dipped in turpentine we conceive a good substitute, and it will generally produce a rubefacient effect.

Oil of turpentine, which was first recommended by Dr. Brennan of Dublin in puerperal peritonitis, may be useful internally in certain forms of the disease, but we conceive it requires to be used with caution: it acts as a powerful cathartic, and at the same time excites the general system; hence it would obviously prove injurious while much heat of skin, frequent pulse, and indications of active local inflammation were present; but in a debilitated patient, after the acute symptoms have been subdued, or in cases of puerperal peritonitis accompanied with typhoid symptoms, or where general and local bleeding cannot, from the delicacy of the patient's constitution, be carried to the requisite extent, it may be employed with advantage.

During the whole course of our treatment, the strictest antiphlogistic regimen should be observed. Light farinaceous diet, in small quantities, and rice or barley-water for drink, are most suitable for the patient; but if symptoms indicative of a sinking of the vital powers should appear, wine and other tonics may be necessary. Dr. Abercrombie used injections of beef-tea and cinchona with advantage.

When we have carried venesection to a considerable extent, and have reduced the vascular action to such a degree as renders the abstraction of more blood inadmissible, if we still find pain and tenderness present, the exhibition of a full opiate, followed by fomentations or a warm poultice to the abdomen, will sometimes remove the symptoms. If vomiting is urgent, it may sometimes be checked by saline draughts with tincture of opium, or by leeching and blistering the epigastrium. When the pulse continues very frequent after the inflammation appears to be subdued, Dr. Abercrombie recommends the use of digitalis.

A tympanitic state of the abdomen at an advanced period of the disease may occur from mere loss of tone, after the inflammation has been subdued. Small quantities of wine or brandy may be given at short intervals. Frictions of the abdomen, and injections of beef-tea, bark, or sulphate of quinine, turpentine, or tincture of assafœtida, with a moderate quantity of laudanum, may be repeated every two or three hours. The bowels may be moved with mild laxatives, such as aloetic wine, or aloes and hyoscyamus, but laxatives require to be given with the utmost caution. The authorities for the tobacco injection in inflammation of the bowels are numerous: among others, De Haen, Fowler, Abercrombie, and Howship, have recommended this remedy; the latter author relates three cases in which, having tried bleeding, the warm bath, and stimulating injections without effect, the fume of tobacco cautiously injected caused a general commotion and rumbling noise in the bowels, which was soon followed by copious evacuations of fæcal matter. The patients were all saved.*

During convalescence the greatest care is necessary in order to prevent a relapse. The patient should observe the strictest temperance in his diet, and return with great caution to the use of animal food or wine. The bowels should be kept regular, the feet warm, and flannel worn next the skin for a long time after every symptom has disappeared.

Treatment of chronic peritonitis.—Chronic inflammation of the peritoneum, when far advanced, is in most cases incurable, especially when the false membranes and other morbid productions are considerable in quantity, or when it co-exists with a tuberculated state of the peritoneum or subjacent cellular texture, such substances being for the most part incapable of absorption; but where the effusion consists of serum, with but little or no solid productions, our chance of success is greater. Much will depend on arresting the disease at an early stage, at which time a degree of subacute inflammation often exists which will require, with some modifications, the same treatment as the acute form. At every period in this disease, when the abdominal pain and tenderness are present, and the constitution of the patient is not very much debilitated, blood may be abstracted from the system to the extent of six or eight ounces at a time, which may be repeated twice a week until those symptoms have disappeared. The application of leeches also may be frequently adopted; this will be found the most effectual mode of relieving the abdominal soreness. All fæcal accumulations should be prevented, and the bowels kept regular by the gentlest aperients or enemata, but active purgatives should be avoided, as they may be productive of serious evil. The

* Practical Observations, p. 19.

warm bath or fomentations to the abdomen may be frequently employed, and will assist much in allaying irritation and pain, and in determining to the surface. Blisters may also occasionally be applied to the abdomen, or the external application of turpentine, as recommended in the acute form, will be found useful in relieving the abdominal tenderness.

The antiphlogistic regimen is to be observed to a certain extent, and light nutritious diet, composed principally of the farinaceæ and milk, in limited quantities at a time, appears the most suitable. Muscular exertion, or pressure on the abdomen, will be found to aggravate the symptoms, and are of course to be avoided; but in some cases gentle exercise in a carriage will promote the general health. A sea voyage has been recommended, and may be useful.

During the whole course of the disease we are to guard against the supervention of acute inflammation, which may be induced by a very slight exciting cause, and is especially to be dreaded, as the patient, from his debilitated state, could not bear the evacuation which would be necessary for its removal. When the pain and soreness are mitigated, if serous effusion exists, its absorption will be promoted by diuretics. Digitalis, either in the form of infusion or tincture, may be given conjoined with the alkalis and the spirit of nitric ether; but care should be taken to excite as little irritation of the stomach or intestines as possible. We have found the iodureted ointment of Lugol, mixed with equal parts of mercurial ointment, applied by friction to the abdomen, a powerful means of exciting absorption in cases of ascites consequent on peritonitis. In some instances it surpassed our expectation in producing the complete removal of considerable ascites in a few weeks. We have also in some cases exhibited at the same time internally the aqua mineralis iodinæ of the same author, and found it a valuable auxiliary. Broussais strongly recommends the introduction of diuretic medicines, such as the tincture of cantharides or squill, by means of friction on the skin, and it may be proper to try this mode of exciting diuresis, when, from irritability of the stomach, we cannot give diuretics internally. Anodynes may occasionally be necessary, and we should select those which do not produce constipation, such as hyoscyamus or conium. Rigid abstinence has been recommended as a means of producing absorption,* and in some cases perhaps it may be tried, but it will be improper where the patient is much debilitated by a protracted disease. Where all inflammatory symptoms have subsided, and a state of exhaustion remains while the effusion continues, tonics combined with diuretics may be cautiously tried. We have in such cases derived considerable advantage from the exhibition of the ferrum tartarizatum in solution, combined with the spiritus junip. comp.: it appeared to improve the patient's general health, and excite the action of the kidneys at this period of the disease. The antiphlogistic regimen will require to be relaxed a little, and more nutritious diet in small quantities may be allowed.

(D. H. Mac Adam.)

VI. *Peritonitis from perforation of the serous membrane.*—This most severe and generally fatal form of peritonitis is the result of a solution of continuity of the peritoneum, which may arise from various causes and occur in various portions of the sac. In most cases the result of this accident is the introduction into the sac of the peritoneum of some solid or fluid substance which produces a sudden, and generally universal, inflammation, so that the principal characters of this form of disease are, the suddenness of the attack, the terrible rapidity and violence with which the disease runs to its fatal termination, and its resistance to ordinary medical treatment. It will be found that in some of the cases, the particulars of which will be detailed, all these peculiarities were not observed, but we shall find, notwithstanding, that the above characteristics will apply to the disease in general. The following are the most common causes of the accident:—1st, external injuries, either of the solid or hollow viscera of the abdomen, or of the parietal peritoneum merely; 2dly, rupture of the bladder from distention, and of the uterus during parturition; 3dly, rupture of some portion of the digestive tube, from the gelatinous softening of its coats; 4thly, ulcerative perforation of the serous membrane, arising either from disease in any part of the subdiaphragmatic portion of the digestive tube, from suppurations of the solid viscera opening into the peritoneum; from ulceration of the bladder or ovaries; or from perforation of the diaphragm by purulent collections on its thoracic surface.

If we examine these different causes with respect to their frequency, it is plain that from the first order arise most cases of the disease. In this order,—which includes surgical operations on the peritoneum,—the introduction of irritating substances into the peritoneal cavity is by no means a necessary occurrence, although, in the case of rupture from external violence, we see the worst examples of this formidable occurrence; for, as will appear presently, the opening in such cases is generally much more extensive, whereby the quantity of matter introduced comes to be greater, and the closure of the orifice much more difficult.

In the present article we shall principally consider that form of peritonitis which results from perforation of the tunics of some portion of the digestive tube,—an occurrence, in the great majority of cases, the result of circumscribed ulceration of the mucous membrane and glands. The study of this form of the disease tends to elucidate those cases which arise from other causes.

It is necessary to remark, in the first place, that ulcerative perforation of the intestinal tunics does not necessarily imply a consequent effusion of the contents of the tube into the peritoneal cavity; for it may happen in many chronic and even in some acute cases, that in

* Med. Chirurg. Rev. Sept. 1820, p. 187.

consequence of adhesions being formed between the two surfaces of the peritoneum, at a point corresponding to the situation of the ulcer, the contents of the tube are prevented from escaping into the general cavity. Thus, the serous membrane covering the opposite fold of intestine, or some of the solid viscera, may come to form the base of an ulcer which originally was wholly unconnected with it. Again, it may happen that this new base to the ulcer may in its turn give way, and an unnatural communication be thus formed between two essentially different portions of the tube, and the fæcal contents pass across the serous membrane, but not enter its cavity. A remarkable case of this description is described by Dr. Abererombie. The patient, who was fifty-six years of age, had laboured for two or three weeks under impaired appetite, languor, and occasional pain in the abdomen, when he was suddenly seized, while walking, with vomiting of fæcal matter, but felt no other inconvenience until about a week after, when a similar attack recurred; he was then seen by Dr. Combe, who found him looking unwell, but with a natural pulse and good appetite. The bowels were easily regulated, and no sign of organic disease could be detected. After this time the vomiting returned at various intervals, sometimes three or four times a day, and sometimes he was free from it a week at a time. The matter ejected always consisted of pure fæces, sometimes so consistent that it was brought up with difficulty until he diluted it by swallowing hot water. During the course of this affection, the body continued regular or easily regulated, and the matter vomited completely resembled that which was passed from the bowels. No tumour could be detected by examination; his appetite continued good, and he never was observed to vomit food or other matters taken into the stomach. In this state he lived for three months, and died gradually exhausted, without any particular change in the symptoms, except that a week before his death he vomited a considerable quantity of blood. On dissection, the stomach was found contracted and adhering to the parietes of the abdomen on the left side, and to the arch of the colon. At the place of the adhesion a soft tubercular mass was formed, which seemed in general to be about two inches in thickness. The stomach appeared externally healthy; internally it showed a mass of ulceration which occupied the whole of the great curvature, and covered about one-half of its inner surface. The pylorus and whole pyloric extremity were healthy. In the centre of the ulcerated part there was a ragged irregular opening fully two inches in diameter, which made a free communication with the arch of the colon; and around the opening there was also some ulceration of the mucous membrane of the colon. The intestines in all other respects were healthy. The small intestines were empty; the caput coli was distended with feculent matter, and the colon throughout contained healthy well-formed fæces.* Chomel has described a case in which the duodenum communicated with the colon through the medium of the gall-bladder.* In another case on record a communication existed between two loops of intestine formed by a little canal about two lines in length and eight in width, which was lined by a mucous membrane continuous with that of the intestinal tube.

Many cases are recorded of perforating ulcers of the digestive tube communicating with the solid viscera. Thus the base of an ulcer of the colon has been found constituted by the tissue of the kidney; ulcers of the stomach have been found resting on the spleen; Rayer has described an ulceration of the duodenum, the basis of which was a portion of the liver. The effusion of the contents of the stomach from ulceration is commonly prevented by the pancreas, the substance or the peritoneal coat of which forms the base of the ulcer. In this way a perfect cicatrix may be formed, and the health of the individual be preserved.

In most of these cases of perforation without effusion, a partial and very circumscribed peritonitis ensues, which, by its adhesions, prevents the escape of the contents of the intestine. It is further to be remarked that this occurrence is commonly the result of a chronic disease, so that time is afforded for the exudation and organization of lymph. But we are not to conclude that this adhesion always takes place in chronic ulcerations; the contrary is the fact, as will be shown presently. In recent ulcerative perforations, effusion of the intestinal contents is, as might be expected, the almost constant result; but we have seen a case where not only one but several perforations, the result of recent ulcerations, occurred, and yet where no effusion of fæcal matter took place. The following are the particulars of this remarkable case.

A young woman was admitted into the Meath Hospital in the beginning of the year 1829. She had enjoyed good health, until thirteen days previous to her admission, when she was attacked with cough, followed on the next day by symptoms of fever. She complained of cough and dyspnœa; there was great prostration of strength, the skin was hot, and the tongue covered with a white paste. She took saline purgatives and effervescing draughts without relief. Headach and deafness supervened.

Two days before admission she complained of pain in the epigastric origin, which was removed by leeching. On the 24th of January, the day of her admission, she had intense bronchitis. Respirations 40, and pulse 130 in the minute. There was great restlessness, and the belly was tympanitic. For the next nine days all her sufferings seemed referable to the chest; but on the 2d of February she had a certain degree of tenderness in the epigastric region. This was again removed by the use of leeches, and for eleven days there was no prominent abdominal symptom; but the distress of respiration and the signs of bronchitis continued without alleviation. The exhibition of tartar emetic was now resorted to; and

* On Diseases of the Stomach, &c.

* *Andral*, Précis d'Anatomie Pathologique.

cough produced vomiting, yet the thoracic symptoms improved so much, and without any sign of abdominal disorder, that great hopes were entertained of her recovery. The skin became cool, the pulse fell to 100, and the deafness gradually disappeared. On the 12th of February, however, there was a severe relapse. The thoracic symptoms became again violent, *with some epigastric* tenderness. She sank on the following day.

On dissection, the lungs were found filled with miliary and granular tubercles; in some places hepatized, and presenting signs of intense inflammation in the bronchial mucous membrane. A small quantity of sero-purulent matter was found in the cavity of the pelvis. The small intestines were glued together by flakes of unorganized lymph; and on separating their folds, we discovered four perforations, each sufficiently large to admit a quill. These corresponded to recent ulcers in the muciparous glands, which had perforated all the coats of the intestine, and, in fact, rested on the serous membrane of the opposite fold. No faecal matter whatever was discovered in the cavity of the peritoneum.

We here see a case where, from recent disease, no less than four large perforations occurred without any faecal effusion; a circumstance explicable by the formation of lymph around each of the orifices, which we must suppose to have taken place prior to the giving way of the serous membrane at the base of the ulcers. Accordingly, the usual symptoms of peritonitis from effusion of the contents of the intestine did not occur. The gluing together of the small intestines, and the fluid in the pelvic cavity, must be then considered as resulting from the extension of the different (at first local) inflammations of the serous membrane; a circumstance not to be wondered at when we consider that the disease was acute, the fever high, and the points of irritation of the serous membrane numerous. How far the latency of the abdominal inflammation is to be explained by the co-existence of intense thoracic disease, we shall not now enquire.

Peritonitis from perforation of the intestinal tube, and effusion of its contents, is, as might be expected, almost always a violent and fatal disease. It is violent, because it arises from the introduction of a highly irritating fluid into the sac, and dangerous in the highest degree from the seat of the inflammation; it is, moreover, kept up by the continued ingress of faecal matter through the perforation, and derives further malignancy, from having supervened in a subject already attacked by another disease. In fact, although in a few cases the patients have shewn some power of resistance to the disease, and have lived for several days from the occurrence of the accident, yet these cases may well be considered as exceptions.

But are we to believe that the effusion of the intestinal contents is inevitably followed by a violent and acute peritonitis? A case recorded by Andral is in opposition to this opinion. It was that of a young person labouring under phthisis, through whose umbilicus a round worm *(ascaris lumbricoides)* was discharged. He lived for several weeks after this occurrence, and during each day a small quantity of faecal matter escaped through the umbilical fistula. On dissection a chronic peritonitis was discovered, and the serous cavity contained a fetid fluid quite similar to that which had passed through the umbilicus, and in which were several lumbrici.

It is obvious that such a case as this, though of great rarity, is not without its analogies in other systems. We know that the occurrence of a pulmonary fistula is not necessarily followed by violent symptoms; that the pleuritis may be so latent as that the period when the fistula was formed shall be quite uncertain. As a general proposition, then, it may be stated that in both the peritoneum and pleura a fistula, through which foreign substances pass into the sac, may form without violent symptoms or acute inflammation. These cases, however, are exceptions to the general rule; and the cause of the absence of acute inflammation in such instances is still to be sought for. Perhaps the anaemic state of the body, as in phthisis, may have some influence.

When we examine the different diseases in which, at some period, a sudden change in the physical relations of parts takes place, we observe, in most cases, that this sudden change is accompanied by striking symptoms, the suddenness of which leads to the diagnosis. For example, the paralysis, which is the result of an apoplectic effusion, comes on suddenly; and by this is distinguished from that from softening of the brain, which comes on gradually. Again, a patient has a recognized aneurism of the aorta: if he drops down dead, the great probability is that an internal rupture of the tumour has occurred. If the signs of an abscess of the liver suddenly disappear, with copious expectoration, or with a diarrhœa, a vomiting, or a peritonitis, we diagnosticate a solution of continuity, an opening into the lungs, the digestive tube, or the peritoneum. When a tuberculous or other abscess opens into the pleura, the empyema and pneumothorax are ushered in by new and violent symptoms. The same observations apply to the diagnosis of rupture of the uterus and bladder.

Now, although cases of exception may be met with in every one of these diseases, yet they are so rare that the general applicability of the diagnosis—as drawn from the suddenness of new symptoms—is not much infringed on. Apoplexy may occur with gradual symptoms. We have already stated that a tuberculous abscess may perforate the pleura without violent symptoms, and so on. On the other hand, suddenness of invasion of new symptoms may be observed without any solution of continuity. Yet both the want of suddenness and violence of symptoms in cases of rupture, and their occurrence where no solution of continuity exists, are to be looked on as exceptions to a general rule.

We shall now detail some examples of peritonitis from perforation of different portions of the digestive tube. "A young woman, aged

eighteen, had been affected for about six months with variable appetite and occasional pain in the stomach, which made her frequently sit with her body bent forward, and her hand pressed upon the epigastric region. Little notice was taken of the attacks, as she was going about, and otherwise in good health; and for some weeks previous to the attack now to be described, her appetite had greatly improved. On the 26th of November, 1824, while in a room by herself, she was heard to scream violently; and when a person went into the room, she was found unable to express her feelings, except by violently pressing her hand against the pit of the stomach. When she was soon after seen by Mr. M'Culloch, she was moaning as if in extreme agony, but was unable to speak. The pulse was 86, and very weak. She could scarcely swallow; but soon after vomited the contents of the stomach, which seemed to be merely food which she had recently taken. Various remedies were employed without relief. She continued with every appearance of extreme suffering till seven o'clock in the morning of the 27th, when she said the pain was considerably easier, but was still very severe in the pit of the stomach, and was extending downwards over the abdomen. The abdomen was now becoming distended; and when we saw her, about three o'clock in the afternoon, it was distended to the greatest degree, and very tense. The pulse was extremely feeble; she was scarcely able to speak, but her countenance was expressive of extreme suffering. Nothing afforded the smallest relief; and she died about two in the morning—twenty-nine hours from the attack. *Inspection.*—The cavity of the peritoneum was distended with air, and likewise contained upwards of eight pounds of fluid of a whitish colour and fetid smell. There was slight but extensive inflammatory deposition on the surface of the intestines, producing adhesions to each other and to the parietes of the abdomen. On the upper part of the small curvature of the stomach near the cardia, there was a small perforation of a size which admitted the point of the little finger. Internally, this opening communicated with an ulcerated space on the mucous membrane about the size of a shilling, with slightly thickened and hardened edges, and a considerable perpendicular loss of substance. The stomach in all other respects was entirely healthy."*

We have given this case at full length, as it may be considered as an example of the mode of inflammation of the serous membrane in these cases, both as to invasion and termination. In this case, and in some to which we shall just now allude, the perforation was the result of a chronic but circumscribed irritation. In another case described by Dr. Abercrombie, the peritonitis suddenly supervened in a subject apparently affected with chronic dyspepsia, in which the prominent symptoms were severe pyrosis and occasional vomiting. In consequence of a careful regulation of regimen, the stomach had recovered its healthy functions, and the patient's general health had become excellent; but he was obliged to observe great caution in regimen, from the occasional recurrence of slight attacks of his former symptoms. During one of these slight attacks, he was suddenly seized with excruciating pain in the pit of the stomach, some vomiting, coldness of the body, and a small frequent pulse. No relief was afforded by treatment, and death took place in thirty hours from the attack. On dissection, extensive recent peritonitis was shewn, and a perforating ulcer of the stomach near to the pyloric portion. The stomach, with the exception of the perforating ulcer, and another, the base of which was formed by the surface of the liver, was perfectly healthy.*

In this case there can be little doubt of the connexion between the primary symptoms and the ulcer, the base of which was formed by the surface of the liver; and in all probability there would have been a permanent cure had not the second ulceration occurred.

In almost all the cases of this form of peritonitis resulting from a perforation of the stomach, symptoms of a chronic disease of this organ had preceded the accident for a greater or less space of time. Of these, local pain and vomiting were the most frequent, but the degree of severity of these symptoms and their effect on the general health were exceedingly various. In some of these cases a cancerous ulceration existed; in others the affection of the stomach was a simple circumscribed ulcer; while in a third class the disease was the gelatinous softening (*ramollissement gelatiniforme*) of the French authors.†

The immediate cause of the accident in by far the greater number of these cases was the progress of the destructive process; but in two the effort of vomiting seemed to be the cause of the solution of continuity. Andral describes a case of an individual who laboured under the symptoms of a cancerous disease of the stomach, and who was suddenly seized with peritonitis during the act of vomiting, which had been brought on by an emetic. On dissection a perforation of the stomach was found in the centre of an old ulceration of the stomach.‡

In another case on record an old ulcer had existed and had formed adhesions with the pancreas. The perforation took place during the efforts at stool, and was found to have occurred at one of the extremities of the above-mentioned ulceration.§

It is admitted that in some cases a perforation of the stomach takes place in individuals who were in the enjoyment of the best health; and that on dissection no evidence of a pre-

* Abercrombie, Researches on the Diseases of the Stomach, &c. p. 35.

* Op. cit. p. 37.

† See *Gerard*, Des Perforations spontanées de l'Estomac.—*Travers*, Medico-Chirurgical Transactions.—*Crampton*, Ibid.—Journal Gén. de Médecine, 1821.—Dr. *J. Crampton*. Transactions of the Association of the King's and Queen's College of Physicians, vol. i.

‡ Précis d'Anatomie Pathologique, tom. ii.

§ *Bouillaud*, Archives de Médecine, tom. i.

viously existing *ulceration* of the organ could be found. Here the absence of gastric symptoms, previous to the fatal attack of peritonitis, is not extraordinary. But even a fatal ulceration of the stomach may occur with singular latency, as in a case recorded by Dr. Abercrombie, where, in a strong and healthy-looking girl, sudden and rapidly fatal peritonitis supervened. On dissection, a perforating ulcer was found in the smaller curvature, all around which the coats of the stomach were found greatly and extensively thickened. *This girl had been residing in the house in which she died for four months, during which she was never known to complain of her stomach, or to show the smallest deviation from the most robust health.** It appeared, however, that she had had fever some months before this; and in all probability this fever was symptomatic of or connected with a gastritis.

We shall now proceed to examine what appears to be the most common case of this disease, namely, that in which it supervenes on a perforating ulcer of the lower portion of the ileum. In the great majority of these cases the ulcerations were recent and the disease acute. In many of them, symptoms of a previous excitement of the muciparous glands were observed.

As Louis is the author who has drawn the attention of pathologists more especially to this disease, we cannot do better than quote from his memoir† the results of his observation of the first eight cases which he describes. "The patients who have been the victims of this disease were young and vigorous, with the exception of the first, who was weak and of a lymphatic temperament; they had a good constitution, were rarely ill, not addicted to excess, and presenting a sanguine, a bilious, or a lymphatico-sanguine temperament. Almost all had been but a short time in Paris. The causes of their disease were unknown. If we except a single case, it commenced as a slight continued fever, and presented no severe symptom before the period of the perforation; in but one patient was there a severe diarrhœa, which was, however, of short continuance; in another it had been moderate; still less in the subjects of the second and sixth case, and not occurring in the remainder. Those with whom the diarrhœa was for a short time severe had slight pains in the epigastrium and more severe pain in other portions of the abdomen, while in the remainder they were very slight, or not at all present before the period of perforation. Three of them believed themselves convalescent, and were considered so for some days, when the symptoms of this lesion occurred. A fourth seemed to have been cured rapidly of a slight enteritis; so that not only in these four subjects nothing occurred which could lead to the anticipation of the disease under which they sank, but it would have been absurd, from the mildness of their symptoms, to have apprehended any serious consequences. And at this moment we have before us the history of many patients who have died from an acute perforation of the intestine, and who, with this exception, presented no symptom which could distinguish them from analogous cases where there was a rapid return to health.

"If the period of the formation of these ulcerations cannot be accurately determined, we shall be scarcely far from the truth in supposing that it coincides with the first symptoms of the disease, from which it would result that the progress of these ulcerations has been very rapid, and that they have arrived at their last period in from twelve to twenty-five days, rarely later.

"At a certain period of the disease, on account of which the patients had entered hospital, they experienced suddenly an exquisite and tearing pain of the abdomen, rapidly followed by alteration of the features, nausea and vomitings, &c. &c. These symptoms continued with greater or less violence from twenty to fifty-four hours, presenting remissions which were more or less well marked, and indicating a most intense peritonitis, produced by a violent cause acting in a sudden manner, just as occurs when an irritating substance is applied to the surface of the peritoneum. It is by the reunion of these signs that the lesion that now occupies us has been recognised by MM. Lerminier, Chomel, and Martin Solon, under whose care the patients were. From these circumstances it appears that we may regard the following as characteristic signs of perforation of the intestine: *if in an acute disease and in an unexpected manner a violent pain of the abdomen suddenly supervenes, if this pain is exasperated by pressure accompanied by rapid alteration of the features, and more or less promptly followed by nausea and vomiting, we may believe and announce that there is a perforation of the intestine.*"

This author further remarks that the most intense pain of the belly suddenly supervening, and accompanied by alteration of the countenance, nausea, and vomiting, will be insufficient to allow us to make this diagnosis with certainty, unless the pain is exasperated by pressure. It is not only necessary that this character should exist, but also that the pain shall extend rapidly to the whole abdomen, so that, if it remains confined to the point where it has first occurred, we cannot, notwithstanding the coincidence of other symptoms, declare that the intestine is perforated, or that any other viscus has opened into the cavity of the abdomen. In illustration of this he states the case of a man who had laboured under symptoms of chronic gastritis, when he was suddenly attacked with violent pain in the epigastrium, soon followed by nausea, vomiting, and alteration of the countenance. This pain, which was exasperated by pressure, was confined to a very small space, where it first occurred. It continued along with the other symptoms for four days, when the patient died, and on dissection was found to proceed from an aneurism of the cœliac artery, which had

* Op. cit. p. 41.

† Recherches Anatomico-Pathologiques. Paris, 1826.

ruptured and caused an effusion of blood behind the peritoneum.

It is not always that the pain, though occurring under the above circumstances, continues until death. In one of the cases of this lesion, which occurred at the Meath Hospital, there was complete cessation of pain and even of tenderness for many hours before death. The patient declared himself much better, yet the other symptoms of peritonitis continued, such as the coldness of the extremities, the rapidity of the pulse, the swelling of the belly, and the Hippocratic expression. In three of Louis's cases the same circumstance was observed; the countenance continued altered, the nausea and vomiting persisted, the surface was pale and of a violet hue, and the patients were perpetually shivering and covering themselves carefully up in the bed-clothes. They resembled persons who, having taken a cold bath, cannot again regain warmth.

We may be further assisted in the diagnosis of perforation of the small intestine by the seat of the pain as it first occurs. This is generally in the ileo-cœcal region; but it may no doubt be felt in other situations, according to the place of the perforation and the disposition of the intestine.

We have now witnessed a considerable number of these cases, which occurred under our observation in the wards of the Meath Hospital. In nine of these cases the diagnosis of perforation of the intestine was made, and proved to be accurate by dissection. It is scarcely necessary to remark that the general features of these cases were the same, namely, *the sudden supervention of the symptoms of peritonitis, and the rapid sinking of the vital powers.*

In three cases, the serous inflammation supervened during the existence of gastro-enteric fever more or less well marked.

In one case, the symptoms came on on the seventh day of a catarrhal fever.

In two cases, the disease occurred after symptoms of acute enteritis, which in one of the cases followed a severe debauch.

In one case (which we have before mentioned), the perforations, though numerous, yet did not produce any well-marked symptoms, the patient dying apparently of acute phthisis.

In one case, the symptoms occurred after an hypercatharsis induced by an over-dose of salts. The same cause appeared to produce the disease in another patient, who recovered under the use of large doses of opium, and to which we shall hereafter allude.

In several of these cases there had been previous diarrhœa, which was suddenly checked at the time when the perforation appeared to take place; but in one of them in which this had occurred, a copious purging of natural coloured fæces came on twelve hours before death. This patient had used calomel freely the day before.

Another remarkable symptom was the irritation of the bladder, shewing itself by sudden inability to pass urine, and constant efforts at micturition. This irritation of the urinary organs occurred in several cases, and in two was the very first symptom observed. The bladder was found inflamed in one case; while in another it was merely contracted and empty, with its mucous membrane pale. This was remarkably the case in a patient who was admitted in December 1830. This man had enjoyed uninterrupted good health until three days previous to admission, when, on getting up in the morning to gratify the extreme desire to pass water, he found himself unable to do so, the attempt putting him to intolerable torture; he had pain in the region of the bladder, not so severe when he was not attempting to pass urine. The pain continued during that day, but towards night became more easy, and he passed about ten ounces of urine; still all the attempts at micturition were attended with considerable suffering. On admission he presented the general appearance of a person affected with peritonitis: he had acute pain in the right lumbar region, and great tenderness in the umbilical, right iliac, and hypogastric regions. What he complained of principally was retention of urine; yet the catheter shewed that the bladder contained but a few drops of turbid high-coloured urine, and that the urethra was unobstructed. Towards evening, after the use of an injection and venesection, he passed a small quantity of urine, the countenance was Hippocratic, and the patient died at three o'clock on the following morning. On dissection, the usual appearances of peritonitis from perforation were seen. The perforating ulcer existed about eighteen inches from the ileo-cœcal valve. Three other ulcers existed lower down, which had not made their way into the serous cavity. The peritoneal surface of the bladder was highly inflamed.

In another case where the symptoms succeeded a bilious diarrhœa, the sudden supervention of the pain was also accompanied by inability to pass urine. On dissection, the perforation was found large and corresponding to the fundus of the bladder. And in a third case, in which the disease appeared on the seventh day of a catarrhal fever, the first symptom of the perforation was sudden inability to pass urine. In this case a turpentine enema opened the bowels, and enabled the patient to empty his bladder. Here the opening existed about three inches above the ileo-cœcal valve, and the mucous membrane of the bladder was found highly inflamed.

In all our cases, evidences of a previously diseased condition of the mucous glands of the intestine existed to a greater or less degree; in some instances accompanied by functional disturbance, in others occurring in a perfectly latent manner. Of this last remarkable fact many other instances have been observed by authors.

The peritonitis thus supervening, as might be expected, almost always runs its course in a very short time. In the first nine cases recorded by Louis, death took place in from twenty to fifty-four hours, while in one case the patient lived seven days from the first appearance of the symptoms of peritonitis. In

this instance the symptoms, which had been violent at first, became moderated at the commencement of the fourth day, and during the remaining three days the pain of the belly was very slight, and if the first symptoms had not been so well marked, doubts would have been entertained of the truth of the diagnosis. "In confirming," says Louis, "those diagnostic symptoms which we have established, this observation is of great importance as connected with prognosis, since it shews that when once the signs of perforation have occurred, we must not depart from our diagnosis, and admit of hope even after an arrest of symptoms, and an apparent amelioration even of some days standing. This reserve is furthermore necessary from the fact that the lesion that brought about the perforation is not so soon arrested, and that the first perforation may be followed by a second, and even by a third. (Obs. vi. and vii.) This prolongation of life after so severe an accident is in accordance with the variations which we so constantly observe in the march of diseases, and points out the analogy between perforations of the intestines and those of the lung."

In our cases the length of time the patients lived after the occurrence of the perforation, varied from twelve to one hundred and twenty hours. We find, on examining the results of nineteen cases observed by ourselves, or recorded in the works of different authors, in which the period of the perforation could be accurately ascertained, that the average length of time that the patients lived after this accident was about twenty-nine hours. In one of our cases, however, which we have brought into this calculation, the patient lived about one hundred and twenty hours; and in a case recorded by Louis, the perforation took place on the 18th of May, and the patient lived until the 25th of the same month. The shortest period in which the fatal termination took place seems to be in six hours. We may observe that in some of the cases which have entered into the above calculation, the perforation occurred in the stomach, and in one in the duodenum.

We have hitherto been principally occupied with those cases of peritonitis from perforation in which the symptoms were well marked, and in which the intestinal contents passed into the cavity of the peritoneum. It is a fact, however, that in a very few cases this accident may supervene without the ordinary sudden and violent symptoms: thus, in the ninth observation of Louis, we read of a patient who was labouring under fever with diarrhœa, in whom the symptoms which appeared to correspond with the perforation were delirium and shivering, which occurred in the morning and continued till the evening of the next day, when the patient sank; there was also increased meteorism, and the patient winced only after a strong pressure of the belly. In this case the perforation was not suspected, yet Louis inquires whether we might not, under similar circumstances, suspect a perforation of the intestine, particularly when it is considered that peritonitis without perforation is rare as occurring in the course of acute diseases. He thinks that if, in the course of a continued fever with diarrhœa, the patient is seized with delirium, shiverings, and a slight tenderness of the belly, which until then had not been painful, we might be authorised to suspect a perforation of the small intestine.

In the case of the young phthisical patient recorded by Andral, through whose umbilicus a round worm (ascaris lumbricoides) was discharged, the individual lived for some weeks after this occurrence.

It must be always borne in mind that the diagnosis of peritonitis from perforation of the intestine in ordinary cases, is founded on the greater probability that the peritonitis thus suddenly supervening proceeds from the introduction of irritating matters from the intestine than from any other cause. It is plain also, that as far as the peritonitis is concerned, we shall observe the same general symptoms in cases of the rupture of abscesses into the peritoneal cavity, or the effusion of urine from rupture of the bladder; but still a few cases may occur where a sudden and fatal peritonitis may supervene without solution of continuity of the serous membrane of the peritoneum. We need scarcely allude to strangulated hernia further than to observe that, where the strangulated portion is exceedingly small, so as not to be capable of detection by external examination, the case may closely resemble one from sudden perforation of the intestine. Of this we witnessed a very remarkable case, where a portion of the intestine not larger than a small hazel-nut had become strangulated. The symptoms supervened with sudden pain, constipation, swelling, tenderness of the belly, and the other signs of peritonitis.

In the article HEPATITIS we have described a case of peritonitis from the opening of an hepatic abscess into the serous membrane; in this case the patient lived for eight days after the occurrence of the perforation; and on dissection we found the false membrane of the peritoneum in progress of organization, as shown by the existence of large bloodvessels of a deep blue colour passing through its substance, which had assumed a laminar structure.

It is scarcely necessary to remark that the prognosis in peritonitis from the introduction of irritating substances into the cavity must be unfavourable in the highest possible degree, for two reasons;—first, from the nature of the exciting cause, which produces a rapid and universal inflammation; and, secondly, from the previous existence of some other disease which was the cause of the perforation. Yet we believe that even under these almost desperate circumstances, we are not justified in abandoning the patient to his fate without an attempt to save life by medical treatment. We know that the peritoneum may recover from inflammation after solutions of continuity in various portions of its extent, and hence this circumstance merely, though dangerous in a great degree, is not necessarily to lead us to

despair. It would seem that it is from the introduction of irritating matters into the cavity that the greatest danger is to be apprehended, and hence to prevent or diminish the extent of such an accident should be the principal object of the physician. In cases of this description the principles of treatment are, then, essentially different from those of ordinary cases of peritoneal inflammation.

In the second number of the Dublin Journal of Medical and Chemical Science, the writer of this article has shewn the inapplicability of the ordinary mode of treatment of peritonitis in those cases. In most of them the powers of life sink so rapidly that bleeding, either general or local, cannot be attempted; neither can we use mercury internally, from the danger of exciting the peristaltic action of the intestine, which of course tends to keep open the communication, and cause a fresh ingress of fæcal matter into the sac; nor can we hope much from the external application of mercury, from its slow action, and the improbability of its affecting the system under these circumstances.

Yet, in a few cases, we find that the patients may live for several days, and that a process of organization of the effused false membrane may be found to have commenced; and hence the two great indications are, to support the strength of the patient so as to gain time, and to diminish, as far as possible, the peristaltic action of the intestine. In the paper above alluded to, we have proposed the use of opium in large doses for the treatment of this form of the disease, to which we were led from having witnessed the admirable effects of that remedy in low cases of peritonitis in the hands of Dr. Graves, who, eleven years ago, treated successfully two cases of peritonitis after paracentesis, and occurring in patients of a bad habit, by means of opium in free doses, and without abstracting a drop of blood. The same physician employed a similar treatment in a case of abscess of the liver opening into the peritoneal sac, and with success, as far as the cure of the peritonitis was concerned.*

In the paper above alluded to, we have detailed two cases in which decided evidence of the utility of this mode of treatment was obtained. In the first, in which the symptoms of perforation had existed for two days, and the patient was in almost complete collapse, the use of sixty drops of the black drop in the twenty-four hours was followed by the most singular improvement: the pulse had become full and soft, the extremities warm, and the countenance had lost the Hippocratic expression. The patient could bear pressure on the abdomen, which the day before was exquisitely painful. The same treatment being continued for twenty-four hours longer, *every symptom of abdominal inflammation had subsided*: the belly was natural, and the pulse good. At this period, the mildest possible saline laxative was exhibited, which produced four evacuations, followed by an immediate return of the symptoms of peritonitis, under which the patient rapidly sank. On dissection we found universal peritonitis, but the intestines were every where agglutinated together except in the left iliac fossa. The perforation existed in the cœcum, and was small; and the mucous membrane of the ileum and colon was but little affected.

The interest of this case consists, first, in the decided advantage derived from the use of the opium; secondly, in the danger it shews to result from any thing that excites the peristaltic action of the intestine; and thirdly, in the verification of the diagnosis of perforation, and the evidence of a process of cure having commenced.

In the next case the disease was of three days' standing, and it supervened suddenly from a hypercatharsis produced by an over-dose of Glauber's salts. The patient was apparently in the last stage when the opium treatment was commenced. He was ordered a grain of opium every hour. Next day the symptoms were decidedly improved, and though he had taken twenty-four grains, he had not experienced the slightest coma, headach, or delirium. The same plan of treatment was persevered in, the daily doses of opium being gradually diminished until the tenth day, when, the convalescence being completely established, the remedy was omitted. During this time diarrhœa set in for three or four days severely; this was treated by the application of a few leeches to the anus, and the use of anodyne enemata. The patient took in all one hundred and five grains of opium, exclusive of that in the injections, without experiencing any of the usual effects of this remedy in large doses.

When we connect these facts, and recollect that, in bad forms of peritonitis, such as that occurring after paracentesis in debilitated subjects, it has been found successful, and also that its efficacy has been proved in a case where the peritonitis supervened on the introduction of the matter of an hepatic abscess into the peritoneum, it seems justifiable to recommend the exhibition of opium in free doses in cases of peritonitis from the introduction of irritating matters into its cavity. Of these cases, that from ulcerative perforation of the intestine seems to be the one most likely to be benefited by such a treatment, as in these cases the solution of continuity is but of small extent, the disease from which it has originated much more often acute than chronic, and generally confined to a small extent.

It is necessary to remark that in the treatment of these cases the strength of the patients must be supported, and the greatest caution observed, even for some time after the symptoms of peritonitis have subsided, in the use of any thing that can excite the peristaltic action of the intestine.

(William Stokes.)

PERSONS FOUND DEAD.—Under this head we propose to treat of those causes by which life is suddenly or quickly extinguished in persons previously in the apparent enjoyment of good health. Cases of this kind are peculiarly the objects of legal investigation by

* See Dublin Hos. Reports, vol. 5. Dublin Journal of Medical and Chemical Science, vol. 2.

the coroner; and as all medical men are liable to be called on to assist him with their professional information and opinion, it is of the utmost importance that clear notions of the true nature of the phenomena that present themselves should be entertained. The object of such enquiry being to ascertain whether death was natural or owing to some accidental cause, the whole subject of sudden death may be conveniently arranged under two heads,—namely, 1. sudden death from natural causes; 2. sudden death from violent causes; comprehending under the latter every variety, whether the result of accident or of criminal intention.

Our first duty on the discovery of a supposed dead body is to ascertain whether any spark of life still remain, by rekindling which animation may be restored; and this leads us, before entering on the causes and phenomena of sudden death, to consider the states of body that may resemble death, and to point out the means of discrimination between those cases in which life is really extinct, and those in which the exercise of the vital power is only suspended. Nothing is more certain than death; nothing is at times more uncertain than its reality: and numerous instances are recorded of persons prematurely buried, or actually at the verge of the grave, before it was discovered that life still remained; and even of some who were resuscitated by the knife of the anatomist. Pliny, who devotes an entire chapter to this subject, entitled "De his qui elati revixerunt," amongst other instances gives that of the Roman consul Avicula, who, being supposed dead, was conveyed to his funeral pile, where he was reanimated by the flames, and loudly called for succour; but before he could be saved, he was enveloped by the fire and suffocated. Bruhier,* a French physician, who wrote on the uncertainty of the signs of death in 1742, relates an instance of a young woman upon whose supposed corpse an anatomical examination was about to be made, when the first stroke of the scalpel revealed the truth: she recovered, and lived many years afterwards. The case related by Philippe Peu is somewhat similar. He proceeded to perform the Cæsarean section upon a woman who had to all appearance died undelivered, when the first incision betrayed the awful fallacy under which he acted. A remarkable instance of resuscitation after apparent death occurred in France, in the neighbourhood of Douai, in the year 1745, and is related by Rigaudeaux,† to whom the case was confided. He was summoned in the morning to attend a woman in labour, at a distance of about a league. On his arrival, he was informed that she had died in a convulsive fit two hours previously. The body was already prepared for interment, and on examination he could discover no indications of life. The os uteri was sufficiently dilated to enable him to turn the child, and deliver by the feet. The child appeared dead also; but by persevering in the means of resuscitation for three hours, they excited some signs of vitality, which encouraged them to proceed; and their endeavours were ultimately crowned with complete success. Rigaudeaux again carefully examined the mother, and was confirmed in his belief of her death; but he found that, although she had been in that state for seven hours, her limbs retained their flexibility. Stimulants were applied in vain; and he took his leave, recommending that the interment should be deferred until the flexibility was lost. At five P.M. a messenger came to inform him that she had revived at half past three. The mother and child were both alive three years after. There is scarcely a dissecting room that has not some traditional story handed down of subjects restored to life after being deposited within its walls. Many of these are mere inventions to catch the ever-greedy ear of curiosity; but some of them are, we fear, too well founded to admit of much doubt. To this class belongs the circumstance related by Louis, the celebrated French writer on medical jurisprudence. A patient who was supposed to have died in the Hôpital Salpêtrière, was removed to his dissecting room. Next morning Louis was informed that moans had been heard in the theatre; and on proceeding thither he found, to his horror, that the supposed corpse had revived during the night, and had actually died in the struggles to disengage herself from the winding-sheet in which she was enveloped. This was evident from the distorted attitude in which the body was found. Allowing for much of fiction with which such a subject must ever be mixed, there is still sufficient evidence to warrant a diligent examination of the means of discriminating between real and apparent death: indeed, the horror with which we contemplate a mistake of the living for the dead should excite us in the pursuit of knowledge by which an event so repugnant to our feelings may be avoided.

Life consists (at least as far as we can perceive) in the presence of a preserving principle proper to all organized beings, and peculiar to each species, which opposes itself continually to the influence of the physical and chemical agents that surround us. The effects of these agents in altering the forms and nature of inorganic substances we daily witness, while our frames resist them in every latitude. This power, in conjunction with sensation and motion, constitutes the state of life; a state which subsists as long as this power remains. But we do not see this power; it only renders itself sensible by the motions given to the heart, lungs, and other organs; and it is by the existence of these motions that we generally judge of the existence of life. This isolated abstract principle cannot subsist, as far as we know, without the instruments by which it makes itself visible; it is for this reason that

* "Dissertation sur l'incertitude des signes de la mort, et l'abus des interremens et embaumens précipites." Bruhier mentions 180 cases in which persons still living were treated as dead; of these, 52 were buried alive, 4 were opened before death, 53 revived spontaneously after being placed in their coffins, and 72 were supposed to have died when they really had not.

† Journal des Sçavans, 1749.

these are to be particularly considered on the present occasion, without in the least, however, diverting us from the consideration of a great first cause. If life depends upon the presence of a force or power continually opposed to the action of physical and chemical laws, real death will be the loss of this force, and the abandonment of organized bodies to these agents; while apparent death will be only the suspension of the exercise of life caused by some derangement of the functions which serve as the instruments of vital action. This suspension may last for a considerable time, if we may judge by the cases collected by credible authors, to some of which we have alluded, and by the numerous instances of drowned persons restored to life after long submersion. From this definition of life and death, it would follow that putrefaction is the only evidence of real death; but in many instances it would be attended with much inconvenience, and often with danger, to wait for this confirmation of the extinction of life. In malignant diseases, and during times of severe general sickness, the keeping of bodies disinterred until putrefaction announced the reality of death, would be a measure fraught with considerable risk to the lives of the survivors. It then becomes desirable that we should be acquainted with those signs by which we may judge that life is extinguished by the interruption of its functions.

As respiration is a function most essential to life, and at the same time the most apparent, the cessation of it may be considered as an indication of death. But as in certain diseases and states of great exhaustion it becomes very slow and feeble, so as to the casual observer to appear quite extinct, various methods have been adopted for ascertaining its existence. Thus, placing down or other light substance near the mouth or nose; laying a vessel of water on the chest, as an index of motion in that cavity; holding a mirror before the mouth in order to condense the watery vapour of the breath; have all been proposed and employed, but they are all liable to fallacy. Down, or whatever substance is employed, may be moved by some agitation of the surrounding air; and the surface of a mirror may be apparently covered by the condensed vapour of the breath, when it is only the fluid of some exhalation from the surface of the body. We, therefore, agree fully with the judicious observations of Dr. Paris* on this subject. "We feel no hesitation in asserting that it is physiologically impossible for a human being to remain more than a few minutes in such a state of asphyxia as not to betray some sign by which a medical observer can at once recognise the existence of vitality; for if the respiration be only suspended for a short interval, we may conclude that life has fled for ever. Of all the acts of animal life this is by far the most essential and indispensable. Breath and life are very properly considered in the scriptures as convertible terms; and the same synonym, as far as we know, prevails in every language. However slow and feeble respiration may become by disease, yet it must always be perceptible, provided the naked breast and belly be exposed; for when the intercostal muscles act, the ribs are elevated, and the sternum is pushed forward: when the diaphragm acts, the abdomen swells. Now this can never escape the attentive eye; and by looking at the chest and belly, we shall form a safer conclusion than by the popular methods which have been usually adopted."

The absence of the circulation of the blood has been looked on as a certain indication of death; but this is a test not much to be depended on, for it is well known that persons may live even for hours in whom no trace of the action of the heart and arteries can be perceived. In applying this test, it is necessary to remember that it often occurs that the pulse at the wrist cannot be felt if the limb be extended or everted; but if it is bent, and the hand turned inwards, it becomes perceptible. We should, therefore, perform this movement, by which the artery is relaxed, and the passage of the blood is facilitated when only feebly propelled. Sometimes, also, the artery can be felt between the thumb and first metacarpal bone when it is not to be found at the wrist. It is well to seek for the artery at the bend of the arm, as the pulse can often be felt there after it has left the wrist. In these examinations it is necessary to press very lightly, lest we should obliterate the pulsation altogether; and care should be taken to guard against mistaking the beating of the arteries in one's own fingers for that of the artery under examination. The trial should be made at every part where large arteries pass; and sometimes the proceeding of laying the body on the left side, and placing the hand under the region of the heart, may be adopted. The stethoscope may be used with great advantage in these cases, as any motion of the heart will be sure to become sensible through the aid of this instrument.

The temperature of the body has also been proposed as a guide, but this is very fallacious, as it is well known that the cooling of a body after death is influenced by many circumstances, such as age, habit of body, and the disease of which the person died. With respect to age, it has been observed that the bodies of young persons retain their heat longer than those of old. In fact, in old age, the winter of life as it has been termed, death is scarcely any thing more than to become cold; and in those cases the temperature of the body is rapidly reduced to that of the surrounding medium. Hence we derive a caution in judging of priority of death among a number of bodies overwhelmed by the same accident; for the body of a young person found warm, and that of an old one found cold, would not indicate that the former had survived the latter. This will be more fully treated of in another article. (See SURVIVORSHIP.)

The habit of body has also been observed to exert an influence over the rate of cooling after death, and it is found, *cæteris paribus*,

* *Paris and Fonblanque*, Med. Jur. vol. ii. p. 10.

that fat bodies lose their heat sooner than lean, but putrefy sooner. The disease which has destroyed life is a powerful controlling agent in the loss of temperature after death. Thus it has been long known that in apoplexy the body retains its heat for a considerable time. This has been particularly noticed by Portal. Again, in that disease or accident frequently witnessed in tropical climates, the "coup de soleil," we are informed by Badenoch that the bodies of the sufferers remain warm much longer than in other forms of death. In most kinds of asphyxia except that by drowning, but especially in asphyxia by noxious gases, the dissipation of the animal heat is greatly delayed. In cases of the latter description, Orfila found the heat preserved for twelve hours after death; and we are informed by Samoelowitz, that during the great plague at Moscow, the bodies of those who were speedy victims to that disease preserved their temperature much longer than the bodies of those who die by ordinary diseases. Besides these cases in which the animal heat is preserved to an unusual length of time after death, there are others in which it is rapidly lost during life, and even when there is no danger of death, as in some forms of hysteria, and in syncope. It is also an effect of submersion in water, and is usually observed in the bodies of those restored to life after drowning. Flexibility of the limbs succeeding their rigidity is one of the most characteristic signs of death: we say succeeding their rigidity, because so long as the limbs are flexible, if the flexibility has not succeeded stiffness, we may presume that there are some remains of life. We are indebted to Nysten and Louis for some valuable observations on the occurrence and duration of the cadaverous stiffness. The rigidity of the muscles commences in the trunk and neck; it then spreads to the thoracic extremities, and finally reaches the legs and feet, and in subsiding it follows the same course. Its duration is in proportion to the lateness of its occurrence, it being found to continue longer in those cases in which it commences latest. Its energy and duration are always in a direct ratio with the degree of development and energy of the muscular system at the moment of death: thus it is extremely strong in the bodies of athletic individuals, in those who die of tetanus, or who are asphyxiated by noxious gases whose delcterious action does not affect the contractility of the muscles. In all animals, the moment when stiffness commences is that in which the vital heat appears to be nearly extinct. Professor Louis, from observations made upon more than five hundred subjects after death, found that at the moment of the absolute cessation of the vital movements, the articulations began to become stiff even before the loss of animal heat. Foderé has verified the justness of this observation several times in hospitals, and concludes that the flexibility of the limbs is one of the principal signs by which we may judge that a person is not dead, although there is no other sign of life. During the whole time this contraction of the muscles continues, they resist the action of chemical forces, and it is only when suppleness is restored that putrefaction commences. Nysten regards this stiffness as a measure of the resistance opposed by organic to chemical forces. Life on the point of extinction seems to take refuge in the muscles, and there causes the spasms we speak of, and during their continuance is able to resist the operation of chemical forces.

The occurrence of the cadaverous stiffness is subordinate to the same causes that influence the loss of temperature. We have seen that old age favours the dissipation of animal heat, and in like manner it is observed that the muscular rigidity comes on soonest in the bodies of old persons. The habit of body in which the temperature is longest preserved is that in which stiffness of the limbs is slowest in its invasion; thus the bodies of full and fat persons remain longer flexible than those of meagre and lean. And again, those diseases which are followed by a long continuance of warmth are also remarkable for leaving a corpse in an equal degree flexible; while those in which the body is rapidly cooled, as hemorrhage for example, favour the approach of the muscular spasm; and after death from these, the body becomes soonest and sometimes suddenly stiff. From this concurrence between the spontaneous cooling of the dead body, and the supervention of the cadaverous stiffness, it might be presumed that accidental cooling would be followed by a similar effect; and this is precisely what takes place; for bodies left exposed in cold situations, as on a field of battle, are found to become rapidly stiff.

The rigidity of the body is a criterion of great value, as it points out the general contraction of the muscular fibre that occurs shortly after dissolution; but in regarding it as a test of death, it is necessary to guard against mistaking the stiffness that arises from other causes for the cadaverous stiffness. In persons frozen but not yet dead, or, in other words, susceptible of reanimation, the rigidity of the body is very great, but on close examination it is found not to be confined to the muscular system, but to pervade all parts of the body. The breasts, belly, and skin, are all equally hard with the muscles, to which alone the stiffness is confined in that from death. This, coupled with the crackling noise caused by forcible flexure of a joint, will be sufficient mark of discrimination between the two. Moreover, it can scarcely be a source of error, because it is an effect of the accident to which the person has been exposed, and if it does not yield to the appropriate remedy (the gradual application of heat), it will be an indication that the subject is really dead.

The stiffness that occurs in certain forms of syncope and convulsive diseases can never be confounded with cadaverous rigidity if proper attention be paid to the facts connected with it; for in the former case it takes place immediately after the invasion of the disease, and always precedes apparent death, while the body still preserves a considerable degree of warmth; whereas the cadaverous stiffness is

not observed until some time after death, and when the heat of the body is scarcely sensible. In all stiffness of this kind there is much difficulty in moving a limb; so far it resembles that from death; but after having bent the limb, on ceasing to apply the force, it immediately flies back to its former position; while the dead limb, on the contrary, remains in the position in which it is placed. If death really takes place in any of these convulsive diseases, the muscular contraction ceases with the extinction of the nervous influence to which it was owing, and the true cadaverous stiffness succeeds at the proper time, and runs its usual course. But above all, the termination of the cadaverous rigidity in flexibility serves to distinguish it from every other, and is a certain indication of dissolution.

That peculiar cast of countenance termed from its first describer the *Hippocratic*, has been regarded by some as another sign upon which reliance may be placed in judging of the reality of death. It is thus described by Hippocrates: "The forehead wrinkled and dry; the eye sunken; the nose pointed, and bordered with a violet or black circle; the temples sunken, hollow, and retired; the ears sticking up; the lips hanging down; the cheeks sunken; the chin wrinkled and hard; the colour of the skin leaden or violet, the hairs of the nose and eye-lashes sprinkled with a yellowish white dust." Such is the alteration in the human physiognomy that usually takes place after death. But it is also produced by the near approach of death; often by the sight of imminent danger; and is also commonly observed in criminals at execution, whatever may be the degree of tranquillity assumed. Moreover, those who perish by sudden death, or of short diseases in which dissolution is not expected, preserve their usual physiognomy; while, on the other hand, the countenance may be pale, ghastly, and contracted in nervous and hysterical affections without extinction of life. Finally, there are some individuals whose integuments during life have a leaden and cadaverous aspect, and whose countenance during natural sleep puts on an appearance little removed from the Hippocratic. From these causes we think that little reliance can be placed on the countenance as a test of death.

The changes that take place in the eye after dissolution are remarkable, and have been regarded by some authors as satisfactory indications of death. These are, the cornea becoming opaque, and covered with a thin slimy membrane, which breaks in pieces when touched, and is easily removed by wiping; and general flaccidity of the eye-ball, which may be perceived by placing the finger on the upper eye-lid and moving it gently over the surface of the eye; when the point of the finger will sink on coming over the cornea, and a distinct ring will be felt, marking the attachment of this membrane to the sclerotic coat. Certainly these signs are valid in many forms of death, but they do not exist in all, and are therefore not infallible. The reason why they are sometimes present and at others wanting, is evident when we consider the causes upon which these changes depend. The cornea owes its brightness mainly to the tension of the eye-ball, produced by a full secretion of the humours. This is proved by evacuating a portion of the humours of a recent eye, when the cornea will become flaccid and opaque; or by taking an eye some time dead, and with the cornea already opaque, and compressing the humours towards the anterior part, when the cornea will reassume its brightness. We find the appearance of the living eye influenced by the same cause, and hence we see the dim cornea in very aged and meagre persons produced by a deficiency in the ocular in common with every other secretion. We do not speak of the arcus senilis, but of the general opacity of the cornea observed in such individuals. Hence we can understand why in death after long illness, when the powers of reparation have been for a length of time impaired, the eye should exhibit its want of fulness by a flaccid and dim cornea. On the other hand, we are led to expect, when death takes place suddenly in a healthy person, that the eye will preserve its lustre for a much longer period; and this experience confirms; for it has been observed that after death by apoplexy, asphyxia, prussic acid, &c. the eyes preserve their integrity for a considerable time, owing to their being at the time of death in a state of tension by the due secretion of the vitreous and aqueous humours. Moreover, it has been observed that in severe diseases of long continuance, and even in some affections of the mind, the eyes have become dim and shrunken although death may not happen, and thus another source of fallacy arises.

Different physical tests have been proposed for doubtful cases, such as incisions, burns, blisters, cupping, flagellation, &c.; but of these it may be said that there are so many instances of disease affecting the nervous system, in which their application causes no sensation in the sufferer, that they will be still less likely to produce any effect on the sensorium in a body nearly deprived of life. The influence possessed by galvanism in the production of muscular contraction in the living body has led to its adoption as a test of death; and with certain limitation it is one of considerable value; for although the muscles retain their contractility for some time after absolute death, yet if the death be real, they soon lose it, and become insensible to this stimulus. On the other hand, if the least spark of life remain, the contractility will be also present, and on the application of the galvanic fluid it will be evidenced by contraction. Galvanism thus becomes a test not of life, but of the reality of death, for if the muscular fibre does not obey it, there can be no doubt that vitality is extinguished. It should be recollected, however, that different parts of the muscular system retain their contractility, and consequently their obedience to the galvanic stimulus, for different periods after death.* Nysten found, in the body of a guillotined

* Dict. des Sciences Méd. art. *Mort.*

criminal which was given to him immediately after execution, that the contractility of the left ventricle was extinguished in forty-nine minutes after decapitation; that of the stomach, intestines, and urinary bladder continued for fifty-six minutes; while that of the right ventricle and diaphragm remained for two hours. He found the locomotive muscles lose their contractility in proportion to their free exposure to the atmosphere, and those that were not at all exposed continued excitable during four hours; but the auricles of the heart, although in contact with the air during the whole time, did not cease to contract, when stimulated, for four hours and forty minutes. From many similar opportunities of observation possessed by Nysten, he concludes that the muscles cease to be influenced by galvanism after death in the following order: 1. left ventricle; 2. intestines and stomach; 3. urinary bladder; 4. right ventricle—this retains its contractility under galvanism for one hour; 5. œsophagus, for half an hour longer; 6. iris; 7. muscles of animal life; 8. auricles.

We have now alluded to the chief criteria of real death; and we may conclude this part of our subject by stating that those most entitled to consideration are flexibility subsequent to rigidity of the joints; loss of contractility of the muscles under galvanism; and incipient putrefaction. These are not liable to any important fallacies: the rest are, for the reasons already mentioned, more or less equivocal.

It now remains, before we proceed to consider the causes of sudden death, to make a few observations on the changes which the human body undergoes after dissolution; and we prefer doing so in this place, because the subject naturally follows that which we have just discussed, and also because a knowledge of the attendant phenomena and their causes is often of the highest importance to the medical jurist in enabling him to determine the length of time a body submitted to his inspection may have been dead; or the period at which dissection may be attempted with a prospect of useful results. It is sometimes of the utmost moment to the surviving relatives of an individual found dead that it shall be determined at what time death took place; of this a case mentioned by Dr. Male* serves as a good illustration. At the Lent assizes, held at Warwick in the year 1805, a cause was tried in which a gentleman, who was insolvent, left his own house with the intention (as it was presumed from his preceding conduct and conversation) of destroying himself. Five weeks and four days after that period his body was found floating down a river. A commission of bankruptcy having been taken out against the deceased a few days after he had left his home, it became a question of great importance to the interests of his family to ascertain whether he was living at that period; for if it could be proved that he was not, his property would remain untouched by the legal proceedings. From the changes which the body had undergone, it was presumed that he had drowned himself the day he left home; and to corroborate this presumption, the evidence of Sir George Gibbes of Bath was required, as he had lately been engaged in experiments on the changes produced in animal substances by immersion in water. He stated on the trial that it required five or six weeks to effect changes similar to those observed in the body of this individual; and upon this evidence the jury were of opinion that the deceased was not alive at the time the commission was taken out, and the bankruptcy was accordingly superseded.

A few weeks back the writer of this article, in passing along the canal on the south side of Dublin, on a Saturday, observed a crowd collected on the bank; on approaching, he discovered the object of their attention to be the body of a man recently withdrawn from the water. None of the bystanders knew anything of the individual, or of the time at which he had been drowned; but, from the fresh appearance of the body, the general belief was that he had fallen in the preceding evening. From certain appearances (to be more fully treated of hereafter) the writer was induced to doubt the truth of this supposition, and to assert that the man had lain in the water for at least five days. An accidental circumstance served to corroborate this opinion. Seeing the individual well dressed, and not observing any hat, the writer inquired whether one had been found with him, to which he received a negative answer; when a boy, who lived in the neighbourhood, came forward and mentioned that a hat and handkerchief were found in the water, at that place, on the previous Tuesday morning, just five days from the time of finding the body. These articles were afterwards proved to have belonged to the deceased. This was a case in which, from the appearances presented by the body, very positive testimony could have been given as to the length of time that had elapsed since death; and in case any question similar to that in the preceding instance was pending, such testimony must have been of the highest importance.

The changes that take place in the body after death may be divided into those that occur before, and those that follow the invasion of putrefaction.

To the first stage belong diminution of temperature, contraction of the muscles constituting cadaverous stiffness, and lividity of certain portions of the surface. We have already taken notice of the causes by which the loss of heat and muscular rigidity are influenced, and therefore it is unnecessary to allude to these phenomena at present. The extensive lividities usually observed on the back parts of the body shortly after death, are entirely owing to gravitation; the blood, still fluid, and no longer kept in its proper course by an impelling power, obeys the physical law by which it is inclined to seek the most depending situations, and this takes place in the interior as well as on the exterior of the body; of which we have examples

* Elements of Juridical Medicine, p. 101.

in the gorged state of the posterior portion of the lungs, and in the vascular turgescence exhibited by the gastro-intestinal mucous membrane in the lowest part of depending convolutions.* That all these appearances are the result of gravitation is proved by the fact that we can produce them in other situations by altering the position of the body; thus, if it be turned on the face, instead of remaining as it usually does on the back, the skin of the face, breast, belly, and anterior parts of the limbs will be found livid, while the back will retain its natural colour, and the congestions in the interior of the body will all be found in the anterior part of the organs. Nay, the lividity, having formed on the back, can be made to disappear, if the body is turned before it becomes cold, and the blood coagulates. Of this the writer has convinced himself by experiment. As it has happened that these lividities have been mistaken for the effects of violence, and suspicions of murder having arisen therefrom, it is necessary, in judging of such appearances, to take into consideration the attitude in which the body may have lain during the first few hours after death, the great extent of surface occupied by them, and the absence of any effusion or infiltration of blood into the cellular tissue. We shall have to recur to this subject when we come to treat of the effects of blows on the dead body, and their resemblance to the consequences of injuries inflicted during life.

The second stage is marked by the occurrence of putrefaction. This is a process peculiar to organized substances, and it seems to follow as a consequence of the manner in which their ultimate elements are combined during life. These elements are few in number—oxygen, hydrogen, carbon, and nitrogen constitute the great bulk of organized substances. Other elements, as phosphorus, sulphur, iron, lime, potassa, and silica, are occasionally present, but in quantities so small as not to invalidate the statement just made. But we find these elements combined in various proportions, and thus constituting the different proximate principles of which our bodies are made up, such as fibrin, albumen, gelatine, urea, stearine, elaïne, cholesterine, &c., which in composition differ from each other chiefly in the proportion of their component elements. Now these combinations are not such as the ultimate elements have the greatest disposition to form; in other words, their natural affinities lead them to different combinations and to the production of more permanent compounds, namely, water, carbonic acid, ammonia, &c. This disposition is controlled by vitality, and as long as it continues, the operation of chemical laws seems suspended; but as soon as life is extinguished, the elements abandon their former combinations, and enter into new ones, and this constitutes putrefaction. The presence of nitrogen expedites this process, and hence vegetable substances, which with few exceptions are deficient in this element, undergo the change more tardily and imperfectly; and some animal substances, as fats, oils, cholesterine, in which nitrogen is absent, are little disposed to the putrefactive fermentation.

The human body, in common with other animal substances, suffers this dissipation of its principles after death; but, as the phenomena attending this change are not constant as to time, order, and results, it is necessary to inquire into those causes that influence its course.

The conditions necessary to the speedy putrefaction of a dead body are the exposure to air, moisture, and a moderate degree of heat. The presence of air, however, does not appear to be essential, although its exclusion retards the process. Putrefaction in vacuo was denied by Gay-Lussac, but some experiments by Guntz of Leipsic have proved the possibility of its occurrence. He took some pieces of human flesh, and having freed them from any air that might be lodged among the fibres by plunging them into mercury, he passed them into jars inverted over and filled with the same fluid. The flesh rose to the top of the jar, and the apparatus was kept in a moderate temperature. Putrefaction went on, but at a slower rate than if the air had been admitted. In a few days the flesh became soft and pulpy, and of a grey colour. Gas was generated, which was found to be carbonic acid gas, and some highly fetid fluid covered the surface of the mercury: the flesh had lost one-third of its weight. He also ascertained that blood alone will putrefy in vacuo. For this purpose he placed the fore-finger of his left hand under an inverted jar filled with mercury, and then made an incision into the integuments. The blood rose to the top, and in five days it was found to be undergoing putrefaction; an accident by which the apparatus was upset prevented an analysis of the product. These experiments shew that though the presence of air expedites the process, it is not essential.

A moderate temperature is a most important condition. If the heat be too high, it prevents the occurrence of putrefaction by rapidly dissipating moisture; and if too low, the process is equally arrested, and, it would appear, from the same cause,—for the fluids being converted into solids by congelation, are as efficiently deprived of the power of assisting putrefaction (so long as they continue in that state) as if they were altogether removed. The practice of packing salmon in ice for the purpose of preserving it fresh during long voyages is a familiar illustration of this point. But the most extraordinary instance on record is the preservation of the mammoth discovered some years ago in Siberia enclosed in a block of ice, on breaking into which the animal was found entire and fresh. This being a specimen of an extinct species of animal, it is of course impossible to calculate the number of centuries it must have been enveloped in its icy tomb. Below 50° Fahrenheit, the process is slowly performed, and at 32° it is altogether suspended. The temperature most favourable

* *Trousseau*, Dissertation inaugurale. Paris 1825.

to its perfection is from 60° to 80° or 90°. This is the range of the thermometer during our summer, and hence at this time putrefaction most readily goes forward.

Moisture is an indispensable condition. This is shewn by the readiness with which substances otherwise disposed to putrefy are preserved by drying, as smoked meats, fish, &c.; and still more strikingly by the preservation of animals buried in sand. Caravans in crossing deserts have been overwhelmed by the shifting sands, and the bodies of men and camels have lain for centuries until exposed by the same cause, when they were found dry, shrunken, but without any sign of having undergone putrefaction. Instances of this kind have occurred in Egypt, Arabia, and Persia. Chardin* mentions the preservation of certain bodies in the sands of Corassan (Persia), where they had been buried 2000 years.

It is supposed that the preserving power possessed by some burying places, as the vaults of the Cordeliers at Toulouse, and those of St. Michan's, Dublin, is owing to the dry and absorbent nature of the surrounding soil. In these situations bodies rarely putrefy, but they undergo a process of natural mummification. The products of putrefaction, when conducted under favourable circumstances, are—water, ammonia, carbonic acid, carburetted hydrogen, sulphuretted hydrogen, phosphuretted hydrogen, nitrogen, and hydrogen gases, and there remains a friable matter of a deep brown colour containing the salts of the body and some carbon.

From these cursory observations it must appear that the transformation of a dead body will be influenced by the medium in which it is placed. The media existing naturally, and to which all others may be referred, are the earth, air, and water. But as these do not exist in a purely separate state, being found mixed together,—as air impregnated with water, water with air, and earth with both,—the term *group* may be given to these combinations. Thus we have earthy group, watery group, and aerial group, by which are meant the combinations usually existing between these media. A group is called cold when the temperature is below 32°; cool between 32° and 60°; warm between 60° and 100°; and hot when it is above 100°.

The metallic oxydes and salts which enter into the composition of the earth exercise but a small influence in the transformation of a dead body. The action of this medium depends upon the greater or less exactness with which it excludes the access of air and water. Thus sandy soils, which quickly absorb water, and argillaceous soils which collect water round a dead body, differ materially in their effects; in the former decomposition goes on slowly, and is sometimes, as we have seen, altogether prevented; in the latter putrefaction readily takes place, and sometimes the transformation into adipocire is effected. Fresh ground or gardens which are rich in mould, and the soil of church-yards, appear to act as a sort of ferment which assists putrefaction; for it is found that flesh enters sooner into the putrefactive process when surrounded by substances already undergoing that change.

We have alluded to the formation of adipocire, and it is necessary, before we leave this part of our subject, to make a few observations on this curious phenomenon. Adipocire, so termed from its resemblance to fat and wax, is a peculiar substance of a soft ductile nature and whitish colour, produced by dead animal substances undergoing decomposition under particular circumstances. We are indebted to Fourcroy for the first scientific account of this peculiar transformation. His attention was directed to it on the occasion of the celebrated exhumations practised at the ancient burying place *Des Innocens* at Paris, in the years 1785, 86, 87, when from fifteen to twenty thousand bodies were removed for the purpose of eradicating this cemetery. This spot differed from common burying grounds, where each individual body is surrounded by a portion of the soil. It was the burying ground of a large district, wherein successive generations of the inhabitants had been deposited for upwards of three centuries. The remains of the human bodies immersed in this mass of putrescence were found in three different states, according to the time they had been buried, the place they occupied, and their relative situations with regard to each other. The most ancient were simply portions of bones irregularly dispersed in the soil, which had been frequently disturbed. A second state, in certain bodies which had always been insulated, exhibited the skin, the muscles, tendons, and aponeuroses, dry, brittle, hard, more or less grey, and similar to what are called mummies in certain caverns. The third and most singular state of these soft parts was observed in the bodies which filled the common graves or repositories. These were cavities thirty feet in depth, and twenty on each side appropriated to contain the bodies of the poor. Each cavity contained between 1000 and 1500, packed side by side in rows, without any intervening earth; so that it might be considered, when filled, as an entire mass of human bodies separated only by two planks of about half an inch thick. The first of these receptacles opened in the presence of Fourcroy had been closed for fifteen years, the coffins were in good preservation, but a little settled, and the wood had a yellow tinge. When the covers of several were taken off, the bodies were observed at the bottom, leaving a considerable distance between their surface and the cover, and flattened as if they had suffered a strong compression. The linen which had covered them was slightly adherent to the bodies, and with the form of the different regions, exhibited, on removing the linen, nothing but irregular masses of a soft ductile matter of a grey-white colour. These masses environed the bones on all sides,

* Traité des Exhumations Juridiques, par MM. Orfila et Leseur, vol. i. p. 382.

which had no solidity, but broke by any sudden pressure. The appearance of this matter, its obvious composition and its softness, resembled common white cheese; and the resemblance was more striking from the prints which the threads of the linen had made upon its surface. The grave-diggers asserted that they never found this matter in bodies interred alone; but that the accumulated bodies of the common graves only were subject to this change. Fourcroy remarked that the conversion appeared in different stages of advancement, so that in various bodies the fibrous texture and colour, more or less red, were discernible within the fatty matter; that the masses covering the bones were entirely of the same nature, offering indistinctly in all the regions a grey substance, for the most part soft and ductile, sometimes dry, always easily separated in porous fragments, penetrated with cavities, and no longer exhibiting any traces of membranes, muscles, tendons, vessels, or nerves. By examining this substance in the different regions of the body, it was found that the skin is particularly disposed to this remarkable alteration. It was afterwards perceived that the ligaments and tendons no longer existed, or at least had lost their tenacity, so that the bones were entirely unsupported, and left to the action of their own weight. In all the bodies so changed the abdominal cavity had disappeared. The integuments and muscles of this region being converted into the white matter, like the other soft parts, had subsided upon the vertebral column, and were so flattened as to leave no place for the viscera; and accordingly there was scarcely ever any trace of them observed in the almost obliterated cavity. The thorax was also flattened, and its viscera were no longer discernible. Sometimes an irregularly rounded mass was found, which appeared to have arisen from the fat and fibrous substance of the heart. The features of the face were converted into adipocire, and no longer distinguishable, and some of the same matter occupied the cavities of the mouth and orbits. The cranium constantly contained the brain, changed into a similar substance. From various observations, it was found that this fatty matter was capable of enduring in these burying places for thirty or forty years, and is at length corroded, and carried off by the aqueous putrid humidity which there abounds.

Adipocire, according to M. Chevreul, consists of margaric acid, oleic acid, a little bitter substance, of an orange coloured principle which tinges the acid, of a trace of odorous principle, of ammonia, very small quantities of lime and potass, and some salts. The alkalies we have mentioned partly saturate the margaric and oleic acids. The latter exists in a very small proportion relatively to the margaric, which abounds in this substance. It is easy to perceive from this analysis that adipocire is a soap with double acid and ammoniacal base. Sometimes, however, the acids are found combined with lime. This has been observed when bodies undergo the change in water containing carbonate or sulphate of lime; and also in earth permitting the infiltration of water which has dissolved these salts in its progress through it. In both cases the ammoniacal soap is first formed, and is then decomposed by the calcareous solution; margarate and oleate of lime, and carbonate or sulphate of ammonia being the result. To prove that such is the case the following experiments were made by Orfila and Leseur.

On the 4th of December, 1828, they interred a stomach, a portion of skin with the subjacent cellular tissue, two testicles, and an omentum, all belonging to the human subject. Each of them was enveloped in linen, and placed in a small deal box, which was buried at a depth of two feet and a half. They were disinterred on the 30th of July, 1829, seven months and twenty-seven days after having been deposited in the ground. In place of the stomach they found about half a drachm of adipocire not in the least ammoniacal, but composed of margaric and oleic acids and lime. The skin presented here and there the appearance of adipocire, and furnished on analysis a calcareous soap; the testicles were similarly transformed. The omentum had preserved its aspect and structure in several places, whilst in others it was changed into a yellowish fatty mass, having the odour of Roquefort cheese, and composed of lime and the acids mentioned above. These distinguished experimenters, although pretty certain that the presence of the calcareous soap at the expense of the ammoniacal, in these substances, was owing to the rain-water in filtering through the ground having dissolved some of the calcareous salts, which having thus got access to the interior of the wooden box decomposed the ammoniacal soap, and changed it into calcareous, nevertheless thought it necessary to prove by direct experiment that it really was so. Accordingly they prepared an ammoniacal soap with pure stearic acid and caustic ammonia, and plunged it into a solution of sulphate of lime. At the end of three weeks, on examining the soap, it was found entirely changed into stearate of lime, and sulphate of ammonia was formed. They made also another experiment: two human stomachs were buried, one in a leaden box enclosed in a wooden one, the other in wood alone: seven months afterwards they were taken up. The stomach contained in the wooden box was transformed into a soap partly ammoniacal but chiefly calcareous, whilst that inclosed in the lead offered no trace of saponification, and was but little altered.

"It is manifest," say they, "that, in this last experiment, the progress of the putrefactive process had been greatly retarded in consequence of the double envelope, and particularly of the leaden cases; and every thing leads to the conclusion, that if the apparatus had remained underground as long as was requisite for converting the stomach into soap, this soap would have been of the ammoniacal and not of the calcareous kind."*

* Traité des Exhumations Juridiques, tom. i. p. 366.

Adipocire is only formed when fat and some azotised substance are found together. The fatty matter furnishes the margaric and oleic acids, and the other the ammonia. This is proved by the following circumstances. Entire dead bodies, or entire parts of a dead body, such as a head, one of the limbs, or the thorax, parts in which are found skin, fat, muscles, &c. are changed into adipocire in stagnant or gently moving water, but isolated muscle furnishes but a small portion of this substance, and that only when it is rich in fat. Fat washed, freed from blood, and separated from parts which contain azote, is not transformed into adipocire. Neither does the fibrine of the blood, when perfectly washed and free from fat, undergo the change. Orfila found that portions of skin previously deprived of the subjacent cellular tissue, were not saponified after eight months of inhumation; while similar portions of the skin of the same individual, to which the cellular substance was left adhering, and buried during the same time, were converted into adipocire. It appears that a sojourn of about three years in the ground is necessary for the complete transformation of a body, and that the change goes forward more quickly in water; and it is only when a number of bodies are buried in the same grave, that the process is perfect, those at the bottom being the first to undergo it. A thick stratum of earth over the grave is necessary, in order to confine the gases given out in the first stages of putrefaction.

The chief object of the medical jurist to whom a dead body is submitted for inspection, is to ascertain the cause of dissolution. In order to assist in this investigation, we will follow the arrangement already proposed.

1. Death from Natural Causes.—Death is the inevitable condition to which all bodies that possess life must, sooner or later, be reduced. This termination of their existence forms a grand distinction between organized and unorganized matter. The gradual termination of life, or natural death strictly so called, is very different in its phenomena from the more common or accidental death. In natural death man expires, as it were, in detail; the external functions and those of the animal life being almost annihilated, whilst those of organic life still remain in vigour. The active powers gradually desert each organ; digestion languishes; secretion, absorption, and capillary circulation are arrested; the general circulation is then suspended in the large vessels; and lastly, the contractions of the heart cease. In accidental death, the general circulation and respiration are first arrested, while the other functions are successively and slowly extinguished. So that it has been said that in the former life is first extinguished in the parts, and then ceases in the heart, the influence of death being exerted, as it were, from the circumference to the centre; while in the latter it ceases first in the heart, and then in all the parts, death proceeding from the centre to the circumference. The termination of life termed natural death is a very rare occurrence in the human species in a civilized state: animals often reach it; but the cessation of existence from mere old age has become with us a rare phenomenon. Haller estimates the average probability of human life, and deduces the conclusion that only one individual in fifteen thousand reaches the hundredth year. Accidental death, in contradistinction to natural death, becomes, therefore, an object particularly worthy of attention. This may take place in two ways—either as the slow and gradual termination of a lingering disease; or as the sudden result of some great disturbance of the animal economy, and then called sudden death, as in apoplexy, hemorrhage, concussion, asphyxia, &c.

We now come to consider the natural causes of sudden death, and our observations upon them must be necessarily brief, as it would not be possible to enter into detail upon them in this place; a circumstance not of much consequence, as they are most of them treated of in separate articles through this work. However, we may notice some of the most frequent and remarkable. These are apoplexy, rupture of an aneurism or of a large vessel into one of the cavities; bursting of purulent cysts or other collections of fluid, or of blood-vessels into the air-passages; ossification of the valves of the heart; rupture of this organ; asphyxia idiopathica.

Apoplexy may attack at any age, but in the great majority of cases the age is above fifty years: certainly it may be said to be a disease rather of the decline of life. It is a disease which in some instances may be mistaken in its early symptoms, and may terminate fatally in situations which preclude any observation of the event. Those most predisposed are of a full plethoric system, with large head and short neck. Diseases of the bloodvessels of the brain, such as ossification of the arteries, aneurism, and obstruction of the sinuses, lead to rupture of their coats; and it is well known that hypertrophy of the heart sometimes produces apoplexy. In ordinary cases an examination of the brain sufficiently develops the complaint. Blood is usually found in some part of this organ, rarely on the surface, more commonly in or about the corpora striata or optic thalami, or effused into the ventricles. In old apoplectics who have had many shocks, cysts enclosing clots of blood are found; and the brain surrounding them is often observed in different stages of inflammation or ramollissement. (See Apoplexy.) It should be borne in mind that persons seized with apoplexy may fall from a height, and thus bear marks of external injury which might mislead a superficial enquirer as to the cause of death. In cases of rupture of internal aneurisms, or purulent cysts, or of ossification of the valves of the heart, an examination of the body will exhibit the true nature of the disease. The last of the natural causes of sudden death which we have mentioned is that peculiar disease termed by Mr. Chevallier "asphyxia idiopathica." A case of this rare and remarkable affection came under the observation

of the writer a few years ago. The subject of it was a healthy woman, forty years of age, in the ninth month of pregnancy. She complained suddenly one evening of weakness and sickness of stomach, and on making an effort to vomit, she fell back and expired without any struggle. The writer examined the body the following day, and enquired diligently after every cause of death in each of the cavities; but he never saw more healthy organs, and, taken altogether, certainly never a sounder body. But the state in which the heart was found led to a discovery of the nature of the case. The parietes of this organ were entire, but quite flaccid, and all its cavities were empty; while its proper veins were much distended with blood. This so exactly resembled the appearances described by Mr. Chevallier, and the manner of death corresponded so fully with that of the cases he mentions, that it was thought justifiable to refer the cause of death to the disease just alluded to. Mr. Chevallier accounts for death in these cases by supposing a sudden loss of power in the vessels, chiefly in the minute ones, to return the blood to the heart; in consequence of which this organ, after having contracted so as to empty itself, and then relaxing, continues in that state for want of its accustomed stimulus, and so dies. We mention this in order to shew that such cases are sometimes to be met with, and that it is necessary to be prepared to detect them. For further information we must refer to the paper alluded to.

II. Death from violent causes.—The wide extent of this division, and the great importance of the topics included in it, render it of the deepest interest to the medical jurist. The violent causes of sudden death may be reduced to seven heads, viz. *asphyxia*, *poisoning*, *wounds*, *burning*, *cold*, *starvation*, and *lightning*. From the very able manner in which the subject of asphyxia has been handled in a former part of this work, little remains to be said upon its general phenomena and theory. (See Asphyxia.) Asphyxia may be defined the suspension of the function of respiration, and consequently of the circulatory and cerebral functions. The interruption may affect primarily either the mechanical or chemical phenomena of expiration. The mechanical are the motions of the parietes of the chest, producing inspiration and expiration; the chemical are the disappearance of oxygen from the air taken into the lungs, the disengagement of carbonic acid gas, and the conversion of the venous into arterial blood. Asphyxia may commence by the cessation of either of these classes of phenomena; but in whichever it first begins, it speedily involves the other, and both are soon equally suspended. A violent compression of the thorax, such as is produced by the falling of heavy beams of timber, portions of buildings, roofs of mines, &c. a double wound giving entrance to the air into both cavities of the chest, rupture of the diaphragm by which the abdominal viscera gain admission to the chest, the effusion of large quantities of fluid into the pleura,—all these put an end to the mechanical phenomena of respiration by interrupting the motions of the thorax. In other cases these motions cease, but from a different cause; we allude to paralysis of the muscles that move the parietes, which happens when the spinal marrow is cut across, or is pressed on above the origins of the phrenic nerve, or above the third cervical vertebra, or when the whole nervous energy is destroyed, as by lightning. Most commonly, however, it is the second class, or the chemical phenomena of respiration, that cease first; and the motions of the chest are only interrupted because the black blood, which is then driven into all the organs, and especially into the muscles and brain, does not carry along with it the power of excitation necessary to carry on the functions of these parts. This interruption of the chemical phenomena may be produced in various ways: thus, sometimes there is total intercception of the passage of air into the lungs, as when an animal is placed in vacuo, or is smothered, drowned, or strangled; at other times, an aeriform fluid does enter these organs, but is not possessed of the principle necessary to act on the blood contained in them, such as azote and hydrogen gases. It may be that the gas inhaled is endowed with deleterious properties; either that it irritates the lungs, as the sulphurous acid gas, muriatic acid, and ammoniacal gases; or that it acts upon the whole animal economy as a poison, such as carbonic acid gas, nitrous acid, carburetted hydrogen and hydro-sulphuretted gases. Thus we find that, by the total interception of all air, or by the inhalation of noxious gases, the chemical phenomena of respiration may be arrested. It is to this we shall direct our attention at present, as the cases in which the mechanical phenomena are first affected are more rare, and will be afterwards considered in treating of death from wounds or bruises, (see Wounds, Death from,) and from lightning.

The causes that produce death by asphyxia are drowning, hanging and strangulation, smothering, and the inhalation of noxious gases or air deprived of oxygen.

The physiology of *drowning* having been already fully discussed in the article Asphyxia, we shall proceed to consider the medico-legal questions that may arise in the case of a body found in water. These may be arranged under the following heads:—1. whether the body was immersed before or after death; 2. whether the individual has fallen in by accident, has drowned himself, or has been thrown in by others.

1. The inference that the person was living at the time of immersion is drawn from an attentive examination of the external state of the body, and from a careful anatomical investigation. The body of a drowned person usually presents the following appearances. It is commonly very cold, apparently even colder than the actual temperature; the limbs are more or less stiff according to the time that has elapsed since death; the visage is

swollen, often dark-coloured, but sometimes pale; the eyes are half open, and the pupils dilated; the mouth is filled with froth; the tongue is advanced beyond the teeth; and the chest and belly are elevated, the latter being often much distended. This state of the body is common to those who perish in cold clear water, as the sea, rivers, &c.; but the body is sometimes drawn out warm, although death is so complete that animation cannot be restored, the countenance violet-coloured, and the veins of the neck turgid. This happens in drowning in warm fluids or in alcoholic liquids, or in marshes where deleterious gases are disengaged, or when the person has fallen into the water in a state of intoxication. The ends of the fingers are often found rubbed or scraped, and dirt or sand, of a nature similar to that of the bottom of the water, is perceived under the nails. Coupled with these is the negative sign furnished by the absence of any lesion that could have caused death previous to submersion. The internal appearances disclosed on opening a drowned body are generally the following. The epiglottis is found elevated, and a quantity of froth fills the trachea and bronchi; the lungs are dilated and gorged with blood; black and fluid blood is found in the right cavities of the heart in a much greater quantity than in the left. The diaphragm is depressed, and water of a nature similar to that in which death took place is discovered in the stomach. In the head there is turgescence of the bloodvessels, more or less intense as the death has been more or less speedy, and in proportion to the amount of struggling made by the individual. Orfila,* in a memoir read at the Academy of Medicine, has reviewed all the signs given by authors for determining whether immersion took place before or after death; and the conclusion he draws is, that there is no certain sign of submersion during life but the presence of water, similar to that in which it is found, in the stomach and air-passages; provided that, with reference to the stomach, the water has not been swallowed before submersion, and has not been injected after death: and with respect to the lungs, that the water shall have penetrated to the last bronchial ramifications, and has not been injected before death; and that the body shall not have remained long in a vertical position in the water, so that the water might have entered after death. It would appear from this that we possess two certain signs of submersion during life; but the restrictions imposed on them are such, that, taken apart from others, they are almost useless in the great majority of cases. In speaking of water in the air-passages, Orfila must have meant the froth formed by this fluid with the air; for it is very seldom found in substance in this situation. Devergie† states that in a great number of cases he could find but very slight traces of water in the trachea; and in two only did he observe it in any quantity. Indeed, from the observations of Cullen,* Goodwyn,† and Meyer,‡ it is plain that a very small quantity of water enters the air-passages in drowning; and this is speedily converted into froth by the motion given to it in the attempt at respiration. On the subject of this froth, Devergie makes some interesting observations, the substance of which is as follows:—It is commonly white, consisting of numerous and very small bubbles, constituting a lather rather than a froth properly so called. It never adheres to the trachea by mucus, but is in immediate contact with that tube. All the bubbles that form it have a watery envelope, easily broken, and often in opening the trachea the greater part disappear like soap-bubbles. The froth of drowned persons, then, has but little analogy with the expectoration of pneumonia or catarrh; and it is sufficient to have attentively observed it to avoid confounding them. Its formation necessarily brings with it the idea of vitality, for it cannot take place without motion; an impulse communicated to a fluid and a gas in mutual contact. In order to appreciate its mode of formation, and the value that it may possess as a sign of submersion during life, it appears necessary to enquire how it is produced in other cases than asphyxia by submersion. In pneumonia, for example, the individual is induced to expectorate because the extreme bronchial ramifications are filled with mucus, and the air can no longer reach them, and come into contact with the blood to effect the necessary changes. The invalid expels a frothy matter, because the mucus secreted under the influence of bronchial irritation is beaten and mixed up with the air by the alternate and quick efforts of inspiration and expiration, which constitute coughing. The formation of the froth takes place more easily as the irritation is nearer to the last bronchial ramifications, when the tubes, being of a smaller diameter, are more easily obstructed. It is, on the contrary, produced with great difficulty in the trachea, on account of the great dimension of this canal. In drowned persons similar phenomena take place, after they have expelled a part of the air contained in their lungs. They are soon solicited by the desire to respire; a small quantity of water enters the trachea, and causes a most distressing stimulus, of which we have a proof in the great suffering experienced by persons into whose larynx a drop of fluid has accidentally fallen while swallowing; a brisk and sudden expulsion of the water is effected, but it is rarely complete: the portion which remains dissolves a little mucus, and becomes viscid, whilst, at the same time, new inspiratory efforts draw in a new quantity of water; from that time the air, agitated with this fluid, rendered more viscid, constitutes the froth. This is formed with more difficulty in the trachea than in the last ramifications of the bronchi; and

* Archives Gén. de Méd. Août 1827.
† Annales d'Hygiène et de Méd. Lég. t. ii. p. 432.

* Letter to Lord Cathcart.
† Connexion of Life with Respiration.
‡ Medical Repository, vol. iii. New Series.

consequently we esteem its existence in the superior part of the trachea as a more certain sign of the life of the individual at the moment of submersion, than when it is met in the extreme branches. This phenomenon does not leave very durable traces of its existence, for it is sensibly diminished, and even often disappears under the influence of putrefaction. The portion of the air-passages where it is preserved during the longest period is at the bifurcation of the trachea. In winter it may be discovered in most cases after eight or ten days, but later it completely disappears. It is true that if we except the water contained in the stomach, the other signs of submersion have not a more extended duration. It should be understood that the water thus taken into the lungs is not, as it was formerly supposed, the true cause of death; an opinion to which Baron Larrey seems to incline in his Mémoires. The experiments of Goodwyn have shewn that a much larger quantity of water than that which is found in the lungs of drowned animals may be introduced into the air-passages without causing death. Thus, he passed into the lungs of a cat, through an opening in the trachea, two ounces of water; a large quantity when compared with the size of the animal. It had, immediately, difficulty of breathing and a feeble pulse; but these symptoms soon abated, and it lived several hours afterwards without much apparent inconvenience: after this he strangled it, and found two ounces and a half of fluid in the air-tubes and cells.

The presence of water, then, in the lungs of drowned persons in the form of froth is to be considered as an accidental and not essential circumstance, although it is one of very constant occurrence. If this fluid is found in large quantity, and in substance, that is, not beaten into froth, the inference would be that it had passed in after death. With respect to the presence of water in the stomach, it has been proved by many authors to be a constant occurrence; and when it is discovered in this organ, and is identical with that in which the body is found, it furnishes a strong indication of submersion during life, being a necessary consequence of the act of deglutition. For it has been proved by Fine, Orfila, and Mare, that it is never found in bodies plunged into water after death, and cannot be made to enter the stomach without the assistance of a tube passed into the œsophagus.

From the above-mentioned circumstances the following conclusions are drawn by Devergie: 1, that almost all the signs, taken singly, do not prove that the individual was living at the moment of immersion; 2, that the one which furnishes the strongest presumption is the existence of froth placed in immediate contact with the lining membrane of a sound trachea; 3, that this sign acquires a value greater as its situation is nearer to the mouth; 4, that water in the air-passages is a sign of little value, for if it can penetrate the trachea after death, and extend even to the last bronchial ramifications, as Orfila has shewn, it becomes almost useless; 5, that water in the stomach is one of the most constant signs, but its value is greatly diminished by the difficulty of proving its identity with the fluid in which the body has been immersed; 6, that if each sign taken singly gives no certainty, the assemblage of all in the same individual may enable a positive conclusion to be drawn.

The proofs that death occurred before immersion are drawn from the absence of all those signs just enumerated; thus the thorax and abdomen will be found flat,—no excoriation of the ends of the fingers,—no dirt or sand under the nails,—no turgescence of the cerebral vessels,—and no froth in the air-passages. The lungs will be collapsed, and the diaphragm will not have passed the natural line. The stomach will be found not to contain any of the fluid in which the body is found, and in addition to these negative proofs, marks of violence may be discovered on the body quite sufficient to account for death. These marks are divided by Foderè* into three classes: 1st, those which are totally independent of any connexion with the circumstance of drowning. Of this nature are the usual signs of poisoning; a regularly formed ecchymosis round the neck, indicative of strangulation, or wounds inflicted by fire-arms or cutting instruments. All these lesions have an essentially distinct character which cannot be mistaken, and hence the evident importance of examining carefully the external appearance of all bodies found in water. It was by pursuing such an investigation that Deveaux discovered, in the body of a woman found in water, a penetrating wound under the left breast, made by a very small instrument which had reached her heart. 2dly. Marks of violence which may have resulted from accidents attending submersion, or may be caused by previous homicide, such as unequal irregular wounds which do not penetrate far into the body, contusions, fractures, and luxations. In all such cases we should ascertain, if possible, the height from which the individual may have fallen, and the resistance he may have encountered in the fall. The rapidity of the current, and the roughness of the banks of a river, may also cause extensive wounds. Dr. Fine remarks that the rapidity of the Rhone, and the numerous mills erected on its side, often produce most shocking wounds in the bodies which are driven against the stakes in the stream, or are drawn into the machinery. 3dly. There may be lesions received after death. These are to be distinguished from those inflicted during life by the lividity and flaccidity of their edges, the absence of tumefaction and redness, and want of hemorrhage, or, if the latter be present, by the fluidity of the blood.

2. It being ascertained that the subject was immersed while living, it is often of importance to be able to say whether the drowning was the result of accident, of suicide, or of homicide. The solution of these questions is to be

* Méd. Lég. tom. iii. p. 112.

obtained by an examination of what may be termed the external circumstances of the case. The locality of the water may be such as to account for the deceased having accidentally fallen into it, or its situation may at once preclude the possibility of such an event. Indications of struggling on the brink, such as tearing of the ground, and many footsteps, together with ecchymoses on the person of the deceased, may lead to the supposition of homicide. Thus, in the case of Mr. Taylor, who was murdered at Hornsey in December 1818, marks of footsteps deep in the ground were discovered near the New River; and on taking out the body, the hands were found clenched, and contained grass which he had torn from the bank.*

However conclusive the existence of ligatures on the hands and feet of the deceased may appear,—as to the question of the forcible interference of others, it should be recollected that suicides have sometimes adopted such precautions in order to insure their death. There are some instances on record in which the individuals seem to have pursued this course.† In June 1816, the body of a gauging instrument-maker, who had been found missing for some days from his home, was discovered floating down the Thames. On being taken out, the wrists were found tied together and made fast to his knees, which were in like manner secured to each other. He had been in a state of mental derangement for two years. The cord with which he had tied himself was recognised as one that had hung from the ceiling over his bed, by which he used to raise himself up, as he had been confined to bed for some weeks. He was a good swimmer, and it was presumed he had taken this precaution to prevent himself from employing that power. The verdict returned was, "found drowned." The other instance was that of a man, aged twenty-eight, who with a wife and child was reduced to great distress. On a certain day he took an affectionate leave of his family, declaring he would not return until he had procured some employment by which he should be able to buy bread for them. The following day his body was taken out of the New River with his hands and legs tied. A card with his address was found in his pocket, and also three-pence; when he left home he had five-pence, and it was supposed he had purchased the cord with the deficient sum; the verdict brought in was "insanity." Another case of a similar nature has been lately published. It was that of a gentleman who was found in the Seine at Paris, having his feet, wrists, and neck tied with a cord. After detailing the appearances on the body, the reporter concludes with the following note: "Mr. X—— had bound his neck, limbs, and hands by means of a rope with slip knots, in order to put it out of his power to aid himself when in the water, and thereby to render certain the execution of his suicide."* We mention these cases to shew how cautious a medical man should be in forming an opinion in similar instances, and how necessary it is to weigh well every circumstance before he expresses that opinion before a legal tribunal.

It is often, as has been already mentioned, of the highest importance to the survivors, that an approximation to the time that has elapsed since death should be arrived at. For assistance in such an investigation, the medical jurist will turn in vain to the systematic works on legal medicine, it being only within the last few years that any accurate information on the subject was possessed by the profession. We are indebted to M. Devergie for the first essay on this interesting subject, one concerning which the most vague notions were entertained previously to the publication of the memoir alluded to, in the year 1829. The observations of M. Devergie are entitled to much consideration, from the unrivalled opportunity afforded for their formation. He was authorized to carry on his investigations at the establishment called "La Morgue" in Paris, a building on the banks of the Seine, to which are transported all bodies found dead in the city and its environs, and where they are exposed during three days for the purpose of recognition by their friends. The number thus exhibited exceeds three hundred annually, and includes all manner of violent deaths. In case of the sudden disappearance of an individual, his friends repair to the Morgue, and leave with the porter an accurate description of his person, his clothes, and the period at which he was last seen; and when a body is brought in, it is carefully examined, and if it corresponds with any of the descriptions that have been left, notice to that effect is sent to the persons interested, who come and claim it. The number of persons recognised is very considerable; in the first six months of the year 1829, out of 148 bodies 116 were claimed. Of this number 62 were drowned, of whom 45 were recognised. Being thus furnished with positive information as to the time of immersion and that of finding the body, Devergie was enabled to prosecute his enquiries with great accuracy. He found that in general no change takes place on the exterior before the fourth or fifth day, and the cadaverous rigidity frequently continues two, three, or even four days after immersion. This is probably owing to the coldness of the medium in which the body is placed. About the fourth or fifth day, the skin on the palms of the hands begins to whiten, and this change of colour takes place particularly on the ball of the thumb, and the fleshy eminence on the inner side of the palm over the metacarpal bone of the little finger, together with the lateral surfaces of the fingers. The back of the hand does not partake of this colouring, and the rest of the body presents nothing particular. On the sixth or eighth day, the skin at the back of the hand begins to whiten; at the

* *Paris and Fonblanque*, Med. Jur. v. iii. p. 41.

† Op. cit.

* Ann. de Hygiène et de Méd. Lég. t. ix. p. 207.

same time that the sole of the foot has acquired a similar tinge: the skin of the face is softened, and of a more faded white than the rest of the body. On the fifteenth day, the face is slightly swollen and red; a greenish spot begins to form on the skin over the middle of the sternum; the hands and feet, with the exception of the dorsum of the latter, are quite white, and the skin of the palm of the hand is wrinkled. The subcutaneous cellular tissue of the thorax is reddish, and the cortical substance of the brain takes on a green colour in the upper part of that organ. At one month, the face is reddish brown, the eyelids and lips are green and swollen, the neck is slightly green, and a spot of about six inches in diameter, brown in colour and with a green areola, occupies the superior and middle part of the sternum. The scrotum and penis are enormously distended by gas, the latter being sometimes in a state of erection from that cause. The skin of the hands and feet is quite white and very much wrinkled, presenting the appearance of having been long enveloped in a poultice. The hair and nails are still very adherent. The lungs are emphysematous, and fill the cavity of the chest, overlapping the heart,—a condition different from that which these organs present at a more advanced period. At a month and a half, besides the appearances first mentioned, the neck and thorax are found very green, and the cuticle begins to detach itself round the base of the hand where it joins the wrist. At two months, the body is covered with slime, which penetrates through the clothes. The face is enormously swelled and of a brown colour, the lips are tumefied and separated so as to expose the teeth. The skin on the middle of the abdomen, as well as that of the arms, forearms, thighs, and legs, is still in a natural state. This is a most remarkable fact, and establishes a striking difference between the progress of putrefaction in water, and when the body is exposed to the atmosphere; in the latter case the abdomen being the first part to manifest any change. At this period the skin has become detached from the hands and feet, and having the nails attached to it, forms as it were a glove. The skin and nails of the feet are longer in separating than those of the hand. The hair begins to fall off, and is easily removed by pulling. The veins are almost completely empty of blood, and commonly distended with gas. The inner surface of the arteries is red, and that of the trachea between the cartilages presents the same colour. If at the moment of death the right cavities of the heart were gorged with blood, the internal surface of the ventricle is of a jet black colour; and in contrary cases an analogous appearance is presented on the opposite side. Devergie considers this a most important diagnostic mark of death by asphyxia. At two months and a half, the green colour of the skin extends to the arms, forearms, and legs; the nails are completely detached from the hands and feet; some adipocire is formed on the cheeks, chin, breasts, arm-pits, and anterior part of the thighs; the abdomen is greatly swollen by putrefaction within: the muscles at this period preserve their natural colour, and do not appear altered in texture. At three months and a half, there is observed destruction of the scalp, eye-lids, and nose, to such an extent as to make it difficult to tell the age of the individual. The skin of the breast is generally of a greenish brown; the centre of the abdomen is of an opaline colour, and scattered with small ulcerations caused by the water. Larger corrosions are found in different parts of the body. The hands and feet are completely naked of skin. The lungs no longer fill the thorax, but leave between them and the pleura costalis a space filled with reddish serum. At four months and a half, occurs complete destruction of the face and scalp, leaving the skull bare; the remains of face, the neck, and anterior part of the thighs is entirely converted into adipocire; and small eminences, indicating the commencement of calcareous incrustation, are observed on the prominent parts. The brain presents traces of adipocire in its anterior part. Devergie has not classified the changes that take place at more advanced periods. The paper from which we have extracted the foregoing account has been severely criticised by Orfila,* who endeavours to overturn the facts and doctrine contained in it. But we think he has been satisfactorily and triumphantly replied to by Devergie,† who adduces as the best proof of the validity of his conclusions, four cases, in which the periods of immersion, varying from fifteen days to one, two, and eight months, were ascertained with the help of his table.

As the physiological phenomena observed in persons dead from *hanging* and *strangulation* are nearly the same, we shall consider them together in the present section, pointing out the differences between them as we proceed.

Notwithstanding the authorities of Boerhaave, Morgagni, and Portal, who imagined that apoplexy was the immediate cause of death in hanging, it is now generally admitted that the event is owing to suffocation. This opinion is confirmed by the experiments of Gregory and Brodie, from which it appears that if an artificial opening be made into the trachea of an animal, below the ligature by which it is suspended, it will continue to live. But we must admit that other injuries are sometimes inflicted, of themselves sufficient to account for death, such as compression of the nerves of the neck, and fracture or dislocation of the spine. With respect to the former, Dr. Paris remarks, "Although the pressure of a ligature on the nerves of the neck cannot be considered as the immediate cause of death in hanging, yet Mr. Brodie has very justly observed that if the animal recovers of the direct consequence of the strangulation, he may probably suffer from the effects of the ligature upon the nerves afterwards. Mr. Brodie passed a ligature under the trachea of a guinea-pig, and tied it tight

* Traité des Exhumations Juridiques, t. ii. p. 83.

† Annales d'Hygiène pub. et de Méd. Lég. t. v. p. 429.

on the back of the neck with a knot: the animal was uneasy, but nevertheless breathed and moved about. At the end of fifteen minutes the ligature was removed; on the following morning, however, it was found dead. On dissection no preternatural appearances were discovered in the brain, but the lungs were dark and turgid with blood, and presented an appearance similar to that which is observed after the division of the nerves of the eighth pair. 'I do not,' observes Mr. Brodie (manuscript notes), 'positively conclude from this experiment that the animal died from an injury to the eighth pair, but I think that such a conclusion is highly probable; and it becomes an object of inquiry whether a patient, having recovered from hanging, may not in some instances die afterwards from the injury of the par vagum.'"* Fracture or dislocation of the spine, when they do take place, must of course contribute to the speedy death of the individual; but these accidents are very rare, even when the fall is great, as in public executions. In numerous instances that have come under the observation of the writer, this cause of death was never observed. As in the case of drowning, two questions present themselves for solution by the medical witness: 1. whether the individual was suspended before or after death; 2. whether it was an act of suicide or of murder. An individual found suspended may have been killed in different ways; first, he may be hung up after having been murdered; and again, he may have committed suicide by hanging after having previously tried to destroy himself by other methods, in which he has failed, as by fire-arms, cutting the throat, &c. In the first case we might be led to mistake murder for suicide, and in the second suicide for assassination. It is necessary, then, to be aware of the signs by means of which death by strangulation in general may be distinguished, in whatsoever manner it may happen. These are lividity and distortion of the countenance, protrusion of the eyes, which are frequently suffused with blood, projection and wounding of the tongue by the teeth. The latter depends upon the position of the rope: if it be below the cricoid cartilage, the tongue is pushed out; but if it presses above the thyroid cartilage, it is carried along with the os hyoides backwards. In addition, we have the mark of the cord around the neck forming a livid depressed circle; the fingers usually bent, the nails blue, and the hands nearly closed, with swelling of the chest, shoulders, arms, and hands, and sometimes ecchymoses in these situations; also semi-erection of the penis, and emissio seminis. Cases of death by hanging occasionally present themselves in which the countenance is pale; this arises from the suddenness of death in some individuals, and particularly if the spine be dislocated. On dissection, the body presents nearly the same appearances as those described as caused by drowning, with the exception of water in the air-passages. A bloody mucus issues from the mouth and nose; but this is very different from the froth of drowned persons. The principal vessels of the head and neck are filled with blood, and sometimes ruptured. With respect to the bruised mark of the rope round the neck, it is stated by M. Klein* to be an uncertain sign,—an opinion founded on fifteen cases of suicide by hanging, in all of which it was wanting. Remer† of Breslau has more lately investigated this subject on an extended scale, and out of one hundred cases collected by him, eighty-nine presented the sugillation on the neck in an evident manner. In one case, instead of ecchymosis, the skin was found of a yellowish brown colour, like parchment; in two others the skin was excoriated; in another putrefaction prevented any certain examination; and in nine cases it is expressly mentioned that ecchymosis was wanting. It follows from this, that out of one hundred hanged persons, nearly one-tenth were found without a bruised mark. But if this proportion is sufficiently great to induce medical jurists to withhold unlimited confidence in this sign, it is at the same time too small to destroy the validity of the general rule, that such impressions are found in hanged persons. In all the cases that have come under the observation of the writer, the mark of the rope was most distinct. These were all executed criminals, in whom, from the nature of the ligature and the height of the fall, such impressions might be expected; but even in the most unfavourable circumstances the ecchymosis has been strongly marked. Remer‡ mentions that it has taken place notoriously in those found strangled in a position in which either the feet or the knees had not left the ground. In all the instances observed by us, the ecchymosis did not occupy the part of the skin with which the rope was in contact, but formed two lines on either side of it, one above, the other below; while the intervening portion, the part actually compressed by the cord, resembled dark-coloured parchment.

It is quite necessary that the medical jurist should not be content with the discovery of a blue ring on the neck, but that he should cut into it, in order to examine the extent of the extravasations, and the injury done to the parts in its neighbourhood. The height of the fall must cause a difference in the injuries inflicted on the parts composing the neck. When the individual falls from a considerable height, as in public executions, the lesions produced are very extensive. Dr. Houston§ has published an account of some dissections of criminals in whom the similarity of injury is most remarkable. "Both the individuals were strong plethoric men, executed for murder. Their death was evidently caused by strangulation. The cervical vertebræ were unbroken, and the spinal marrow and brain presented no trace of injury. In both, the sterno-mastoid muscle, on the right side (the opposite to that on which the knot of

* *Paris and Fonblanque*, Med. Jur. v. ii. p. 44.

* Journal de Méd. prat. de Hufeland (1815).

† Annales de Hygiène pub. et de Méd. Lég. tom. iv. p. 166.

‡ Loc. cit.

§ Dublin Hosp. Reports, vol. v. p. 317.

the rope was applied) was ecchymosed, contused, and broken; that of the left side was only slightly bruised. The os hyoides and thyroid cartilage were completely severed from each other. The omo-hyoid, sterno-hyoid and thyro-hyoid muscles, were so bruised and lacerated, that only some stretched shreds of them remained to hold the parts together. The thyro-hyoid membrane was also torn across, and the epiglottis, pulled from its root at the back of the thyroid cartilage, had passed up with the os hyoides and tongue into the back part of the mouth. The skin alone remained unbroken, and interposed between the rope and the cavity of the pharynx. This was the only region of the neck which gave evidence of much injury; the great vessels and nerves all escaped unhurt. In two other criminals, which more lately I have had an opportunity of examining, precisely the same effects had been produced by the rope on the soft parts of the neck, and without any injury to the brain or spinal marrow." The preparations from which the above statement is taken are preserved in the museum of the Royal College of Surgeons, Dublin. The semi-erect condition of the penis, and emission of semen, are signs which, although frequently met with, are not constantly found in hanged persons. Thus Klein, in the memoir alluded to, states he did not perceive them in any of the instances examined by him, and Remer found them only in the proportion of three to four. In some of the cases examined by the writer they were wanting, but in the majority there were evident traces of excitement of the organs of generation. The practice adopted by worn-out libertines, of causing themselves to be half hanged in order to arouse their dormant generative power, is a proof that some effect is produced on these organs by suspension. But as erection is not constantly found in hanged persons, we cannot accord to this phenomenon much value as an indication of death by strangulation, unless when accompanied with other characteristic signs. It adds, then, to the certainty of this kind of death, but it is no proof when it exists alone, for it has been found in other forms of violent death; and its absence is no proof of the contrary. A remarkable proof of the occurrence of this phenomenon in hanging is given by M. Guyon,* surgeon-major at Martinique, who attended the execution of fourteen persons, with a view of ascertaining the truth respecting the disputed subject of emission. Being situated near them at the place of execution, he observed the penis of all become erect at the moment of strangulation, and immediately after five of them made water abundantly. An hour after execution he found in nine of them the penis in a state of semi-erection, and its canal filled with a kind of matter with which the shirt was too profusely impregnated to allow it to be supposed that it came from any other organ than the prostate.

* Anderson's Quarterly Journal of the Medical Sciences, vol. ii. p. 151.

The second question is, whether it was an act of suicide or of murder. It is admitted by most medico-legal writers that this is a difficult and unlikely method of committing murder, unless the assailants be numerous and powerful. Dr. Smith remarks, "It is perhaps not going too far to say that a man cannot be hung alive by others, unless his hands be previously tied, and probably his legs also." Accordingly, when a body is discovered hanging, the first impression is usually that the individual has hung himself. But this opinion should not be confirmed until an accurate investigation has been made into all the external circumstances connected with the occurrence. It should first be ascertained that death has been caused by strangulation; for it has happened that crafty murderers have destroyed their victim in some other manner, and then suspended the body in order to create the suspicion of suicide. But supposing strangulation to be recognized, particular attention should be paid to the part of the neck which bears the impression of the ligature, and the kind of mark left by it. Thus, if we find the track of the cord to be low down, and to pass horizontally round the neck, while another and fainter impression exists at the upper part, taking an oblique course, it should excite suspicion that manual strangulation had been resorted to in the first instance, and that the body had been hung up after death. An examination of the dress and person of the deceased will sometimes aid the inquiries of justice by pointing out the signs of resistance and struggling, or robbery. It is necessary, however, to judge of any marks of external violence with great caution, for although they may generally be esteemed proofs of homicide, they may have been purely accidental, or have been inflicted by the individual previous to voluntary suspension. De Haen records the case of a person who, while hanging, inflicted several wounds on his face; and Ballard* mentions a case of suicide, in which the individual first cut his throat partially. The following interesting case is related by Dr. Male:† "An apprentice-boy in my neighbourhood, working alone in an attic, tied one end of a rope loosely round his neck, whilst his master was from home, probably without any intention of destroying himself, and twisted the other round the projecting part of the top of a door, the planks of which were irregular and somewhat divided; a small stool, on which he stood, slipped from under him, when he fell forwards, striking his temple against the corner of a box which cut him to the bone; he lay along the floor, his head and shoulders only elevated a few inches above it; the cord not being tied had run nearly its whole length, and then caught between the planks of the door, in which state he died. The wound was magnified by popular rumour into many, and vengeance was denounced against the innocent master, who was accused of having first killed and afterwards suspended the boy. On examining the boy, the mark of

* P. 409.
† Juridical Medicine, p. 243.

the cord was found to extend from ear to ear; the vessels of the brain were turgid, the thyroid cartilage broken, the nails blue, and the hands firmly closed. From this and other important circumstantial evidence, the coroner's jury were convinced that the charge was unfounded." It should be recollected that a person may be hanged accidentally, and therefore the usual verdicts of insanity, or felo de se, are not to be given in all cases where proofs of homicide do not exist, without due caution. A remarkable instance of this kind is related by Dr. Gordon Smith,* which occurred in April 1821, in Northamptonshire. A girl, aged thirteen, was swinging in a brewhouse, and near the rope used by her for that purpose was another for the purpose of drawing up slaughtered sheep. In the course of the exercise her head got through a noose of this second cord, which pulled her out of the swing, and kept her suspended at a considerable height until dead. We have said above that it is difficult, without an overwhelming force, to hang an individual against his will; but, on the other hand, it is surprising with what facility death may be accomplished by this means, in situations which at first view would seem to preclude its possibility. The late Prince of Condé, who committed suicide on the 27th of August 1830, was found hanging to a window-shutter, with his feet touching the ground and his knees bent. The attitude in which the body was found raised some suspicion of foul play, and a most accurate investigation of all the circumstances connected with the event was instituted, from which it appeared to have been a case of voluntary suicide. An interesting memoir† on the subject was published in January 1831, in which are related several instances of self-destruction by hanging, where the bodies were found in the most extraordinary situations and attitudes, accompanied with plates of the same. In one, a man was found in a granary hanging by a cotton handkerchief made fast to a rope which stretched across; the knees were bent, so that the legs formed a right angle backwards; the feet were supported on a heap of grain, over which the knees hung at a distance of a few inches. In another, a prisoner was found hanging to the bars of a window so low that he was nearly sitting on the ground; he had previously tied his hands together. In a third, the body was found in a vertical position, with the heels resting on a window-stool. In a fourth, an Englishman, a prisoner in Paris, hung himself in his cell, which was an apartment with an arched roof, and at the lower part of it was a grated window, the highest part of which was not near the height of a man; nevertheless he hung himself to this grating, and was found almost sitting down, with his legs stretched out before and his hips within a foot and a half of the ground. In a fifth, the attitude of the body was similar to the first: the man had suspended himself to a large iron pin driven into the wall to support the bed-curtains, and his feet, bent at a right angle, rested on the bed, while his knees approached it within a few inches. In a sixth, the point of suspension was so low that the person (a female) was obliged to stretch out her legs, one before resting on the heel, the other behind resting on the toes, in order to accomplish her purpose. In a seventh, a female was found stretched at the foot of her bed, the legs, thighs, and left hip, lying on the floor; the upper part of the body was raised, and suspended by a cord fixed on the neck, and fastened to the hospital-bed. There are other cases recorded in the memoir alluded to, of persons found hung in equally extraordinary situations, but we think it unnecessary to particularize them. A few years ago, a man aged seventy-five, destroyed himself at Castle Carey, by fixing a cord round his neck while sitting on his bedside, leaning forward till his purpose was accomplished. His wife, who had for years been bed-ridden, and therefore not likely to have been fast asleep, was in the room during the transaction, and knew nothing of what was going on.* In order to show the power of the will and firmness of resolution in certain suicides, we quote the following case from Remer, (loc. cit.) "Une femme alla, avec l'intention de se pendre, de la chambre où ses enfans se trouvaient, dans celle où ils couchaient. Sa fille aînée, agée d'environ huit ans, la suivit bientôt, et la trouva pendue; la fille exerça tant de tractions sur sa mère pour la détacher, qu'elle y parvient en rompant le lien. Alors la mère, qui avait toujours la corde au cou, repoussa son enfant dans la première chambre, la reprimanda, et lui ordonna, ainsi qu' à ses frères et ses sœurs, de rester où ils etaient, revint sur ses pas, et se pendit une seconde fois. Les enfans allaient chercher du sécours, mais il n'était plus temps." From these cases we learn how quickly consciousness must be destroyed in this form of death; for were it not so, some exertion would be made by the individuals to save themselves after the experiment had been tried to a certain extent.

Strangulation, properly so called, differs from hanging in the individual not being suspended; but whether death be caused by suspension or a ligature drawn tight, or by the hand alone, or any other pressure on the trachea, the physiological phenomena are the same. Strangling is a more common method of committing murder than hanging, arising from the greater facility with which it is accomplished. A remarkable instance of this is that of Dr. Clench, who was strangled in a hackney-coach in London, in 1692, by two men, who called him out in the night under pretence of taking him to visit a patient. After driving about the city for more than an hour the two individuals left the coach, and the coachman found Dr. Clench sitting in the bottom with his head against the cushion. He was quite dead, and had a handkerchief bound about his neck, in which was a piece of coal placed just over the windpipe. The coach-

* Principles of Forensic Medicine, p. 236.

† Annales de Hyg. pub. et de Méd. Lég. tom v. p. 156.

* Beck's Med. Jur. by Darwall, p. 283.

man had not the slightest knowledge of the transaction, having heard no noise while driving the carriage.

The appearances presented by strangled persons, when a ligature has been employed, do not differ much from those already detailed as characteristic of death by hanging. The position of the rope-mark constitutes the chief point of distinction; if it is not at the upper part of the neck, there can be no doubt the person was not hanged, dislocation of the neck is not to be expected, but the cartilages of the larynx and trachea frequently suffer. The track of the ligature in strangling is horizontal, and usually rather low down on the neck. A question has arisen as to the possibility of strangling being resorted to for the purpose of suicide. Upon this subject Foderé remarks, "Je dirai relativement au second chef de la question, qu'en général les impressions circulaires laissées par la simple strangulation forment seules une présomption d'homicide, parcequ'il n'est guère possible de se donner la mort par ce moyen, les mains cessant de faire force au moment ou la compression commence à s'exercer."* Notwithstanding this opinion he relates a case communicated to him by Desgranges of Lyons, on which the Society of Medicine were consulted, and replied that voluntary strangulation was possible. The case was that of an individual found strangled in a hayloft by a handkerchief which had been tightened by a stick. Another case of a similar description is given by the same author. One of a more recent date is recorded by Dr. Dunlop,† on the authority of a navy-surgeon, a friend of his. A Malay, who on board of a man-of-war in the East Indies had made repeated attempts to commit suicide, at last succeeded by the means alluded to. He tied a handkerchief round his neck, and with a small stick twisted it several times, and then secured it behind his ear to prevent its untwisting. Jealousy was the cause assigned for the act. The well-known case of General Pichegru, who was found strangled in prison, in Paris, during the consulate of Buonaparte, gave rise to various suspicions; and the rarity of this form of suicide, together with a general disbelief in its possibility, served to strengthen the common fame of that day, that he had been thus privately murdered in order to avoid the risk of a public trial. Certainly the condition in which the body was found seemed to point to such a conclusion. It was lying in bed on the left side, in an easy attitude, with the knees bent, and the arms lying down by the side, with a black silk handkerchief twisted tightly round the neck by means of a stick passed under it. The cheek was torn by the ends of the stick in its rotations. In allusion to this case Remer‡ observes: "Je n'ai d'ailleurs ici aucune intention de me constituer le défenseur d'un homme qui a trop versé de sang pour ne pouvoir pas prendre facilement sur lui un meurtre de plus. Bien mieux, j'accorde que ce genre de mort n'est que très rarement le résultat d'un suicide, mais je doute que sur cette seule considération, et sans autres preuves plus fortes, on puisse absolument affirmer qu'il y a eu meurtre." Indeed, when we consider the number of cases that occur, of suspension, some of which we have mentioned, where the position in which the body is found establishes with what promptitude the loss of sense must have taken place, or how strong the desire of self destruction must have been when the resolution was once taken, we think it is going too far to deny the possibility of death by voluntary strangulation, however cautious we may be in receiving testimony on the subject.

Persons destroyed by manual strangulation exhibit, instead of the circular ecchymosis on the neck, irregular patches corresponding to the fingers of the assailant. We must not expect, however, to find the internal mark of suffocation so distinct as in cases of hanging, because the closing of the air-tube not being so complete, the functions of respiration and circulation go on in some measure for a longer time. Traces of violence on the chest and limbs are also frequently observed in consequence of the struggling and force employed in the act.

Death by *smothering* is nearly allied to the former. It consists in cutting off the supply of air to the lungs by forcibly closing the mouth and nostrils. This form of death is more usually accidental than intentional, because, unless in the case of very young or old feeble persons, it is a difficult method of committing murder. Children have been smothered in bed accidentally, by the nurse or a pillow, overlaying them in such a manner as to close the mouth and nostrils. Persons in a state of intoxication may be smothered accidentally by falling with the face in mud, shallow water, or the like, and being unable to extricate themselves they perish by suffocation. But drunken persons are also easily destroyed by intentional smothering, of which the woman Campbell murdered by the notorious Burke and Hare in Edinburgh in 1828, furnishes a melancholy example. This was the last of three charges of murder laid in the same indictment as having been committed within six months in the same way, and for the same purpose, of supplying subjects for the anatomists' dissecting-room; and there is now no reason to doubt that, in conjunction with their two accomplices who turned king's evidence, they had carried on the dreadful trade of human butchery to a far greater extent. The direct evidence of the manner of death, as derived from the testimony of the accomplices, was that Burke and Hare were fighting together, when the deceased, in attempting to part them, was struck down by Hare to a sitting posture on the floor; that Burke, as soon as he had overpowered his companion and thrust him on the bed, threw himself on the deceased, kept her down by the weight of his body, and covering her mouth and nose with one hand while he applied the other under her chin, held her thus for ten or

* Méd. Lég. tom. iii. p. 174.
† Beck's Med. Jur. by Darwall, p. 290.
‡ Ann. de Hyg. et de Méd. Lég. t. iv. p. 186.

fifteen minutes till she was dead. The most remarkable appearances presented by the body when examined two days after death, were the following:—joints flaccid; features composed, red, and rather more turgid than natural; lips affected with dark livor; conjunctivæ of the eyes, even in the horizontal position of the body, much injected with blood; a little fluid blood on the left cheek, proceeding apparently from the nostrils; tongue not protruded or torn by the teeth; the scarf skin under the chin much ruffled, and the surface of the true skin dry and brown when denuded, but without blood or surrounding ecchymosis; integuments every where very free of lividity except on the face; no effusion of blood or laceration of the parts around the windpipe; no injury of the cartilages; the os hyoides and the thyroid cartilage farther apart than usual, in consequence of stretching of their interposed ligament: on the inside of the windpipe some tough mucus, not frothy, with a few points of blood between it and the membrane, which last was healthy; organs within the chest perfectly natural; the lungs remarkably so, and unusually free of infiltration; blood in the heart and great vessels, and indeed throughout the whole body very fluid and black, and accumulated in the right cavities of the heart and great veins. There were some appearances of violence on the limbs and in the spinal canal, unnecessary to notice, as they were the effects of injuries after death, caused by forcibly doubling up the body to enclose it in a box. Upon this case, Dr. Christison* (from whose admirable and detailed account we have extracted the foregoing) very justly observes: "A conviction has gained ground among the public, and has been encouraged by the sentiments currently expressed in society by some medical men, that the signs of suffocation generally, and as they existed in the body of the woman Campbell in particular, are so obvious and characteristic that they would of themselves, and independently of a knowledge of collateral circumstances, at once attract the attention of a professional person conversant with anatomy, and excite a very strong and well-grounded suspicion of the cause of death. This idea, if erroneous, must have a pernicious tendency in various ways. A sufficient reason for my taking notice of it is, that it may throw medical inspectors off their guard, by leading them to expect strongly-marked appearances in every case of death by suffocation. That such appearances are very far from being always present, should be distinctly understood by every medical man.

"In the body of the woman Campbell no person of skill, whose attention was pointedly excited by being told that from general circumstances murder was probable, but the manner of death unknown, could have failed to remark signs that would raise a suspicion of suffocation. But if his attention had not been roused,—if, for example, he had examined it in the anatomical theatre of an hospital, without knowing that suspicions from general circumstances were entertained regarding it, he might have inspected it even minutely, and yet neglected the appearances in question. Nay, a person of skill and experience would have been more likely to do so than another, because every one who is conversant with pathological anatomy must be familiar with such or similar appearances as arising from various natural diseases."

For persons found dead from *noxious inhalations, poisoning*, and *wounds*, see the articles Asphyxia, Toxicology, and Wounds, Death from.

Persons found burned.—In cases where bodies are found dead with traces of extensive burning upon them, the medical jurist to whom the investigation may be committed, has some delicate and interesting questions to solve. This difficulty has been of late years increased, by the admission of the possibility of spontaneous human combustion, and he is now expected to state—1st, whether burning was the cause of death or not, or, in other words, whether the body was burned before or after death; 2d, whether the burning was spontaneous or ordinary combustion. It is much to be feared that a want of information respecting the peculiarities of these different cases, has led, even in times not very remote, to the condemnation of innocent persons. "On a vu dans le courant du dixhuitième siècle, condamné à périr sur l'échafaud, un malheureux habitant de Rheims, accusé d'avoir assassiné sa femme, et de l'avoir ensuite brulée, afin de se dérober au supplice, qui l'attendait; et M. Vigné a jetté des fleures sur la mémoire de l'infortuné Millet, dont la femme sujette à l'ivrognerie, fut trouvée le 20 Février 1725, presque entièrement consumée dans sa cuisine, à un pied et demie du foyer."* Two cases related by Dr. Christison,† on the authority of the late Dr. Duncan, appear to us of a similar nature. In each the prisoner was accused of having murdered his wife, and burnt the body afterwards to conceal the murder. "The first was the case of a man, Gilchrist, who was condemned and executed at Glasgow. The prisoner and his wife lived on tolerably good terms, but used to take fits of rambling and get drunk for days together. At last, on one of these occasions, after their return home in the evening, the people who lived in the floor above them heard a noise like that of two persons struggling, and soon afterwards a rattling or gurgling and moaning, as of one choking or bleeding to death. They so strongly suspected that all was not right that they called down to Gilchrist through the floor that they were afraid he was killing his wife. In no long time they were further alarmed by the smell of fire and the filling of the house with smoke; upon which they went down to Gilchrist's apartment and demanded admission. After some delay he admitted them, and in doing so appeared to have come out of an inner room, where he said he was asleep in

* Edinburgh Med. and Surg. Journal, vol. xxxi. p. 243.

* Foderé Méd. Lég. tom. iii. p. 204.

† Edin. Med. and Surg. Journ. vol. xxxv. p. 316.

bed. On letting them in, he stumbled over the body of his wife, who lay in the outer apartment quite dead, kneeling before a chair and very much burnt. In these circumstances the prisoner was accused of having murdered her and then burnt the body to conceal the manner of death; while, on the contrary, he alleged he had gone to bed tired, and knew nothing of what had befallen her till he was awakened by his neighbours, and that he presumed her clothes had caught fire while she was intoxicated and burnt her to death. The medical gentlemen who had been appointed to examine the body, merely reported that they found the body so much burnt that they could learn nothing from it as to the cause of death. The general evidence was all against the prisoner. He was accordingly condemned, although the precise manner of his wife's death was not proved even presumptively, and the sentence was put in execution; but to the very last he vehemently and solemnly denied that he was guilty." The second case occurred to Dr. Duncan within the same year, at Leith. "The general evidence was of the same nature as in the case of Gilchrist, but even stronger against the prisoner. He lived on bad terms with his wife. On the evening of her death she returned home at a late hour with a lighted candle, after getting some whiskey at a neighbour's. At this time the prisoner was in bed; but some time afterwards there was heard a considerable noise, like that of struggling, and of chairs pushed up and down the room; and after this the man was heard in an adjoining bed-room, endeavouring to quiet his child, who was crying. Presently the neighbours were alarmed by a strong smell of fire proceeding from the prisoner's apartments. At last a man forced his way in by breaking the window. On entering he found the room full of smoke, and observed something burning red in a corner, over which he instantly threw a pitcher of water, and which proved to be the body of the woman burning on the hearth." Dr. Duncan was present at the examination of the body under the sheriff's warrant, and reports as follows. "We found some parts of the body, especially the belly, burnt to a cinder. We then examined the parts on which the fire had acted more moderately, namely, the face and extremities, and here there was every mark of vital reaction; some spots were merely red and inflamed; others scorched to a hard transparent crust, but surrounded with distinct redness, and a great many blisters filled with lymph perfectly different from those produced on the dead body, which are not filled with a fluid, but with air or vapour. In short, we found appearances exactly similar to those of fire on a living body, and therefore we reported as our unanimous opinion that the deceased was burnt to death." As there was no proof of the prisoner's having set fire to her, he was not found guilty, but the jury returned the intermediate verdict of *not proven*.

It is worthy of remark, that although the possibility of spontaneous combustion was not mooted at the time of these occurrences, yet the acute mind of Dr. Duncan led him to perceive something extraordinary in the phenomena which presented themselves; and he particularly comments upon the violent and destructive action of the fire, compared with the small quantity of combustible matter consumed. In neither case was there any trace of burning in the house or furniture, and in the last the woman was found on the hearth with part of her clothes unburnt, and a chair from which she had fallen quite entire. She was dead when the neighbours entered, and in the dark the body was discovered by a red light issuing from it.

Upon reviewing these cases, particularly the last, we cannot avoid agreeing with Dr. Christison, that the body was in that singular state in which it is apt to undergo spontaneous combustion; it being difficult to explain otherwise the great extent of injury inflicted. It is not our intention at present to enter into a discussion of the theory of spontaneous human combustion, that subject having been already most fully and ably treated of in a former article, (see COMBUSTION, SPONTANEOUS); but we wish to direct the attention of practitioners to that interesting phenomenon, in order that they may be prepared to detect it when it occurs; and we have mentioned the instances just quoted as examples in which a knowledge of this peculiarly morbid condition of body might possibly have saved the lives of innocent persons.

Was the body burnt before or after death?—This question can only be solved by a reference to the phenomena which are known to occur on the application of a burning heat to a living and a dead body, and by observing those indications of vital reaction which are peculiar to the former, and remain visible after life is extinct. We are indebted to Dr. Christison* for some interesting experiments and observations made for the purpose of arriving at a more certain knowledge of these phenomena; particularly with a view of ascertaining whether the effects of a burn on a living body can be imitated immediately after death by the application of heat. It appears that the most immediate effect of the application of heat to a living body is a blush of redness to a considerable extent around the burnt part, removable by gentle pressure, disappearing in no long time, and not permanent after death. Next to this in order (according to the author quoted), and occurring most generally at the very same time, is a narrow line of deep redness, separated from the burnt part by a stripe of dead whiteness, bounded towards the white stripe by an abrupt line of demarcation, passing at its outer edge by insensible degrees into the diffuse blush already described, but not capable of being removed like it by moderate pressure. In every instance in which Dr. Christison watched the effects of the actual cautery, as well as in those cases observed for him by others, this deep crimson line appeared in a very few seconds, sometimes in five,

* Edin. Med. and Surg. Journ. vol. xxxv. p. 321.

generally within fifteen, and once only so late as thirty seconds. Dr. Christison never failed to observe this appearance on the bodies of persons burnt a few hours before death, forming a line on the entire skin near the burn, from a quarter to half an inch in breadth, and about half an inch from the burn. Blistering is the next appearance in point of order, but it is not a very constant consequence of a burn if life be extinguished a few minutes afterwards. When the heat is applied by means of a scalding fluid, blisters usually appear in a very few minutes. Yet sometimes, in very extensive burns of this kind, especially in young children, there is no vesication at all in many hours. "It follows, then, that the only effects of burns which appear immediately after the injury and remain in the dead body, are, first, a narrow line of redness near the burn not removable by pressure, and, secondly, blisters filled with serum; that the former is an invariable effect; but that the latter is not always observable when death follows the burn in a few minutes."

In order to try whether these appearances could be imitated by the application of burning substances after death, Dr. Christison made the following experiments:

1. In a stout young man who had poisoned himself with laudanum, a very hot poker and a stream of boiling water were applied to the skin of the chest and inside of the arm one hour after death.

2. A stout young woman died in ten or twelve days of a low typhoid fever, and at her death was but little attenuated. Ten minutes after death boiling water was poured in a continuous stream on the breast and outside of one of the legs.

3. A very powerful, athletic young man poisoned himself with laudanum. Four hours before death a tin vessel filled with boiling water was closely applied on several parts of the anus, and a hot smoothing iron was held to the outside of the hip-joint. Half an hour after death a red-hot poker was applied to three places on the inside of the arm. The body was examined in thirty-eight hours. "Some of the spots burnt during life presented a uniform blister filled with serum; on two there was no blister, but the cuticle was gone, and the true skin dried into a reddish translucent membrane, at the edge of which there were drops of serum, and also particles of the same fluid dried by evaporation. Round all these spots there was more or less scarlet redness, particularly round the two spots last mentioned. A bright red border, half an inch wide, surrounded the whole burns; and the redness was not in the slightest degree diminished by firm pressure. The spots burnt *after death* were some of them charred on the surface, and not elevated; two presented vesications, but the blisters were filled with air, the cuticle over them dry and cracked, and the surface of the true skin beneath was also quite dry. On the white parts of the skin there was no adjacent redness." Similar appearances were presented in the two former experiments to those now mentioned as the effects produced after death. Three other experiments were made on amputated limbs immediately after operation, with results of a similar nature. From these experiments it appears that the application of heat to the body, even a few minutes only after death, cannot produce any of the signs of vital reaction formerly described; and that a line of redness near the burn, not removable by pressure, and likewise the formation of blisters filled with serum, are certain signs of a burn inflicted during life.

Was the burning spontaneous or ordinary combustion? We have already referred to the article SPONTANEOUS HUMAN COMBUSTION for an account of this extraordinary phenomenon and its probable causes. It is remarkable that by far the greatest number of victims to this accident are females. Sixteen out of seventeen cases related by Kopp, and all those, amounting to eight, given by Lair, were of this sex. In like manner the four cases mentioned by Dr. Apjohn as having occurred in Ireland, were all old women, and in all the use of spirituous liquors had been carried to a great extent. This kind of combustion penetrates the body with extraordinary rapidity, and the flame which accompanies it is with difficulty extinguished by water: but although it acts so rapidly and extensively on the body, it is observed that objects in the neighbourhood, unless those in actual contact with it, are not attacked. The trunk of the body is the part that suffers most, being generally almost entirely consumed, while the head and extremities are more spared. The rapidity and depth of these combustions, together with the small quantity of other surrounding combustibles consumed, contrast strongly with the slowness observed when bodies are burned on a funeral pile or at the stake, and lead us to understand that similar effects cannot be the work of criminal intention, for when burning is resorted to in order to conceal crime, its operations are infinitely more slow, more imperfect, and extend more to surrounding objects, than in cases of spontaneous combustion.

Persons found dead from cold.—Death from this cause is by no means rare in countries where the winter is very severe, as we learn from accounts of travellers in Siberia, Lapland, Switzerland, &c.: and even in these countries, when the winter is unusually severe, cases occur which equally illustrate the destructive effects of cold. If such accidents happen at a distance from inhabitated places, in snow and frost, they are generally too strongly marked by circumstances to be mistaken. But they may occur in populous places, and even in large cities, and are then more liable to misconstruction and suspicion. "The degree of cold necessary for the production of its fatal effects varies in a very remarkable degree with the strength and circumstances of the individual to whom it is applied, as well as with the rapidity of the cooling process. In some instances we find man enduring an extreme degree of cold with but little inconvenience, whilst in others we see him perishing in a temperature at which

water retains its fluidity."* There is a very striking description of the effects of cold in the account of the first voyage of Captain Cook. When the Endeavour was off Terra del Fuego, Sir Joseph, then Mr. Banks, Dr. Solander, and some others of the company, wished to make a botanical excursion to a mountain that appeared but a short distance from the shore. They set out, twelve in number, including domestics. An intense cold soon seized them, which they were encouraged to resist by Dr. Solander, who had crossed the mountains separating Sweden and Norway, and knew the fatal effects of yielding to its influence. He assured them that whoever sat down would sleep, and that whoever slept would never waken. Nevertheless, he was himself the first to yield to the desire for sleep, against which he had warned the rest. He begged to be allowed to lie down; he stretched himself, and slept some time upon the ground covered with snow, and it was with great difficulty that his friend Banks could rouse him to go a quarter of a mile to a fire which he had lighted. A black servant of Mr. Banks lay down also, replying to the threats of death held out to him, that he only desired to be allowed to sleep and die. Dr. Solander, when aroused at the end of five minutes, had almost lost the use of his limbs, and his feet were so shrunken that his shoes fell off. It was not possible to waken the negro, and he perished with another negro who had been left for a moment with him to assist him. All the persons in the expedition felt the effects of the cold more or less, but the whites were all saved, even Mr. Buchan, a painter, who had a fit of epilepsy, to which he was subject.

In this example, as well as from more recent observation in the polar seas, it appears that a great degree of cold, particularly when joined with fatigue, produces in the body a stupor and numbness almost insupportable, and that the ardent desire to sleep arising from this stupor is such that it cannot be conquered by the fear of the consequences. We also perceive that men least accustomed to cold are those who most readily sink under its influence, as we find the negroes dying while the whites were saved; and also that strength of mind and body tended much to enable the sufferer to resist, since Sir Joseph Banks, a man endowed with great moral and physical energy, was the one who suffered least of the whole party. The same cause will enable animals to sustain cold with impunity. For instance, among hybernating animals, as the dormouse and marmot, it has been observed, in experiments made to ascertain the cause of their sleep, that the most vigorous are the most susceptible of invigoration by heat; and that they are least readily thrown into a state of slumber by artificial cold during summer. Foderé, who was a Swiss, says that whilst inhabiting his native mountains, all the cases of death of this nature whose histories he could discover, were of sickly persons, children, old men, or females. From the experiments of Mr. Brodie, to ascertain the source of animal heat, it is plain that the temperature of animals is in some way or other dependent upon the integrity of the functions of the nervous system; and hence the power of an animal to resist cold will be determined by his power of generating heat. Now it is found that any cause by which the powers of the nervous system are impaired favours the action of cold upon the body; and for this reason an individual labouring under the effects of a narcotic may be killed by a degree of cold that otherwise would have been quite supportable. It is for this reason, also, that intoxicated persons perish in severe cold more readily than those whose nervous system is not so impaired. Dr. Paris* notices two instances that occurred in London, a few winters back, of drunken persons being taken to the watch-house, and there not being any charge against them they were dismissed by the constable of the night, and perished in the streets. A military friend of his communicated to him an instance where, out of a great number of troops who were exposed to intense cold, the only one who perished was under the influence of intoxication. This was also exemplified on a large scale in the disastrous retreat of the French troops from Russia, for we learn from La Beaume's account that intoxication seemed to insure death.

Mr. Brodie is inclined to think that cold probably destroys the principle of vitality equally in every part, and does not exclusively disturb the functions of any particular organ. This opinion is supported by the experiments of Dr. Chassat.

In case of persons found dead from cold, if the accident be recent, attempts may be made to restore life. The application of heat should be very gradual; and artificial respiration may be tried with a prospect of utility. Internal stimulants should be cautiously administered after signs of returning animation are apparent.

Persons found dead from hunger.—Food being necessary to the maintenance of life, it is plain that its deprivation cannot be endured for any length of time without causing death, and those cases of long fasting, or of refraining altogether from food for years, have all turned out to be impositions. It has, however, been ascertained that the want of nourishment is borne differently by different persons, a difference depending on age, health, constitution, sex, &c. Thus, a great number of persons doomed by some calamity at sea or elsewhere to perish by this dreadful death, do not all die at the same time, but some, according to their constitution, have the sad privilege of surviving their companions in misfortune. Young persons bear hunger worse than old, and sooner sink under its influence,—a fact no less correctly than beautifully illustrated by Dante in his description of the sufferings of Count Ugolino and his children, four in number, all enclosed in a dungeon together, and condemned to death by starvation. The father is represented as surviving until the

* *Paris and Fonblanque*, Med. Jur. vol. vii. p. 59.

* Loc. cit.

eighth day, having witnessed the death of his sons in the order of their age, beginning with the youngest. We see that in general, of the two sexes, women bear the privation of food more easily than men; thus, in all accounts of long voluntary abstinence, three-fourths or more of the individuals are of the female sex. Women usually do not consume much, and all being equal as to age and health, they require much less nourishment than men. The power of resisting hunger varies also with the total privation or otherwise of water. Redi * made many experiments to discover how long animals could live without food. Of many fowls that he kept without eating or drinking, none passed the ninth day. He gave to one as much water as it chose, of which it drank freely and often during sixteen days, and it did not die until the twentieth. Dogs in like manner lived much longer when allowed water. But it would appear from a number of instances, that the moisture of the atmosphere of the place in which an individual may be confined may compensate in some degree for the want of drink. Foderé relates an instance where three women in Piedmont were overwhelmed by snow, and shut up in a narrow stable without any provision for thirty-eight days, and at the end of that time were rescued alive; and he thinks it probable that they owed their preservation to the moisture of the place of their confinement; the absorbents on the skin being thus able to derive a certain portion of fluid for the use of the system. Chaussier reports the case of some workmen who remained fourteen days without eating or drinking, shut up in a deep damp quarry by the sudden falling in of the roof. They were withdrawn at the end of that time, with a small feeble pulse, scarcely any heat, and just a spark of life remaining, which was with difficulty kindled. The absorption of moisture had sustained them as it did the women at Bergamoletto. A very striking instance of the power of water to prolong life occurred in the case of Luc Antoine Viterbi, who starved himself to death in prison in Corsica.† From the fifth to the sixth day, to hunger insensibly succeeded the much more grievous suffering of thirst, which became so acute, that on the sixth, without ever deviating from his resolution, he began to moisten his mouth occasionally, and to gargle with a few drops of water to relieve the burning pain in his throat; but he let nothing pass the organs of deglutition, being desirous not to assuage the most insupportable cravings, but to mitigate a pain which might have shaken his resolution. Until the tenth the thirst became more and more intolerable, when, overcome by excess of pain, he seized the jug of water and drank immoderately. On the thirteenth, the unhappy man thinking himself at the point of death, again seized the jug and drank twice. On awaking on the morning of the fourteenth, and finding his powers restored, he fell into a rage with his keepers, protesting that they had deceived him, and then began beating his head against the wall of his prison, and would inevitably have killed himself had he not been prevented. During the nineteenth, the pangs of hunger and thirst appeared more grievous than ever; so insufferable indeed were they, that for the first time Viterbi let a few tears escape him, but his invincible mind instantly spurned this human tribute. On the twentieth, he declared to the gaoler and physician that he would not again moisten his mouth, and feeling the approach of death he stretched himself, asking, as on a former occasion, whether he was well out, and added, 'I am prepared to leave this world.' Death did not this time betray his hopes. On the twenty-first Viterbi was no more.—In this interesting case, which we have here abridged, we perceive the effect of a small portion of fluid in producing vigour in a body worn out by abstinence. There can be no doubt Viterbi would have died much earlier if he had not made use of the water. In the examination of bodies dead from hunger, the following characters are usually observed. There is general emaciation of the body, together with an acrid fetid odour. The eyes are open and red, the tongue and throat dry, and the intestinal canal is empty. The gall-bladder is usually filled with bile, which exudes and tinges the neighbouring viscera. The lungs are shrivelled, and all the other organs healthy. It is thought by Foderé that some conjecture may be drawn as to whether the person has been totally deprived of water or not; for according to the experiments of Dumas, the dogs which he killed by thirst had the viscera inflamed, and the blood thick and coagulated—phenomena which did not present themselves in the bodies of those dead from hunger alone.

Persons found dead from lightning.—Death from this cause is sufficiently common to warrant a consideration of it in this place. Its phenomena may be studied by observing those of common electricity, as it has been sufficiently proved that they are identical. The human body is alike affected by both, and death, whether it be occasioned by the discharge of an electrical battery or by that of a thunder-cloud, exhibits effects precisely analogous. Two theories respecting the manner of death by lightning are extant, the first that of Mr. Hunter, the second of Mr. Brodie. Mr. Hunter supposed that when death is thus occasioned, there is an instantaneous and total destruction of the vital principle in every part of the body, and that the muscles are therefore relaxed and incapable of contraction; that the limbs do not stiffen as after other forms of death, nor does the blood coagulate, and that putrefaction is rapidly set up. On the other hand, Mr. Brodie concludes from his experiments, given from his manuscript notes by Dr. Paris,* that an instantaneous extinction of vitality does not take place, but on the con-

* Osservazioni intorno agli Anim. viventi, No. 3, 4.

† *Paris and Fonblanque*, Med. Jur. v. ii. p. 69.

* Med. Jur. vol. ii. p. 64.

trary the functions of the brain are those on which the electric shock exercises its primary influence. In one of his experiments an electric battery of six jars having been charged with electricity, the shock was made to pass through a guinea-pig in the longitudinal direction from the head to the tail. The animal immediately fell on one side insensible, as if stunned; a convulsive action of the muscles of the extremities was observed, but did not long continue, and the function of respiration was not interrupted. In a few minutes sensibility was restored and the animal recovered. In another experiment a shock from nine jars was passed in the same manner through another guinea-pig. The animal immediately fell on one side, exhibited a convulsive action of the voluntary muscles of the limbs, but uttered no cries, and although attentively watched, no signs of respiration could be discovered after the shock had passed through. Three minutes afterwards Mr. Brodie opened the chest, and found the heart acting with regularity and vigour about eighty times in the minute, and circulating dark-coloured blood. The peristaltic motions of the intestines were also visible, and the muscles obeyed the galvanic stimulus.

In this experiment it is plain that neither the irritability of the muscular system at large nor that of the heart was destroyed by the shock, but death took place as from a severe injury of the head and destruction of the functions of the brain. In this case Mr. Brodie remarks, that if the lungs had been artificially inflated, the action of the heart might have been maintained, and the animal probably restored to life.

When a discharge of lightning strikes a human body, it may affect the surface and produce vesications, which most commonly, according to Mayer, pass in the direction of the spine; or it may penetrate a particular part of the body and act locally. The clothes are not unfrequently torn, and buttons, coin, or other metallic substance melted, but occasionally cases are met with where the clothes are uninjured. Death has sometimes occurred when the thunder-cloud has appeared to be at a considerable distance. This is accounted for by supposing it to be a discharge of electricity from the earth to the cloud, which had become negatively electric, constituting what is termed the returning stroke. All discharges of electricity occur in consequence of the approach of two bodies in opposite states of electrical excitement. When a substance excited positively is brought near another in its natural state and insulated, the electric equilibrium of the latter is instantly disturbed, the parts nearest to the former become negative, and the distant ones positive. If the body is not insulated, its electricity passes into the earth, and the whole becomes negatively electric. If, on the contrary, the exciting body be negative, it causes the contiguous parts of a body in its vicinity to become positive. Hence it is established as a law, that an electrified body tends to produce in a contiguous substance an electric state opposite to its own. The electricity developed in this way is said to be induced, or excited by induction. The construction of the Leyden phial is upon this principle; when the inside of the jar is rendered positive by contact with the prime conductor, the outside, if in communication with the earth, parts with electricity and becomes negative; both surfaces are therefore electrified, but in opposite states; and if a communication be established between them by a good conductor, the excess of electricity instantly passes along it, and both sides of the jar return to their natural condition. Now when a negatively electric cloud approaches the earth, all objects in its vicinity are positively excited, and when it comes within striking distance,—that is, so near that the tendency of the electricity to pass from the positive to the negative body overcomes the resistance of the intervening portion of air,—the equilibrium is restored with a report and a flash of light, exactly as in the discharge of the Leyden phial. If a person is found in an open place or under a tree shortly after a thunder-storm, with the ordinary appearances mentioned above, we may attribute his death to lightning, and particularly so if the metallic substances about him are found melted and his clothes torn or burnt, while dissection exhibits no other cause of death.

(T. E. Beatty.)

PERTUSSIS.—See Hooping-Cough.

PHARYNGITIS.—See Throat, Diseases of.

PHLEBITIS.—See Veins, Inflammation of.

PHLEGMASIA DOLENS.—Some of the hypothetical names which have, up to the present time, been employed by authors to designate the disease which forms the subject of this article, are—*Œdema Lacteum*, *Œdème des Nouvelles Accouchées*, *Dépôts Laiteux*, *les Infiltrations Laiteuses des Extrémités Inférieures*, *Hysteralgia Lactea*, *Metastasis Lactis*. As it has been demonstrated by the researches of recent pathologists that the swelling of the affected limbs, and all the other local and constitutional symptoms of this affection, invariably depend on inflammation of the iliac and femoral veins, we propose to substitute the term *crural phlebitis* for phlegmasia dolens, and the other names which have now been mentioned and were in general use before the true nature of the disease was ascertained.

We shall consider *crural phlebitis* as it is observed, 1. in puerperal or lying-in women; 2. in women who have not been pregnant; 3. in the male sex.

1. *Crural phlebitis in puerperal women.*—In the works of Hippocrates, Rodericus a Castro, and Wiseman, we find obscure notices of this disease. Mauriceau was, however, the first author who distinctly pointed out its characteristic symptoms, and he referred the swelling of the lower extremities to a reflux upon the parts of certain humours which ought to be evacuated by the lochia, of which he says, "le gros nerf de la

cuisse s'abreuve quelquefois tellement, qu'il en peut rester à la femme une claudication dans la suite."* It is not improbable, from the manner in which Mauriceau has expressed himself in this passage, that he had actually felt with the finger the indurated and inflamed femoral vein in the upper part of the thigh, which he mistook, however, for a nerve, as some other observers seem to have since done, for an inflamed absorbent. When the disease was accompanied with great fever, difficulty of respiration, pain, and tension of the abdomen, he considered the affection to be dangerous in proportion to the severity of these symptoms.

A more full account of crural phlebitis was published, not long after Mauriceau, by Puzos and Levret, both of whom considered the swelling of the limbs to depend on a deposit of milk in the part.

Puzos states that it is a painful and protracted, and sometimes a fatal disease, and that it occurs most frequently about the twelfth day after delivery, though sometimes as late as the sixth week. He also observed that one limb only is at first affected, and that the pain and swelling commence in the groin and superior part of the thigh, and descend along the course of the crural vessels to the ham, and thence along the calf of the leg to the foot. He observed, likewise, that the disease attacked the other limb, and that it presented the same appearances as the first affected. The extent of the mischief, he remarks, is readily recognized by a painful cord formed by the infiltration of the cellular tissue which accompanies the crural vessels. "C'est dans l'aine et dans la partie supérieure de la cuisse, que le dépôt commence à donner des signes de sa présence par la douleur que l'accouchée y ressent; et la douleur suit ordinairement le trajet des gros vaisseaux qui descendent le long de la cuisse; elle est même plus vive dans tout ce trajet. On reconnoit l'étendue du mal par une espèce de corde douloureuse que forme l'infiltration du tissu cellulaire qui accompagne ces vaisseaux, et l'enflure se joint presque toujours à la douleur."† Puzos recommended repeated venesection, cathartics, and sudorifics, and various local applications, as warm fomentations, and embrocations of oil of almonds with ammonia.

Levret's description of crural phlebitis strikingly coincides with that of Puzos, and he refers the disease to the crural vessels in so direct a manner, that it is singular he did not discover its precise nature. When the disease attacks one side, a tumour more or less considerable, he observes, is found on examination in the iliac fossa. The cord of crural vessels is also painful through a great part of its course. "On distingue même souvent, dans toute son étendue, de petites tumeurs olivaires qui l'entourent ça et là."‡

* Traité des Maladies des Femmes grosses, tom. i. 1638, p. 446.

† Traité des Accouchemens, 4to. p. 350, Paris, 1759.

‡ L'Art des Accouchemens, p. 932, 2nd edition, Paris, 1761.

In a manuscript copy of Dr. William Hunter's Lectures, taken in 1775, no account is given of this disease; but from the following note, written by Mr. Cruickshanks to Mr. Trye, at the time he was engaged in the publication of his work on the subject, it is evident that Dr. Hunter had seen cases of crural phlebitis, and was convinced that the opinions of Puzos and Levret respecting the nature of the disease had no solid foundation. "They have imputed the swelled leg, which happens after lying-in, to a dépôt de lait, but it is not: to something wrong in the constitution; the patient is first seized with pain in the groin, the pulse becomes smart, and the part becomes tender, the pain and tenderness get gradually lower down, and the muscles are stiffened into hard bumps, and an œdema frequently succeeds the inflammatory swelling. It is generally called a cold, but it is not. In some it is over in a short time, in others it will last some months; it generally does well."

In the year 1784, Mr. White of Manchester published an "Inquiry into the nature and cause of that swelling in one or both of the lower extremities which sometimes happens to lying-in women," and he suggested or adopted the opinion that the disease depends on obstruction, detention, and accumulation of lymph in the limb, or on some other morbid condition of the lymphatic vessels and glands of the affected parts. He considered it to arise from some local accident during labour, and to be a purely local disease. Mr. White saw fourteen cases, either during or subsequent to the attack; but as none of them proved fatal, an opportunity was not afforded him to determine the truth of his hypothesis by an examination of the actual condition of the different textures of the affected extremities.

An essay on the swelling of the lower extremities incident to lying-in women was published in 1782, by Mr. Trye of Gloucester, in which he referred the symptoms to rupture of the lymphatics as they cross the brim of the pelvis under Poupart's ligament. Six cases came under the observation of Mr. Trye, and in all recovery likewise took place. He clearly perceived, although he was not able to explain the fact, that an intimate relation subsists between puerperal fever and the swelled leg of lying-in women. Dr. Ferriar soon after maintained, without the slightest evidence, that there is a general inflammatory state of the absorbents in this disease.

Dr. Hull published an essay on phlegmasia dolens in 1800, in which he satisfactorily shewed that it was impossible to account for the phenomena of the disease on the supposition that the lymphatics were affected independently of a considerable primary affection of the sanguiferous system of the limb. He considered the proximate cause to consist in an inflammatory affection producing suddenly a considerable effusion of serum and coagulating lymph from the exhalents into the cellular membrane of the limb. All the textures, muscles, cellular membrane, lymphatics, nerves,

glands, and bloodvessels, he supposed to become affected.*

It is a remarkable circumstance in the history of crural phlebitis, that nearly a century and a half should have elapsed from the time when it was first clearly pointed out by Mauriceau, before an opportunity was presented of ascertaining by dissection the precise nature of the disease. There had indeed been opportunities to determine the accuracy of the different hypotheses which had been advanced, but these were neglected, and the seat of the disease and its commencement in the uterus were imperfectly understood until the writer of this article ascertained by dissection the true nature and origin of the complaint.†

In January, 1823, M. Bouillaud related several cases and dissections in which the crural veins were obliterated in women who had suffered from a swelling of the lower extremities after delivery; and M. Bouillaud distinctly stated that he considered obstruction of the crural veins to be the cause, not only of the œdema of the lower extremities in lying-in women, but of many partial dropsies.

"Elizabeth Perfu, æt. 38, was received," he says, "into the Hospital Cochin two months and a half after her delivery. She had tuberculous phthisis, and the left lower extremity was infiltrated with serum. She died in three months, and on opening the body the veins of the affected extremity were found plugged up with a very old, red-coloured, easily broken-down fibrinous coagulum, which extended into the common iliac vein. The vena cava and the other veins were healthy, and contained more or less liquid blood."

Marguerite Colliere, æt. 30, was delivered by the forceps in the Maternité, about the end of January, 1822. She entered the Hospital Cochin on the 20th March following, having the left lower extremity greatly swollen and infiltrated with serum. She died on the seventh day after. An enormous abscess was found in the pelvis, which appeared to have commenced on the left side of the cavity before and within the psoas muscle. All the surrounding parts were extensively disorganized. The coats of the left iliac veins were thickened, and their interior layers were altered in structure, and converted into a lardaceous substance. The whole of the veins of the inferior extremity were plugged up with a solid friable clot.

M. Bouillaud observes that Chaussier and Meckel had both before related cases of swellings of the lower extremities in puerperal women, where the crural veins had been found inflamed and obstructed.‡

In May, 1823, the valuable essay of Dr. Davis on phlegmasia dolens was read before the Medical and Chirurgical Society, subsequently published in the twelfth volume of the Transactions. Although the cases of M. Bouillaud were published four months before Dr. Davis's paper was read, it does not admit of dispute that Dr. Davis was the first who proved by dissection that phlegmasia dolens depended on inflammation of the iliac and femoral veins. So early as 1817 a fatal case occurred to him, which was examined by Mr. Lawrence, in which the iliac and femoral veins were found inflamed and obstructed. Two other cases were recorded by Dr. Davis, and another by Mr. Oldknow, in all of which there were proofs of the previous existence of inflammation of the crural veins.*

For six years after the publication of the cases of M. Bouillaud and Dr. Davis, pathologists remained in doubt whether these cases should be considered as examples of genuine phlegmasia dolens, or be viewed as essentially different diseases, and analogous in their nature to those formidable attacks of phlebitis which sometimes succeed to venesection and wounds. In opposition to the views of Dr. Davis, it was forcibly urged that if phlegmasia dolens depended on inflammation of veins, three out of four patients would die; whereas death does not take place in one case in an hundred where that disease is distinctly marked. Even that distinguished pathologist, Mr. Lawrence, who had examined the first fatal case which occurred to Dr. Davis, declared, in the Medical and Chirurgical Society, as late as 1828, that he was fully convinced, from what had subsequently fallen under his observation, that Dr. Davis's views were incorrect, and that phlegmasia dolens did not arise from inflammation of the iliac and femoral veins. Dr. Davis has communicated no additional information on the subject since 1823, and he is still of opinion that the inflammation commences in the common iliac, and not in the veins of the uterus, and that the disease is produced by the pressure of the gravid uterus during pregnancy.

In none of the cases of Dr. Davis does it appear that any attempt was made to trace the hypogastric veins to the uterus, though it is now certain, from what is known respecting the progressive changes witnessed in cases of phlebitis, that the alteration of structure which he has described must have originated in the veins of the uterus.

Thus, then, none of the writers who have been hitherto quoted have made any allusion to phlegmasia dolens commencing in the uterine veins; and even M. Velpeau, the latest continental author on the subject, has given it as his opinion that the affection of the veins is not the primitive disease, but is the consequence of the inflammation and suppuration of the articulations of the pelvis, with which he observed it to be frequently combined. The puriform fluid found within the veins he supposes to have been introduced into their cavity by absorption, and not to have been the effect of inflammation, nor the cause of those affections of the articulations, which is now known

* An Essay on Phlegmasia Dolens, by John Hull, M.D. Manchester, 1800.

† Pathological Researches on Inflammation of the Veins of the Uterus, Med. Chirurg. Trans. vol. xv. 1829.

‡ Archives de Médecine, tom. ii. Janvier, 1823.

* Med. and Chirurg. Trans. vol. xii. 1823.

to be the case. How far this opinion was incorrect we need not now point out.

It is due to Mr. Guthrie to mention, that in a paper on inflammation of veins after amputation, published in the Medical and Physical Journal for 1826, he suggested the importance of tracing the veins from the common iliac of the affected side down to the uterus, and expressed a suspicion that the disease would be found to originate in that organ.

All the authors who have treated of phlegmasia dolens describe it as commencing, in the great majority of cases, subsequent to the tenth day after parturition, with symptoms of uterine irritation and constitutional disturbance of a low typhoid character, and with pain and swelling in one extremity only. They have assigned various reasons for these remarkable peculiarities, in the period and mode of development of the disease, as pressure of the gravid uterus on the iliac veins during gestation, the change in the distribution of the blood from the sudden removal of this pressure, exposure of the extremity to cold, suppression of the lochia, deposits of milk in the limb; all of which, taken singly or combined, are insufficient to account for the phenomena; and the occurrence of the disease after menstruation, abortion, and the malignant affections of the uterus, proves that these causes are neither necessary nor sufficient for its production.

The numerous cases and dissections of which the writer of this article has published detailed histories in the Medical and Chirurgical Transactions, and in a recent work on the "Pathology and Treatment of some of the most important Diseases of Women," offer a more satisfactory, and, he trusts, a conclusive explanation of the phenomena. They demonstrate that if inflammation be excited in the uterine branches of the hypogastric veins, it may continue to spread along these until it reaches the common external iliac and femoral veins, and by the morbid changes induced in them give rise to all the subsequent symptoms.

The two following cases are here introduced, not merely because they were the first in which crural phlebitis was distinctly traced into the uterine veins, but as they afford good examples of this affection in its most mild and most severe forms, and illustrate, better than any general description could do, the phenomena of the disease, and the alterations of structure produced by inflammation in the hypogastric and crural veins.

A patient of the British Lying-in Hospital, who had been suffering for some weeks before delivery (May 8, 1829) from the usual symptoms of tubercular phthisis, experienced, on the 4th June, a sense of soreness in the left groin, which gradually extended along the inner surface of the thigh to the ham, and from thence along the posterior surface of the leg to the foot. She stated that for two days before the occurrence of pain in the groin, she had felt great uneasiness in the region of the uterus; that this suddenly quitted the hypogastrium and passed into the groin, and that from thence it extended downward along the inner surface of the thigh to the leg. The limb became swollen twenty-four hours after the invasion of the disease.

The whole left inferior extremity is now affected with a hot, painful, colourless swelling, no where pitting on pressure, except over the foot. The thigh is fully double the size of the other, and any attempt to move the limb produces excruciating pain along the inner surface of the thigh; and the pain excited by pressure along the tract of the femoral vein is so acute, that the condition of the vessel cannot be ascertained. Several branches of the saphena major above the knee are distended and hard; pulse 120; respiration quick and laborious; tongue peculiarly red and glossy; diarrhœa continues. 10th. Pulmonary affection aggravated. The limb continues extremely painful, and is still more swollen. The groin is so tender that she cannot bear the slightest pressure over it. The same is the case with the inner surface of the thigh. The branches of the saphena are still hard and painful. 11th. The femoral vein, under Poupart's ligament, can now be felt indurated and enlarged, and it is exquisitely painful when pressed; as is the inner surface of the thigh, the ham, and the calf of the leg. There is comparatively little tenderness along the outer surface of the limb. 17th. Diarrhœa, emaciation, colliquative sweats, and difficulty of respiration increasing. The left inferior extremity is still much swollen; but there is less pain in the groin and in the course of the femoral vessels. Died on the 24th.

Dissection.—Thorax. Adhesions between the pleuræ on both sides. Scarcely a portion of lung could be observed which did not contain tubercles in various stages of their growth. The right and left superior lobes contained several large tuberculous excavations. The vena cava and right common and external iliac veins were in a sound state. The *left common external* and *internal iliac* veins were all impervious, and had undergone various alterations of structure. The common iliac, at its termination, was reduced to a slender tube, about a line in diameter, which was lined with a blueish slate-coloured adventitious membrane. The remainder of the common and the external iliac veins were coated also with a dark-coloured membrane, and their centre filled with a brownish ochrey-coloured tenacious substance, rather more consistent than the crassamentum of the blood.

The left hypogastric or internal iliac vein was in the same condition, but in some places reduced to a cord-like substance, and its cavity throughout completely obliterated. The branches of this vein, taking their origin in the uterus, and usually termed the uterine plexus, were found completely plugged up with firm red coagula. From the commencement of the branches of this plexus of the hypogastric vein to the termination of this vein in the iliac, the whole had become thickened, contracted, and plugged up with coagula and adventitious membrane of a dark blue colour.

The same changes had taken place in the uterine plexus and trunk of the right hypogastric vein, from the uterus to its unusual termination in the left common iliac vein. The coats of the left femoral vein were thickened, and closely adherent to the artery and surrounding cellular substance; its whole interior lined with an adventitious membrane, and distended with a reddish-coloured coagulum. The same morbid changes presented themselves in the deep and superficial branches as far as they were examined down the thigh.

A woman, aged forty, who had been delivered of twins a month before, and had nearly perished from flooding, and subsequently from an attack of uterine inflammation, was seized on the 27th August 1829, with a violent fit of cold shivering, followed by pyrexia and pain in the right iliac region and groin. In the course of the two following days, the pain increased in severity, and extended down the inner surface of the thigh towards the ham, and the whole leg and thigh became much swollen. 29th. The whole right inferior extremity affected with a general intumescence, and completely deprived of all power of motion. The temperature of the limb, particularly along the inner surface, much higher than that of the other; but the integuments retain their natural colour, and do not pit on pressure. The femoral vein, for several inches under Poupart's ligament, is very distinctly felt enlarged, and is very painful when pressed. Out of the course of the crural vessels little uneasiness is produced by pressure. In the right side of the hypogastrium there is also great tenderness; pulse 120; tongue furred. She appears pale and depressed, and complains of deep-seated acute pain in the lower part of the back when she attempts to move. From this period until the 22d September, when she died, she suffered from repeated fits of shivering, which occasionally assumed a regular intermittent form; there was diarrhœa, with brown tongue; the glands in the right groin became much enlarged, and the left inferior extremity became affected in a manner similar to the right.

Dissection. The veins presented nearly similar appearances to those observed in the preceding case. The divisions of the vena cava were in this instance both affected. On the left side the cavities of the iliac and femoral veins were filled with a dark purple coagulum, their coats being not much thicker than natural; whilst on the right side the coats of these veins were dense and ligamentous, and the cavities blocked up by adventitious membranes, or lymph of a dull yellow colour. The lower part of the vena cava, for the space of two inches, as well as the right common iliac, was obstructed by a tough membrane of lymph surrounding a soft semi-fluid yellowish matter. The right common, external, and internal iliac veins were imbedded in a mass of suppurating glands, the purulent fluid of which had escaped into the adjacent cellular membrane, and forced its way downwards in the course of the psoas muscle, as low as Poupart's ligament. The right hypogastric vein was reduced to a small impervious cord, and its branches were distended with coagula of lymph of a bright red colour. The right femoral and its branches were in like manner impervious, their coats being greatly thickened, and their interior occupied by coagula. The cavities of the left common external iliac and hypogastric veins contained soft coagula, disposed in layers which adhered to the inner tunic of the vessel.

The trunk of the left hypogastric vein was contracted, its coats somewhat thickened, and its branches filled with worm-like coagula. The spermatic veins were healthy. The cellular membrane of both lower extremities was infiltrated with serum.

The *causes* of uterine and crural phlebitis have already been pointed out in the article Puerperal Fever. Inflammation of veins, it was there observed, rarely takes place in any part of the body where it cannot be referred to a wound or to some specific cause externally applied to the coats of the vessels. In uterine phlebitis the inflammation cannot, it is true, be traced in all cases to the semilunar shaped orifices in the lining membrane of the uterus which communicate with the sinuses where the placenta had adhered; yet it scarcely admits of a doubt that the frequent occurrence of the disease arises from the orifices of these veins in the lining membrane of the uterus being left open after the separation of the placenta, by which a direct communication is established between the cavities of these veins and the atmospheric air, in a manner somewhat analogous to what takes place in amputation and other extensive wounds.

The veins which return the blood from the uterus and its appendages may be either wholly or in part inflamed; generally, however, the inflammation attacks the spermatic veins alone, and for the most part the one only on that side of the uterus to which the placenta has been attached: and it may confine itself to a small portion of the vessel, or extend throughout its whole course from the uterus to the vena cava. The same is the case with regard to the hypogastric veins, one only being generally affected. These veins are, however, rarely inflamed in comparison with the spermatic; and this would seem to depend on the latter veins being invariably connected with the placenta, to whatever part of the uterus it may happen to be attached.

In eight of the twenty-three cases of puerperal crural phlebitis which have come under the writer's immediate observation, the disease has commenced between the fourth and twelfth days after delivery, and in the remaining fifteen it appeared subsequent to the end of the second week after parturition. In most of the patients there was either an attack of uterine inflammation in the interval between delivery and the commencement of the swelling in the lower extremity, or there were certain symptoms present which are to be regarded as

characteristic of venous inflammation, viz. rigors, headach, prostration of strength, a small rapid pulse, occasional paroxysms like those of ague, nausea, loaded tongue, and thirst.

The sense of pain, at first experienced in the uterine region, has afterwards been chiefly felt along the brim of the pelvis, in the direction of the iliac veins, and has been succeeded by tension and swelling of the part. After an interval of one or more days, the painful tumefaction of the iliac and inguinal regions has extended along the course of the crural vessels, under Poupart's ligament to the upper part of the thigh, and has descended from thence in the direction of the great blood-vessels to the ham. Pressure along the course of the iliac and femoral vessels has never failed to aggravate the pain, and in no other part of the limb has pressure produced much uneasiness. There has generally been a sensible fulness perceptible above Poupart's ligament before any tenderness has been experienced along the course of the femoral vessels; and in every case at the commencement of the attack, we have been able to trace the femoral vein proceeding down the thigh like a hard cord, which rolled under the fingers.

A considerable swelling of the limb, commencing in the thigh and gradually descending to the ham, has generally taken place in the course of two or three days, and in some cases immediately after the pain has been experienced in the groin. In other cases the swelling has been first observed in the ham or calf of the leg, and has spread from these parts upward and downward until the whole extremity has become greatly enlarged. The integuments have then become tense, elastic, hot, and shining, and in most cases where the swelling has taken place rapidly there has been no pitting upon pressure or discoloration of the skin. In several well-marked cases, however, of crural phlebitis, at the invasion of the disease, the impression of the finger has remained in different parts of the limb, more particularly along the tibia; but as the intumescence has increased, the pitting upon pressure has disappeared, until the acute stage of the complaint has passed away. At the onset of the disease we have also observed, in several cases, a diffuse erythematous redness of the integuments along the inner part of the thigh and leg. In one individual only has suppuration of the glands taken place in the vicinity of the femoral vein; but in several, by an extension of the inflammation, the inguinal glands have become indurated and enlarged. In some women the inflammation of the femoral vein has appeared to be suddenly arrested at the part where the trunk of the saphena enters it, and the inflammation has extended along the superficial veins to the leg and foot. The swelling and pain in these instances have been greatest along the inner surface of the thigh, in the course of the saphena veins. In most cases of crural phlebitis, not only the whole lower extremity, but the nates and vulva have been affected with a glossy, hot, colourless, and painful swelling, which has not retained the impression of the finger.

The power of moving or extending the leg has been completely lost after the disease has been fully formed, and the greatest degree of freedom from pain has been experienced by the patients in the horizontal posture, with the limb slightly flexed at the knee and hip joints. The severity of the pain and febrile symptoms has usually diminished in a few days after the occurrence of the swelling; but this has not invariably happened, and we have seen some individuals suffer from excruciating pain for many weeks, or through the whole period of the acute stage of the disease.

The duration of the acute local symptoms has been very various in different cases. In the greater number they have subsided in two or three weeks, and sometimes earlier, and the limb has been then left in a powerless and œdematous state. The swelling of the thigh has first disappeared, and the leg and foot have more slowly resumed their natural form. In one case, after the swelling had subsided several months, large clusters of dilated superficial veins were seen proceeding from the foot along the leg and thigh, to the trunk; and numerous veins as large as a finger were observed over the lower part of the abdominal parietes. In some women the extremity does not return to its natural state for many months or years, or even during life. In the summer of 1831, a lady was placed under our care for an affection of the left lower extremity, who, forty years before, had suffered from an attack of crural phlebitis in the same side. The left leg and thigh had remained larger and weaker than the other during the whole of this long period, and was liable to suffer severely from fatigue, and slight changes in the atmosphere. This lady was attended in her confinement by a celebrated London accoucheur, who was so strongly impressed with a belief of the truth of the doctrine of Puzos respecting milky deposits in crural phlebitis, that he ordered the infant to be kept night and day at the breasts, lest the milk should make its way into the thigh.

In four cases of this affection, after the acute symptoms had begun to subside, the same appearances were observed in the iliac and femoral veins of the opposite extremity, and the other thigh, the leg, and the foot became similarly affected. In two individuals only has the disease attacked the same extremity twice. In one woman an interval of twelve years elapsed between the first and second attack.

Dr. Hull has given the following description of the disease.* "It has in many instances attacked women who were recovering from puerperal fever, and in some cases has supervened, or succeeded to thoracic inflammation. It not uncommonly begins with coldness and rigors. These are succeeded by heat, thirst,

* On Phlegmasia Dolens, p. 133. Manchester, 1800.

and other symptoms of pyrexia; and then pain, stiffness, and other symptoms of topical inflammation supervene. Sometimes the local affection is from the first accompanied with, but is not preceded by febrile symptoms. Upon other occasions the topical affection is neither preceded by puerperal fever nor rigors, &c.; but soon after it has taken place, the pulse becomes more frequent, the heat of the body is increased, and the patient is affected with thirst, headach, &c. The pyrexia is very various in degree in different patients, and sometimes assumes an irregular remittent or intermittent type.

"The complaint generally takes place on one side only at first, and the part where it commences is various; but it most commonly begins in the lumbar, hypogastric, or inguinal region, on one side, or in the hip or top of the thigh, and corresponding labium pudendi. In this case the patient first perceives a sense of pain, weight, and stiffness in some of the above-mentioned parts, which are increased by every attempt to move the pelvis or lower limb. If the part be carefully examined, it generally is found rather fuller or hotter than natural, and tender to the touch, but not discoloured. The pain increases, always becomes very severe, and in some cases is of the most excruciating kind. It extends along the thigh, and when it has subsisted for some time, longer or shorter in different patients, the top of the thigh and the labium pudendi become greatly swelled, and the pain is then sometimes alleviated and accompanied with a greater sense of distention. The pain next extends down to the knee, and is generally the most severe on the inside and back of the thigh, in the direction of the internal cutaneous and crural nerves; when it has continued for some time, the whole of the thigh becomes swelled, and the pain is somewhat relieved; the pain then extends down the leg to the foot, and is commonly most severe in the direction of the posterior tibial nerve; after some time the parts last attacked begin to swell, and the pain abates in violence, but is still very considerable, especially on any attempt to move the limb. The extremity, being now swelled throughout its whole extent, appears perfectly or nearly uniform, and it is not perceptibly lessened by an horizontal position, like an œdematous limb. It is of the natural colour, or even whiter; is hotter than natural; excessively tense and exquisitely tender when touched; when pressed by the finger in different parts, it is found to be elastic, little if any impression remaining, and that only for a very short time."

After describing the manner in which the constitutional and local symptoms subside, Dr. Hull further observes, that "hitherto the disease has been described as affecting only one of the inferior extremities, and as terminating by resolution or the effusion of a fluid that is removed by the absorbents; but unfortunately it sometimes happens that after it abates in one limb, the other is attacked in a similar way. It also happens in some cases that the swelling is not terminated by resolution. For sometimes a suppuration takes place in one or both legs, and ulcers are formed which are difficult to heal. In a few cases a gangrene has supervened. In some instances the patient has been destroyed by the violence of the disease before either suppuration or gangrene has happened."

2. *Crural phlebitis in women who are not in the puerperal state.*—The cases which have been related in the work already referred to, prove that inflammation of the iliac and femoral veins is a disease not peculiar to women who have recently been delivered, but that it may also arise from suppressed menstruation, malignant ulceration of the os and cervix uteri, and other organic diseases of the uterine organs.

In a lady aged thirty-one, whose case has been recorded by Tommasini, the catamenia were suddenly suppressed from immersion of the body in cold water. Headach, fever, and swelling of one of the limbs took place, and in three months she was attacked with great anxiety, prostration of strength and spirits, and other signs of a severe disease. The pulse was frequent and irregular, and there was great anxiety in respiration; the blood drawn was buffy. Phlebitis of the inferior extremity manifested itself. The pulse became intermittent, the veins of the limb painful and turgid, and the skin covered with spots of a dark colour. The sense of oppression increased, and death took place about four months after the commencement of her illness. On dissection, the lungs were found inflamed. In the limb affected, the coats of the saphena, sural, popliteal, crural, and iliac veins were thickened, injected, and filled with coagula of blood, which in some parts of the crural veins appeared to be changed into a fleshy substance. The coats of the iliac above the crural arch, to the bifurcation of the vena cava, were much thicker than the other veins, and more injected, without any manifest collection of purulent matter. The arterial system was healthy; the condition of the internal iliac and uterine veins has not been described, although there can be little doubt the effusion originated in the uterus.*

In four cases which have come under our observation, inflammation of the iliac and femoral veins, giving rise to all the phenomena of phlegmasia dolens, has followed the sudden suppression of the catamenia from exposure to cold.

In the first there was great tenderness of the hypogastrium and left thigh, a rapid feeble pulse, delirium, brown tongue, vomiting, exquisite pain in several of the joints both of the upper and lower extremities, and abscesses formed in different parts of the body.

In the second case, which occurred in a young lady, the whole left inferior extremity was swollen, hot, and painful, but not discoloured. The femoral vein was felt under Poupart's ligament like a large hard cord, and pressure over it and along the course of the iliac veins of the same side produced great

* *Tommasini*, Saggio di Pratiche Considerazioni fatte nella Clinica Medica di Bologna, p. 317.

suffering. The affection presented the same characters as in puerperal crural phlebitis, and could be distinctly referred to the sudden suppression of the catamenia.

In another case, referable to exposure to cold, the disease occurred in both lower extremities.

In the article (Edema it is observed that in women suffering from amenorrhœa, œdema is one of the most common attendants. In these cases there is considerable tenderness in the course of the femoral veins, the most common site of this tenderness being just before the vein pierces the tendon of the triceps to pass into the ham, and probably depends on some inflammation of the vessel. (See (Edema.)

From cases which we have likewise related, it appears that uterine phlebitis sometimes follows abortion, and that it has taken place and proved fatal after the removal of a polypus of the uterus by ligature. Tenderness in the course of the venous trunks of the lower extremities, and œdema of the limbs, have also in several cases been traced to some external injury inflicted on the uterus.

The first case of crural phlebitis from malignant ulceration of the os uteri came under our notice nearly four years ago, and for several weeks before death the patient experienced great tenderness in the course of the left femoral vein, with a tense swollen state of the limb. On opening the abdomen, the peritoneum covering the intestines and liver was found to be inflamed, with an effusion of purulent fluid into the abdominal cavity. The os, cervix, and a great part of the body of the uterus, had been destroyed by phagedenic ulceration, and extensive openings had formed in the bladder and rectum. On the left side, between the remaining portion of the uterus and the pelvis, to the brim of which it firmly adhered, was a spongy cancerous mass, enclosing within it the branches and trunk of the hypogastric vein and artery, and a considerable portion of the common and external iliac veins. When cut into it presented a spongy texture, and a thick whitish purulent fluid escaped as if from numerous cells, but which were subsequently ascertained to be cavities of veins. A portion of the common and external iliac veins was lost in removing the parts from the body. What remained of the common iliac was reduced to a slender tube, which was partially coated on the inner surface with an adventitious membrane of a black colour.

The commencement of the external iliac was also contracted so as to be impervious, and lined with a dark-coloured false membrane. The common superficial and deep femoral veins were all plugged up with firm red coagula, the coats thickened, and the inner surface lined with adherent false membranes.

The cellular texture of the limb was loaded with serum; but in other respects it was healthy, as were the other tissues.

From these and similar cases which have since occurred to the writer, to Mr. Lawrence,* and to Dr. Blundell, it appears not only that inflammation of the veins of the uterus may be produced by malignant ulceration of the os and cervix uteri, but that this inflammation may extend along the internal to the common, external iliac, and femoral veins, and thus give rise to all the phenomena of crural phlebitis, as observed in puerperal women.

3. *Phlegmasia dolens in men.*—It has recently been ascertained that this disease, in the male sex, may commence either in the hemorrhoidal, vesical, or in some of the other branches of the internal iliac veins, in consequence of inflammation or organic changes of structure in one or more of the pelvic viscera. Crural phlebitis in men arises much more frequently, however, from inflammation being excited in the superficial veins of the leg, extending upward and involving the great venous trunks of the thigh and pelvis. External injuries, exposure to cold and moisture, and ulcers, are the most frequent causes of inflammation of the saphena veins. Amputation may also excite crural phlebitis, both in the veins of the same side and in those of the opposite extremity. Tumours, by pressing upon the vena cava and iliac veins, may also give rise to the disease.

The following observations will illustrate, though in a less perfect manner than might be desirable, this interesting part of the pathology of veins.

Mr. Lawrence examined the body of a man who died in St. Bartholomew's Hospital of cancer of the rectum, and he found the iliac veins inflamed and obstructed. The affection not having extended into the veins below Poupart's ligament, none of the usual symptoms of crural phlebitis manifested themselves.

In two cases of crural phlebitis, related by Mr. Holberton, the patients died of phthisis, with diarrhœa and ulcerations of the bowels. In the first case the examination was imperfect, but in the second the writer traced the left hemorrhoidal veins close to the spots of ulceration in the mucous membrane of the rectum, and the coats of these vessels were unusually thickened, and exhibited other marks of previous inflammation.*

The patient whose case has been recorded by Dr. Forbes, likewise died of phthisis and suffered from diarrhœa. The internal iliac vein was not traced to the rectum, but Dr. Forbes has recently stated to us his belief that the mucous membrane of the lower intestines was ulcerated.†

Dr. Cheyne observes in his Report of the Whitworth Hospital, which contains an account of dysentery, that "it is worthy of remark that a swelling occurred in several of the patients, both males and females, resembling the phlegmasia dolens in all respects but in its connexion with parturition."

Dr. Tweedie has related cases of fever which were followed by painful swellings of the lower extremities, which also in all essential circumstances resembled phlegmasia dolens; but as

* Med. Chir. Transact. vol. xvi. p. 59. 1830.

* Med.-Chir. Transact. vol. xvi. part i. p. 70.

† Ibid. vol. viii. p. 293.

these patients recovered, the condition of the veins or the intestines was not ascertained.*

Drs. Graves and Stokes have subsequently related cases of painful swellings of the lower extremities after fever, which presented all the usual symptoms of phlegmasia dolens, and were considered by them to be identically the same diseases. In both, they remark, œdema occurred unattended by redness, but accompanied by increase of heat with great tenderness and pain, and followed for a considerable time by impaired motion of the limb. In both diseases the swelling and the other symptoms are frequently not confined to any one portion of the extremity, but extend uniformly over the leg and thigh. In both diseases, however, we have also often observed that the pain, heat, and swelling occupied particular parts of the limb, while the rest was comparatively free from disease. Thus, in some cases a portion of the thigh was extensively engaged while the leg and foot remained in the natural state, and after some days the diseased action seemed to change its place, and successively attacked the other portions of the limb, without, however, any precise order in the mode of succession.†

In the spring of 1833 a case of chronic dysentery came under the observation of Dr. Macann, in which phlegmasia dolens took place a short time before death. On dissection, the common, external iliac, and femoral veins of the left side were found to be completely obstructed, and their coats extensively disorganized by inflammation. The writer is indebted to his friend Dr. Forbes for this valuable specimen of inflamed veins, which was presented to Dr. Forbes by Dr. Macann, previous to his departure for the West Indies. In the short notice of the case it is stated that both lower extremities were swollen. It has not been ascertained whether the condition of the lining membrane of the rectum was examined by Dr. Macann, or if he attempted to trace the hemorrhoidal veins to their commencement.

In Dr. Cheyne's cases of dysentery it is highly probable the disease commenced in the hemorrhoidal veins, and from the frequent occurrence of inflammation and ulceration of the intestines in continued fever, we are disposed to think the affection had the same origin in the cases of Drs. Tweedie, Graves, Stokes, and Macann.

A man, whose case is recorded by Cruveilhier, had a sound introduced into the bladder for retention of urine, occasioned by a swelling of the prostate. Pain was experienced soon after in one of the lower extremities, and the veins became painful and distended like hard cords. The patient died, and all the different degrees of phlebitis were observed in the veins of the limb. There can be little doubt, M. Cruveilhier observes, that inflammation of the prostatic or vesical veins had been induced by the introduction of the instrument in this case, but the examination not having been conducted with a view to ascertain this point, it was not positively determined.

More frequently, both in the male and female sex, the inflammation does not commence within the pelvis, but originates in the superficial veins of the limb, and gradually extends upwards to the large deep venous trunks.

Mr. C. Hutchison has related the history of an interesting case of phlegmasia dolens in a gentleman who received a blow on his right shin, immediately over a branch of the saphena vein, by a small piece of timber accidentally falling upon it. The accident was followed by considerable swelling and inflammation all over the limb; pain was felt in the direction of the upper third of the saphena before it actually dips to unite with the femoral vein. The whole leg and thigh soon became enlarged and inflamed, and many months after the acute symptoms had subsided, when we examined the limb with Mr. Hutchison, Sir Gilbert Blane, and Dr. Gairdiner, there could be no doubt that the saphena and femoral veins had become completely impervious from inflammation.*

Sir A. Cooper performed an operation for varix of the saphena vein, which was followed by inflammation of the coats of the vessel and all the symptoms of phlegmasia dolens.

The following fatal case of crural phlebitis induced by exposure of the limb to cold and moisture, has been recorded by Drs. Graves and Stokes. A young man, of a strong habit, was employed for two successive days in working in a ditch, and was consequently obliged to stand in water above his knees during that time. On the following day he became affected with lassitude, vertigo, and general weakness, and complained of severe pain in the right thigh. These symptoms continued for seven days, when he was admitted into the Meath Hospital. His countenance was anxious and depressed, the tongue furred; thirst, headach, urine scanty, turbid, and high-coloured; pulse ninety-six, skin mottled with petechiæ. In addition to these general symptoms, the respiration was laboured and unequal, with some cough; face very livid. But his chief complaint was a severe pain in the upper and anterior part of the right thigh, which was greatly aggravated by motion or pressure. He had also severe pain in the left hypochondrium.

At this time no swelling of the limb whatever could be detected; but in the course of two days the upper portion of the thigh became evidently swollen, the part being extremely tender, but not at all red. The pain of the side continued, and extensive bronchial and pneumonic inflammation was detected. General bleeding and very free leeching to the limb was employed. The blood was not inflammatory, and no relief was experienced by the patient. The swelling of the thigh increased; calomel and opium were freely exhibited, but without any effect. The typhoid symptoms increased, and the patient died on the fourth day after his admission.

* Edin. Med. and Surg. Journal, vol. xxx.
† Dublin Hospital Reports, vol. v. p. 29.

* Med. and Chir. Transactions, vol. xv. 1829.

On dissection, the right lower extremity was found to be tense and swollen in its superior portion, while the leg and foot were slightly anasarcous. The sac of the pericardium contained some sero-purulent fluid; and that portion covering the auricles and great vessels was vascular, and in many cases covered with coagulable lymph. Both lungs were in a state of extreme sanguineous congestion, with commencing solidity in their posterior inferior portion, and general inflammation of the pleura. The bronchial mucous membrane was universally red, and the tubes filled with frothy mucus.

The vena cava contained a few portions of a substance of a granular appearance, friable, and of a yellowish colour. This did not adhere to the vessel, which otherwise appeared healthy. In the external iliac vein, however, just above Poupart's ligament, there was a large concretion of a similar nature nearly plugging up the vessel, and extending into some of the minute collateral branches. The lining membrane was red, and in one point adhered to the coagulum. No puriform matter could be detected. The femoral and popliteal arteries were healthy. The cellular tissue of the limb was œdematous. The condition of the saphena vein where it enters the femoral is not described, although the inflammation most probably originated in the superficial vessel.

On the 2d of February 1832, the body of an aged man was brought into the dissecting-room of Webb-street school. The whole left inferior extremity was much swollen, and a chronic ulcer was observed over the tibia. The coats of the saphena vein along the leg and thigh were found, on examination, to be much thickened, and plugged up with coagula of blood and lymph. The left common and external iliac and femoral vein to the ham were all completely obstructed with coagula of blood and lymph, and lined with adventitious membrane. The lower part of the vena cava, to the extent of three inches, was filled with a soft yellowish coagulum of lymph, which adhered to the inner coat of the vein. The coats of the principal arteries of the left lower extremity were ossified.

In April 1832 Sir Henry Halford read an account at the College of Physicians of crural phlebitis as observed in the late Earl of Liverpool. The attack commenced many years before; and it is highly probable, from a circumstance stated to us by Sir A. Cooper, that it was induced by exposure to a current of cold air, which passed through an open window and fell upon the lower extremities when but thinly clothed, his lordship being at a crowded levee. The left groin, thigh, and leg were affected; and in the acute stage of the complaint, leeches and the usual antiphlogistic remedies had been employed by Dr. Pemberton and Sir A. Cooper. Lord Liverpool subsequently died from an affection of the brain; and on examining the body, the left iliac, femoral, and saphena veins were found to have undergone changes of structure similar to those which have previously been described as occurring in puerperal crural phlebitis. Sir Henry Halford related two other cases of crural phlebitis in men. They were similar to the case of the Earl of Liverpool, and were succeeded by marked tendency to head affection. In none of the cases of crural phlebitis which have fallen under our observation, has any remarkable slowness of pulse or tendency to disease of the brain been observed. Even where the vena cava and both iliac and femoral veins have become completely impervious, the blood has been returned to the heart without difficulty, and no affection of the brain has taken place.

In a patient of the British Lying-in Hospital, who had suffered much from varicose veins in the latter months of gestation, inflammation of the saphena veins of both lower extremities came on two days after delivery with most severe constitutional symptoms. From the left knee to the ankle on its inner surface, the integuments were hot, and swollen, and tense, and in several places large patches of a dark red colour were observed over the superficial veins, which being laid open in two places, a considerable quantity of purulent fluid was discharged. Where the swelling and tension were least, the superficial veins could be felt distended like hard cords; as could also the saphena through its whole course upward from the ham to its junction with the femoral vein. In the course of this vein there was considerable swelling; and the integuments in this situation, as far as the middle of the thigh, were hot and of a dark red colour.

The symptoms which characterise venous inflammation in its most severe forms took place, and she sank on the fourteenth day after delivery. Dr. Sims assisted us in inspecting the body, when the following morbid appearances were observed. The left lower extremity was very much enlarged. The cellular and adipose membranes from Poupart's ligament, along the inner surface of the thigh and leg to the ankle, were indurated, vascular, and infiltrated with a red-coloured serous fluid. Several abscesses were observed in the cellular membrane immediately beneath the skin in the calf of the leg, and an extensive collection of pus had formed in the interstices of the gastrocnemii muscles. The branches of the saphena in this situation were converted into solid impervious cords; and the coats of this vein, from the knee to its junction with the femoral, were thickened and contracted, and in the lower part the cavity was nearly obliterated. The saphena vein was lined with an adventitious membrane of considerable thickness, which was easily separated from the inner coat. Its opening into the femoral vein, though reduced in size, was pervious; and the coats of the deep femoral vein, from this point to the ham, were thickened and contracted. The inner membrane was rugous, and of a deep red colour; but no deposit of lymph was observable, and its canal was pervious. The femoral vein above the termination of the saphena, and the whole of the external iliac,

were thickened and slightly contracted in their dimensions, and lined with a thin coating of lymph. These vessels were pervious, and the common and internal iliac exhibited no sign of disease. The intestines were inflamed; and on the ascending colon there was a small part in the state of sphacelus.*

We have related other cases of inflammation of the saphena veins of less severity, occurring in puerperal women, where the swelling, heat, and tension were confined to the course of these vessels; and it is now clearly ascertained that the whole limb does not become affected when the iliac and femoral veins have remained pervious. The preceding and other cases likewise prove that the inflammation in crural phlebitis, when violent, is not limited to the coats of the veins, but may extend to the cellular membrane, glands, muscles, and other contiguous tissues.

In July 1830 the author was indebted to the kindness of Dr Ashburner for the opportunity of observing the progress of an interesting case of crural phlebitis in a female about the middle period of life, who had not been pregnant for several years. A small ulcer above the left internal malleolus gave rise to inflammation of the saphena and femoral, and probably of the iliac veins, and the whole limb became affected with a hot, shining intumescence.

Sir Charles Bell has informed us that he has observed upwards of twenty cases of painful swellings of the superior extremities in women afflicted with cancer of the mammæ. He has been accustomed to refer these swellings to obstruction of the lymphatics, or to compression of the veins by the induration and enlargement of the glands of the axilla. No opportunity has yet occurred to determine by dissection whether or not the painful swelling of the arms is to be attributed in such cases to inflammation and obstruction of the veins; but this has been rendered probable by the facts already related respecting the effects produced on the iliac veins by malignant ulcerations of the uterus. It is rendered still more probable by the following observation of Laennec: "that it is not uncommon to find the veins in the neighbourhood of a cancerous breast filled with pus, either pure or mixed with blood; sometimes fluid, at other times more or less inspissated, and occasionally of the degree of consistence of an atheromatous tumour."†

Treatment.—Puzos recommended repeated and copious venesection for the treatment of phlegmasia dolens; but in all the cases which we have witnessed, there has been so much feebleness of pulse and prostration of strength that we have not ventured to draw blood from the arm. There are cases, however, occasionally met with where the symptoms are immediately relieved by a general bleeding. An example of severe crural phlebitis after delivery recently occurred in the practice of Dr. Duffin, where the abstraction of twenty ounces of blood seemed at once to break the force of the attack. In a great proportion of cases venesection is not required, and we are to trust for the relief of the inflammation to the repeated application of leeches above and below Poupart's ligament, in the course of the crural veins. From two to three dozen of leeches should be applied immediately after the commencement of the disease, and the bleeding should be encouraged by warm fomentations, or by a bread and water poultice to the part. Should the relief of the local pain not be complete, it is requisite soon to re-apply the leeches in numbers proportioned to the severity of the attack, and to repeat them a third or even fourth time at no very distant intervals, should the disease not yield.

Some patients experience greatest relief from the use of warm cataplasms to the limb; others derive most advantage from the application of cold, or of a tepid evaporating lotion.

The bowels are often much disordered in this disease; but the employment of strong acrid cathartics is always injurious. Repeated small doses of calomel and antimonial powder should be given with some mild purgative, not only with the view of correcting the disordered state of the bowels, but to subdue the local inflammation and the great constitutional disturbance usually present. It is of importance, also, to administer saline and diaphoretic medicines, and to procure rest and relief from pain by anodynes, until the acute symptoms pass away: the diet should be the same as that usually allowed to patients who are labouring under inflammatory and febrile diseases. We have seen no advantage derived from the use of digitalis in any stage either of uterine or crural phlebitis. Dr. Sims has informed us that the painful swelling and tension of the limb, in a case of phlegmasia dolens, were strikingly relieved by puncturing the skin in different parts with a fine needle.

When the acute inflammatory symptoms have passed away, the limb remains in a weak œdematous state, and great uneasiness is often experienced from congestion of blood in the veins. Until the collateral branches, which are to carry back the blood to the heart, become enlarged, it is impossible by any means we possess to afford complete relief. Much benefit may, however, be derived in this stage of the complaint from the occasional application of a few leeches to different parts of the limb, and by preserving it in the horizontal position. We have seen mischief produced by having recourse too early to remedies intended to promote the absorption of the fluid effused into the cellular membrane. Blisters, frictions, stimulant embrocations, and bandages to the limb, are only useful when the inflammation of the veins has wholly subsided, and other vessels have become so much enlarged as to carry on the circulation of the blood in the extremity without interruption.

We have not perceived any sensible benefit accrue from the use of mercurial ointment and iodine in crural phlebitis, and we consider the local abstraction of blood at the commencement

* Medical and Chirurgical Transactions, vol. xv.
† *Translation*, 2d. edit. p. 652.

of the attack to constitute by far the most important part of the treatment.

(Robert Lee.)

PHRENITIS. See Brain, inflammation of the.

PHTHISIS PULMONALIS. See Tubercular Phthisis.

PHYSICAL DIAGNOSIS.—See Symptomatology.

PITYRIASIS, from *πίτυρον*, *bran*, denotes a cutaneous affection in which irregular patches of the cuticle, varying much in size, appear covered with thin branny or minute powdery scales, which fall off and are soon succeeded by others. This disease is not contagious, and is seldom productive of inconvenience to the patient; it never terminates in crusts or excoriations, but, if neglected, it may alter its character and degenerate into porrigo. During health, the cuticle over the whole body is constantly undergoing changes, peeling off in minute fragments, while a new and sound surface is formed below. Of this we have sufficient proof in the scales which are daily detached from the scalp by the hair-brush, and those which are always seen on drawing a black silk stocking off the leg. Now when this process of exfoliation is greatly increased on particular spots and patches of the skin, it constitutes the most simple form of pityriasis. There are several varieties of this affection.

1. *Pityriasis capitis.* (Dandriff of the head. Dartre furfuracée volante, *Alibert.)* This eruption is seen on the scalp and eyebrows of infants and sometimes of old men; on the temples and forehead it has a white mealy appearance; but on the occiput it consists of distinct flat scales, semi-transparent, and of a light brownish colour. In children it is occasionally connected with imperfect nutrition, but most frequently originates from a mere want of cleanliness. In adults and the aged, dandriff of the head accompanies the falling off of the hair, which so often takes place during convalescence and under chronic disease. This form of eruption sometimes occurs also on the chin and other parts of the face, when they exhibit patches of a rough and mealy appearance; it is occasionally the result of indigestion, but more frequently of some local irritation, as acrid soap or a rough-edged razor.

Treatment.—This eruption, when on the scalp, in general yields readily to removal of the hair, washing of the affected parts with soap and water morning and evening, and anointing them afterwards with some mild cerate. All causes of local irritation must be removed, the general health attended to, and a plentiful supply of wholesome nourishment afforded, should that appear to have been deficient.

The other forms of pityriasis are more remarkable for the discoloration of the skin which attends them than for the mealy or branny desquamation of the cuticle; and hence, although Willan, Bateman, and other English writers have considered them as species of pityriasis, Alibert,* Rayer,† and Biett‡ arrange them among the *ephelides*, or *tan-spots*. We prefer adhering to the arrangement of our countrymen, because we have always observed some exfoliation of the cuticle in these forms of pityriasis, at least during the height of their course; and because they differ from true ephelis in appearing especially on those parts of the body which are not exposed to the sun's rays. Three varieties have been distinguished by the names of *versicolor*, *rubra*, and *nigra*.

2. *Pityriasis versicolor.* (Chequered dandriff. Ephelides hepatiques; chloasma pseudo-porrigo; maculæ hepaticæ; leberflechte.) This is characterized by yellowish or light brown spots, and sometimes large patches of the most irregular outline, branching into the healthy coloured surface, or enclosing portions of it; not in the least elevated, and usually covered thinly by fine powdery scales. The colour varies in intensity according to the greater or less vascular turgescence of the skin, and when this is much excited, verges into the reddish tint of the succeeding variety. The most frequent seats of this eruption are the front of the chest and upper part of the belly; it appears also on the neck and back, and sometimes on the shoulders and arms. It is seldom productive of any discomfort, except under particular circumstances of excitement, when it is accompanied by itchiness of the skin on the patient becoming warm in bed; and should the stomach be disordered, this occasionally proves very troublesome. But the great source of uneasiness is more commonly in the mind, from the fears of the patient, who sees in this affection what he imagines to be the copper-coloured blotches of a confirmed venereal infection. Many times have we been consulted by persons affected with the light brown and red varieties of pityriasis under this impression, and not a few of them had been subjected to prolonged courses of mercury and sarsaparilla,—we need not add without benefit. The difference between pityriasis and syphilitic eruptions is abundantly well marked, the latter being of a darker and more coppery hue, distinctly elevated above the surface, and leading ultimately to the formation of crusts and ulcerations—appearances which are not observed in any form of pityriasis.

A diversity of opinion exists respecting the anatomical seat of pityriasis versicolor; Dr. Willan§ states that the rete mucosum or cutis is always affected in this disease, the brown stain being still perceptible after the cuticle has been removed; while Dr. Bateman,‖ on the other hand, asserts that in some cases he has seen the discoloured cuticle peel off at intervals in a thickened state, leaving a new cuticle underneath of a red hue. But to this latter statement it may be fairly replied, that when the cuticle becomes thickened and thus

* Maladies de la Peau.
† Maladies de la Peau.
‡ Abrégé Pratique des Maladies de la Peau.
§ On Cutaneous Diseases, vol. i. p. 194.
‖ Synopsis, p. 47.

peels off, the disease has lost the genuine characters of pityriasis versicolor. With a view to decide the question, we applied a blister to a portion of skin affected with this disease. After the cuticle was wholly removed, the mottling still remained; but the patches, instead of being tawny, were now changed to a deeper red than the rest of the excoriated surface; thus proving to our satisfaction that the anatomical seat of pityriasis versicolor lies beneath the cuticle.

It is rarely in our power to trace the occurrence of this cutaneous affection to any satisfactory cause; we have sometimes seen it connected with a feeble digestion and indifferent health; but on other occasions nothing of this kind could be observed. An opinion held by some, that it is dependent on disease of the liver, probably originating in the name *maculæ hepaticæ*, is certainly quite groundless. Bateman has observed this eruption in a severe form to follow the free use of spirits while fasting, and exposed in an open boat; and Dr. Willan speaks of various sources of irritation of the stomach and skin as possible causes of this disease, such as acid fruits, mushrooms, sudden alternations of temperature, violent exercise with flannel next the skin; but the whole of these are more likely to give rise to urticaria than to pityriasis.

Treatment.—It must be acknowledged that we have not much power over this disease by internal remedies; and after the patient has been satisfied as to its innocence and the absence of all syphilitic taint, he often ceases to think of it, and allows time, if it will, to work a cure. Should the disease seem to have originated from any irritation either of the cutaneous surface or of the alimentary cavities, its cause must, if possible, be removed without delay: when the digestion is impaired, light tonics are to be used, as infusion of calumba with sulphuric acid, or small doses of sulphate of quinia; the bowels are to be regulated, and a milk and nourishing diet enjoined, with abstinence from spirituous liquors, and a very guarded use of wine and ale, if any be allowed. When itching exists, a spirit lotion with borax or alum, or acetate of lead or zinc, will be found useful; or, what rarely fails to give relief, a lotion with hydrocyanic acid. The vapour-bath at a moderate temperature will serve to equalise the cutaneous circulation, and soften the branny spots. In our hands nothing has proved so effectual in restoring the natural colour and functions of the parts as a lotion of chloride of lime or soda, varying in strength according to circumstances. The success which has attended this application has exceeded our expectations; but whether its effects are to be regarded as the result merely of a stimulus, or of its bleaching property, admits of question.

3. *Pityriasis rubra* (red dandriff). This differs from the preceding species chiefly in the redness of its colour, and the greater excitement of the surface which attends it. It is more uniformly accompanied by heat, itching, and general languor and restlessness, and may be considered as remotely allied to psoriasis diffusa, although altogether free from elevation above the surface, and vastly more mild in all its symptoms. On its decline, it leaves sallow faded stains marking the parts which were affected. The anatomical seat of pityriasis rubra is certainly deeper than the cuticle; its red colour evidently depending on the injected state of the vascular tissue lying beneath.

Treatment.—We have never in any case of red dandriff found the irritation such as to require the abstraction of blood; but in every instance the bowels should be opened by mild purgatives, and those which correct acidity. A soothing or slightly astringent lotion, such as those already described, ought to be applied to the affected parts, and any cause of cutaneous irritation immediately removed.

Dr. Bateman has recommended a diaphoretic plan of treatment,—antimonials, with decoction of the woods, and the warm sea-water-bath; and he adds that he has found benefit from small doses of the *tinct. veratri.*

3. *Pityriasis nigra* (black dandriff; ephelide scorbutique). This is an exceedingly rare disease; so much so that Dr. Willan had not seen it at the time of his publication, and Dr. Bateman does not appear to have ever met with it. Alibert has described it under the name quoted above, and figured it as it affects the hands (plate 27 bis). The cases seen by Dr. Willan occurred in children born in India, and brought to this country. The disease commenced in a partially papulated state of the skin, and terminated in a black discoloration, with slight furfuraceous exfoliations: it sometimes affected half a limb, sometimes the fingers and toes.* In allusion to the foreign origin of this species of pityriasis, we may mention a curious dusky mottling of the skin, which is seen in the children of mulatto women by European fathers, when they approach, as they sometimes do, to the fair complexion of the European. It seems as if patches of the dark hue of the mother shone through the pure skin of the father; and it is chiefly perceptible when they are heated with exercise, or the skin otherwise increased in vascularity.

Some years ago we had the good fortune to see a case of pityriasis nigra. The patient was an unmarried female, aged forty-five, a native of Scotland, her parents Scotch; and she had never travelled to any distance beyond the precincts of her native city. The skin of her arms, legs, bosom, and neck, but especially the last, was of a dark tint like that of a mulatto, but varying in different parts in depth of hue; and scattered over the dusky surface were many white spots, from which crusts appeared to have separated; and on other parts some crusts appeared still adhering. Both the white spots and the mulatto-coloured surface were slightly sealy. With this disease was combined an eruption of scabies affecting severely the hands, from the itching of which she suffered great an-

* *Bateman*, Synopsis, p. 49.

noyance. The disease had existed for some months; and at the time when it commenced she was reduced to a state of great misery and destitution. By the employment of sulphur frictions, the warm bath, and a plentiful supply of nourishing food, the natural colour of the skin was nearly restored after the lapse of some weeks; but we are ignorant whether a complete cure was in the end effected. This case confirms the remark of Dr. Bateman, that the disease is the result of misery and filth, but not his opinion that both the disease and its cause are wholly unknown in this country.*

Treatment.—Our first object in pityriasis nigra is to clear out the bowels by mild purgatives, and thoroughly purify the surface of the body with soap and water. A course of tonic aperients, with the regular use of the warm water or vapour bath, should then be prescribed, while the patient is put upon a moderate allowance of nourishing food. As his appetite and strength improve, the quantity of food is to be increased, and the warm-bath exchanged for sulphur fumigations; or if the disease prove obstinate, recourse ought to be had to the cautious employment of the arsenical liquor, and the external use of the chloride of lime or soda, as in pityriasis versicolor.

(W. Cumin.)

PLAGUE, from πληγὴ, Gr. *plaga*, Lat. *a blow* or *wound;* th. πλήσσω, *to strike*.—This is the name of a well-known and extremely fatal disease, which is endemic in Egypt and certain other countries bordering on the Levant, and has made frequent and destructive irruptions into Europe. The malady thus designated is called *pestis* and *pestilentia* by the Latin writers, λοιμὸς by the Greeks, *la peste* by the French, *pestilenza* by the Italians, and *pest* by the Germans, which last name is not unfrequently bestowed upon it by ourselves. It is a curious fact that these words have each in their respective languages a signification distinct from the primary one, and expressive of various kinds of moral and physical evil, the malignancy of the disease in all situations being thus evinced by its suggesting the same analogy to people differing widely in physical constitution and mental habitudes.

The words plague, pest, and pestilential, and their corresponding terms in different tongues, have frequently, even when applied to diseases, a sense considerably vague. The disease we are about to treat of has always been comprised in these terms, but other maladies have been similarly designated, with which, probably, it had no quality in common excepting that of being extremely diffusible and fatal; and hence by *morbi pestilentiales* we are not always to understand a form of plague in a strict sense of the word. This want of precision of language is very conspicuous in Hippocrates and his commentator Galen,† whose idea of a pestilential disease appears to have corresponded very nearly with that which we express by the term epidemic; and a similar want of accuracy is perceptible in the writings of the Arabians, from whom we might for obvious reasons have expected the greatest precision.

The subject was so much obscured by the vague application of terms, that even at so late a period as 1775 the Faculty of Medicine of Paris proposed the following queries as the subject of a prize essay: "*If plague be a distinct disease*, what is its character? and what are the means of treating and preventing it?" —queries which were thought to have been successfully solved by M. Paris of Arles. We need scarcely observe, what is now universally admitted, that the characters of plague are as distinctive as those of small-pox, measles, scarlatina, or any other disorder.

This disease is endemic in Egypt, and very often exists in adjacent territories; but the former country is unquestionably the great source whence it extends its ravages into surrounding districts; and a very learned and ingenious writer is of opinion that there only is it ever engendered, and that in other regions it is always an alien.* In Egypt it is said to arise every autumn, and to prevail till the beginning of June of the succeeding year: its ravages then cease, and its contagion is extinguished or remains in abeyance during summer, to be again called into existence or activity in the autumn. The vernal equinox is the period of the greatest fatality of the disease. About this time, we learn, southerly winds blow with great violence. They last ordinarily three or four hours, and are frequently renewed daily for fifty successive days. They are very warm, passing over the burning deserts which border Egypt on the south, and they are, moreover, loaded with putrid emanations exhaled from the animal and vegetable substances which are decomposed in the lakes formed by the retiring of the waters of the Nile, or in the cemeteries which its inundation has reached. At this sickly season, diseases of all kinds assume a malignant character: it was at this season, that after the great inundation of 1801, the plague committed the greatest ravages among the inhabitants of Cairo and Upper Egypt. In June the wind blows from the north, and being cooled in traversing the Mediterranean, renders that season the most refreshing and salubrious of the year, during which no sickness manifests itself.†

It was to be expected that a disease eminently contagious should be occasionally diffused through countries having incessant intercourse with the land of its origin; and we find it repeatedly visiting the people paying allegiance more or less direct to the Ottoman Porte, and not unfrequently ravaging Constantinople. Formerly it penetrated into more northern climes. Previously to the year 1665

* Synopsis, p. 49, note.

† Galeni Commentar. in lib. i. Epidemic, in lib. iii. cap. xx.; et in Aphor. lib. iv. &c.

* *Foderé*, Dictionnaire des Sciences Médicales, v. 41. p. 87.

† *Baron Larrey*, Description d'Egypte, ou Recueil d'Observations et de Recherches, &c. publié par ordre du Gouvernement, Paris, 1821.

it usually invaded England, as Sydenham informs us, at intervals of from thirty to forty years; but since the cessation of the celebrated epidemic of that year, which destroyed eight thousand inhabitants of London in the course of one week, though two-thirds of the population had previously fled from the city, it has not been seen in Britain. In other European countries it has much more recently manifested itself. Marseilles, which had previously suffered twenty severe visitations in the course of seventeen centuries, was ravaged by it in 1720; Moscow suffered a severe infliction in 1771 and 1772; and within the present century it prevailed at Noja in the Neapolitan dominions, in 1815 and 1816; it appeared in the Lazaretto of Venice in 1818, and at Gressemberg in Silesia in 1819. But with these exceptions it has been for a century generally confined to Africa, the land of its origin, and to those portions of Asia and Europe which own the Ottoman sway.

Symptoms.—The following definition will suffice to convey a general idea of plague, although, as is usually the case with nosological definitions, it does not comprise certain cases sometimes observed, which form exceptions to the ordinary character of plague:—an exanthematous disease, the eruption consisting of buboes, carbuncles, and pustules, white, livid, or black, distributed in various parts of the body, and generally attended with malignant and very fatal fever.

Various divisions have been proposed by systematic writers; but there is every reason to think that there is no difference existing between cases of the disease which can be regarded as specific, all the varieties being found intermingled in the same epidemic. Plague possesses two prominent characteristics—fever and eruption, both of which are found in fully formed cases; but examples of the existence of one of these symptoms without the other are not of unfrequent occurrence. The cases in which the eruption is wanting constitute the most rapidly fatal type of the disease; whilst, on the other hand, bubo occurring without constitutional disturbance is the slightest form in which this disorder, usually so fatal, can exist. Between these extremes there are various shades of intensity discernible, which, as well as the most severe and the mildest type, we shall endeavour to depict.

The following sketch of the most rapid and intense form will remind the reader of malignant typhus, and of cases of the ordinary exanthemata, in which the system is so entirely overwhelmed that the eruption fails to appear, or displays itself but faintly. The patients are sometimes attacked suddenly with a loss of strength, a sense of confusion or weight in the head, occasional giddiness, oppression about the præcordia, and extreme dejection of spirits. They are inclined to be silent, and shew great anxiety in their aspect, but make little or no complaint, and, either having no febrile symptoms or such as are very obscure, are considered by the persons about them as indisposed in a slight degree. Death takes place in such cases sometimes within twenty-four hours, or occasionally on the second or third day. Neither buboes nor carbuncles appear, and it is rare to find suspicious marks of infection on the dead bodies.*

Others, who are at first attacked in the same manner as the foregoing, become in a few hours more manifestly disordered. Their eyes become muddy, the surface of the body cold; they grow drowsy and lethargic, and complain of pain at the heart. As the distemper advances, they often lose the power of speech; the skin seldom recovers its warmth, or, if it does, there is a mere irregular flushing, which soon gives place to cold and clammy sweats. The pulse sometimes remains nearly in its natural state, but is generally low and quick. Patients are by turns delirious, confused, and sensible, but the comatose disposition is the most prevalent. Towards the close there is incessant inquietude. Buboes rarely appear, and in those only who survive the third day; petechiæ, vibices, or broad, livid, roundish spots occur sometimes, but are not common, and the two latter are seldom visible till after death. All the cases of this description which fell under Dr. Russell's observation were fatal, the patients generally dying on the second or third day, a very few living till the fifth.†

This intense form of the disease is most frequently observed at the commencement of an epidemic of plague, when it generally possesses the greatest malignancy. At a later period the following more mild but still dangerous variety is that which is most commonly met with.

The disease commences with coldness sometimes amounting to shivering, which is speedily followed by fever, accompanied occasionally with vomiting, and uniformly with giddiness and pain of the head; but rarely at first with delirium, and scarcely ever with a comatose disposition. The fever increases during the latter part of the day and the following night, but there is a perceptible remission, though by no means a cessation, of fever the following morning. In this form of disease, buboes and carbuncles generally make their appearance the first day, and it is not unusual to see successive eruptions of them appear throughout the disorder.

As the second day advances, there is again an exacerbation of fever; some of the sick are harassed by vomiting; there is distressing headach; the tumours are painful; there is confusion of thought, occasionally a slight disposition to coma; and the muddy eye, so characteristic of the disease,—in which Dr. Russell says muddiness and lustre are so strangely blended together—manifests itself. The skin is hot, the pulse frequent, the tongue dry; the patient is anxious, restless, and complains of pain or oppression about the heart. As night approaches, the feverish symptoms are aggravated; the heat is more intense; the pulse

* *Russell*, History of the Plague at Aleppo in 1760, 1761, and 1762. p. 96.

† Ibid. p. 97.

less full, but very quick; the jactitation is great, the eye very muddy, and the patient is disposed to incoherent raving or to stupor. Sweat breaking out early in the morning of the third day always brings a mitigation of the symptoms, and sometimes proves completely critical, but more commonly produces only a remission so favourable as to encourage the expectation of a more perfect crisis on the fifth. But where the patient neither sweats nor experiences a sensible remission on the third day, as is sometimes found to occur without perspiration, danger is always to be apprehended. During these remissions, it should be observed, the pulse becomes slower, softer, and more full, especially after perspiration; and though the eyes still remain muddy, the anxiety and disquietude abate, the intellectual faculties are clearer, and the patient finds himself in every way better.

There are again exacerbations on the third and on the fourth day. A remission takes place on the morning of the latter of these days, preceded by perspiration, but rarely so profuse as that which takes place on the third. The exacerbation of the fourth day is more severe, especially towards night, than that of the second and third, and continues intense till perspiration appearing on the morning of the fifth, and increasing to a profuse sweat of various duration, leaves the patient faint and languid, but in every other respect manifestly relieved. After this day the subsequent exacerbations become slighter and slighter, and, the buboes generally advancing favourably to suppuration, little or no fever remains after the beginning of the second week, excepting symptomatic heats occasioned by the eruptions. But where the sweat on the fifth day proves imperfectly critical, milder exacerbations, which usually decline with gentle perspirations, continue to recur till the seventh day, when a second profuse sweat places the patient beyond all danger.

The formidable symptoms which generally occur on the second day in this form of the disease, sometimes do not take place till the third or fourth, and hence it sometimes happens that those who for some days seem to be slightly affected suffer a tedious illness or die contrary to expectation, while more alarming attacks terminate favourably. In the latter case the event remains doubtful till the fifth day; in the former till the end of the week. At these periods a conjecture as to the result may be made with tolerable success; though cases sometimes occur in which matters remain in suspense some days longer.

A much more severe and fatal form of plague, constituting the second class of Dr. Russell, begins generally with slight shivering or sense of cold, which is soon succeeded by fever, accompanied with giddiness, headach, vomiting, and sometimes purging. The fever increasing towards night, the face becomes flushed, the eyes glisten, and the patient either becomes delirious, or drowsy and comatose. The pulse in this stage usually continues full and strong, and though the tongue is not dry, the thirst is excessive; but the stomach retains little of the liquid taken, and the patient, harassed by the vomiting and other symptoms, passes a very unquiet night. There is an abatement of the symptoms on the succeeding morning; but the pulse is frequent and more or less full, the skin is hot and dry, and the patient dejected. As the day advances, there is an exacerbation, the accession of which is accelerated by vomiting and especially by diarrhœa, which frequently supervenes at this time. The symptoms during this exacerbation are muddy eyes and a peculiar confused expression of countenance, quick pulse, sometimes low and fluttering, but rarely intermitting; a whitish, but rarely a parched tongue; the external heat moderately feverish, or occasionally intense in irregular flushings; pain at the heart or oppression about the præcordia; burning pain at the pit of the stomach and incessant inquietude. The more or less rapid progress of these symptoms denotes more or less danger; but when to these are joined a faltering in the tongue or loss of speech, while the surface of the body, losing its natural or feverish heat, becomes cold and damp with clammy sweats, death is inevitable, though perhaps the fatal moment may still be at some distance. In certain cases, especially where vomiting has been severe, and where diarrhœa or hemorrhage adds to the debility, the third day proves fatal; but the disease is more commonly protracted two or three days longer, advancing so far regularly to its termination that each subsequent night proves worse than the preceding, and in the day the remissions are so transient and obscure as to leave no room for hope.

Few of the sick recover from this form of plague, whether the disease be left to itself or treated methodically; neither does the result appear to be materially influenced by the course of the buboes. They generally appear on the second day, sometimes on the third, and occasionally later. Suppuration does not take place, and the tumours, advancing or not towards this state, have no visible effect in hastening or retarding the termination of the disease. Carbuncles, as well as petechiæ and vibices, are occasionally met with.*

In the cases of which the eruption constitutes the principal feature, either buboes or carbuncles form, and frequently both occur in the same subjects. The patients are so little indisposed as to be able to walk about the streets or labour at their accustomed avocations, unless prevented by the inflammation of inguinal buboes. Even in more intense forms of the disease, the prostration of strength is in some cases slight; for in the expedition into Syria of the French army of Egypt, several soldiers affected with plague were able to march during a considerable length of time,† and Diemerbroeck relates many examples of which he was an eye-witness, of infected

* *Russell*, p. 101.

† *Fodéré*, Dictionnaire des Sciences Médicales, vol. xli. p 77.

persons walking within a few hours of their death.*

The pestilential bubo is a swelling of the glands of the groins, the axillæ, the neck, or of the parotid itself; though tumours in this last situation are sometimes named distinctively parotids. Buboes are at first small and deeply seated; they are more or less painful, but never entirely indolent, and they advance towards the surface, and in some cases to suppuration, with various degrees of rapidity. They terminate either in resolution, suppuration, or gangrene, but this last termination is rare, though examples of it are recorded by authors;† and it is remarked that it rarely takes place in the cellular tissue, but merely in the gland itself, and hence that it can be ascertained only by dissection.‡ It is considered in all cases a fatal termination. There is a general opinion that the suppuration of buboes, if not essential to the safety of the patient, is in the highest degree conducive to his recovery; but it having been repeatedly observed that buboes never begin to inflame externally, or to show signs of approaching suppuration till the fever is manifestly on the decline, and restoration to health having taken place in innumerable instances though buboes did not undergo this process, there is every reason to think that too much importance has been attached to it, and that it is at most rather a sign than a cause of recovery. Buboes are rarely solitary, two, three, or four existing in the same subject; and this circumstance, their complication with carbuncle and other forms of eruption, and the antecedent and concomitant symptoms which generally exist, will secure us from confounding them with syphilitic swellings. It should be remarked, moreover, that pestilential bubo in the groin generally affects the glands in the vicinity of the crural vessels, though it sometimes appears in the situation of the ordinary venereal tumour.

Besides buboes situated in glandular parts, tumours to which the same name has been given are found in various situations, as on the head, the nape of the neck, the shoulders, the thorax, the vicinity of the umbilicus; in short, they may appear in almost any part of the body or limbs.§ During six or eight days they are small hard bodies which do not involve the superjacent skin; but subsequently to this period they become protuberant, and the integument is inflamed. They sometimes disperse, but more frequently suppurate, though more slowly than the glandular bubo. They are numerous, from five to nine generally existing in one subject. Dr. Russell calls them spurious buboes.

Carbuncles may form in any part of the body, and they are not unfrequently observed in the integument covering buboes. Various forms of them are described, but it is probable that varieties have been multiplied by observers depicting the same species in different stages of its progress. They commence generally in a pustular form, but occasionally like a vesication of the size of a horse-bean, filled with a dusky-yellow or blackish fluid. In the more advanced stage they are hard and very painful, speedily becoming gangrenous, and forming eschars, which tend to spread and rapidly destroy the skin, and sometimes muscular and tendinous parts. They occasionally exist in considerable numbers on the same patient. When recovery is approaching, suppuration takes place round the edges of the eschar, which, separating, leaves an ulcer of greater or less depth, discharging abundantly for some time and then gradually healing; but in fatal cases the eschar remains dry, with little appearance of being cast off.

There are other cutaneous affections observed in plague: of this kind are petechiæ, at first of a pale or purplish red, and subsequently livid; a certain marbled appearance of the skin, evanescent till towards the close of the disease, the variegating colours being of a pale faint blue or darkish red, and an erysipelatous efflorescence remaining visible for a short time. Narrow streaks of a reddish purple or livid colour are sometimes observed; and when they affect the face, they give a frightful appearance to the countenance, producing such an alteration of features, and so disguising the patient, that he can scarcely be recognized by his acquaintances. Vibices or weals, and large blue or purple spots, the maculæ nigræ of authors, occur in the more depending parts of the body sometimes shortly before death, but they are more frequently not discoverable till after this event, and in both cases probably result from the infiltration into the subcutaneous cellular membrane of the blood attenuated by the disease.

Morbid anatomy.—In a disease considered highly contagious, a deficiency of information on this head is to be expected, and we find that writers on plague are more copious on any branch of the subject than this. Some authors have, however, endeavoured to illustrate the nature of the disease by dissection, but it must be acknowledged without much success. Deidier made many dissections of persons dead of plague at Marseilles in 1720; but the only material result of his labours was the discovery that the gall-bladder was extremely loaded with black or greenish bile.* Another observer of the same epidemic informs us that in some bodies every thing was found in a natural state, and in others that nothing was discovered but slight traces of inflammation of the intestines, which, the writer remarks, were certainly produced in the last moments of the disease.† Savaresi, in his Topography of Damietta, relates that in three

* De Peste, obs. xxxvi. et liv.

† *Diemerbroeck*, part i. p. 431.

‡ *Russell*, p. 115.

§ Ibid, p. 118. *Zacutus Lusitanus*, apud Diemerbroeck, p. 66. Goodwin's Historical Account, p. 49, and *Baron Larrey*, in the Dictionnaire des Sciences Médicales, tom. xli. p. 77.

* Dissertation sur la Contagion de la Peste, Montpellier, 1725.

† Relation Historique de la Peste de Marseille, p. 447, 448.

cases the only morbid appearances were the lining of the intestinal canal and the stomach being covered with a yellowish mucus, and a general hardness of the conglobate glands.* Certain individuals have expected to derive information regarding the nature of the disease from the condition of the blood; but the humoral pathology does not appear to have furnished results more satisfactory and uniform than the inspection of the solids; the blood having been found in various states, namely, of a natural consistence and appearance, unduly liquid, and inflammatory or sizy.† In conclusion, we are compelled to acknowledge that plague is one of the numerous diseases in which the changes during life leave no determinate trace after death to explain their nature or the cause of their fatal issue.

Nature of plague.—This dreadful disease, like others of the febrile class to which it belongs, evidently results from the introduction into the system of a morbific poison; but much obscurity prevails with respect to the part of the frame which it first affects, and many of the pathological changes which it ultimately produces. The external inflammations and the fever are the only parts of the disease of which we have distinct knowledge. It has already been stated that examples occasionally occur of the absence of one or the other of these phenomena, the imperfection of medical definitions being exemplified by plague as by many other diseases. This imperfection, resulting from the variable phenomena with which the physician is conversant, so markedly contrasted with the uniformity presented by nature to the philosopher, or which in his experiments he can form for himself, does not invalidate the substantial accuracy of the definition, which comprehends an immense majority of cases, and excludes only what may be justly considered as the exceptions to the rule. Many persons have been disposed to look beyond the manifest symptoms of the disease to the interior changes of which these are only the signs or the effects; but it is to be feared that there has been more of speculation than of cautious induction from facts in the opinions these individuals have published to the world; or at least that they have made a portion only, and this the smaller portion of cases of plague, the representatives of the whole class. M. Broussais informs us that the causes, the symptoms, and the changes observed in the bodies of those who die of plague, show that the digestive canal is the seat of *the inflammation which constitutes the disease*. If petechiæ, carbuncles, and inflammations improperly called buboes, appear, these symptoms are only according to him, as in typhus, the effects of the sympathetic irritation of the skin and cellular membrane, of which irritation the heat of the climate favours the development.‡ According to this view, the eruption hitherto deemed characteristic of plague is a mere contingency, and the inflammation of the digestive canal is exalted from an occasional occurrence into the constitment of the disease. It has apparently escaped this writer's observation that the eruption which he attributes to the influence of heat has accompanied the disease in every climate in which it has manifested itself,—in our own in winter,* for example; and that the affection of the intestines is indicated only in a small proportion of cases, either by symptoms during life, or by the pathological condition of parts after death. The analogy between the petechiæ, which only occasionally appear in typhus, and the characteristic eruption of plague, is too remote to identify these diseases, though we would willingly admit that they are in some degree related, as all febrile disorders are, to each other. Professor J. P. Frank places plague in the same genus with continued nervous fever, which is, he says, a fever occasioned by causes acting especially on the nervous system, and which escape the observation of the senses; and this fever, he informs us, may be complicated with gastric and other inflammations,†—an opinion in which we fully concur with him; though we do not agree in thinking plague a mere variety of continued nervous fever or typhus, but, on the contrary, we deem it an independent disease which preserves its character in all climates and situations in which it may exist.

The strongest analogy with plague which we have any where found occurs in the following example of disease, induced, as it would appear, by exposure to the effluvia of common putrefying animal matter.

An American merchant-ship was lying at anchor in Wampoa Roads, 16 miles from Canton. One of her crew died of dysentery. He was taken on shore to be buried. No disease of any kind had occurred in the ship from her departure from America till her arrival in the river Tigris. Four men accompanied the corpse, and two of them began to dig a grave. Unfortunately they began in a spot where a human body had been buried about two or three months previously. The instant the spade went through the lid of the coffin, a most dreadful effluvium issued forth, and the two men fell down nearly lifeless. It was with the greatest difficulty their companions could approach near enough to drag them from the spot, and fill up the place with earth. The two men then recovered a little, and with assistance reached the boat and returned on board. On the succeeding morning, they presented the following symptoms: very acute head-ach, with a sense of giddiness and dimness of sight, (which had existed more or less from the moment of opening the grave); eyes of a peculiar muddy appearance; oppression about the præcordia; dull heavy pain in the regions of the

* Histoire Médicale de l'Armée d'Orient, p. 89.

† Relation Historique, p. 447.

‡ Expos. de la Doctrine de M. Broussais dans le Journal Complément. du Dictionnaire, tom. ii. p. 148, 149, et seq.

* Sydenhami Opera, p. 108. *De Foe*, History of the Plague, p. 266.

† *J. P. Frank*, de curandis hominum morbis Epitome, t. i. p. 30 et seq.

heart and liver, with slight palpitation at times, and fluttering pulse; sense of extreme debility, with occasional convulsive or spasmodic twitchings of the muscles of the lower extremities; nausea; slight diarrhœa; rigors, succeeded by flushings of the face, neck, breast, and upper extremities; tongue white and much loaded; pulse from 110 to 120, weak and irregular; urine scanty and high-coloured, and skin sometimes dry, sometimes covered with a clammy sweat. On the fourth day from the commencement of the attack, numerous petechiæ appeared over the breast and arms, and in one of the patients a large bubo formed in the right groin, and another in the axilla of the same side, which speedily ran to suppuration. To one, the disease proved fatal on the evening of the fourth day; to the other, on the morning of the fifth.

On examination after death, in both cases the vessels of the brain were found loaded, and an effusion of lymph existed between the tunica arachnoidea and pia mater; there was an unusual quantity of fluid in the ventricles, and upwards of three ounces of dark-coloured liquid at the base of the brain. The optic nerve of the right side, in one of the patients, was surrounded, where it emerges from the thalamus, by a portion of gelatinous matter, and appeared thickened and discoloured; and the surface of the brain was very vascular. The heart in both cases was much enlarged, and distended with blood. In one case, five ounces of a dark-coloured fluid flowed from the pericardium when slit open, and the vessels on its internal surface were gorged with blood, and this was indeed the case throughout the whole portal circle. The stomach, near its pyloric orifice, was thickly beset, in one case, with small purple-coloured spots. The intestines in several places assumed a brownish appearance, as likewise the omentum. There were numerous petechiæ on the surfaces of both bodies. In one of the cases the medulla spinalis, in the dorsal region, to the extent of three or four inches, was of a light brown colour; and in the other case it exhibited evident marks of congestion throughout. Most of the inguinal and axillary glands were enlarged and hardened, and several of them, when cut into, contained a light straw-coloured matter. No other morbid alteration of structure existed.

One of the two men not immediately engaged in digging the grave was attacked on the eighth day from his being on shore. The symptoms resembled those in the preceding cases. For three days previously to the avowed attack of illness there had been pain and enlargement of one of the inguinal glands, which at the period he was visited had acquired the size of a hen's egg; and early in the disease the breast and arms were covered with petechiæ. By active treatment this person recovered, as likewise did the fourth man, who had slight indisposition of no decided character.*

* Medico-Chirurgical Review, N. S. vol. ii. p. 202 et seq.

Systematic writers have generally been more struck with the analogy between plague and eruptive diseases than with its relation to typhus or any form of idiopathic fever, and hence it is universally found in nosologies placed among the exanthemata. But this analogy is not so complete as to cause it to be ranked among diseases which attack persons but once in the course of their lives. Popular opinion in the Levant, where plague may be considered almost endemic, imposes this limitation on the disease,—an error not destitute of advantage, as it prevents the sick from being deprived of the requisite attendance; and the kind of confidence it is calculated to inspire is to a certain extent justifiable, as second attacks are unquestionably rare. Dr. Russell informs us, for instance, that he met with only twenty-eight examples of well-ascertained re-infection in four thousand four hundred pestilential cases. This accurate observer cautions us, however, against regarding this as the precise proportion in which second attacks occur, there having been no plague at Aleppo for eighteen years previous to the appearance of the epidemic he describes; and he found great difficulty in obtaining accurate information, after so long a lapse of time, as to the sickness of his patients, or their exemption from disease, during the former visitation, and the number stated must be understood to comprise the double attacks which took place from 1760 to 1762 only.

This opinion of the liability of sufferers from plague to second attacks is not universal among writers on the subject. The Chevalier Butel, for instance, is of opinion, from personal observation, that an attack of plague in Egypt furnishes complete exemption from all future accidents of the same nature, though, with some inconsistency, he subsequently quotes the case of an English physician (perhaps he alludes to Dr. Whyte) who died of the natural disease six months after an attack he had inflicted upon himself by inoculation.*

Authors on plague, however, who at all advert to this question, are almost unanimous in regarding second attacks as, at least, occasional, if not frequent occurrences. Diemerbroeck mentions several, and, among others, that of a Chevalier Schabhals, a bold and rash man, who was attacked with the prevailing disease, indicated by violent fever, a bubo in the groin, and three carbuncles, from which he had the good fortune to recover. He consequently became so presumptuous as to neglect all precaution, and was again attacked, five weeks after his complete convalescence, with the malady, of which he died before the sixth day.† There is reason to think that some writers have exaggerated the proportion of second attacks from not having duly discriminated such attacks from relapses; thus it has been urged in evidence of the frequency of second invasions, that *convalescents* employed as nurses about the sick, both at Marseilles and with the French army in Egypt, were

* Journal Universel, Jan. 1826.

† De Peste, lib. iv. hist. 37, 45.

frequently attacked and perished; but a sufficient number have been noticed by judicious observers to warrant our concluding that plague does not impart that kind of security from second invasions which is afforded by small-pox and certain other exanthemata.

Diagnosis.—Difficulty will never be experienced in discriminating a well-marked example of plague from any other disease, provided the practitioner have an opportunity of observing it throughout its course; for the buboes, carbuncles, and other external affections attending it, constitute, with the intense fever, a group of phenomena which belongs only to this malady. But, on the first appearance of an epidemic, a difficulty, arising from various circumstances, has not unfrequently been experienced in pronouncing on the character of the disease. In the first place it often happens that the early cases belong to the intense type, in which death occurs before the characteristic eruption has time to display itself; and, again, even in cases which ultimately assume the normal form of the disease, a certain period elapses before buboes, carbuncles, or other external marks appear. The symptoms on which, the eruption excepted, most reliance is placed for discriminating plague, are the peculiar inflamed appearance of the eyes, which was previously mentioned, swelling of the tongue, difficulty of articulation, and tottering gait. Of these phenomena, the Chevalier Butel declares that the two first are never absent in any case of plague; but it seems more than questionable whether they belong so exclusively to this disease, that we could pronounce from them alone on the nature of any case we might witness, especially at the commencement of an epidemic, unless our diagnosis were aided by extrinsic circumstances, such as our being aware of the arrival of persons or goods from infected districts, of the sufferers having had intercourse with such persons, or having been exposed to effluvia from the goods, &c. Should such circumstances be shewn to have occurred to the subject of a suddenly fatal disease, it would certainly be advisable to act on the assumption of its being pestilential, and to take the precautions which the safety of the community requires. Prudence would dictate also that suspicious cases which do not terminate so rapidly, should be kept secluded for a period sufficiently long to allow their real character to manifest itself, especially if the disease occurred in a country or district of which the geographical or commercial relation with territories in which plague was prevailing was such as to render its importation a probable event.

Mortality and prognosis.— Plague is one of the most fatal diseases which afflict human nature; and the general prognosis in the event of its introduction into any place must be in the highest degree unfavourable, unless the early cases admit of being so totally secluded that any general contamination of the inhabitants may be prevented. Very accurate statistical details, from which we may estimate the amount of ravage it generally commits in proportion to the number affected, or to the population of the place or district in which it prevails, are scarcely to be procured, since plague has not proved in modern times a disease of the more civilized nations of the world; and it is only among a civilized people, and at a very recent period, that any thing like very precise records of the fatality of disease is to be found. But such information as we possess leads to the conclusion that of those attacked with plague, fully fifty per cent. perish. At Marseilles, for example, in 1720 and 1721, it is calculated that of a population of 90,000, 40,000 fell victims to the disease, though more than 10,000 are supposed to have escaped infection;* whilst the following returns from the hospitals, and, as it would seem, from certain corporate bodies, show a rate of mortality higher than this general average.

	Received.	Died.
L'Hôpital de la Charité, from the 3d of October to the end of February	1013	585
L'Hôpital du Jeu de Mail, from October to the 3d of July.....	1512	820

Of 100 manufacturing hatters, there died 53; and of 134 house-carpenters, 84. The tailors, who were in number 138, lost 78. Of the shoemakers, who were 200, there died 110; the cobblers were reduced from 400 to 50; and of 500 and odd masons, there perished 350. Of persons in a still lower station of society, such as porters and chairmen, the mortality was very great indeed; scarcely a sixth part remaining at the close of the epidemic.†

In the capital of our own country the ravages of plague have occasionally been very great. Thus, of the last five epidemics, those which prevailed between the close of the sixteenth and the latter part of the seventeenth century, there perished in that of 1593, between March and December, 11,166; in that of 1603 the mortality amounted, between the same periods, to 29,992; in that of 1625 to 34,754; in that of 1636, commonly called, not from the amount or rapidity of its fatality, but from its having lasted twelve years, "the great plague," 11,000 died between April and December of the first year, and in that of 1665 the mortality for the same period amounted to 69,602.‡ But the estimates transmitted to us furnish neither the proportion of deaths to the number treated, nor to the amount of population amid which plague prevailed; for it was so customary for individuals to fly from London on its first appearance, that population returns, however accurate, fail to supply the requisite information on the second point. Defoe (but

* Traité de la Peste, p. 464.

† Relation Historique de la Peste de Marseille, p. 437, 438.

‡ Graunt's Natural and Political Observations, &c. London, second edition, 1662. A Collection of very valuable and scarce Pieces relating to the Plague, p. 81, London, 1721. London's Deliverance predicted by John Gadsbury. London, 1665. Russell on the Plague, p. 274, 275.

we do not regard him as very precise authority) estimates at two-thirds the proportion of the population of London which fled in 1665. Thus much seems certain, that these returns record a difference in the amount of mortality in the same place, but in different epidemics, which no supposable variation, either in the amount of stationary population, in the number of fugitives, or in both conjointly, can possibly explain.

It thus appears that we are deficient in statistical details whence to draw a general prognosis, and that, even if we possessed them of the utmost accuracy, (epidemic visitations of the disease varying so much in intensity even in the same district,) they would not furnish secure grounds for estimating the probable danger to a population from an attack of plague. Observers, however, are almost unanimous in marking in every epidemic three periods at which the fatality, and consequently our predictions, must vary. At the beginning of a pestilence, the disease, though less diffused than it subsequently becomes, appears in its most fatal form; during the increase and height of an epidemic, though many more persons are attacked, the comparative mortality is diminished; and during its decline there is a decrease at once in the numbers attacked and the proportion of deaths. A curious anomaly is, however, pointed out by Dr. Russell in the last-mentioned law of the disease, namely, that persons in constant communication with the sick, who have resisted infection in the most contagious stages of the pestilence, are sometimes attacked in its decline.*

The circumstances which, independently of the period of an epidemic, should influence our prognosis, must be found in the age and general constitution of patients and the symptoms of the disease. On the former head it is important to remark that young, robust, and vigorous adults are more prone to plague, and are more frequently its victims when attacked, than feeble and valetudinary males, and women and children.† Women often appear to owe their recovery to the supervention of menstruation; but it may be questioned whether this occurrence is not rather an indication of returning health than the cause of it. Of the different forms of the disease which we have endeavoured to describe, that in which the febrile commotion is slight, the system appearing to be overwhelmed from the commencement, and not possessing sufficient vigour to throw out the eruption, is the most hopeless; whilst in the mildest degree of the disease, indicated only by the existence of bubo, a favourable result may be always calculated on, unless some gross error of regimen be committed to aggravate a slight into a serious disorder. In an affection of an intermediate degree of intensity, the result can rarely be predicted in an early stage. When there is an amelioration of symptoms with subsidence of delirium on the fifth day, we shall generally find a critical and favourable termination on the seventh; and it is commonly remarked that the fact of the patient's surviving till the eighth furnishes grounds for a favourable prognosis. Intense fever with unabating delirium, attended by the three forms of eruption,—buboes, carbuncles, and petechiæ,—indicates a very dangerous disease, from which recoveries are rare, death frequently occurring from the third to the fifth day. Inferences as to the result may be sometimes drawn from individual symptoms. A copious eruption of buboes is not deemed unfavourable; but buboes and carbuncles conjointly in great numbers betoken a dangerous disease, and one which the constitution frequently proves unable to contend with; and the prognosis is still more unfavourable if petechiæ are superadded. A firm and resisting bubo is a good omen, even though it should have a carbuncle in the centre; whilst one of a soft and yielding consistence is thought to be less favourable. Hiccough, convulsions, cardialgia, diarrhœa, and colliquative sweats, are grounds for an unfavourable augury.

Causes.—So much were early observers of this disease impressed with the evidence of its infectious nature, that in the writings of many of them, the words plague and contagion are used synonymously;* and from this kind of metonymy considerable confusion pervades the works of certain able authors, and among others those of Dr. Read. But how conclusive soever this evidence may be to the majority, there have existed persons, both in ancient and modern times, disposed to deny its validity; and on this account we think it advisable not to confine ourselves to the bare assertion of the fact that plague possesses a contagious property, but to adduce examples of it which may prove of sufficient force to convince those who might be influenced by the doctrines of certain very well-intentioned but dangerous speculators.

We have already quoted the opinion of M. Foderé, that plague may be generated by the abundant endemial causes existing in Egypt, which this writer in common with many others regards as the father-land of the disease. Having had no opportunity from observation of verifying or refuting this opinion, we shall leave it a matter undecided, whether all the visitations of plague arise from a permanent stock of human contagion, occasionally re-

* On the Plague at Aleppo, p. 262.

† Histoire Médicale de l'Armée d'Egypte, p. 78. Jackson on the Plague of Morocco.

* —— patet et pestem esse omnium morborum qui contagione serpunt, etiam ad distans, contagiosissimam, unde à nostris contagionis solo nomine subauditur. *Guill. Beaumontensis*, de Peste, lib. i. 1629.

La peste, uno dei piu terribili mali che possano affligere il genere umano, benche non sia propriamente lo stesso che il contagio, pure suole avere fra noi il nome di contagio perche toccare i corpi, o l'aria degli appestati; o le merci, o robe, loro, se ne infettano i sani, con piu forza e strage che non accade in altri morbi epidemici et attaccticci—il perche contagio suo l'anche appellarsi la peste. *Muratori*, Della Peste, edit. 4. 1743.

ceiving increments from the subjects of the disease, when the atmospheric influence is favourable to its diffusion, and occasionally lurking in fomites to burst forth at a suitable season; or, whether the malady is engendered from time to time by the endemial causes we have mentioned, and there is consequently a reproduction of the contagious principle in Egypt. But though disposed to leave this question undecided in the case of Egypt or other eastern realms in which plague seems to be naturalized, we must express an opinion that its appearance in Western Europe has been owing to imported contagion—an opinion which is supported by a host of the greatest authorities that are to be found on this or any other question of pathology. Sydenham, though by no means inclined to exaggerate in any case the influence of contagion, and considering the co-operation of a peculiar atmospheric disposition or constitution essential to the diffusion of plague, yet thinks this pestilential constitution inadequate to its production without importation by fomites or the arrival of a diseased person from an infected district.* To the authority of Sydenham might be added that of Mead and others of the greatest reputation in medicine; but in a question of this nature we prefer, to the weight of great names, facts illustrative of its importation, and of its possessing contagious qualities not exceeded by those of any disease whatsoever, and sufficient to account for its diffusion through countries not guarded against it by rigorous quarantine.

The proofs we shall adduce of contagion will be derived principally from the history of the plague at Marseilles in 1720, this being one of the most accurately reported of European epidemics. Its importation into the city appears to have taken place by means of a vessel commanded by Captain Chataud, which left Seyde with a rich cargo on board on the 31st of January, her bill of health being clean, by which is meant that both the place and the ship were free from the disease at the time of sailing; but it was afterwards learnt that it existed avowedly in the town a few days after. The vessel then touched at Tripoli, which is near Seyde, and has constant communication with it, in order to undergo some repairs. Here additional goods were taken on board, and some Turks embarked to be conveyed to Cyprus. One of these Turks fell sick and died in a few days. Two sailors who touched the dead body sickened and died after a short illness, and in a few days other two persons, one of whom was the surgeon of the vessel, took the disease and likewise died. The captain, becoming alarmed, secluded himself from his crew, and three more men falling sick, and there being now no surgeon on board, the vessel was put into Leghorn. The disease of the three men last attacked was fatal at Leghorn, and Captain Chataud received from the medical men of the place a certificate that they died of pestilential fever. The ship reached her ultimate destination, Marseilles, on the 25th of May, and was put under quarantine of merchandise for forty days. On the 27th another of the crew died. At this time three other vessels from the same suspected places arrived, those of Captains Aillaud and Fouque, and the bark of a second Captain Aillaud. On the 12th of June the vessel of a Captain Gabriel likewise reached Marseilles from the same ports. These ships had all foul bills of health, declaring that at the time of their departure there was a suspicion of plague. The goods of all these vessels, as well as those from Captain Chataud's ship, were landed in the infirmaries for purification.

The disease and mortality continued on board of the first vessel. On the 12th of June the individual placed on board as a guard during the quarantine died, and on the 23d a cabin-boy sickened, and at the same time two porters employed in the purification of the goods, and subsequently a third similarly occupied with those of Captain Aillaud. The disease in all these persons was the same, and all died in two or three days. On the 5th of July two porters, shut up with the merchandise of Captain Chataud, were attacked, and had buboes in the axillæ; and some days after the priest who administered the sacrament to these men died. The passengers from all these vessels, even those from Captain Chataud's ship, were admitted into the town on the 14th of June with their baggage and private merchandise, after their persons and goods had undergone *fumigation*.*

The first case in the town occurred on the 20th of June, and on the 28th of the same month a tailor was attacked and perished, with his whole family, after a few days' illness. On the 1st of July a woman named Ligazière, living at the foot of the Rue de l'Escale, was attacked with the disease, and had a carbuncle on her nose; and immediately after a woman named Tanouse, in the neighbourhood, took the disease, and had buboes, and from her the whole street appeared to become contaminated, the contagion invading first the houses adjoining that of Tanouse.†

It was from this street (Rue de l'Escale) that the disease was introduced into the Hôtel Dieu, through which its progress is one of the strongest evidences of contagion that is to be found any where recorded. This hospital was closed against pestilential cases and all that had communication with them, it being intended to reserve it for the patients who occu-

* Interea aëris dispositionem quantumvis λοιμώδη pesti suscitandæ per se imparem esse vehementer suspicor; quin pestilentiæ morbum alicubi semper superstitem aut per fomitem, aut per pestiferi alicujus appulsum, e locis infectis in alios deferri; ibidemque, non nisi accedente simul idoneâ aëris diathesi popularem fieri.—*Sydenhami Opera*, sect. ii. cap. ii.

* The expression in the original is "parfums." The nature of these perfumes is not mentioned, but the author of the Relation Historique censures the quarantine department for their excessive confidence in them, and the neglect of ventilation. Relation Historique de la Peste de Marseille, p. 35.

† Ibid. p. 26—38.

pied it at the time of the breaking out of the disease, those who might be attacked with other disorders besides plague, and between three and four hundred children (enfans trouvés) who were its permanent inmates. A woman, who had escaped from the street we have mentioned, applied for admission, and either the characteristic marks of plague not having appeared, or having escaped the observation of the examiners, she was supposed to labour under ordinary fever, and was received into the house. She was conveyed by two girls into the women's apartment, and the principal nurse changed her linen. On the following day the two girls sickened, and died after an illness of six or eight hours; on the day after this the nurse became ill and died almost as suddenly. From these four patients the disease spread rapidly through the house, and *all its inmates*, directors, confessors, physicians, surgeons, apothecaries, and all the other officers, servants, and nurses *perished*, excepting thirty of the children, who were the sole survivors from a number of persons amounting to between five and six hundred.*

The effect of seclusion was exemplified in the case of the convents of nuns, all of which cut off communication with the town, and remained exempt from the disease throughout the whole of the pestilence. The Poor-House (La Charité) adopted the same precaution, and enjoyed the same exemption till the end of September. It was then converted into a pest-hospital, its original inmates being removed with the exception of a few who were retained as nurses; of these almost all perished.† The exemption imparted to religious communities by seclusion was strikingly contrasted with the ravages of the disease amid the orders of ecclesiastics who were employed in offices about the sick. Of the order of capuchins, who furnished a great number of confessors to the town and hospitals, forty-three perished, out of the whole body of fifty-five.‡

The contagious nature of plague is strongly exemplified, in the early stage of epidemics, by the gradual manner of its diffusion, the paucity of the attacks at the commencement, and their slowly increasing in frequency, till, foci of contagion being multiplied, vast numbers are invaded at the height of the disease. The rarity of the early invasions at Marseilles, and the havoc it ultimately committed, have been described. A similar mode of progression is observable in all epidemics of plague. In that of London of 1603, the number of deaths were progressively as follows: in March 11, April 26, May 83, June 362, and July 2999; in that of 1625, in March 23, April 85, May 224, June 954, July 5887; in that of 1636, April 37, May 162, June 440, July 456, August 1239, September 3856; in that of 1665, April 2, May 43, June 1060, July 5667.

We need not, as it appears to us, enlarge further on the evidence of contagion in plague, enough having, we trust, been adduced to convince the most sceptical. It appears transmissible from individual to individual in all the ascertained modes in which diseases are thus communicated; by contact, inoculation (from the matter of buboes), through the atmosphere, and by fomites. Observers have endeavoured to illustrate certain obscure points in these different modes of transmission. Thus, with regard to the matter of buboes or of sinuous ulcers consequent on them, it has been conjectured that its contagious property ceases before the healing of the sore; but no precise conclusion having been attained regarding the period when this cessation takes place, Dr. Russell advises that all pestilential ulcers should be held infectious till after the expiration of two months from the first attack, and the patient secluded accordingly. The contagious distance from the person of the patient has been matter of discussion, some persons imagining that a degree of proximity almost equivalent to contact is necessary for the communication of plague; but there is reason to think that this circumscription is much narrower than facts justify us in drawing it; though it is probable that the effluvia when once transmitted into pure air are soon blended with the common mass, and suffer such alteration as renders them innocuous at no great, though not an ascertained, distance from the patient. At what period of the disease the communicable property commences, and how soon after convalescence it ceases, are points which may be considered quite undecided. The most accurate observers are of opinion that consciousness of receiving infection, a feeling occasionally discerned in ordinary contagious fever, does not occur in plague.* When received, it does not hang ambiguously about a person in any case for more than two or three days, but its operation once announced by visible signs of disorder, the progress of the disease is rapid, there being a difference in this from the course frequently observed in typhus, in which the effect of contagion on the system is frequently manifested by slight indisposition, sometimes lasting for weeks, previously to the complete formation of the disease. (See Contagion.)

It would be desirable to ascertain the duration of the latent period of pestilential contagion from its reference to the safety of intercourse between infected and healthy districts; but the information to be obtained on this important question is of a very unsatisfactory nature. Only at the beginning of a pestilence, when foci of contagion are rare, can any attempt be made to illustrate it, and hence the data are too scanty to furnish a conclusion which can be implicitly relied on. Dr. Russell has known the disease sometimes manifest itself a few hours, and in some cases two or three days after intercourse, and is disposed to consider that infection rarely remains latent beyond ten days; but he acknowledges that wider experience is required to determine positively the latter point. The period during which conta-

* Relation Historique, p. 94, 95.
† *Deidier*, Traité de la Peste, p. 353.
‡ Relation Historique, p. 177.

* *Russell*, p. 302.

gion may adhere to unventilated goods appears as unascertained as the latent period in the case of persons; but many circumstances lead to the belief that it is of considerable length.

The question has been raised whether dead bodies have an infecting power, and M. Desgenettes answers it positively in the negative; but there is much reason to think that this decision is too general, however warranted by the experience of its author. During the pestilence at Marseilles burying the dead was found so dangerous an operation that free persons could not be procured to perform it even for an enormous recompense, and consequently the galley-slaves were employed on a promise of liberty when the duty should be completed. They were sent out in detachments. The first, consisting of twenty-six, were all attacked with the disease in two days, and successive numbers were sent on the duty, till, from the 20th to the 28th of August, one hundred and thirty-three had been employed, when the officers of the galleys refused to send any more, almost the entire number furnished being either sick or dead. It was likewise observed in the plague of London of 1665, that officiating at funerals was an office fraught with extreme peril.

Certain conditions of the atmosphere influence the diffusion of the contagion of plague, or the susceptibility of bodies to be affected by it. Of these the most manifest is temperature, extremes in this respect checking, and warmth within a certain degree appearing to favour, the propagation of the disease. It hence occurs that the abatement of pestilence in the east takes place during the heats of summer, and in Europe in winter. Popular superstition among the Christians resident in Europe fixes on St. John's day as the exact period of the cessation of pestilence: we scarcely need remark that this opinion is much more precise than is justified by facts. The following, according to the most accurate observers, is the ordinary course of the diminution and ultimate disappearance of plague in the Levant. There is a manifest abatement of the disease at the commencement of the summer heats, and in proportion as these continue and increase, cases become more and more rare, and finally cease; while contaminated goods lose at the same time, as we are informed, their infecting property. The uniformity in this course is so great that Christians who shut themselves up during pestilence almost always come abroad in June, the instances being very rare in which they remain confined to July. Epidemics in Europe have generally commenced in spring, or in the beginning of summer. Autumn has frequently been the period of their greatest prevalence and fatality, and they have either been totally extinguished in winter, or have then received a very considerable check, and have finally ceased in the early part of the ensuing spring. The great plague which prevailed in London from 1636 to 1648 presents an exception to this rule; but during this extensive period there was invariably a diminution of cases in winter, though at no time a cessation of the disease.

Independently of manifest atmospheric conditions, that inscrutable state of the air to which the term epidemic constitution has been applied so much influences the propagation of plague, that certain very experienced writers have denied its possessing a communicable property unaided by this atmospheric peculiarity. In illustration of this view, Dr. Russell informs us that experience in Turkey, where generally no precautions are taken in times of pestilence, clearly evinces that in a certain state of the air a communication with infected places may subsist without any material consequence. The return of plague at Aleppo happens at irregular periods; the intervals are of considerable but unequal length; and in these the commerce with Egypt, Constantinople, and Smyrna, remains uninterrupted. In the intervals between 1744 and 1760, and from 1762 to 1780, the plague raged several times in the places now mentioned, without affecting Aleppo; and even in two or three years subsequent to 1762, though it was at Marash, as well as other places not far distant, with which Aleppo has continual intercourse, no instances were discovered of communicated infection, and this exemption continued notwithstanding that infected families from some of these places took refuge in the town. It would appear, moreover, that this constitution, favourable to the progress of plague, varies considerably in degree. Thus we learn from the able author last quoted that the progress of plague at Aleppo was exceedingly restrained in 1760; it was much more vigorous in 1761; it raged with great fatality in 1762, and in this year was finally extinguished, though there was no appreciable difference in the state of the seasons in the respective years to explain the varying diffusion of the disease or its ultimate extinction. To the cessation of this atmospheric condition, which is known only by its influence on the propagation of disease,* is to be ascribed the occasionally sudden and otherwise inexplicable disappearance of plague in oriental countries where no disinfecting process is employed. Much, too, that ought rather to be attributed to a change in this latent state of the atmosphere, is frequently ascribed in other countries to disinfecting processes, which are in truth rarely so general or efficient as to account for the cessation of pestilence.

Treatment.—There are few points in medicine on which greater discrepancy of opinion prevails than the mode of treatment to be adopted for conducting patients safely through this dangerous disease. Remedies which are the favourites of one class of observers, in the hands of others prove to be fraught with danger. Bloodletting, emetics, and other heroic measures, are alternately lauded as cures and

* At vero quæ qualisque sit illa aëris dispositio, a quâ morbificus hic apparatus promanat, nos pariter ac complura alia, circa quæ vecors ac arrogans philosophantium turba nugatur, planè ignoramus. *Sydenhami Oper.* sect. ii. cap. ii. p. 107.

censured as poisons. We believe that had any of the remedies the reputation of which has been so fluctuating, been announced as cures for any of our ordinary epidemics, such as small-pox, scarlatina, or continued fever, without reference to the period or type of the disease in which they were to be employed, the testimony for and against them would have proved equally conflicting. The general treatment of any epidemic, independent of that required to combat local lesions, may be comprised, if we mistake not, in few words:—We must deplete the excited, and stimulate and support the sunken and collapsed; and in an immense majority of instances the condition requiring the former means, if it exist at all, will be found in an early stage of the disease; that demanding the latter will occur in an advanced period.

The best authorities inform us that bloodletting is to be employed at the very commencement of the disease, if the pulse possess sufficient force to render such a proceeding prudent; and some are of opinion that a second bleeding may be occasionally admissible; but that very judicious observer, Dr. P. Russell, cautions us against performing any bleeding after the third day. He mentions, however, one case* in which bleeding was successfully performed on the third day from both arms at once, though the patient, a female, had been bled the preceding day. The presence of buboes, which Sydenham and others have regarded as a valid objection to bloodletting, from a dread that the operation might occasion their recession, ought not, we are assured by more recent authorities, to prevent its employment, as neither the eruption nor progress of these tumours is injuriously influenced by it. Dr. P. Russell, indeed, remarked, that where the pain of buboes was excessive, bleeding was necessary to moderate that and other inflammatory symptoms, for till the fever declined, these tumours never advanced kindly to suppuration.

Many cases, however, occur, in which the collapse of the system is so well marked from the commencement that the employment of bleeding is manifestly inadmissible, and emetics are then thought the most suitable remedies. Should the first emetic dose fail to act, it is advisable to repeat it after the interval of an hour or an hour and a half. Full vomiting, we are assured, especially if bilious matter or worms were discharged, was found so efficacious during the prevalence of plague at Aix in Provence, that almost all from whom such matters were ejected recovered, whilst those on whom the emetic failed to operate perished.† It is probable that the failure of emetics was not so properly the cause as the token of death, as it indicated an extremely collapsed state of the system, of which the sensibility was almost annulled by the vehemence of the disease.

Purgatives are generally regarded as suspicious remedies, from the tendency to diarrhœa being so general in the disease, and its very fatal effects; and practitioners concur in declaring costiveness to be less prejudicial in plague than other febrile disorders. The irritability of the bowels is so great, and hypercatharsis is consequently so liable to be produced by the more active purgatives, that we are advised to empty the bowels at the commencement of the disease by means of the most lenient of the class, such as cassia pulp, manna, or rhubarb, with cream of tartar. Sir Brooke Faulkner, however, employed calomel and jalap, without intimating that inconvenience resulted from the practice.*

Among the older physicians, the object of whose practice was to eliminate from the blood the noxious principle on which they conceived the phenomena of the disease depended, the more heating diaphoretics, such as contrayerva and serpentaria, were favourite remedies, whilst their operation was aided by excluding the air, heating the apartment, and heaping the patient with bed-clothes. This method of treatment, so injudicious in any febrile disorder, is now universally abandoned by European practitioners. Some of the more cooling sudorifics, as liquor ammoniæ acetatis, and saline draughts, are customarily given by many physicians, and by some are thought to be beneficial. Dr. P. Russell says that saline draughts given in an effervescing state are much more efficacious in checking the retching which is sometimes a distressing accompaniment of plague than that of ordinary malignant fevers.

It has been stated that diarrhœa is a very common and very dangerous symptom. The judicious observer we have so frequently quoted, Dr. P. Russell, informs us that he was at first unwilling to administer opium for its relief, from an apprehension of aggravating the stupor or comatose disposition; but finding that this effect did not follow its employment, he used it in 1762 much more freely than he had done in former years, and in general remarked that where he succeeded in stopping the looseness early in the disease, the patient became more alert and sensibly better. In the more advanced stage, however, we learn from the same writer, astringents and opiates rarely checked or suppressed the diarrhœa. Inflammation of the intestines being one of the few pathological appearances generally recorded by authors, there can be little doubt that the diarrhœa which accompanies plague indicates some inflammatory affection of the bowels, and that local bleeding, from the integuments of the abdomen or anus, and perhaps subsequent blistering, would be found important auxiliaries in its treatment.

Coma and other affections of the brain it is customary to combat by means of blisters between the shoulders, to the nape of the neck, temples, and occiput.† It is extremely probable that the dread of drawing blood, which is so general among those who treat this disease, is the reason why local bleeding is not

* On the Plague at Aleppo, case ciii.
† *Sauvages*, Classes Morborum, vol. ii. p. 368.

* Treatise on the Plague, p. 238.
† *Sir B. Faulkner*, loc. cit. p. 241.

conjoined with the counter-irritants to subdue the cerebral affection. From the symptoms we have detailed of the intellectual disorder in plague, there can be little doubt of its depending upon the same causes as that which accompanies other malignant fevers, and that the same method of treatment would be found applicable to both.

Certain remedies of the general febrile state, besides those already mentioned, have been tried by European practitioners in this disease. Cold affusion is thought by Sir B. Faulkner to present a considerable prospect of benefit if applied at the very commencement: this writer, however, it should be remarked, speaks from a very limited experience of its effects. Several writers speak favourably of mercury; some on merely speculative grounds; others from the analogy, real or presumed, between plague and other disorders in which they have observed that this mineral is useful; Mr. Stafford from considerable experience. This gentleman declares that, when his regiment was infected, thirty or forty cases of axillary tumour recovered under its use, and he relates at length five severe cases of plague, of which three recovered under mercurial treatment. The mode of administering it was internally in the form of calomel, and by inunction. The statements of this writer seem to show that the mineral may be serviceable in the treatment of the disease.*

Should the vital powers appear to be failing at any period of the disease, wine and cordials are administered, and many writers advise that they should be accompanied by tonic medicines, of which calumba, bark, and serpentaria are those most usually resorted to.

Friction with oil has been praised as a means of curing the disease by inducing diaphoresis, and likewise as a preservative from infection. The property of inducing diaphoresis it certainly possesses; but its power of curing the disease is questioned by numerous authorities. A writer, whom we have often quoted, Sir B. Faulkner, is equally sceptical as to its prophylactic powers. On this point he remarks: "there are so many instances of persons living in the closest intercourse with the infected who escaped without the use of oil, and so few well-attested cases of persons having come into actual contact with pestiferous matter who were protected by oil alone, that I cannot hesitate to conclude that the opinion of its possessing any independent or certain prophylactic efficacy is destitute of foundation."† Vaccination has been recommended as a means of prophylaxis. The last quoted writer furnishes us with the following forcible argument against its claim to such a property. "I took pains," says he, "to ascertain whether those who had recently been vaccinated were rendered less susceptible; and I found that the instances of its inefficacy were every where numerous, of which I may mention rather a striking one, which was communicated to me by a Maltese surgeon, who was much employed in the plague, namely, that of a numerous family who had been recently vaccinated, the whole fell sacrifices to the prevailing contagion, with the exception of the parents, who had never undergone the operation."* For the prophylactic means to be adopted, we beg to refer to the articles CONTAGION and DISINFECTION.

The general plan of diet is the same as in other febrile disorders. Of preparations of animal food nothing stronger than chicken broth should be allowed; the rest ought to consist of preparations of farinaceous or leguminous vegetables, ripe fruits, and simple diluents, such as lemonade, toast-water, or tea.

The local treatment of buboes should be limited to the application of warm emollient poultices. By the older writers, who erroneously conceived that the suppuration of buboes was the cause rather than the effect of the abatement of the fever, various irritating measures were resorted to for accelerating the process, but sounder pathological views have occasioned them to be abandoned. When suppuration has taken place, the matter may be left to discharge itself spontaneously, or the lancet may be employed to give exit to it. Should the original aperture be too small, it should be dilated, as its narrowness is apt to give rise to sinuses. If the carbuncles require topical treatment at all, it should be of the same simple nature as that of the buboes. Prior to the forming of the eschar a mild poultice only is required: subsequently a slightly stimulating dressing, such as unguentum resinæ, or the same with oleum terebinthinæ, may be interposed between the tumour and the poultice.

(Joseph Brown.)

PLETHORA, πληθώρα, *fulness.*—Before entering on the discussion to which this article is appropriated, the writer wishes to guard himself against a misconception that has at times been inconsiderately formed respecting the doctrines maintained in it. Though connected with the foundations of all pathology, they are by no means intended to represent the whole of it. Pathology regards living actions, which depend on organized structure, and this both derives its nutrient elements from the blood, and returns to it the effete matter which the nutrient deposits displace. This connexion, subsisting without intermission so long as life endures, is so intimate, that whatever affects the condition of the blood must immediately concern the well-being of the whole frame; whence every approach to a correct pathology of the circulation must contribute to the establishment of sound principles, and improve medical science. But pathology embraces more than the mere lesions of the blood or of its circulatory apparatus: there is a nervous system as well as a vascular, which cannot be over-

* Cases by Mr. Stafford, quoted by Sir B. Faulkner, p. 245-253.

† Op. cit. p. 232.

* Op. cit. p. 233.

looked. We wish it, therefore, to be understood that in the following doctrines of plethora we have not the slightest intention of establishing an exclusive pathology, or of claiming for the facts and reasonings adduced a higher importance than they intrinsically merit.

The term *plethora* but ill expresses the state of constitution which it is used to designate, yet it would be difficult to substitute one more correct and appropriate. Indeed, no concise term could convey the compound idea which requires to be represented, and which involves the conception not so much of the quantity of the circulating fluid, as of the relative proportions of its constituent parts. The term hyperæmia, as being of similar import, would not be preferable even if it were not otherwise appropriated. It is applied to denote local accumulations of blood arising from congestion or determination, in which the phenomenon results solely from the increased quantity of blood, without reference to its quality, and is, consequently, expressed with correctness by a term representing such excess.

Plethora, though inducing a morbid condition of the body, has not in general been designated a disease, nor treated of by practical writers, save in connexion with some special malady attendant on or derived from it. Linnæus has given it a place in his nosology in the class *Deformes* and order *Decolores*, and thus defines it: "Rubedo corporis a distensis vasis sanguineis, cum dyspnœa." Sagar also admits it in the class *Cachexiæ*, and order *Intumescentiæ*, giving not only a definition but a description also: "Intumescentia universalis, proportionata et æquabilis ex abundantia sanguinis." "Amystidis et ventris cultus, pulsus plenus aut suppressus, venarum amplitudo conspicua, æstus et gravitas totius corporis, respirandi difficultas, lassitudo spontanea, stupor artuum, somni turbati, partes epidelio tectæ rubentimæ, temperamentum sublaxum, sanguineum." The former of these would seem to denote rather special disease of the lungs, and the latter to characterize obesity. Neither is calculated to convey a clear or correct notion of the morbid condition which excess of blood occasions. As this condition is present in many diseases, and actually gives rise to several; and as, even in cases where it does not exist, it is of importance to be assured of the negative, it cannot but be deemed an important part of pathological science to trace the circumstances which generate a state of plethora, and the phenomena which indicate it, so as to be prepared both to recognize it when present, and to apply means suitable and adequate for its correction.

Disease is considered to exist when there is any observable deviation from health in any of the functions or structures of the body. When the whole constitution is disturbed or depraved, without any part being more prominently affected, the disease is said to be general or constitutional, and according to its character is called either febrile or cachectic. If any function or organ be particularly disturbed, a name is thence affixed; and if an organ or function suffer without apparent disturbance of the general health, the disease is pronounced local. On such views have classifications of diseases been formed, yet are they wholly wanting in that precision which the productions of a nosological arrangement should indisputably possess.

When morbid symptoms of any kind arise, it is necessary to consider not only the morbid lesions which immediately produce them, but also the deviations from health in which these morbid lesions themselves originate, tracing these back to the point where deviation from health first occurs. By such investigation only can the history of disease be rendered complete, or its true pathology be established.

It is easy to understand why the investigation of disease has for the most part commenced with that period when a nosological malady is considered as formed. Until this period arrives medical aid is rarely sought for, the patient's consciousness of indisposition being aroused only when the functions of health become so impeded as to fail sensibly in their accustomed exercise. The accession is then referred in general to some exciting cause, real or imaginary, and is considered as having commenced at the time when the imputed cause was supposed to operate, a state of previous good health being assumed. Thus suddenness of accession has been regarded as a character of most acute diseases, and the period when the accession has been first observed has been regarded as identical with the commencement of disease. Yet it may be doubted whether any disease, excepting such as results from a morbific poison, ever takes place suddenly or without previous derangement of general health, cognizable by its appropriate manifestations, and capable of being corrected so as to obviate the morbid accession to which it leads. If this can be demonstrated, it is clear that this introductory stage of disease is of the highest importance, as being that to which prophylactic treatment can be most beneficially directed, and also as forming a part of the ensuing disease essential to its complete history, and without a knowledge of which its intimate nature or the series of morbid changes never can be thoroughly understood.

In tracing the progress of plethora, and the derangements of function which it occasions, it is necessary to commence at that point where the equable and temperate exercise of all the functions of life constitutes the state which we denominate health. By this means physiology becomes connected with pathology; the actual transition of health into disease is elucidated; and a light is thus shed on morbid processes which no other source of investigation can supply. When disease has made a certain advance, and continued a certain time, so complex are the derangements resulting, that without some clue for unravelling their intricacies, an exposition of them is in vain attempted, and, as the history of physic abundantly shews, conclusions the most opposite may be arrived at in inquiries directed to the same end. This could not be the case if the several morbid changes, as occurring in the respective func-

tions, were marked in their regular progression, so as to determine, when any one presented, what were its antecedents, what would be its consequents. Were this knowledge clearly possessed, each symptom of disease would be discriminated as belonging to a determinate train of morbid actions; and however obscured it might be by contingent or derivative disturbances, it would point out unequivocally the appropriate means of its own correction. With such accurate knowledge we should not see such ambiguity prevailing as that in certain maladies some practitioners enjoin bloodletting where others give opium and ammonia.

Almost all systematic and theoretical writers have left their inquiries incomplete; with each an important stage of the diseases of which they respectively treat remains unexplained. This stage embraces the interval between the first deviation from a state of health, and the occurrence of the special lesion of which each has taken cognizance; and it is chiefly to this stage that we purpose to direct attention in the following pages.

The constant, unremitting exercise of the functions, the aggregate of which constitutes all that we know or can conceive of life, is attended with a physical expenditure which daily nutrition replaces. The nutritive matter taken into the stomach, and which forms the chief support of animal life, undergoes several successive changes in its passage through the body; it is digested, assimilated to the animal juices, deposited in the several structures for their appropriate nutrition, and finally, when no longer fit for supporting their healthy actions, is taken up by the absorbents and carried out of the system by appropriate excretories. It is obvious that there is a natural proportion between the ordinary waste of the body and the supply of fresh nutritive matter, and that if the latter be either too sparing or excessive, the functions of life must undergo some deviation from their healthy exercise.

Considerable variations are liable to occur in the quantity and quality of food which any individual consumes, in the assimilating processes by which what is taken into the stomach is animalised and fitted for repairing the waste of the system, and in the several secretions in which the blood is expended. If more food be assimilated than the ordinary waste of the body requires, a state of repletion must be the natural and inevitable result. But repletion may also take place under a moderate and even abstemious use of food, when, from sedentary habits, inactive life, or other cause, appropriation of blood by the nutrient and other secretions is languid and inefficient. As repletion, then, may take place under very different circumstances, so is its presence marked by different phenomena. Whenever it arises, one of two consequences is sure to result; either it excites the several functions, if sufficiently healthy and vigorous, to increased actions leading to its speedy appropriation and removal; or, if these be weakly and unable at the moment to institute and support those increased actions by which the redundant matter is to be appropriated and expelled, then, oppressed by a labour to which they are unequal, they manifest a decline of even their ordinary power, and all the outward phenomena of debility are displayed. To discriminate this state from one of real debility arising from exhaustion of animal power or from defective nutrition, is a matter of practical importance not inferior to any which medical science may be engaged in illustrating.

When redundancy of nutriment takes place in a healthy constitution, its earliest effects manifest what may be termed rather exuberance of health than a state of disease. The several functions of the body are more vigorously performed, the nutrition of its several structures is more abundant, and it acquires increase of bulk, especially if the habits of life are not of an activity capable of increasing excretion to a degree proportionate to the nutriment inordinately supplied. And if the excess be casual or inconsiderable, the self-adjusting powers of the body are amply sufficient to dispose of it so as to prevent the transition of healthy actions into diseased. If from extent or continuance the excess be such as to urge these powers beyond a certain point, then their conservative energies fail, and irregular actions of various kinds take place, laying the foundation of a large proportion of the specific diseases to which the human body is liable. The general character of diseases so induced is inflammatory. They are marked by a quickened circulation, increased heat, and a more or less depraved state of the several functions. According to the predisposition of the system, hereditary or acquired, to the accidental weakness of particular parts, or to the casual excitement to which the body may be exposed, is the specific form of the ensuing disease determined. For this diseased condition the means of essential relief are, depletion and abstinence; the one to remove or abate the original cause of distemper,—the other to prevent its recurrence. There can be little doubt that the process of nature here referred to, though generative of what we term disease, is yet intrinsically sanative; its object being to dispose by increased energies of that which the ordinary powers are unable to appropriate, and the continuance of which is inconsistent with their healthful exercise.

When repletion occurs in a habit of less natural vigour, the self-adjusting powers are not so successful in effecting early restoration; and inflammatory actions are more tardy in their accession. The interval which precedes the occurrence of morbidly increased actions is one of peculiar interest, because its phenomena are of an equivocal character, resembling in many respects those which belong to a very different state of the system, and hence liable to be misunderstood; and more especially because they have hitherto been very imperfectly investigated.

The two kinds of plethora here described may be conveniently distinguished by the terms *absolute* and *relative*; the former implying that the redundancy exceeds what the

healthy state of the individual constitution would require or bear; the latter that, without being absolutely excessive, it is relatively so in reference to the deficient powers of the constitution for appropriating or otherwise disposing of it. Absolute plethora would thus correspond with the *plethora ad molem*, *ad vasa*, *ad venas* of systematic writers; and relative plethora to the *plethora ad vires*. With respect to the *plethora ad spatium*, or that referred to reduced capacity of vessels, the actual quantity remaining the same,—or the *plethora ad volumen*, arising from increase of bulk without actual increase of quantity, it would serve but little purpose to notice them in a practical treatise; the former being resolvable into relative plethora, and the latter, if it ever take place, being only a transitory effect of a temporarily operating cause, such as increased temperature, by which the volume of the blood was supposed to be expanded. The distention of vessels, however, from which this expansion was inferred, was much more probably occasioned by the excitement of the arterial system caused by the stimulus of heat. It is questionable whether a real plethora ad volumen ever occurs except in the instance of persons ascending great heights, at which the diminished pressure of the atmosphere seems to give rise to some such effect.

The subject of plethora might be comprised under the heads of absolute and relative; but its discussion would not then be complete, for so continually is nutritive plethora combined with another source of vitiation of the blood, that it is impossible to do justice to the one subject without at the same time illustrating the other. This vitiation takes place when under moderate nutrition there is defective excretion; in which state the system is oppressed, not so much by the quantity of nutriment, or the labour of disposing of it, as by the load of excrementitious matter with which the blood is overcharged. The phenomena and treatment of this condition of the body are also of high interest, and deserving attentive and mature consideration; for unless its nature be clearly understood, the treatment must be purely empirical, and its success precarious and incomplete. Each of these morbid conditions will now be considered; and the discussion will, we trust, assist in reconciling some of the apparent anomalies and inconsistencies with which medical practice is so frequently charged.

I. To the first of these conditions, or that of absolute plethora, belong all the cases of pure inflammation which we daily witness. It is usual, when these occur, to refer them almost exclusively to the exciting cause which may have immediately produced them. Yet the fallacy of the conclusion must be obvious when we reflect that, of several individuals exposed to the same exciting cause, scarcely two will be affected alike. From exposure to cold, for instance, one will be attacked with catarrh, another with rheumatism, a third with inflammation of the bowels, a fourth with sore throat; while by far the greater number will escape altogether. Were the exciting cause solely chargeable with these several effects, they would unquestionably be marked with greater uniformity. The truth is, that the exciting cause produces its effect because the body exposed to it is prone to be morbidly affected in consequence of its own previous derangement; and the specific form of the disease is determined, partly by the operation of the exciting cause, but chiefly by the predisposition of the parts affected to undergo those morbid actions to which the general indisposition of the system and their own partial weakness render them liable.

To distinguish by its appropriate phenomena that condition of an apparently healthy body which subjects it to be affected by slight exciting causes, must be an important part of medical knowledge. This state and these phenomena the writer of this article endeavoured to explain and illustrate at some length several years ago. He then made known the course of inquiry by which he was led to investigate these phenomena, and to trace them backwards to the point where health first passes into disease. His earlier observations were conducted on what occurred in his own person, at a time of life when he was prone to severe attacks of inflammation, and when regard for his safety compelled him to watch vigilantly the premonitory indications so as to anticipate the approach of inflammation, and by timely interference avert its more severe accessions. By close attention he was enabled to detect those indications in certain derangements of functions, sufficiently clear and undeniable when noticed, but which might, on superficial examination, be overlooked or regarded as trivial and insignificant. The success of his early endeavours to arrest advancing disease encouraged him to observe still more closely, and detect at still earlier periods, the morbid actions introductory to inflammation; in which way he progressively ascended to the higher links in the chain of causation, availing himself always of the knowledge thus acquired so as to apply means of relief at the earliest period when a necessity could be perceived; and with such effect that he succeeded thoroughly in subduing a liability to inflammation, from which he had suffered repeatedly and severely for several years. Engaged in hospital duties of some extent, he had ample opportunity of making corresponding observations in a tolerably wide field of practice; and the result was a full confirmation of all that the experience of his own case had taught him. From the principles thus deduced, the writer has derived much valuable guidance in the investigation and treatment of disease for more than twenty years; an experience which may be considered as justifying some confidence in now again submitting them to the profession through the medium of a work devoted to practical medicine. To detail here the analytic processes of inquiry from which this experience was derived would extend the present article beyond its allotted limits. Premising, therefore, that it was from research so

conducted the following information was obtained, we shall proceed to state synthetically what we believe to be the course of morbid actions consequent to and resulting from redundancy of nutritive matter in the blood, both absolute and relative.

We have stated that absolute plethora is the parent of pure inflammation. If there be no plethora, inflammation will not be excited by slight causes; or if it be aroused through the operation of an exciting cause, it will be mild and easily subdued. The severity of inflammation, too, will, *cæteris paribus*, be proportionate to the degree of plethora pre-existing. Previously to the occurrence of febrile or inflammatory action, there is always a sensible interval of disease marked by evidences of diminished power in the arterial system, the oppressed and irregular actions of which evince its inadequacy to carry on the circulation with its wonted vigour. The pulse, if examined, will be found low, oppressed, irregular; which state passes progressively into one of permanently increased action or fever. Multiplied observations have satisfied us both that the stage of disease here mentioned precedes that of febrile action, and that the morbid actions indicated by the pulse succeed each other in the order here announced; the first being that of feebleness or overloaded power, the second of irregularity, and the third of permanently quickened circulation. It has been already stated how incipient plethora, when the redundancy is no longer disposed of by the healthy action of the several organs of appropriation, and when these can no longer perform steadily the increased labour, gives rise to the state of feebleness now under discussion. To comprehend the nature of these several changes is not difficult, it being readily explicable by reference to well-known laws of vital action.

When redundancy of nutritive matter first occurs, its immediate effect is to promote more vigorous circulation, and to excite to increased actions the several capillaries, especially those engaged in nutrient secretion. The peculiar stimulus of the nutritive matter excites these actions; their end is to dispose of the redundancy by natural appropriation, and the effect on the frame in the first instance is only that of increased volume and exuberant health. But to all vital actions, and the degree to which they can be continuously sustained, there is a limit; and when increased beyond this they after a time become relaxed, sinking even below the natural standard. By incipient plethora increased actions are excited which at first differ from perfectly healthy actions only in degree. In time, however, and especially if the plethoric state be kept up by excessive nutriment, they become enfeebled and abate; then it is that the pulse, which antecedently was fuller and stronger than natural, first becomes low and oppressed. The disposal of redundancy by increased action of healthful processes proving inadequate, from inability of the vital powers, to continue it, other efforts are now needed; and as these, though in their tendency corrective of what is amiss, no longer resemble the healthy actions, they must be considered as morbid; disease being the result of their institution. While we thus regard them, however, we should never lose sight of the corrective tendency which originally belongs to them, nor fail to profit by the curative indications which the efforts of nature point out. The minute changes so induced we pretend not wholly to explain, though many of them are readily intelligible; but the cognizable phenomena are sufficiently obvious to mark their connexion and dependency, and thus to establish a rational theory of the course which nature pursues.

Relief by increased nutrient secretion not sufficing, a more general excitement seems now required, the object of which may be to call into more vigorous exercise the several excretories; and a state of generally increased or febrile action ensues. The state of irregularity is obviously the transition from the state of feebleness to that of permanently increased action or fever; and the end of the latter is to get rid of the original cause of disturbance. It is in proof of the correctness of these views that if in the stage of feebleness depletion and abstinence be resorted to, the feebleness disappears, natural vigour is renewed, and health is restored, without any febrile action being instituted; while if this state be treated with stimulants and nutritive diet, febrile or inflammatory action is sure to result. We wish here to observe that in these remarks we use the term *fever* to denote, not any of the specific diseases known by that name, but simple pyrexia, characterised by a quick pulse, hot skin, and furred tongue, being the constitutional state attendant on the ordinary phlegmasiæ, and so generally, through a radical misconception, denominated symptomatic fever. As the stage of feebleness is relievable by evacuations and abstinence, so are those of irregular action and of febrile excitement to be remedied by the same means; and if these be duly employed, any or all of these morbid conditions may be promptly corrected without specific disease or local lesion of any kind ensuing. But if they be not employed, and more especially if, through misconception, stimulants be used and nutritive diet continued, then febrile action becomes more determinately aroused, and some specific disease of an inflammatory character is engendered: or else, if the constitution be, from natural inertness or the extent of labour to be performed, unequal to the effort necessary for generating a state of fever in inflammation, the general health progressively declines, the powers of life become enfeebled, and the constitution finally sinks under some of the complicated forms of chronic disease. When under the former of these results active fever or inflammation occurs, it is in general speedily subjected to medical treatment; and as opinions vary but little respecting the measures to be pursued under such circumstances, while the urgency of disease requires them to be employed with proportionate vigour, it seldom happens that

this stage of disease is improperly treated, at least so far as regards the use of evacuants. At this time the propriety and necessity of active treatment and of depletory practice are admitted on all sides; yet previously to the acute attack a deviation from a healthy state existed, which admitted of detection, and which as clearly indicated the propriety of some depletion, though it might not demand it so imperatively, nor require it to the same extent, as when the acute attack had supervened. Were this introductory stage relieved by adequate depletion and other suitable means, there can be little doubt that the accession of acute disease might in every instance be averted, or at least so greatly mitigated as to be free from all danger.

It appears from all that has been stated, that incipient plethora in a healthy constitution excites at first only increased energies of healthy functions, manifested in the increased bulk and more florid aspect which such persons usually present, and in the evidences of more vigorous circulation which the pulse affords; that this state of increased healthy action, if urged too far, declines into one of diminished power, still evinced by the pulse, which then becomes low, oppressed, and irregular; and that, if these progressive changes be overlooked or unrelieved, a state of permanent excitement succeeds, such as constitutes fever or inflammation. It is obvious, then, that the increase of bulk and more florid aspect in which so many exult as evincing sound health, and which they endeavour by all the aids of good living to promote, is not a source of unmixed congratulation; but that, on the contrary, it deserves to be regarded with no slight suspicion, as actually verging on consequences by which both health and life may be forfeited. Up to this period, however, disease cannot be said to have commenced, however it may be approached; and reduction of diet, with free bowels and increase of active exercise, would suffice for getting back to sounder health without any need of medical interference. When abatement of healthful energies becomes evinced by a low and oppressed pulse, diseased actions may be said to commence, and when the stage of irregular action ensues, sensible progress may be considered as made towards the establishment of febrile action and inflammatory disease. When these latter result, medical aid and active discipline are indispensable; but up to this period much may be done by mere reduction of diet and a free state of bowels to avert the pending mischief. This condition of the body will be further illustrated, when the practical treament required for its relief comes under discussion, the course of enquiry rendering it necessary to proceed now to the consideration of the second division of the subject, or that of relative plethora.

II. In relative plethora the earlier deviations from a healthy state take place so gradually, and the constitutional efforts are so feebly exerted, that for a long time they are nearly unnoticed. Health is observed to be less perfect; there is occasional languor and disinclination to the customary exertions, with irregular distribution of blood as marked by coldness of feet and variable countenance; the bowels are irregular, the appetite is capricious or fails, and both flesh and strength decline.

At the earlier periods of this state the pulse will be found weak, often irregular. Sooner or later a febrile or inflammatory state ensues, marked by a quickened circulation, some increase of temperature, and a white or furred tongue. This state may continue for an indefinite period, and be subject to frequent fluctuations; most frequently in course of time some part more particularly suffers, a local ailment arises which excites attention, and to which, when discovered, the constitutional indisposition is most commonly ascribed. In order to judge correctly of this condition of plethora, it is necessary to mark particularly the accordance of its phenomena with those which absolute plethora presents, especially in the changes which the pulse undergoes. This, here also, is at first feeble and oppressed, then irregular, and finally it becomes permanently quickened.

As the incipient lowness of the pulse is the symptom which so generally misleads, conveying the impression of debility, and suggesting the employment of tonic and stimulant remedies, it is highly necessary to distinguish it from a pulse of pure debility. Happily there are other circumstances besides the pulse to direct the judgment in this respect; other obvious derangements co-exist, displaying a harmony of symptoms, which, taken collectively, establish beyond a doubt the existing condition of the vascular system. But the language which they speak is not always understood; their warning voice is unheeded; and the deceptive lowness of pulse is suffered to counteract the evidences which the other co-existing symptoms display. On this account it is that we dwell so much on an accurate discrimination of the indications which the pulse affords; not so much for the positive evidences which it furnishes—for there are others much less equivocal, and far more worthy of being relied on—as that, when this peculiar lowness exists, it shall not be suffered to bias the judgment or to divert the practitioner from those measures by which alone the morbid condition referred to can be corrected. A little accuracy in the mode of examination, with attention to the impressions made on the finger, will readily detect the peculiarities which we have stated; and when familiarised to the touch by habitual perception, there can be little difficulty in distinguishing them. In the condition of which we are treating, if firm pressure be made on the artery, it will be found to resist beyond what its apparent feebleness would indicate, and, on gradually withdrawing the finger, to rebound with a force much greater than would at first be imagined. If the pressure and relaxation be a few times alternated, the sensation will be rendered more distinct. This inherent

firmness is sufficiently indicative of the condition existing, and affords the best assurance of depletion being well borne. As we before stated however, and as will be hereafter more distinctly pointed out, there are other evidences to confirm what the pulse proclaims.

The state of irregularity of the pulse also requires precision in determining both its character and extent. It may be perceived as affecting both the force and frequency of the pulsations; and the irregularity of force, or that in which the artery makes a few strong pulsations, as if by a transient effort, and again relapses into a state of oppressed and diminished action, indicates, so far as we have been able to discover, a nearer approach to febrile or inflammatory excitement than the irregularity of frequency only; repeated observation of which fact has led us to infer that this stage of irregularity is the connecting link between the stages of feebleness and of permanently increased action, and that it consists of the early but yet imperfect efforts of the vascular system to form this latter stage; for when the febrile or inflammatory action is fully formed, the irregularity is no longer perceived.

The decline of power incident to a plethoric state of circulation has not been overlooked by theoretic or practical writers, however they may have failed to mark the order of succession which the phenomena present in the initiatory stage of disease, or to have deduced from these conclusions capable of affording practical guidance. Dr. Gregory, who has faithfully represented the state of physiological and pathological science as they existed when he wrote, notices distinctly both the weakness of the circulating organs and the inordinate burden imposed on them by a state of plethora. "Multa mala à nimia plenitudine oriuntur. Homo nonnunquam fere opprimitur, hebes, languidus, debilis fit, neque ipsa quæ sanguinem movent organa ad tantum onus impellendum valent. Pulsus languet, et aliquando syncope, et vertigo, et palpitatio observantur. Sæpius vero vasa nimis distenta, ad motus præter solitum vehementes et abnormes proclivia fiunt." Here the facts are explicitly stated, but the connexion of the state of debility with that of increased action is not traced, while symptoms, which belong to more advanced periods of disease, and arise from ulterior derangements, are intermixed, creating confusion. And, further, the stage of permanent excitement is regarded rather as the result of over-distention of vessels, than of the stimulus of redundant nutritive matter over-exciting the vital powers.

As the succession of these several stages may be observed taking place naturally, so may the changes be accelerated and displayed by means of medical treatment; for if the constitution be long oppressed, and have long endured the stages of feebleness and irregularity, moderate depletion has the effect of relieving the vital powers, so as to bring on the period of increased action much sooner than it would otherwise occur. This effect is strikingly exemplified by Dr. Watt in his valuable treatise on diabetes; in which he has shewn that the pulse may be raised from the extreme of depression to vigorous action by free bloodletting, and that under this process the blood itself becomes changed from a dark grumous mass, scarcely coagulating, to the blood of active inflammation, with firm coagulum and thick buff. Changes similar to those recorded by Dr. Watt we have had repeated occasion to witness both in diabetes and in cases where no urinary affection existed; and for many years we have been accustomed to refer them to the pathological state of the vascular system which we are now endeavouring to explain. This state also will require further illustration when its practical treatment comes to be considered; but ere we pursue the subject of nutritive plethora further, it is necessary to notice the vitiation to which the blood is liable from its becoming overcharged with the excrementitious matter carried back to it by the absorbents, which in the ordinary course of health ought to be regularly expelled, but which, under impaired energies or interrupted functions of the excretory organs, accumulates in the blood, oftentimes to a considerable extent, vitiating its quality, unfitting it for healthful nutrition, and oppressing and debilitating all the powers of life. The necessity for noticing this state arises from its being continually combined in various proportions with the condition of relative plethora, the progress of which it sensibly impedes, and the phenomena of which it complicates and obscures.

III. In the morbid condition which we are now to notice, the deviation from health takes place still more gradually than in relative plethora. Indeed, so insidious is its advance, that, not producing any immediate or special disease, and marked only by change of aspect and some abatement of wonted powers, it is for the most part overlooked, or at least undergoes no adequate investigation. Combined as it is, too, with relative plethora in every proportion, and by its debilitating effects even ministering to this latter, it becomes confounded with derangements of a character essentially different, and the influence which it exerts both in generating and modifying disease, fails to be recognised. It arises from defective excretion; and as exercise is the natural stimulant for exciting the various excretions to an adequate performance of their functions, this condition more peculiarly occurs in the sedentary and the indolent. It is characterised by great sallowness of aspect and duskiness of skin; the pulse is low and compressible; the surface of the body is in general harsh, dry, and deficient in natural transpiration; the tongue is for the most part moist and clean; the appetite capricious, often voracious; the alvine evacuations are inveterately foul, exhibiting no traces of healthy secretion; the urine is high coloured, depositing a dark sediment, and often very fetid; even the perspiration has frequently an offensive odour, and gives a dusky tinge to the linen which absorbs it. The state here described has not escaped

observation, having been noticed by medical writers, and even ascribed by them to the causes here assigned. Ramazzini more than a century ago represented distinctly this condition of body, as induced in certain artificers by sedentary habits and inactive life, explicitly referring the sallowness of aspect and depraved health, together with certain defœdations of the skin, to the *excrementitious* matter of the body being imperfectly discharged. In his work, "De Morbis Artificum," ch. xxx. he remarks, "Scabiosi quoque decolores, ac mali habitus esse solent sedentarii artifices, sarcinatores potissimum, ac mulieres quæ suis in laribus die ac nocte, ut victum sibi quæritent, acu operantur, hæ enim mala inexercitatos comitantur; nam vitium capit sanguis ni moveatur corpus, *unde illius excrementa in cute restitant, et universus corporis habitus vitiatur.*" Again he states, "Mala igitur intemperie et multa vitiosorum succorum redundantia laborare solent hujus modi artifices, ob vitam sellulariam quam degunt, ac præsertim sutores. Non sic tamen multi alii artifices qui sedendo operantur, uti figuli, textores, qui brachia et pedes, totumque corpus exercent ac propterea saniores sunt, ut *quibus sanguinis impuritates facilius per hujusmodi motum discutiantur.*" Here are represented as distinctly as words can convey, both the accumulation of excrementitious matter resulting from inactivity and defective excretion, and the depravation of habit to which such redundancy gives rise.

The manifestations now noticed as belonging to excrementitious redundancy are intermixed in every proportion with those of relative plethora, the two conditions mutually reacting on each other. Arising, however, as they do from totally different sources, it is highly necessary to discriminate them so as to impute to each what belongs to it, and thus render the practical treatment more definite and precise. No symptom marks the existence of excrementitious excess in the blood more signally than the obstinate foulness of bowels so often encountered in various maladies, and which no employment of purgatives seems to correct. If by their use such relief be given to the system as empowers it to make a febrile or inflammatory effort for impelling blood into the capillaries, renewing more active processes of secretion, and thus ministering to its own relief; if the pulse become quicker and firmer, the tongue white and loaded, with such evidences of increased activity of circulation as to warrant the use of small bleedings, these, if employed with sound discretion, and adapted to the powers of the constitution, will, in conjunction with the excited powers with which they are used to co-operate, do more to correct the morbid condition of the bowels, and thus restore healthy evacuations, than any use of purgatives however judiciously managed or perseveringly employed. This fact we have so often witnessed, that when this state of bowels is found to resist purgative treatment, we have for many years been accustomed to resort to the moderate use of the lancet, as the most effectual auxiliary of purgatives that can be employed. Bloodletting, however, in this morbid condition of the system, requires much caution and a clear conception of the principles on which its employment is founded, to guide its use; for if resorted to at too early a period, while the powers of life are still torpid and inert, or if pushed even a little beyond what those powers can bear, much mischief and formidable exhaustion may result. Some tendency to renewed excitement ought perhaps to be manifested ere the lancet is used; but when this presents, then small bleedings will contribute to rally the dormant powers far more effectually than the most potent tonics.

In the transition here noticed of the sluggishness of system belonging to a state of excrementitious redundancy, into the excited power manifested by febrile action, it cannot fail to be observed how closely the latter corresponds with what has already been described as occurring in relative plethora. In fact, so far as the state of excitement is concerned, the conditions are identical, displaying the same pathological phenomena, and ministering to the same end, the only difference being the modification which any great degree of excrementitious accumulation produces in the actions and symptoms; which after all is a difference more in degree than in kind; for when relative plethora has existed for any time, excrementitious accumulation is sure to become combined, it being the direct product of the debility and imperfect excretion incident to this morbid condition.

The consideration of excrementitious redundancy might with propriety have been included in that of relative plethora, were it not that the separate notice of it renders its nature and phenomena more clear and explicit. For practical purposes, however, the two states cannot in our conceptions of them be disunited, for relative plethora gives rise to excrementitious redundancy; and when any high degree of the latter primarily occurs, it is most probably incapable of correction without the intervention of those sanative efforts which the constitution itself makes when aroused into febrile excitement. To promote these efforts, not merely by exciting enfeebled powers with stimulants, as is too much practised, but by diminishing their labour, and thus rendering them more adequate to its performance, through the cautious abstraction of blood, and the establishment of more efficient excretions, is the process by which the objects of the medical practitioner will, in numberless instances, be best attained. To pursue this course, however, requires unbending integrity on the part of the practitioner, and firm confidence on that of the patient. It is opposed by many prejudices; it works not like a charm, and extravagant expectations of instantaneous results would not be realised. Time is required for its success; it is nature that effects the cure, and her operations are not to be hurried. They, however, who are willing to abide by her slow but sure exertions, and who value the re-establishment of perfect health more than the temporary alleviation of some partial ill, will be amply

repaid in the fulfilment of their more rational desire, so far as it is attainable by human means; and we can confidently say, from the experience of a life which has for above thirty years been devoted to medical science and practice, that the satisfaction which we have derived from witnessing the renovation of health and strength thus effected, has surpassed even that which the signal relief of acute disease by active treatment, and the consequent saving of life, has ever afforded.

Treatment.—We proceed now to consider the practical treatment of the three several conditions to which we have directed attention, namely, absolute plethora, relative plethora, and excrementitious redundancy.

1. *Absolute plethora.*—In this condition, including the diseases to which it gives rise, we may trace three progressive stages. The first embraces the period which precedes febrile or inflammatory excitement; in the second, febrile excitement exists unaccompanied by any prominent local affection; and in the third is superadded some local inflammation, or other partial derangement, constituting what is usually deemed a specific disease. When the latter arises, it no doubt reacts on the constitution, aggravating the several disturbances in proportion to the importance and the degree of derangement of the organ or function specially affected. But if the series of morbid actions here represented be that which nature follows, it is clear that they are much in error who ascribe what is miscalled sympathetic fever to the local disease coexisting, which, instead of exciting the attendant fever, is only its direct product.

The phenomena which mark the incipient stage have been already noticed and explained; and it was stated generally that the proper treatment for correcting this morbid condition consisted essentially of depletion to remove the plethora, and abstinence to prevent its recurrence. And this treatment, if timely employed, would always suffice. Indeed, in the very early periods, abstinence alone would, by cutting off the supply of inordinate nutriment, give effectual though slower relief. But were this otherwise, inasmuch as they who become so affected are still considered as enjoying perfect health, it would be useless to lay down rules of treatment to which none would be likely to resort or conform. Indeed, we should be reluctant to lay stress on this initiatory stage, if doing so were to induce any suspicion of a wish to bring under medical discipline those who probably exult in their not requiring its unenviable interference. Even if it were in our power, therefore, to arouse every such individual to a full sense of his approximation to disease, and of the dangers to which this exposes him, we should hesitate to give rise to such incalculable misery as a perpetual watchfulness over the feelings of health could not fail to occasion; for though many might, by timely precaution, avert diseases that would otherwise ensue, the constant anxiety to which numbers would be unnecessarily consigned by the prevalence of such impressions, however correct, would greatly counterbalance any good that could result. It is of consequence, however, that medical men should have a just conception of this state when subjected to their observation, so as not to be misled by delusive appearances; and it is of the highest importance, when, as continually happens, acute and dangerous maladies have a tendency to return, to be aware of the premonitory signs that mark an approaching accession, so as to employ in time the means necessary for averting its recurrence. To precautions of this kind, as formerly mentioned, the writer was indebted many years ago for his own preservation and reestablishment of health; since which period he has had ample opportunity of proving, by extensive application of the principles now inculcated, the value and efficacy of such timely prevention.

When the stage of disease now under consideration is subjected to medical treatment, the means of relieving it are simple in the extreme, consisting only of moderate bloodletting, occasional purging, and reduced diet, with a speedy return to such exercise as may be required for keeping the several secretory and excretory organs in the adequate and healthful discharge of their functions. By these means, pursued without any sensible impression on the general strength, and scarcely an interruption of ordinary avocations, may this condition be effectually relieved, and the dangers to which it leads successfully averted. It may conduce to accuracy of conception to explain here what is meant by *moderate bloodletting*. The object is to remove a certain portion of the circulating fluid in order to diminish the proportion which the nutrient matter bears to the watery solvent. This latter is so readily absorbed and carried into the circulation, that the actual volume of the blood becomes speedily restored. For the relief of incipient plethora it will in general suffice to abstract twelve or sixteen ounces of blood at a time, the evacuation being repeated as circumstances may require, both the amount and the repetitions being dependent on the individual constitution. In the case of the writer, when suffering under this stage of plethora, much larger depletion was required; above thirty ounces being often taken from the arm without the evacuation being otherwise felt than in the relief which it afforded. If the necessary relief happened to be postponed, so as to approach the period of active fever, the bloodletting required to be of still larger amount. At such time there was generally some uneasy sensation, caused by certain local determinations of blood to which the writer was subject; and when this existed, blood was usually suffered to flow without regard to quantity, until the uneasiness subsided. If the evacuation stopped short of this effect, the relief was incomplete, and a speedy repetition of venesection was sure to be required, and to a greater amount. From this free use of the lancet, guided as it was by a definite purpose, and bounded by certain limits, though these were not measured by quantity, the writer never in any instance suffered injury such as is so often ascribed to large bleedings, and he is

quite satisfied that by observing the rule which has been stated, more effectual relief was obtained, and that morbid actions were restrained with less ultimate loss of blood, and less prostration of general powers, than if blood had in the first instance been sparingly taken.

The principle of carrying bloodletting to the extent of making some impression on the constitution, and thus arresting the progress of morbid action, we shall have to consider more fully when we come to treat of its employment in active inflammation. We may here, however, cursorily remark, that when morbid actions of an inflammatory kind prevail to such extent as to demand direct depletion by bloodletting, effectual relief is not afforded unless the sufficiency of the depletion is manifested by some impression on the vital powers; for under high and active inflammation, twenty, thirty, forty ounces or more, may be abstracted without making any impression, when the loss of a few ounces more will, by inducing a disposition to syncope, at length arrest completely the inflammatory action, and repress the violence of disease. In such case, if the depletion be regulated by regard to the quantity of the blood taken rather than the effects resulting; and if from vague apprehension of injury it stop short of that relief which ought alone to set limits to it, the morbid action is left unsubdued, and much greater loss of blood is required eventually to allay it; and this with considerable risk of its then failing to accomplish its end; for independently of the hazard of allowing inflammation to continue in any organ essential to life, it should ever be borne in mind that in proportion to the time during which morbid action of this kind is suffered to continue unrestrained, will be the difficulty of finally subduing it; and consequently, that whenever active inflammation arises, it can never be too soon nor too effectually arrested.

From ample experience of the correctness of these views, we have long been convinced that when active inflammation occurs in a robust and vigorous frame, copious depletion in the earlier stages is the surest means of saving animal power and of accelerating perfect recovery. In the initiatory stage of plethora, however, such active measures are not needed. The object here is to reduce the quantity of blood as the most direct means of altering its quality; there is no inordinate action to subdue; and however moderate the depletion, it must give relief proportionate to its extent, the ground gained being afterwards maintained by other evacuations and abstinence. But when, from continued or increasing plethora, the second stage or that of febrile action ensues, then the principle which we have noticed becomes directly applicable. When the oppressed pulse passes into a state of irregularity, and thence into one of permanently excited action, as manifested by a quickened circulation, hot skin, and white tongue, active depletion becomes necessary, and it requires to be regulated on the principle now stated. At this time, too, other auxiliary remedies are needed. Of these purging is the most direct and most powerful, and saline purges, which produce copious watery discharges from the bowels, are among the most effectual. Several neutral salts and antimonial preparations are also valuable, as cooperating in the general purpose by the increased secretions to which they incite the kidneys and skin; and by the judicious administration of these several remedies, in conjunction with low diet, may this second stage in general be promptly and effectually relieved. The mode of exhibiting these remedies is so familiarly known and so continually practised in the treatment of the several phlegmasiæ, which so much prevail, that it would be superfluous here to enter into further details.

When local inflammation becomes superadded to the febrile excitement, we have then to consider not only the general plethora and febrile condition of the system, but also the state of the organ or part locally affected. If it be an organ essential to life, then the utmost activity of practice is required to guard against the danger arising from its functions being suspended or impeded, and from the disorganization of structure which continued inflammation is sure to induce.

It would exceed our province to notice here every local inflammation with which a predisposed body is liable to be assailed. For the purpose of illustration, therefore, we shall confine our remarks to two of the more urgent, and, by particularizing the treatment which they require, exhibit the principles of practice so clearly as to render them easily applicable to every corresponding case that can occur. With this intent we shall select two organs of primary importance, the brain and the lungs. When active inflammation of either organ is manifested by its appropriate symptoms, the necessary treatment must be promptly and vigorously applied, for the danger arising from suspended or impeded function is considerable, and both the obstinacy and danger are enhanced in proportion to the delay of the necessary depletion, and the insufficiency of its early employment. If bloodletting be not early and vigorously employed, such derangement of structure may quickly ensue as to destroy life, or permanently unfit the organ for the discharge of its ordinary functions. The effect of bloodletting in this case is twofold; by the quantity of blood abstracted it diminishes plethora, and by its influence on the moving powers it moderates or subdues the arterial actions by which inflammation is upheld. As inflammatory action in such cases cannot be too soon arrested, and as suddenness of depletion greatly promotes its speedy effect on the moving powers, the blood should be taken from a large orifice, in a full stream, and with the body erect. To be effectual, the depletion should be carried to the extent of making sensible impression on the local symptoms of either head or chest, and this will be found to coincide almost uniformly with abated action of the artery as felt at the wrist. When under the flow of blood the pulse falters, the lips become pale, and the face be-

dewed with perspiration, bloodletting may be confidently relied on for yielding all the relief which this truly potent remedy is capable of affording. The quantity necessary to produce this effect varies greatly. The writer has himself lost from forty to fifty ounces at one bleeding, and has nevertheless required a repetition to smaller amount within a few hours. We have known much larger bleedings employed in urgent disease with only salutary effect and without a single bad consequence resulting. As cases of extreme violence are those in which inadequate depletion would prove most fatal, it is necessary to notice the amount to which bloodletting may under urgent necessity be safely carried. Happily such cases are not the most frequent, and in the more moderate instances which most prevail, evacuations much more moderate will suffice. When by one or two bleedings, so conducted as to make impression on the moving powers, the more urgent symptoms are alleviated, the repetitions may then be regulated so as to keep within the bounds of all possible risk of excess.

If the plethora be considerable and the fever continue high, it may still, even though the local symptoms have yielded, be requisite to take more blood, so as to bring back the circulation to a healthy standard, and subdue remaining excitement, or relapse of inflammation may occur. By such means, combined with the auxiliary remedies already noticed, and assisted by the topical treatment suited to each local disease, a state of the most imminent danger may be speedily changed to one of perfect safety, provided organic lesion has not yet taken place.

The practice here inculcated may possibly appear to some bold and hazardous, but we can confidently appeal to the experience of those whose opportunities of treating active inflammation have been greatest, for the soundness of the principles which we advance, and for the perfect safety of the measures enjoined. We willingly admit that the ordinary course of medical practice may be carried on by less active treatment, for a large proportion of ordinary cases requires no more; but when urgent disease occurs, the attempt to dispense with proportionate activity of treatment can lead only to fatal results or tediously protracted disease. We have purposely dwelt on the severe rather than on the milder instances, in order to shew more clearly and forcibly what the principles are on which the treatment should be conducted. As the symptoms of each case, and the constitution to be acted on, denote the activity required, and thus guide the practitioner in the use of his remedies, there can be little hazard of the representations here made misleading any one into a rash or excessive use of bloodletting.

It may not be amiss here to take notice of two consequences, either of which may attend a very full bloodletting, namely, syncope and convulsion. They are prone to occur when much blood is taken, and especially when the patient is bled in an erect posture. There seems little room to doubt that both arise from the vessels of the brain being too much emptied, the enfeebled action of the heart being insufficient to re-fill them; and, as is familiarly known, recumbency of the body, which allows the blood to return to the brain with less of the heart's impulse, is the direct, and, we may add, uniformly effectual remedy. It has happened that patients bled to syncope have not revived; but this has been of rare occurrence, and when it has taken place, we should strongly suspect that blood must have been drawn beyond all prudent bounds, or that the propriety of taking any blood was questionable. We have witnessed many instances both of syncope and of convulsion, and can truly affirm that we never saw a single case in which injury of any kind resulted. We are no advocates, however, for bleeding to syncope, and never direct it, although, if urgent disease were to be arrested, we would go to the verge of it, for the reasons already assigned. Convulsion is an effect more formidable in appearance than syncope; and yet, though we have frequently seen it so induced, we have never known harm attend it. In its effect of lowering arterial action, we regard it as perfectly analogous to syncope, and for all that we have seen, equally innocuous. Yet, as it is always alarming to the bystanders, and as neither it nor syncope is necessary to ensure the full effect of bloodletting in subduing inflammation, we would willingly avoid both. There is a caution which we wish here to suggest to those who may have occasion to draw blood largely, namely, never to leave a patient so depleted until placed in a recumbent posture. The following case, of recent occurrence, will illustrate what we mean. We were requested to visit a man who had been seized with apoplexy some hours before. We found that he had been promptly bled, and to a large amount. The quantity of blood which we saw could not be under seventy ounces; it was thickly buffed in the earlier drawn portions, and we saw no reason to doubt the propriety of its abstraction. Having bled the patient, the medical attendant, pressed by other engagements, went away, directing him to be placed in bed as soon as possible. Circumstances prevented this being done, and when we arrived he was still sitting in the chair in which he was bled, held there by four stout men, whose united efforts were required to restrain the horrible convulsions which recurred every quarter of an hour or twenty minutes: he had been in that state for nearly two hours! His countenance was ghastly, the eyes glassy, lips livid, and breathing irregularly laborious. We had him instantly laid on the ground, and as speedily as possible transferred to bed; nothing more was required, for circulation soon returned, the pulse again became distinct, the countenance calm, with returning colour to the lips, and the breathing tranquil. This was an extreme case, being by far the worst we had ever witnessed. The bloodletting was unusually large, and severe convulsions continued at intervals for nearly two hours, owing to the im-

prudent continuance of the erect posture. Yet so little injury did this man suffer, that in less than ten days he walked to his physician's house, free from complaint, to thank him for having visited him.

It should be recollected that in the practical remarks hitherto offered, we have had in view inflammatory complaints only as they occur in absolute plethora, consequently in their most active and violent degree. In this state they require large depletion, and there is always ample power to sustain it, the danger being that of falling short of the quantity necessary, rather than of exceeding it. Diseases of the same species, however, occur in every condition of the system, and according as they take place in feebler constitutions, and are marked by less violence of symptoms, may measures of less energy be trusted to for their relief. It is from not noticing the differences of constitution or the degree of general plethora present under attacks of local inflammation, that so much diversity of opinion has prevailed among medical practitioners respecting the extent of depletion required. From peculiarities of local districts some practitioners never encounter diseases of this violence. They accordingly find that copious depletion may be dispensed with—that, if employed, it sinks the powers of life, and lessens the chance of recovery, and thence they somewhat hastily conclude that the active treatment pursued by others is rash and unnecessary. Diseases of this languid character may be supposed to prevail most in large and crowded cities, where the habits of life are sedentary and luxurious, and where inflammatory complaints are connected more with relative plethora than with absolute. Perhaps London may be taken as the best exemplification of this remark, and it is very generally believed that there the corresponding diseases do not bear the activity of treatment which the provincial practitioners find indispensible. We have it asserted, however, from high authority, that this is a misconception, and that no such difference exists, at least to the degree represented; for that London citizens both require bleeding as freely and bear it as well as the residents of any other district. The subject, however, will come more appropriately into the next section.

2. *Relative plethora.*—This variety being of more frequent occurrence than absolute plethora, and having connected with it a greater number of diseases, the consideration of it is still more important, and entitled to closer attention. In it, too, the progress of morbid action is more gradual, and the constitutional efforts to rectify existing derangements are more varied and more general. Hence the character of the disease produced by or incidental to this condition is complicated, and their elucidation proportionally difficult.

The earlier phenomena, being less conspicuous, attract less attention, and the equivocal character which they frequently present being liable to misconception, it becomes important to illustrate clearly the real nature of this condition, to exhibit distinctly the phenomena which characterise it, and to point out accurately the practical treatment suited to its relief, in order to prevent the highly injurious practical errors to which misconception in this respect so continually gives rise.

In relative plethora, as in absolute, the earliest deviation from health is marked by evidences of diminished power in the general circulation. The pulse becomes low and oppressed, and the general powers enfeebled. When from natural feebleness of constitution, or the absence of excitement, this incipient stage is prolonged for any considerable time, the impaired energies and deficient exercise of the several excretory functions give rise to more or less of excrementitious accumulation, and a combination of these opposite conditions results. More frequently, however, this stage passes into that of increased action, and some congestion, inflammation, or other local malady becomes manifested. A hard and frequent pulse, increased heat of skin, and whiteness of tongue, mark the formation of the second stage; and if in moderate degree, and unexasperated by stimulants, this may, in constitutions not predisposed to any particular malady or local lesion, continue for months or even years without any specific disease ensuing, and with only progressive deterioration of general health. We have so often met with this state clearly characterized, that we have been in the habit of distinguishing it by the term *constitutional inflammation*, meaning thereby to designate general inflammatory action in the system unattended by local inflammation.

All the phenomena which belong to this stage are of an inflammatory character. Blood drawn frequently exhibits a thick buffy coat, with cupped and with contracted edges, and the treatment of inflammation is that which alone affords effectual relief. If taken at an early period, moderate depletion and antiphlogistic regimen will speedily correct it; but if neglected or improperly treated by tonics and stimulants for any length of time, it becomes more difficult to remove, acquiring obstinacy from its continuance, and through the congestions and local determinations which are prone to occur during its progress, laying the foundation of various specific diseases of the worst kind. The treatment of the several stages requires to be discussed at some length, and copiously illustrated.

Absolute plethora in its simplest form and earliest stage may be relieved by artificial means, without any excitement of the system being necessary to co-operate in the restoration of health. This the writer has unequivocally experienced in his own person, and he has thus been enabled to satisfy himself of a fact which is not often subjected to medical observation. In relative plethora it is questionable whether the capillary congestions, and other derangements of minute structure and function attendant on this condition, be removable without some sensible effort of the constitution, and whether febrile excitement in some degree be not a necessary agent in effecting recovery. That it is often contributory to this end, we enter-

tain no doubt. These observations have direct relation to the practice suited to the several stages. Should the earlier of these, in consequence of the decline of health to which its long continuance gives rise, come under medical cognizance, sparing depletion to lessen the redundancy, with moderate excitement to arouse the energies of the system, will be the most judicious and suitable treatment. Under extreme feebleness of pulse and great muscular debility, it may be prudent to commence with gentle excitement, watching carefully the time when increased action in the pulse manifests that renewed energy which will both justify and bear direct depletion. We are certain from much observation, that when the pulse becomes irregular, blood may be taken not only with safety but advantage, and that the relief afforded will be speedily manifested by the increased fulness and tone which the pulse acquires. For this purpose the earlier bleedings should be small; from four to six ounces may suffice to commence with. The repetitions will of course depend on the effects, and it is a subject of interest inferior to none which pathology presents, to mark in the extreme cases of such condition how progressively under repeated venesection the pulse rises, and the buffy coat is displayed on the blood. Some striking instances of this we have recorded in another place. In an enfeebled and emaciated boy labouring under diabetes, 209 ounces of blood were drawn in twelve successive bleedings, the blood becoming changed from a dark grumous coagulum of loose texture to the thickest and firmest buff; and the strength of the body increased from feebleness hardly admitting of an erect posture, to a degree of vigour which enabled him to hold the plough for several hours a-day. It may afford a clearer conception of this condition, and shew the ability which the body acquires through bloodletting of bearing copious depletion, to present here a tabular view of the successive venesections practised in this case, with their amount, intervals, and the character of the blood drawn.

No.	Date.	Amount.	Quality of blood.	Total amt. at each period.
1,	Nov. 6,	12 oz.		12 oz.
2,	„ 7,	14 „		26 „
3,	„ 9,	17 „		43 „
4,	„ 11,	14 „		57 „
5,	„ 15,	17 „	buffy,	74 „
6,	„ 18,	20 „	„	94 „
7,	„ 20,	20 „	„	114 „
8,	„ 25,	18 „	„	132 „
9,	„ 27,	18 „	„	150 „
10,	Dec. 13,	20 „		170 „
11,	„ 20,	17 „		187 „
12,	„ 29,	22 „	buffy,	209 „

In another case, of a weakly and delicate female, without any special disease or local ailment save pains irregularly alternating in the head and chest, 106 ounces were taken at seven bleedings, with similar changes of blood, and as well-marked improvement of general strength. Such instances must be deemed conclusive of the fact that the state of constitution which we are endeavouring to illustrate has a real existence. In these cases the early symptoms were those of seeming debility; yet if this had been such as is generally imagined, life must have been inevitably destroyed by the means employed. If, then, there are states of disease marked by considerable debility, in which the constitution not only bears depletion without sinking, but acquires very considerable accession of strength under copious evacuations, it surely must be of the first importance to medical science to scrutinize such conditions of the system, and acquire juster notions of its real nature than are generally entertained.

When by the judicious combination of small bleedings and moderate excitement, assisted by other evacuations, the system is aroused to greater energy, and a state of febrile excitement ensues, the treatment of this must be conducted on principles with which all are familiar. When a hot skin, quick pulse, and furred tongue present, no practitioner is deceived, or fails to resort to proper remedies. Our great object is to direct attention to the earlier and more obscure stages, to shew their connexion with the febrile state, and to demonstrate the correspondence which prevails in the treatment which they respectively require. The earlier the advance of such disease can be detected, the less will the interposition of art be needed, and the more effectual will it prove both in correcting the febrile state, and averting the local injuries which continued febrile action will always sooner or later induce. There are occasions when this vigilance in detecting the incipient deviations from health is of the very first importance; a signal instance of which we shall briefly notice, as illustrating what it is wished to impress, and as proving the soundness of the principles by the efficacy of the treatment which they dictated, perfect recovery having taken place under circumstances which seemed to augur a very different result. A young woman applied to the writer above three years ago with ovarian tumour, accompanied with great inflammatory action both local and constitutional. Active treatment was employed, and the progress of the disease arrested. Continued attention, however, was required to keep down inflammation, and both bleeding from the arm and cupping were in constant requisition. Auxiliary means were freely employed, but bloodletting was the remedy which gave most decisive relief. So sensible was she of the advantage, and so intelligent in noting the premonitory indications which marked the necessity of depletion, that she was accustomed to ask for the lancet or cupping-glass, specifying her reasons for thinking they were needed; and on these occasions she was invariably right. To detail minutely a case which was subjected to medical discipline for so long a time, would be tedious and unsuited to our present purpose. It may suffice to say that the constitutional state tended throughout to inflammatory action, and that by the fluctuations of this the local disease was influenced. The tumour advanced so as to form a consi-

derable prominence in the right hypogastrium. Cupping, leeching, blistering, were all employed, and eventually a caustic issue was established over it. So much relief was obtained that she was occasionally discharged from the hospital in order to recruit her general health. After a short absence, however, she was sure to return with renewed disease both local and general. It being sufficiently manifest that the local excitement was always preceded by febrile action, the propriety of looking closely after the latter was apparent. If fever was not speedily arrested, the tumour became active and increased; when by early bloodletting febrile action was reduced, the tumour remained quiescent. Early bleeding was therefore the remedy most worthy of reliance, and it was resorted to accordingly, with due caution, but determined perseverance. And here we were happily assisted by one well-marked evidence of renewed plethora and approaching fever that never deceived us. Ere pain was felt in the seat of disease, or any of the ordinary indications of fever presented, a dark narrow dry stripe appeared on the centre of the tongue. If this were unheeded, it soon expanded at the tip, and spread slowly towards the edges. By a moderate bleeding this was promptly removed, and its sure attendants, general fever and local pain, were averted. By steady perseverance in the treatment here noticed, all disease was eventually removed; and within these few days we have seen this person in perfect health, and without a vestige of tumour remaining. We have no hesitation in attributing the fortunate result to bloodletting, and also to this being regulated on the principles which it is the object of this essay to inculcate. We may add that it never required to be carried to the extent of making even a temporarily injurious impression on the general powers of the constitution.

We have stated that the stage of febrile excitement is preceded by certain changes in the pulse indicative of its approach, and also that we are not under the necessity of judging solely from this evidence, for that other derangements coexist, which evince a harmony of symptoms, and that the whole collectively furnish indisputable proof of the actual condition of the vascular system. On the peculiarities of pulse we are not anxious to dwell, further than to give a seasonable warning that they be not suffered to bias the judgment through fears of an unreal debility. In judging of the approach of febrile excitement we are accustomed to rely more on the state of the tongue than on that of the pulse. When the constitution is assuming a disposition to febrile excitement, ere this is announced by the pulse, still feeble and compressible, the tongue presents a peculiar whiteness strongly characteristic and expressive, being distinct from any apparent secretion, and obviously resulting from some defect of capillary circulation in the tongue itself. This whiteness we have often seen disappear under bloodletting ere the arm was tied up. To describe it more particularly would be useless; to be known it must be seen, and they who are accustomed to inspect inflammatory tongues will at once recognize the condition to which we allude. We know not a stronger or surer evidence of incipient febrile excitement than this appearance of the tongue presents, and when it exists we should consider some abstraction of blood both justifiable and necessary. It appears, then, that bloodletting is suited to each stage of relative plethora. In the stage of feebleness when long protracted, small evacuations of blood relieve the oppressed constitution, thus enabling it to form the stage of febrile excitement which seems so necessary an agent in correcting the several derangements of the system. When used for this purpose, the early depletions should never be large, from four to six ounces being oftentimes as much as can with propriety be taken. According as febrile excitement advances, more copious depletion will not only be borne but required. The object of the incipient bleedings is not to make that impression on the moving powers which is necessary for the abatement of inflammatory action, but merely to abstract a portion of the circulating fluid, and thus lessen the plethora by which the system is oppressed. The blood may therefore be taken from a small orifice and in a recumbent posture. According as the period of excitement approaches, the effect of depletion in hastening its advancement becomes more manifest; and indeed it is a matter of familiar observation to surgeons, that even while the blood yet flows from the vein, the arterial powers so sensibly increase that the tardy and sluggish stream, which at first only trickled down the arm, becomes converted to a full and vigorous jet, the blood being oftentimes propelled to a distance of several feet. When this degree of increased action is displayed, blood may be more freely taken, and antiphlogistic treatment more rigorously pursued.

During the advanced stage, the object of venesection is both to abstract blood and to moderate inflammatory action by the direct impression which this remedy makes on the arterial system. Wholly or suddenly to subdue this action is not here intended, unless there be also local inflammation of a hazardous kind. The abstraction of eight or ten ounces will often suffice; that of twelve, sixteen, or even twenty will very frequently be well borne.

When local inflammation is superadded, then the extent and frequency of bloodletting must depend on the urgency of symptoms present, the importance of the organ principally affected, and the danger of this sustaining injury such as would be either immediately fatal to life, or ultimately subversive of health and vigour. Though in this state of constitution bloodletting is the remedy most essential, and which most effectually arouses the sanative energies of the system, yet other means are required for co-operating in the general purpose, and for re-establishing the several functions of life in their healthful and efficient exercise.

Next in power to bloodletting as an evacuant is purging, and this requires to be employed

with much discrimination, if the full benefits of it are to be obtained. The objects of it here are both to deplete the system, and to restore to healthful efficiency the excretory processes connected with the alimentary canal, which, in the early stages of relative plethora, are always inadequately performed. Simple as the process seems to be by which the bowels are evacuated, we scarcely know a term in medicine more vaguely employed than that of purging. It is continually used to express processes essentially different, and which require to be accurately distinguished from each other. By observing closely the effects of different purgatives and the nature of the discharges produced by them, we may perceive some well-marked differences in their modes of operation. Those of one class simply evacuate the feculent contents of the bowels; those of another excite the various exhalent arteries, producing watery stools; and those of a third stimulate the mucous follicles which so abundantly line the intestines, causing them to throw off the mucus which they so copiously secrete. When the bowels are merely inactive, their secretions healthy, and no constitutional disease present, the simple aperients of the first class suffice to obviate costiveness and prevent feculent accumulations. Medicines of the second class are indicated, when, besides unloading the intestines, it is expedient to abate arterial action, or allay fever by abstracting fluids from the system. Those of the third are required when mucus, inordinately secreted, accumulates so as to clog and obstruct the secretory vessels themselves, and also when this accumulated mucus, acting as a foreign body, becomes instrumental in exciting or aggravating disease. The particular medicines belonging to each class will readily present themselves to every practitioner, and need not here be specified; neither is it important to distinguish them by any very accurate arrangement. The same medicines will act differently on different habits and under different circumstances, and it is the effect, not the medicine producing it, that is the chief object of consideration. On the simple aperients we have little to remark; they form a most useful class of remedies, and may be combined with the second and third classes, so as to assist in producing every species of alvine discharge. The several aperient neutral salts are well known as the principal purgatives for producing watery stools. When increased discharges of mucous secretions are required, our chief reliance is on certain preparations of mercury and of antimony. The stomach, forming part of the alimentary canal, requires itself to be occasionally unloaded, which is effected by emetics. And here too we should distinguish between those emetics which simply discharge the floating contents of the stomach, and those which cause it to throw off increased mucous secretions. Even though vomiting be not resorted to, the mucous secretions of the stomach may yet be expelled by combining with purgatives such preparations of antimony as have an emetic operation. Consistently with these views it would appear that the most perfect evacuation of the whole canal must be that procured by combining medicines of each class, and accordingly we find the purgatives in most general use so constituted. When full purging is required to allay fever or lessen arterial action, no practice is more common than to give at night a suitable dose of extract of colocynth or of aloes, which are simple aperients, combined with calomel and antimony, medicines that expel mucous secretions, and followed next morning by a saline purgative, which, while it accelerates the operation of the previous dose, produces also copious watery stools. When these latter are not required, but yet a state of disordered intestinal secretion is manifested, it is often expedient to correct this latter gradually, the nature and activity of the cathartic employed being suited to the particular design; and whether it consist of colocynth, calomel, and antimony, or of rhubarb, blue pill, and ipecacuan, the same principles govern its administration, and similar effects, differing only in degree, are produced. With these principles to guide the employment of purgative remedies, they may be so administered as to prove most powerful auxiliaries of bloodletting in the several stages of relative plethora. In the earlier stage, simple aperients, combined with mild doses of mercury and antimony, are the most suitable. According as the febrile stage succeeds, saline purges may be more freely employed; and when fever becomes active, or local inflammations arise, these are indispensable. In proportion as the mucous secretions are accumulated or depraved—and they become signally so whenever the earlier stage of relative plethora has been of long duration—then must those combinations be employed which most effectually deterge the loaded membrane, and restore the secreting vessels to their natural condition.

A consideration of the several changes that take place in the body under febrile excitement, and a more minute observation of the immediate effects produced by increased arterial action on the several secretory and excretory organs, will shew the value and importance of purgatives in a still clearer point of view, and lead to a more discriminative employment of them.

A certain degree of arterial action being necessary to the healthy exercise of the secretory and excretory functions, it might be reasonably supposed that increase of such action would lead to a more energetic performance of these functions, and increased formation of what they respectively secrete,—a supposition which the evidence of facts amply confirms, one of the earliest effects occurring in a state of febrile excitement being an increased secretion of the natural mucus which lines the stomach and intestines. Of the existence of such superabundant mucus during inflammatory complaints sufficient proof is afforded in the discharges brought off by appropriate evacuants, or occasionally by the natural efforts. With respect to the stomach, if the examination of its rejected contents be superficial, it may mislead, for the mucus, if of recent secretion, being clear and

colourless, is not readily distinguished from the surrounding fluid. Its tenacity, however, furnishes a ready means of detecting and demonstrating it, for if a rod or wire of any kind be drawn through it and elevated, it will raise from the watery fluid, discharged by vomiting, the mucus diffused through it, and sufficiently display its dense and viscid nature. Similar secretions go forward at the same time through the whole intestinal canal, as evinced by the quantity of mucus which a dose of calomel, or of calomel and antimony, administered under these circumstances, expels. And to the power of these medicines in dislodging such secretions is owing much of the efficacy so long and so justly attributed to them in the cure of acute diseases. The increased secretions proceed immediately from the greater activity of the secerning vessels. These again derive their excitement from the greater abundance and more stimulant quality of the blood conveyed to them; and the effect of their increased action is to correct the stimulant property of the blood, by disposing of the nutritive constituents which render it unduly stimulant, and thus to allay indirectly their own inordinate actions. Hence the relief of the constitution by means of the improved quality of the blood may be fairly considered the final cause for which these secretions are increased, for which febrile excitement is generated. In this view we can perceive the importance of purgatives, not only as general evacuants, but also as specially promoting those curative efforts by which nature herself endeavours to throw off redundancies and minister to her own relief.

The want of sufficient attention being given to the peculiar effects produced by different purgatives may account for much of the uncertainty and indecision that have prevailed in the employment of them. This part of medical practice, indeed, has been much improved of late years; and the labours of several modern writers, of whom Dr. Hamilton and Mr. Abernethy are preeminently distinguished, have done much to assert for it the importance due to it. Still much remains to be investigated respecting it. If the mucous matter be recently formed, and in no great quantity, a common purgative will suffice to remove it, together with all such feculent lodgements as the bowels may contain. A source of injurious irritation is thus removed; the various secretory and excretory vessels are disencumbered of an oppressive load, and left free to perform their natural functions, or to renew their sanative efforts; and the process of nature instituted for the removal of redundancy and restoration of health goes uninterruptedly forward. If the mucous secretions be of older formation, consequently more viscid and tenacious and less easily expelled, the common purgatives fail to give relief, and a doubt is thus often cast on the propriety of employing purgative treatment. The patients may be misled, as many continually are, by false experience; but the practitioner should not fall into this error. The fault lies not in employing purgatives, but in not suiting those given to the effect required; for if a suitable preparation of mercury or antimony be in such case combined with the simple aperient, the result will rarely occasion disappointment. If saline purgatives be given with the intention of cleansing the intestines at a time when they are coated with viscid secretions, the purpose will be very imperfectly answered, while, if persevered in when general evacuation is no longer needed, and there is no febrile action to call for their use, they fruitlessly exhaust strength and do sensible injury. Even the powerful remedy which a combination of calomel, antimony, and drastic purgatives supplies, may be misapplied, and if rashly given when the bowels are irritable, with little mucus present, distress and injury may result, and an useful remedy thus fall into unmerited disrepute. In fine, by neglecting to ascertain the precise nature of the evacuation required, and to apply with accuracy the remedy suited to effect it, we must ever run considerable risk of disappointment in the effects expected from purgatives, and of so misapplying them as really to do injury in cases where purging, judiciously regulated, is the best if not the only means of cure. The quantity of mucus secreted in the stomach and intestines under febrile excitement, which implies a general increase of vascular action, is often considerable. It lines the whole canal, and when accumulated (and more especially when inspissated by long retention) is the cause of many powerful medicines passing through without producing their ordinary effects; for in consequence of the interposed mucus, the medicines come imperfectly or not at all in contact with the living fibre on which alone they can act. They pass, therefore, as if either the living fibre were torpid or the medicine inert, when neither supposition would be correct. This is signally the case with respect to the stomach, the accumulated mucus of which is often thrown off like a dense membrane. In this state of stomach we have oftentimes given tartarised antimony in grain doses quickly repeated to the extent of twelve or fourteen, ere vomiting could be excited, the matter discharged furnishing abundant evidence why such inordinate quantity was needed. We mention the circumstance here in order to enforce the expediency of judging on all occasions, not from the quantity of medicine administered, but from the effect produced; and, as the principle applies no less to the bowels than to the stomach, to impress the indispensable necessity of a constant inspection of the alvine discharges, without which it is impossible to form an accurate judgment either of the propriety of purging, the selection of purgatives specially indicated, the extent to which their operation should be carried, or the period for which their use should be continued.

It has been shewn that the derangements of circulation incident to a state of plethora, whether absolute or relative, manifest an uniformity which serves to mark the nature of the morbid changes induced, and to illustrate the processes which nature institutes in her endeavours to effect her own relief. Redundancy of nutritive matter first excites the healthy functions to in-

creased energy, tending to its appropriation by natural secretion: when too much urged this energy abates, and feebleness of arterial action ensues; to this succeeds a state of general excitement, such as is expressed by the term fever; and finally, some local congestion or inflammation occurs, producing what is called a specific disease. From this view the dependency both of the general fever and local affection on the constitutional state is at once perceived; and the treatment by which these are severally relieved acquires thence a clearness and consistency which no speculative theory of disease has ever yet imparted. For absolute plethora in its simple state, it has been shewn that depletion and abstinence, the remedies directly suggested by a knowledge of its cause, are those which experience proves to be most efficient, and which may alone give full relief. For the active fever and local inflammation induced by this condition, the same means are essential, and are still the most powerful of all that can be employed; though when these derivative maladies occur, other evacuations besides that of blood are needed, it being here required to call forth the energies of all the excretories of the system in aid of those constitutional efforts by which the febrile excitement is aroused. In relative plethora the morbid condition of the system is less simple, yet it still corresponds with the other throughout. Owing to the duration of morbid actions antecedently to the occurrence of febrile excitement, the constitutional derangements are more extensive; more functions are depraved; the difficulty of restoring these severally to a healthy state is increased; and a longer time is required to correct their aberrations and renovate their powers. During this period, too, various disturbances, originating in depravation of nervous function, become intermixed with the ordinary symptoms, complicating and obscuring the whole. To these latter we shall have occasion to advert more particularly by-and-bye. In absolute plethora the purpose is simple. If the redundancy of nutriment be diminished, and a fresh supply withheld—in other words, if bloodletting and abstinence be carried to the requisite extent, the powers of nature, thus relieved, are amply sufficient to re-adjust all that is amiss, and perfect health becomes restored.

No artificial stimulus is here needed to arouse the natural powers; but, on the contrary, the chief care is to restrain them within salutary bounds. In relative plethora, while depletion and adaptation of diet are equally necessary as in positive, more care is necessary for maintaining in due activity the several secretories, and some degree of stimulant treatment requires to be combined, in order to excite and support those increased energies of the system by which alone this condition can ever be thoroughly rectified. Ordinary stimulants, however, which merely excite the heart and larger vessels, are inadequate to this end. Nay, they do mischief; for they lead to no effectual exercise of power, and from that which they do excite, exhaustion rather than benefit results. The great deficiency of power which here prevails is in the capillary vessels, and to depravation, abatement, or suspension of their functions, may all the coincident derangements of the frame be readily traced. The two most essential processes of animal life are nutrition and excretion. These are exclusively performed by capillary vessels, on the due energy of which they are dependent. When from any debilitating cause these minute vessels fail in power, or become obstructed, both nutrition and excretion must become impeded; and hence we can understand why emaciation often takes place, even where there is a redundancy of nutritive matter in the general circulation, available for nutrition if the capillaries could so dispose of it. It is hence also intelligible, how a debilitating impression made on the system has, through abatement or suspension of the capillary function, the direct effect of throwing back on the mass of blood that which in ordinary course the capillaries would have disposed of, and of thus inducing a state of relative plethora. It is clear from this view, that the object of treatment in relative plethora is not merely to remove the relative excess, although this demands its full share of attention; but also to renew the activity of the capillaries, in order, first to re-establish their healthy functions as essential to the well-being of the general constitution; and secondly, by thus providing for the just appropriation of the nutritive matter supplied by the blood, to restore that balance between appropriation and supply without which health cannot subsist, and which the occurrence of plethora, however induced, never fails to disturb. We have stated that ordinary stimulants, which produce but transient excitement of the heart and larger vessels, are not the remedies here needed. What we require is an agency which, without exciting inordinately the general circulation, is capable of acting on the capillary vessels, and of arousing them to a renewal of their several functions both secretory and excretory. Such a remedy we happily possess in mercury, which is signally endued with this peculiar property, and which, in consequence, affords a powerful agency in relieving the larger bloodvessels, when overcharged, from part of their excessive load, by causing it to be diffused more freely through their numerous and wide-spreading ramifications; and when the aggregate capacity of the minute vessels thus expanded and restored to the exercise of their natural functions, is estimated, there will be little difficulty in comprehending how mercury proves so powerful an auxiliary of bloodletting in relieving an overcharged state of the general circulation, as well as in correcting the congestions and other derangements to which this state gives rise. If the effects of mercury on the animal frame be examined, it will be seen that, however diversified, they all correspond in one respect—namely, in evincing increased action of capillary vessels. Mercury has the effect of increasing almost every secretion, and by capillary vessels all secretion is performed. It promotes transpiration by the skin, diuresis, and secretion of bile; it more especially excites the salivary glands; and there is reasonable ground of con-

jecture that it similarly affects the pancreas, to the increased secretions of which gland mercurial diarrhœa has been with some plausibility ascribed. It increases the intestinal discharges independently of its direct action on the bowels when taken internally, for mercurial frictions are well known occasionally to purge. In every effect which mercury induces this common character is observable, that capillary action is more or less excited. Now a renewal of capillary action is what has been shewn to be needful for correcting the derangements incident to relative plethora, and hence the inestimable value of this remedy when judiciously administered, in restoring to health those who suffer under such derangements.

In absolute plethora the febrile action aroused suffices to impel blood into every extreme vessel, and thus to equalize circulation by extending it to every part where nature requires its full activity; and to effect this seems to be the great end for which febrile excitement is instituted by nature. In relative plethora this effort is more feeble, the natural powers being weaker, (indeed it is in this natural weakness that relative plethora has its origin;) and as every day but adds to the labour to be performed, while under the general depravation of habit the natural powers tend to further decline, we have little difficulty in comprehending why this state does not become aroused to those energetic efforts which are so often witnessed in the active fever of absolute plethora. To excite such effects then by the peculiar stimulus of mercury becomes an essential part of the treatment of relative plethora; and when in the correction of this state mercury is used with the necessary discrimination, and in aid of bloodletting, no course of medical treatment can be more successful, nor more strikingly illustrative of the principles by which it is guided, than that which this combination of depletory and stimulant agency supplies. The principle here adduced is confirmed by all that we know of the action of mercury, whether in its abuse or its use. Consistently with the views here presented, this action ought to be salutary only when the labour to be performed is not beyond what the animal powers are capable of sustaining. If the labour be too great, if inordinate plethora prevail, then must the excitement of mercury fail to effect its object, and the animal powers, exhausted by the vain effort, must still further decline. This operation of mercury corresponds exactly with the course of active fever where no bloodletting is employed. The powers exercised are in either case considerable, but the labour is disproportionate, and they sink under it. But if the labour be lightened by lowering the nutritive quality of the blood, (and this can only be effected with the necessary promptitude by bloodletting,) then will both febrile action and that of mercury accomplish all that is required from them.

We must here call attention to a physiological truth which requires to be borne in mind. When nutritive matter is introduced into the blood, if it find not an outlet by artificial bloodletting or natural hemorrhage, it must go through the processes of secretion and excretion ere it can be again expelled. If it be so redundant as to require these functions to be inordinately exercised in disposing of it, the respective organs lose power, and from the over-excitement sink even below the natural standard. Bloodletting, by lowering the quality of the blood, and lessening the proportion of its nutritive constituents, supersedes much of this inordinate and unnecessary labour, and thus actually saves animal power instead of expending it. In absolute plethora this is all that is required, for the natural powers thus relieved are fully equal to accomplish their own work. But in relative plethora the case is somewhat different. Here, while the nutritive matter of the blood is relatively redundant, requiring to be reduced, the animal powers are also enfeebled, and the several functions dependent on the capillary vessels are all more or less depraved. In addition, then, to reducing the nutritive matter by abstracting some blood, it is here necessary also to excite both the general powers and the capillary actions, in a way more effectual than simple febrile excitement can accomplish. Here mercury comes appositely and powerfully in aid, and by its direct influence on the capillary vessels effects what the natural powers, even when aroused into febrile excitement, would under such circumstances be unable to perform.

An analogy has been traced between the action of mercury and febrile excitement; and if this be followed up by closer observation, the respective processes will appear little short of identical, the only difference being in the excitant by which these processes are instituted and maintained. In absolute plethora the redundant nutritive matter suffices to arouse the system to corrective efforts: in relative this is inadequate, and the excitement of mercury is needed for stimulating to due activity the arteries, more especially in their minuter ramifications. This it effects in a way so closely corresponding to febrile action, that when the full effect of mercury is produced, it would be difficult to show that its phenomena differ essentially in any respect from those of fever. There are induced a quick pulse, hot skin, white and furred tongue, muscular debility, increased secretions, attenuation,—in short all that characterises simple fever. And further, if this state be neglected or maltreated, it passes into one which exhibits the whole train of typhoid symptoms—black and dry tongue, accumulation of sordes on the teeth, prostration of power, high nervous excitement, and finally death. These consequences are attributable, not to any necessary effect of the remedy, nor to any poisonous properties inherent, but to the constitution not being prepared by sensible depletion for its safe and salutary exhibition. When mercury is administered in unreduced plethora, and especially when its use is rashly urged, the effects are precisely such as result from febrile excitement, when, besides being inordinate in degree, it fails in its corrective agency. The excited powers, exhausted by their efforts, fall into a state of collapse, the object for which

they were exercised is not attained, the capillary actions are either not renewed, or if renewed they are overworked, and thus again enfeebled; they are consequently incapable of ministering to the general restoration as they would do if their healthful functions were re-established; and the consequence is, that the constitution is left in a far worse state by the effort than if it were not made. Far different is the result when either febrile excitement or the action of mercury is regulated by the guidance which sound principles supply. If plethora be reduced, and a state of active secretion be maintained, then may either febrile action, or that of mercury, be rendered conducive to the restoration of health, through renovation of functions such as seem almost beyond the reach of other influences.

The evils occasioned by neglect of the principle here inculcated are abundantly displayed in the history of syphilis; and we believe that all experienced surgeons are now agreed on the danger of administering mercury in an overcharged constitution.

Enough has now been stated to display the principles which should guide the employment of mercury in the treatment of relative plethora, and of the manifold diseases incident to this condition of the frame; and from long and extensive experience and close observation, both of diseases and the operation of remedies, we can confidently affirm, that if the principles here inculcated be applied to the elucidation of diseased conditions; if in these the attendant state of constitution be regarded rather than the specific disease, and at all events in connexion with it; and if the treatment indicated by the foregoing principles be employed so as to correct the constitutional derangements, many an apparently formidable malady will insensibly subside without requiring any specific treatment to be directed towards it, its surest corrective being the removal of the causes in which it originated, and by which it was upheld.

The practical application of these principles in the treatment of relative plethora is simple in the extreme. If the diseased condition be of recent occurrence, and the depravation of capillary functions slight, very moderate evacuations and renewed activity of the secretory and excretory functions, with regulated diet, will suffice to restore health. But if the plethoric state have continued so long as to deprave materially the general habit; if the capillary functions have been so long inactive as to have become indisposed to a renewal of their healthy energies; if the secerning vessels have through their abortive efforts become obstructed and powerless; and if, through congestion or subacute inflammation, structural changes have commenced in any of the organs or tissues, then these simple means must fail, and some constitutional effort, such as is exerted under febrile excitement, is necessary for restoration. But as natural febrile action is in this case inadequate to effect what is required, we here need the artificial excitement which mercury supplies to accomplish the purposes which medical treatment has in view. The indications by which the use of mercury is to be guided are neither obscure nor equivocal. If there be the debility of incipient plethora, moderate evacuations will relieve the vital powers, and enable them to display their inherent energies. When febrile action is thus aroused, the course of procedure is clear, and if the powers called forth be adequate to effect perfect restoration, no artificial excitement can be needed. But should it be, as in the larger proportion of such instances will prove to be the case, that the natural powers are feeble and inadequate to maintain the curative processes by which a healthy state of capillaries is to be renewed; if the obstructions be considerable, and the indisposition of the capillaries to a renewal of their natural exertions be clearly marked, then is the stimulus of mercury indispensable, and for this end there exists not in the wide range of medicinal agency a remedy possessed of powers so certain or so manageable. We have medicines which emulate some of its properties; antimony promotes many of the capillary secretions; iodine promises to afford much valuable aid of a corresponding kind; but so far as our present knowledge extends, we have no medicine entitled to rival mercury in the properties which the foregoing observations ascribe to it. When a soft, calm, and firm pulse evinces a healthful state of circulation; when the several secretories and excretories cease to display in their products a morbid condition; when under these changes the general feelings improve, and health progressively amends, it is quite needless to exceed the means by which a change so favourable has been effected, and far better is it to trust to this slow but sure process of amendment, and await the time necessary for completing it, than by over anxiety for more rapid progress hazard the disappointment which too sedulous endeavours might occasion.

But when the constitutional efforts do not make perceptible advance in the removal of general indisposition and local derangement; when the pulse continues oppressed, the skin dry, the tongue irregularly coated or otherwise unhealthy, the excretions morbid, the aspect sallow, and the general feelings unrelieved, then if depletion have been employed, and carried to the extent which sound experience justifies, it becomes absolutely necessary to resort to that agency which mercury supplies, and to administer at intervals small and unirritating doses of this mineral so as to excite the animal powers to the efforts necessary for relief.

It occasionally happens that in this use of mercury too much excitement follows, and from this circumstance its inexpediency has been at times somewhat hastily inferred. The occurrence may no doubt proceed from the medicine being unsuitable; but it may also take place either from plethora not having been sufficiently reduced, or from the medicine being too freely administered. In these latter instances further depletion and reduction of dose are what reason would direct. Precipitately to withdraw the remedy under such circumstances,

without trial of the expedients here proposed, would be little reconcilable with that knowledge of the operation of mercury which all should possess who venture to prescribe it. In general it is advisable to continue its use until its constitutional effects are evidenced by slight affection of the gums; but this is not indispensable, for we have often seen its curative effects obtained without any soreness of mouth being induced. Much minute detail on what is called the alterative effects of mercury, and the modifications which its exhibition continually requires, might here be introduced, but it would encumber an article already too long, and it cannot be needed.

No morbid condition can more clearly illustrate the operation of mercury than that which the advanced stages of continued fever present. Such cases have often been consigned to us as hospital patients when the early treatment had proved unsuccessful. The phenomena of this stage of the disease we need hardly describe. Great emaciation, prostrate powers, a feeble and rapid pulse, black and dry tongue, lips and teeth covered with sordes, insensibility, with a train of corresponding symptoms, characterise this stage. Yet, appalling as is the condition here presented, we never despair of it, provided no organ essential to life have yet suffered irreparable injury. Stimulants to recruit power are of course needed; but the chief agent for exciting the several secretory and excretory vessels, and for renewing the activity of the capillaries generally, is mercury. By small doses of this, repeated at suitable intervals, the pulse is rendered fuller and firmer, the secretions improve, the tongue becomes moist and clean, sordes separates from the teeth and lips, consciousness returns, appetite revives, and sleep is restored. Large doses are not needed; from one to two grains of calomel, given three or four times in the twenty-four hours, will generally suffice. Aperients and nourishment are of course required, and wine to such extent as the existing debility may demand. This effect of mercury we have so often witnessed that we can entertain no doubt either of the correctness of what is here stated, or of the agency to which the amendment is owing. No subject in pathology can be more interesting than the progressive development of power and improvement of function which such a case presents. It has repeatedly occurred to us to see so much reaction thus aroused as to require actual depletion of blood at late periods of the disease to relieve the local determinations which resulted. In the same subject we have been obliged to apply leeches alternately both to the head and chest, in order to allay the respective local excitements. That these resulted from the use of mercury we were well assured, but, instead of withdrawing it under a false alarm, we relieved the local disturbances by depletion, continuing a guarded use of the mineral so long as its specific agency was required for the re-adjustment of the system.

The accordance of the principles maintained throughout this article with the best established doctrines of idiopathic fevers cannot fail to be perceived by those who have given to this latter any particular attention. Dr. J. Armstrong, in his excellent treatise on typhus, distinguishes three stages in the disease, namely, those of congestion, reaction, and collapse. It is in confirmation of his accuracy that a corresponding succession, differing only in the intenseness of each stage, may be traced in every instance where simple inflammatory action arises,—a circumstance which claims for his theoretic views a high credibility, by shewing that the essential phenomena of continued fever do not result from any peculiarity of character imparted by its special cause, but that they correspond accurately with the successive processes which nature institutes in the simplest febrile disturbances of the animal frame.

Even the minuter observations which we have made on the changes of the pulse, and which were derived from the examination not of idiopathic fever but of incipient plethora, correspond with what Dr. Armstrong states as occurring in the congestive stage of typhus, among the symptoms of which he notices "a quick, low, struggling pulse, *changeable as to frequency, and even irregular as to force.*" But the most impressive illustration of the debility connected with internal congestion, and of the effect of copious bloodletting in relieving it, is, perhaps, that which is furnished by the epidemic, or, as it is commonly termed, spasmodic cholera.

In the pamphlet published by the London General Board of Health, by authority of the Privy Council, the following passage occurs: "But the remedy which is described to have been most uniformly successful, when it could be used, is bleeding, and this even in cases where the pulse was scarcely perceptible at the wrist. This practice seemed to apply itself to the root of the disease, by relieving the congestion of the venous system, which was invariably found loaded on examination after death, and which congestion (though only an effect of the first impression made by the attack of the disease on the constitution) appeared to be the immediate cause of death. In the lighter cases, or in those of a severe nature which came under medical treatment before the pulse at the wrist was lost, or had become fluttering, bleeding was attended with the most decided advantage. The oppression of the chest, the burning heat of the præcordia, the spasms, the vomiting and purging, are stated in some instances to have ceased at once; at others, on a repetition of bleeding. In such as allowed a free abstraction of blood these effects very uniformly occurred; but even in some, when the pulse was indistinct, bleeding was successful, if it could be carried to the extent of eighteen, twenty-four, or thirty ounces, the pulse rising in power and becoming more distinguishable in proportion to the flow of blood. If the pulse in this state of feebleness was distinct enough to give the finger the feeling of oppression, bleeding was almost always successful. The blood drawn was black, whether procured from a vein or an artery, and flowed with great difficulty,

commonly first coming from the vein in drops, and gradually in a stream; but before it could be induced to flow with freedom the patient often required warm baths, frictions, external and internal stimuli, to produce a sufficient quantity for his relief. If a small quantity only could be procured, the heart seemed to feel the loss without being relieved, the bulk of the blood actually circulating being reduced, while the great mass of it, congested in the inferior and superior vena cava, did not make its way to the heart. The effect of bleeding was mechanical, and acted only as removing an obstruction to the passage of the blood from the distended venous system; and if not carried far enough to remove this impediment and allow the large veins to empty themselves into the heart, such weakness was produced as is occasioned by the loss of blood in a constitution worn out by disease." This statement of the Board of Health we adduce in preference even to the authorities from which it was derived. It was the result of deliberate and mature consideration of all the information which public records and private testimony could supply; it was issued to the public under a responsibility which must have precluded all slovenly examination of facts, all influence of speculative theories; and it hence carries authority as an announcement of facts, which no individual testimony could possess in an equal degree. It is difficult to conceive a correspondence more complete than that which subsists between the facts here recited and the pathological principles which we have endeavoured to illustrate throughout the present article.

It cannot fail to be perceived how intimately these principles are connected, not only with the morbid conditions described, but also with the whole course of medical practice. If such morbid conditions of the frame have any existence, they must more or less affect the progress and influence the treatment of a large proportion of diseases. Wherever they prevail it is obvious that the treatment of specific maladies cannot be wholly independent of them, and even where no plethora exists, the negative can only be ascertained by a familiar acquaintance with the phenomena which denote its presence. Nay, so many specific diseases depend wholly on the depravations of habit noticed in this article, that when the constitutional derangements are corrected, the special diseases spontaneously cease. On every account, then, the doctrines of plethora, its rise, progress, and treatment, must be allowed to constitute an essential part of medical science.

But of all sciences, that of physic is perhaps the least simple. Its principles, individually considered, are clear deductions from well established facts, and, so far, simple in their nature. But it very rarely happens that any one of them, however irrefragable, suffices for our guidance. Morbid actions, however simple in their origin, become so soon combined with others, whether derivative or contingent, that the assemblage manifested in every instance of advanced or specific disease loses all character of simplicity, and requires for its exposition a variety of knowledge, a clearness of conception, and an accuracy of judgment exceeding perhaps what any other earthly pursuit demands.

A most important complication of vascular derangements is that which is derived from coincident disturbance of nervous function; and so continually are these conditions intermixed, that the consideration of plethora would be incomplete if this source of complication were unnoticed. As a matter of fact, it is familiarly known that inflammatory diseases of the same general character and denomination present in different individuals different phenomena according to the degree of nervous irritability respectively attendant. The predominance of this latter may proceed from peculiarity of temperament, or from the influence of stimulants particularly exciting the nervous system, in operation antecedently to the special disease, and independent of it; or it may result from cerebral congestion or irritation incident to the febrile state which plethora is seen to induce. It is further known that nervous irritability, when in excess, is capable of producing derangements which so much resemble those of pure inflammation as frequently to mislead practitioners into employing active depletory treatment where this is unsuitable, if not absolutely injurious. It is time that these several conditions and their combinations should be more fully investigated and better understood, were it only for guarding against an error to which recent enquiries on this subject seem to tend,—namely, that of regarding the inflammatory and irritative states as opposite and contradictory; so that where one state is proved to exist, the other must, by implication, be considered as negatived. The truth of such a position we would not admit; and we are anxious to display the grounds of our persuasion in this respect, entertaining as we do considerable apprehension lest the views of nervous excitability which some able and discriminating writers have of late years presented, (or rather the practical evidences which they have adduced of this being preponderant in certain maladies which had been very generally regarded as purely inflammatory,) should withdraw attention from inflammatory action beyond what the writers alluded to contemplated or would have approved.

The morbid irritability which, simulating inflammatory excitement, gives rise to local disturbances liable to be confounded with pure phlegmasiæ, and which, however it may be temporarily alleviated by bloodletting, is eventually aggravated by it, while it is relievable by opium and ammonia, has been ably illustrated by the late Dr. Gooch in his valuable "Account of the Peritoneal Fevers of Lying-in Women," and also by Dr. Marshall Hall in an "Essay on some Effects of Intestinal Irritation," as in several other of his works. In all that these judicious and eminently practical writers have adduced respecting this condition, and the treatment

required for its relief, we entirely concur; but in admitting fully the truth of their statements, we are anxious at the same time to impress that though the higher degrees of irritability may exist independently of plethora or of inflammation,—nay, may have their origin in actual inanition or in excessive loss of blood, the same nervous depravation is continually found combined in every proportion with plethora, inflammation, and congestion; and that when it is so combined, the treatment, to be safe and effectual, must have relation to both sources of disease. In proportion as plethora and inflammatory action prevail, must depletory treatment take the lead; and according as irritability is excessive, will opium and stimulants be needed. To discriminate these respective conditions, then, so as to assign to each its appropriate treatment, is the point to which practical observation would be most beneficially directed. And in this scrutiny much advantage will result from founding diagnosis not on one or two prominent symptoms, but on the whole assemblage; among which, as was remarked in a former part of this essay, such harmony should subsist that no individual symptom should be contradictory of what the others proclaim. When such contradictions present, then instead of leaning exclusively to that side to which the balance inclines, each class of symptoms should receive its appropriate consideration, and be referred to the principles in which it originates. In the morbid conditions under discussion, it is not difficult to distinguish the purely inflammatory cases from those in which excess of irritability is combined. In the latter, while the disproportionate degree of irritability should itself excite suspicion, a scrutiny of symptoms will shew that these do not all in equal degree denote such activity of inflammation as the prevailing irritability would imply. The pulse, temperature, and tongue do not present that correspondence of derangement which is usually attendant on purely inflammatory action. The pulse, however accelerated, (and in such cases it is often inordinately so,) wants the firmness which belongs to inflammation. The temperature is not always in accordance with the high sensibility evinced by particular parts of the frame; and the tongue, instead of being dry or furred, is oftentimes moist and preternaturally red. So endless, however, are the varieties induced by the combinations which occur, that it would be impossible to render a distinct account of them by any description, or to do more than to point out the sources of disease to which the practitioner's own observation should be directed.

For plethora and inflammation the appropriate remedies, as we have often stated, are bleeding, purging, and antiphlogistic treatment; while morbid irritability yields but to opium and other sedatives, combined, as occasion requires, with cordials and tonics. In proportion as either condition prevails, must its appropriate remedies be combined in the treatment; and on the accuracy with which these remedies are severally adapted does much of the success of medical practice depend.

The subject is much too copious to be discussed fully in this place, where our chief object for introducing it is to impress a warning against hastily inferring, that because irritability predominates, inflammation or congestion is not co-existent. Even where morbid irritability results from exhaustion or inanition, congestions continually occur which call for topical bleeding, however unsuited depletion may be to the constitutional state existing, and even though to sustain strength by tonics and nutritive diet may be at the same time required. This is well exemplified in a state of disease of frequent occurrence, and with which most practitioners must be familiar.

Females under too protracted lactation fall into ill health, marked by exhaustion, and attended with various nervous derangements. This state is common among the poor, who, for various reasons, are accustomed to suckle their children for long periods,—even for two or three years. Pallid aspect, disordered digestion, irregular bowels, and acute pains of head, with prostration of strength and great nervous irritability, are the prominent features; but the whole condition thus induced is so peculiar and characteristic that they who are familiar with it are at once led to a knowledge of the cause by inquiries which they might otherwise not think of making. Taught by experience, we have oftentimes, among the out-patients of the hospital, discovered the fact by direct inquiry where there was nothing save the general character of the disease to induce suspicion of the woman being engaged in suckling; there being either no child produced, or one able to walk by its mother's side. Weaning the child is here the indispensable requisite; and its effects are quickly displayed. They are assisted by mild aperients combined with sedatives, cordial remedies, and sustenance. No state would appear on principle less suited for evacuant treatment than this; and under this impression we were for a long time averse to relieving the head by any direct depletion. The inveteracy of the headach, however, forced us to the application of leeches; and the prompt relief which they afforded soon removed all scruples on this score. A few suffice; six or eight applied to the temples give in general all the relief required; but nothing can be more decisive, or more strongly marked than the benefit which they thus afford.

We do not say that all such cases require leeching, but the attendant headach yields readily to this remedy when all others fail to subdue it. The only inference which we can draw is, that notwithstanding the general debility, and perhaps by reason of it, the vessels of the brain become congested and unable to unload themselves; that the topical bleeding, by lessening their contents, enables them to contract and recover their natural diameter,

and with it the power of carrying on the circulation so tranquilly as no longer to disturb the cerebral functions.

The above state only displays congestion as coinciding with irritability and exhaustion; but the instances are of daily occurrence in which morbid irritability is complicated in every variety with relative plethora; and when these states are so combined, it is quite as necessary to correct the plethora as to allay the irritation, the most effectual way of restoring health in such case being, not to pursue any exclusive system, but, guided by experience, to give to each derangement the consideration which it specially claims, and to combine the respective remedies as the prominent derangements may severally demand. A knowledge of the principles on which each class of remedies should be employed furnishes the best guidance for regulating those combinations which such complex states of disease must ever require. One of those conditions, at least, we have endeavoured to illustrate in the foregoing pages; and however we may have failed to do justice to the subject, it is hoped that sufficient ground has been shewn for pursuing the inquiry, and a motive furnished for other observers to complete what we must necessarily leave imperfect.

Before concluding this article, it is necessary to offer a few remarks on the vitiation of blood which arises from redundancy of excrementitious matter, regarding this in its simple state, unconnected with the various degrees of plethora with which it is so continually combined. In doing so the motive is not so much to designate the morbid condition as likely on its own account to become an express object of medical discipline, as to establish the principles which should govern its treatment, when, as continually happens, it is found combined with other derangements. The general phenomena which denote this condition are, a sallow aspect and dusky skin; the pulse low, soft, and compressible; the surface of the body for the most part harsh, dry, and obviously deficient in natural transpiration; the tongue moist, clear, red; the appetite capricious, often craving and voracious, with an endless train of dyspeptic ailments; the alvine discharges inveterately foul, dark, slimy, pitch-like, and exhibiting no trace of healthy fæces; the urine high-coloured, depositing more or less of dark, often fetid sediment: these, with decline of flesh and strength, are the general characteristics of this state. The condition itself we believe to arise from the accumulation in the blood of excrementitious matter imperfectly discharged, and the depraved state of the several secretions we regard as resulting from the laboured though ineffectual efforts of the constitution to accomplish, through their agency, its own purification. It may give a clearer conception of this condition to contrast its phenomena with those which characterize nutritive plethora. In the latter the general aspect is more full and florid; the surface is hot and dry, or inclining to moisture; the pulse hard and frequent, or full, strong, and bounding; the tongue white and furred; the stomach inclining to nausea, with thirst; the stools feculent, though foul, and charged with mucus.

In specifying the symptoms of excrementitious accumulations, it may be imagined that we have included several which belong to the different forms of hepatic disease. That they are frequently regarded as evidences of diseased liver, and treated accordingly, we are well aware; but that they are certainly to be met with where there is no organic lesion of this viscera, nor any particular functional disturbance of it, we are fully convinced. It is true that the functions of the liver are, in common with those of the whole alimentary canal, greatly depraved, but they are so not from any primary defect or derangement of their own powers, but from being required to act inordinately on a vitiated mass which nature is sedulous to purify.

According as nutritive plethora becomes more or less combined with this state, the constitutional efforts increase, and various degrees of febrile and inflammatory excitement ensue. In proportion as this excitement is energetic, and as measures of suitable activity are employed for its relief, the vitiated state of the blood becomes corrected, the secretions and excretions improve, and the general health and strength amend. The increased secretions from the bowels seem to be the discharge by which nature aims at getting rid of such impurities. To promote them, therefore, by suitable purgatives, at the same time supporting the strength by moderately nutritive diet, is the first indication.

When relief, to a certain extent, is thus afforded, the powers of the constitution rally, and a febrile effort is made to assist in the work of purification. According as this advances, depletion should be more active and the diet less stimulating. When sufficient excitement exists to warrant the employment of bloodletting, we may then consider the curative process as in the most favourable train. Perhaps the powers of the constitution are hardly adequate to rectify any high degree of this derangement without the extraordinary effects which a state of febrile excitement supplies, and hence we see experienced practitioners often hail the appearance of febrile symptoms in chronic maladies as announcing a more remediable form of disease.

In every view that can be taken of this condition, it must be considered as intimately connected with the state of cuticular excretion, from defect of which it is more likely to arise than from any other cause. When we reflect on the large amount discharged by this excretory under a healthy state of the system, and that, according to accurate experiments, more than one half the ingesta is carried off by transpiration, it will be readily conceived that great excrementitious accumulation must result from impeded cuticular excretion. This matter being in consequence thrown in inordinate quantity on the other excretories, it can excite little surprise that their ordinary functions should

be thence disturbed, or that their several secretions should present a morbid character.

A constitution naturally feeble, especially if exercise be inadequately taken, sends the blood to the surface too languidly for the exhalent arteries to act with full power, whence excrementitious accumulation commences; the effect of this being directly debilitating, it serves to aggravate the cause, and thus the foundation is laid for a broken constitution and many inveterate chronic diseases. The best preventive of this diseased condition is, unquestionably, exercise, and in slighter degrees of it this would also be the most effectual cure; but when great depravation of habit has already taken place, there is neither the capability of taking adequate exercise, nor would it alone, under such circumstances, succeed. To be effectual it should be carried to the extent of producing some moisture on the skin, as the only sure evidence of the blood being impelled with sufficient force into the capillary vessels. The various forms of warm-bathing are of great value, especially those which combine frictions and other means of softening and detaching hardened cuticle. That of the Russian vapour-bath, noticed by northern travellers, and so accurately described by the late Dr. Clarke, would appear eminently calculated for establishing a healthy state of skin, and an adequate activity of cuticular excretion.

(E. Barlow.)

PLEURISY, PLEURITIS. *Gr.* πλευρῖτις, from πλευρὰ, *the side*, also the membrane that lines the ribs, *the pleura*. Pleurisy signifies inflammation of the serous membrane which lines the cavity of the chest, and invests the organs of respiration therein contained. Modern pathology has narrowed the application of this term, which, in the earlier ages of medicine, was employed to express pain of the side, no matter what tissue was the seat of the uneasy sensation, provided it was acute in its character and accompanied with fever. The frequency of the complication of pleurisy and pneumonia led many to suppose that the former was so essentially connected with the latter as to be incapable of an independent existence. It is, however, now clearly established that, although the parenchyma of the lung and its enveloping membrane are often involved in the same inflammation, still there is no necessary connexion between the affection of the one and that of the other.

If adhesions between opposite surfaces of serous membranes are to be looked upon as evidence of pre-existing inflammation, the frequency with which we meet with this morbid phenomenon between the pleural surfaces warrants us in asserting that no organ or tissue in the body is more subject to inflammation than the pleura.

Pleurisy presents itself under so many varied forms, that we shall find it difficult to exhibit it in one general description. It may be acute or chronic; it may affect one side of the chest or both sides; it may be general, involving the whole of one side, or partial, only involving part of one side; it may be simple or complicated; the complication may be either accidental or essential, and in the latter case the pleurisy and its complication stand to each other in the relation of effect and cause.

I. Acute Pleurisy.—The anatomical characters which the pleura affected with acute inflammation presents, consist of change of texture and change of secretion. We have also to consider the changes which the lung, compressed by the effused fluid, undergoes both in form, volume, situation, and other relations.

The inflamed pleura exhibits numberless minute capillary vessels carrying red blood; these vessels anastomose freely among themselves, and present injected patches of various forms. Sometimes the injection is so general as to appear like an ecchymosis. Careful anatomical examination proves these injected vessels to be situated in the subserous cellular tissue; and that what was considered an actual thickening of the serous membrane in the first stage of inflammation, is due to a serous infiltration into this cellular tissue, as well as to a loosening of the connexion between the serous membrane and the subjacent tissue by the increased caliber of the capillaries, now carrying red blood. In some cases we can peel off the serous membrane, and thus prove the pretended thickening to be nothing more than what we have just stated.

Inflammation of the pleura induces changes both in the quantity and in the character of the ordinary serous exhalation. The first effect of inflammation upon the exhalation of a serous surface is, if not completely to suppress it, at least to diminish it very considerably; so that the dry surfaces have no longer that easy gliding motion which it is the physiological object of this lubrefying fluid to maintain. After an interval varying from an hour to two or three days from the commencement of inflammation, the serous exhalation is much increased in quantity, or, to adopt the language of pathology, the inflammation terminates in effusion. Laennec objects to this mode of expression, as calculated to convey an erroneous idea as to the time when the effusion begins to take place, as he is of opinion that in serous membranes the inflammation and effusion commence at the same moment, and proceed *pari passu*. With this, we must confess, our experience does not agree; and although in the larger cavities, viz. the abdomen, heart, and chest, our examination may not be capable of that degree of precision which would enable us to pronounce with certainty upon the point, still there are other cavities in which the train of morbid phenomena takes place more immediately under the cognizance of our senses, and where we have an opportunity of recognising a determinate interval between the supervention of the inflammation and the effusion; for instance the joints and the tunica vaginalis testis. In iritis, we have ocular demonstration that it is some time after the pain has announced the inflammation, that the increased

secretion of the aqueous humour takes place, causing an unusual prominency of the cornea.

The fluid effused into the cavity of the chest in acute pleurisy varies considerably in quantity; sometimes not exceeding an ounce, at other times amounting to several pints. When it is considerable, and has exercised a pressure upon the yielding parenchyma of the lung, reduced it to its smallest possible dimensions, and pushed down the diaphragm so as to cause the viscera placed below it to be felt lower than their normal situation, viz. the liver on the right side, and the spleen upon the left, it seems to be next directed against the walls of the chest, and produces a change in the form of the side, to which we shall have occasion to advert when we come to enumerate the physical signs of acute pleurisy.

The effused fluid presents itself under very various appearances. It may be colourless, transparent serum; or we may find flocculi of lymph floating in the serum without affecting its transparency; or, again, some of the lymph may be as it were dissolved in the serum, and, rendering it turbid, may impart to it an appearance resembling unclarified whey. Again, it may be a greenish fluid made up of serum and pus in various proportions, and approaching to each of these fluids in colour and consistence, according to the proportions in which they enter into its composition. Or it may be unmixed pus, resembling in its sensible qualities the matter of a phlegmonous abscess; and in this case the disease is ushered in with a strong rigor, the ordinary announcement of suppuration. Lastly, it may be either pure blood, or the ordinary serous effusion more or less deeply tinged with this fluid; the blood in this instance may be forced out either from the capillary vessels of the pleura in a high state of orgasm, or from the vessels developed in the organised false membrane.

In a case of acute pleurisy which we have had recently under our care, and in which the urgency of the symptoms required the immediate performance of the operation of *paracentesis thoracis*, the fluid drawn off was of a yellowish colour and oily consistence, very much resembling in appearance copal varnish. On remaining a short time in the vessel in which it was drawn, it was converted into a tremulous jelly, and after some hours resolved itself into two distinct parts, a thickish crassamentum floating in a thin serum; it in fact very much resembled the blood without its colouring matter. The fluid having collected again, it became necessary, in the course of a fortnight, to repeat the operation, when we found the effusion to present very different sensible properties from those of the original fluid; it was of a greenish colour, and though apparently of a homogeneous consistence, on standing a short time it separated into a thick purulent sediment and a thin greenish supernatant fluid. This operation afforded a very temporary relief; the individual died in four days, and on examination we found not less than eight pints of thick purulent matter (such as is met with in a phlegmonous abscess) in the left side, and both pleura pulmonalis and costalis densely coated with lymph. The difference presented by the effusion on three different occasions constitutes the interesting feature of this case. Andral, in the second volume of his *Clinique Médicale (Sur les Maladies du Poitrine,)* mentions a case in which the fluid effused into the pleura resembled the jelly of meat.

A portion of the fluid effused in pleurisy has a natural tendency to pass to the solid state; from thence we have the false membranes, which present so much variety in their organization, form, extent, consistence, and thickness. The coagulable lymph is scarcely deposited upon the free surface of the pleura when it becomes solid. In the first instance it is a soft, whitish mass, exhibiting no appearance of organization or vitality; but soon red points make their appearance in it, which, elongating themselves into red lines, present unequivocal characters of vascular canals, and, passing beyond the lymph, the matrix of their development, proceed to inosculate with the vessels of the pleura, and thus establish a communication between the circulation of the false membrane and the general circulation. It is impossible to fix the time when organization takes place in these false membranes; nor is it easy to determine to what special influences this process is subject, evidences of such organization being found in false membranes, the result of pleurisy of a few days standing, and being wanting in others of as many months' duration; thus, at least, proving that time is not the sole regulating circumstance.

The form assumed by the lymph deposited on the pleura is very various; sometimes it is deposited in isolated drops, having either the appearance of transparent vesicles or of miliary granules; at other times they closely resemble tubercles. In the differences presented by the lymph deposited in this form, we recognize the grounds of the opinion that hydatids are the form under which tubercles first present themselves, the transparency of these globular concretions countenancing such a belief. In a case of cancer of the lung, in which the cancerous matter presented itself in all the intermediate stages of development between hardened scirrhous structure and soft dissolved encephaloid matter, we found lymph deposited in the form of these isolated drops upon the pleura of the opposite lung, while the lung itself was quite free from disease. We suspect that lymph is the rudiment or matrix of all these morbid growths, which derive their special character from the peculiar cachexy of the individual.

Sometimes the lymph covers a greater or less extent of the pleura in the form of concretions of variable density. The surface of these concretions is sometimes smooth and polished, sometimes it is rough and unequal, and sometimes it has an areolated honeycomb appearance. In many cases these concretions are converted into cellular bands, of variable length, connecting the two pleura, and are

often found traversing the effused fluid. These bands acquire all the characters, both anatomical and pathological, of cellular tissue; they are subject to dropsical infiltration, and in jaundice present a yellow hue; they are often the matrix of morbid developments. That these bands do not fetter the motion, or in any way interfere with the function of the lung, is abundantly demonstrated by the fact of the frequency with which we meet them in our necroscopic examinations where we had no reason to suspect them during life.

The false membrane varies in thickness in different instances; sometimes it can be removed from the subjacent pleura in the form of a thin pellicle, not exceeding the thickness of the pleura itself. Most commonly the thickness of the false membrane greatly exceeds the natural thickness of the pleura, and it seems to be made up of several distinct laminæ superposed. We have seen this membrane an inch thick, and the laminæ of which it was composed admitted of separation like the different laminæ composing the coagulum of an aneurismal sac.

As the false membrane resembles cellular tissue in its properties, it is subject to all the transformations of structure of which this latter texture is susceptible; thus it may be converted into cartilage, fibro-cartilage, or even into bone. It is this membrane, converted either into cartilage or fibro-cartilage, which, in phthisis pulmonalis, establishes such an intimate union between the pleuræ pulmonalis and costalis as to defy our utmost efforts to separate them.

The false membrane may be the matrix of different accidental developments, of which tubercle is by much the most frequent. We often find the surface of the membrane studded with small miliary tubercles: at other times we find these bodies in the substance of the membrane in their different stages of softening. We have no precise data whereupon to average the time when tubercles begin to form in the false membrane; and though we believe they may develope themselves within a very short period, we conceive the work of tuberculization in general to be a slow, insidious process, even in organs most essential to life.

The lung of the side, when the effusion exists, deserves our attention, both in reference to the position which it occupies, and the changes which it undergoes in its proper structure. In general the effused fluid tends to press the lung into the space beside the vertebral column, and when it is in considerable quantity, the organ is reduced to a thin lamina, so that sometimes it is not easy to find it, and thence we have heard of its having entirely disappeared. Adhesions will of course modify the position of the lung, and protect a portion of it from pressure. Sometimes the lung is applied against the ribs by being pressed backwards and outwards; at other times it is completely suspended in the fluid. In general the only change induced in the lung, pressed upon by the effused fluid, is a diminution of size, the mechanical effect of the peculiar circumstances in which it is placed. The air is squeezed out of it. The organ becomes more dense and less crepitating than natural; it assumes very much the anatomical characters of a fœtal lung; it has a smooth, uniform appearance, and does not tear as a portion of hepatized lung will do; its vesicular structure has quite disappeared, and even the bloodvessels are flattened and exanguious: the bronchial tubes become contracted in their caliber. Its resemblance to a portion of muscular tissue which has been submitted to maceration has procured for it the expressive term of carnification.

Tubercles may form in the compressed lung, and there undergoing their ordinary changes, will modify the symptoms of the disease; still it more frequently happens that the tubercles already existing in the lung, in softening, perforate the pleura, and give rise to that modification of pleurisy which might with propriety be termed *puopneumothorax*.*

General symptoms of acute pleurisy.— Acute pleurisy is well entitled to a place among the Pyrexiæ, from the symptoms of high febrile excitement with which it is in general announced; to these symptoms are superadded pain in the side, difficulty of breathing, a hard dry cough, and, usually, decubitus upon the unaffected side: upon these follow, sooner or later, a dulness of sound or absence of the ordinary resonance of the affected side when percussed, a peculiar modification of the voice designated ægophony, and bronchial respiration; then the complete absence of the respiratory murmur, and a palpable dilatation of the affected side.

The febrile symptoms of acute pleurisy are not marked by a uniform intensity. When the disease prevails as an epidemic, these symptoms partake more of a low typhoid type, and considerable derangement of the digestive apparatus holds a prominent place amongst them. The pain is unequivocally the most constant symptom of acute pleurisy; it is the one which especially attracts the patient's attention, and which, from the expression of anxiety and suffering which it imparts to the countenance, is seldom overlooked by the physician: it is described as a sharp, lancinating pain, increased by coughing, by inspiration, by pressure in the intercostal spaces, or by lying on the affected side; its situation is generally referred to near the mamma, and is felt in a very circumscribed space, no matter what may be the extent of the inflammation. It is not easy to explain why this should be the usual situation of the pain. Morgagni attempted to account for it by the greater mobility which this point of the chest presents, as being equally distant from the apex and base of the thorax, and from the sternum and spine. Though the point mentioned be the most usual seat of the pain, still it may be felt in any part of the side, or even in the opposite side, without this side participating in the inflammation.

When pleurisy depends upon tubercles in

* Πύον, pus, πνεῦμα, air, θώραξ, chest.

the pulmonary tissue, the pain is felt in parts of the chest corresponding to the situations of the formation of these foreign bodies; hence in the early or nascent stage of phthisis pulmonalis we hear the frequent complaint of pain under and above the clavicle, in the hollow of the axilla, or between the shoulders, this pain indicating the existence of tubercles in the apex of the lung, the usual seat of their earliest development. This symptom of early phthisis is of much practical value, as it assists our diagnosis at a stage of the disease when the stethoscopic signs are equivocal, and when treatment interferes with most prospect of success.

When the pain is confined to the margin of the ribs, it is not always easy to determine whether it depend upon inflammation of the thoracic or of the abdominal serous membrane, and the difficulty is increased by the fact that jaundice has followed upon unequivocal pleurisy by an extension of inflammation of the pleura lining the diaphragm. Morgagni mentions a case in which Valsalva mistook the complication of jaundice for the primary disease, and overlooked the less palpable signs of a pre-existing pleurisy, proving how difficult it is to establish a certain diagnosis when the situation of the disease is a point where many organs are as it were placed in the same parallel of latitude, and when the disease itself is not marked by any striking functional derangement. The pain is seldom constant, but is brought on by every thing calculated to impress the slightest motion upon the affected side; it sometimes assumes an intermittent character, and returns with a regular periodicity.

In the first moments of acute pleurisy, the respiration is marked by a peculiar nervous hurry. Nature is instinctively aware of the pain produced by a full inspiration, and therefore avoids it; she compensates for the smallness of the volume of air admitted at each inspiration by the frequent repetition of the act, and hence the respiration is short, hurried, and jerky *(saccadée)*. When effusion has taken place, the dyspnœa depends upon a different cause, viz. the mechanical obstruction to the expansion of the lung, and is in proportion to the extent of the effusion and suddenness with which it has taken place. This latter circumstance has much more effect in embarrassing the respiration than the former, as we have known cases where individuals were quite unconscious of any thing affecting their chest, while at the same time there existed unequivocal evidence of extensive pleuritic effusion; and this arose from the organs having had time to accommodate themselves to the encroachment upon their functions. Should the opposite lung be affected either with bronchitis or emphysema, the dyspnœa will be more distressing.

The characteristic cough of acute pleurisy is a short cough, either dry, or accompanied with a thin mucous expectoration: should the sputa be more abundant or deviate from this character, we may suspect a complication either of pneumonia or bronchitis. The cough is often wanting altogether, or is so slight as to attract the attention of neither the patient nor physician.

The difference of opinion which obtains among systematic writers upon the subject of the *decubitus*, or position of the patient in pleurisy, proves at least that it is not constant, and therefore cannot be exclusively relied upon as a diagnostic sign; still we may say that, as long as the acute lancinating pain of the side continues, the aggravation of it, caused by the pressure when lying upon this side, makes the individual seek the more easy position either upon the opposite side or upon the back. When the pain has ceased and extensive effusion taken place, the position, before avoided, is now adopted; because the effusion, interrupting the function of one lung, and placing it as it were *hors de combat*, a necessity for greatly augmented action devolves upon the other, and in order to favour this, nature instinctively points to the position which allows the easiest and most unembarrassed play to those muscles whose province it is to dilate the unaffected side of the chest, and this position is upon the affected side. It is only when the effusion has been sudden and considerable, when the respiration has (if we may be allowed the expression) been taken by surprise, that nature seeks to relieve herself by particular posture. It may happen that a fresh attack of inflammation in the side originally affected, or the lung hitherto free becoming involved, will produce the necessity for a certain position, to which nature in the first instance seemed to be indifferent.

Physical signs.—In the earliest stage of acute pleurisy there is no physical sign to mark its existence. When effusion takes place into the cavity of the chest, its extent is marked by percussion of the side yielding a dull dead sound instead of its ordinary clear tympanitic resonance. This dull sound, it is true, may arise from other causes than from fluid effused into the cavity of the pleura; it may be owing to solidification of the pulmonary tissue, the effect of pneumonia; or to some morbid growth formed in the lung: still we can take such advantage of this sign as will enable us to determine upon what it depends; for although Laennec denies that fluid effused into the cavity of the chest can change its place, and states that it arranges itself between the lung and the walls of the chest, the experiments and examinations of Piorry on this subject, concurring with our own experience both during life, and confirmed by examination after death, enable us to assert that this fluid, being specifically heavier than the lung in its natural state, will displace it, and gravitate towards the most dependent part, and thus by change of position of our patient shall we be enabled to change the results both of percussion and auscultation. We believe the only internal limitation to the displacement of the lung to be the root of the organ; and when the effusion is considerable, and we examine the patient in the sitting posture, the weakness if not the complete absence

f respiration and dulness of sound are owing o the fluid having pushed up and now occupied the place of the lung; but as the root of he organ is its fixed point, when the fluid rises bove its level, it is now that it presses upon it n all sides, and when it has filled the cavity, he lung is as it were suspended in it, and, eing retained here, undergoes different degrees f compression according to the extent of the ffusion. The analogy of the fluid in ascites, isplacing the intestines, confirms the view that ve have just taken of the displacement of the ung by the pleuritic effusion. Adhesions beween the pleuræ pulmonalis and costalis will revent the fluid displacing the lung; and if we id not keep this fact constantly in view in our examinations, we should often be misled. We well remember the embarrassment which the unusual phenomenon of distinct bronchial respiration produced in a case of unequivocal pleuritic effusion, related by Dr. Graves in the fifth volume of the Dublin Hospital Reports, and which an adhesion between the pleuræ pulmonalis and costalis afterwards accounted for. It is only when the dulness of sound and absence of respiration present themselves when we see the patient for the first time, that we can ever be at a loss to determine whether they depend upon pleuritic effusion or solidification of the lung; for the short time in which the whole side or even its inferior half will yield a dull sound, (sometimes occurring within a few hours,) is conclusive of its being due to effusion and not to hepatization, which is a very gradual result, and is always preceded by the crepitant râle. We may state generally that the sudden, equal, and uniform absence of respiration and dulness of sound are peculiar to pleuritic effusion.

When the effusion is very abundant from the first moments of its formation, the respiratory murmur ceases to be heard in any part of the chest, except along the vertebral column, where it is still perceptible for the space of about three fingers' breadth, although more feeble than in the opposite side. When, on the contrary, the effusion is gradual, the respiratory murmur begins by being a degree fainter, and continues to diminish its intensity until it is entirely lost. The respiratory murmur will survive the dulness of sound sometimes for days. When it has ceased in all other parts except beside the spine, it will often continue to be heard under the clavicle, in consequence of the frequent adhesions between the pleuræ pulmonalis and costalis in this situation in phthisis. To the cessation of the respiratory murmur or vesicular respiration succeeds a peculiar modification of respiration, which, from its apparent dependence upon the air not penetrating beyond the larger bronchial tubes, has been termed *bronchial respiration*. As this same character of respiration exists in solidification of the lung in pneumonia, we may presume that it depends upon the same cause in both cases,—namely, the peculiar condition to which the pulmonary parenchyma has been reduced, in one by the compression of the fluid, and in the other by a deposition of foreign matter into its proper structure; so that the phenomenon would seem to depend upon the air entering the bronchial tubes, placed not in the midst of their ordinary spongy medium, but of a dense solid structure, and therefore better calculated to convey every modification of sound, whether of voice or of the entrance of air; furnishing us in the former instance with *broncophony*, and in the latter with *bronchial respiration*.

The voice, as heard by the stethoscope, is observed to acquire a particular character in pleuritic effusion, which led Laennec to regard it as one of its most characteristic signs. From its resemblance to the shrill, jerky, tremulous sound of the goat, he has termed it *ægophony*. (See Auscultation.) This phenomenon is most perceptible about the inferior angle of the scapula, and in the space comprised between the posterior margin of this bone and the spine, and is found to exist only when the effusion has attained to a certain extent, and to cease when it either goes beyond or falls short of this: hence it is not met with either in the very early or advanced stage of pleurisy; and when it has been present and disappeared, its return is hailed as indicative of progressive absorption of the effused fluid. Laennec ascribes it to the transmission of the voice through the compressed lung and the fluid interposed between the lung and the side of the chest. As we before stated that our own experience, confirmed by Piorry's experiments, made us question Laennec's opinion of the stratum of fluid interposed between the lung and side of the chest, of course we cannot admit his *rationale* of the phenomenon, as far as relates to the transmission of the voice through this hypothetical interposed fluid. As the most experienced stethoscopists allow that they can with difficulty distinguish between ægophony and broncophony, we believe the former to be a mere modification of the latter, and to differ only in the structure of the lung not having undergone an equal degree of compression: hence we see the reason why, in the earliest stage of pleuritic effusion, the compression has not been sufficient to produce the phenomenon; as the effusion increases, the compression is greater, and the phenomenon appears, the effusion increases still more, and ægophony gives place to broncophony; as absorption takes place, the compression becomes less, and ægophony appears again; hence we have equal reason to hail the return of this phenomenon as an indirect expression of the diminution of the fluid, but an immediate result of the diminished compression of the lung, and not of the diminished interposed fluid through which the voice is transmitted.

When the effusion is considerable and has formed within a short space of time, the respiration in the opposite lung becomes puerile. The increased action which has devolved upon this lung strongly predisposes it to disease, differing, however, from the original affection; that is to say, the lung is more likely to become consecutively affected either with bronchitis or pneumonia than with pleurisy. When

pleurisy is double, the two sides have become simultaneously affected, and their respective affections proceed *pari passu*.

When the effusion has proceeded to a considerable extent, it produces a change in the side, consisting in an actual increase of its size and form. It is remarkable how small a difference between the two sides, as ascertained by actual measurement, will strike the eye; an increase of six lines will have this effect. The change of form of the side consists in its becoming more rounded, and in the intercostal spaces being either effaced, or rising beyond the level of the ribs. In these spaces fluctuation can sometimes be detected. Change in the form and dimensions of the side has been recognized as a diagnostic sign of pleuritic effusion since the dawn of pathology.

When the effusion is on the left side, it will have the effect of displacing the heart, and of causing its pulsations to be heard either on the right side or in the epigastrium; hence, if we miss the heart in its normal position, and perceive its action in either of these situations, we have very strong grounds to suspect, if not conclusive evidence of, this lesion.

M. Reynaud has suggested a mode of ascertaining the existence of fluid effused into the chest, which consists in the application of the hand to the side where the effusion is suspected, and then making the individual speak, when the effused fluid will be found to interrupt the vibrations which the voice communicates to the walls of the chest when the lungs are sound.

Varieties of acute pleurisy.—Acute pleurisy may be double, that is, it may involve both sides of the chest at the same moment. This is by no means a common occurrence, and when it does take place, and is speedily followed by extensive effusion into both sides, the sudden and extensive mechanical interference with the function of respiration soon extinguishes life. Percussion affords us no assistance in forming our diagnosis in this case; for as we have no absolute standard of the degree of resonance which it should yield, it is by comparison of the two sides that we can alone judge; but the effusion, producing a dull sound in both sides, deprives us of the value of this physical sign. However, if we keep in mind the observations we before made upon the differences between pleurisy and pneumonia, and apply them to the subject under consideration, we shall have little difficulty in identifying this affection, and distinguishing it from the only modification of disease with which it could by possibility be confounded. Double pleurisy, but of inconsiderable extent, often takes place in the agony of acute diseases.

Partial or circumscribed inflammations of the pleura are very common. They in general produce no fever or constitutional disturbance, and are only announced by a pain more or less acute in some point of the walls of the thorax: the pain too is not a constant symptom. A slight exudation of lymph takes place, and this, in the course of time, is transformed into a cellular band. This is the history of those cellular adhesions which unite the pleuræ pulmonalis and costalis more or less intimately. These adhesions have often been found in persons who, during life, never gave reason to suspect any affection of the chest. Although these partial pleurisies may exist alone, they more frequently occur in cases of affection of the pulmonary parenchyma. Phthisis pulmonalis is their most fertile source, and hence arise the frequent pains in different points of the side, of which the subjects of this disease so often complain. These painful points bespeak inflammation of the corresponding portions of the pleura, and in our subsequent examinations we find adhesive cellular bands in these situations. The number of these adhesive bands is, in general, in the direct ratio of the number of tubercles, and they exist particularly in points corresponding to those where the tubercles are most abundant: hence their most constant situation is between the apex of the lung and the summit of the cavity of the chest; the adhesion here is sometimes so firm as to defy our utmost efforts to break it.

Some partial pleurisies demand peculiar attention in consequence of the particular symptoms to which they give rise. Inflammation of that portion of the pleura which lines the diaphragm claims our especial consideration upon this score. Its characteristic features are, in addition to the ordinary constitutional symptoms of acute pleurisy, pain more or less acute of the cartilaginous border of the false ribs, extending into the hypochondria, and even to the flanks; complete immobility of the diaphragm in inspiration, which is performed by the elevation of the ribs; orthopnœa, with an inclination of the body forwards; an inexpressible anxiety of countenance, marked by a sudden change of features; the respiration more hurried and jerky than in ordinary pleurisy; the voice low and interrupted, (entrecoupée); a frequent desire to cough, but an obvious dread of it from the pain which it causes. The intellect is free at first, but when the case is aggravated, and the constitutional symptoms run high, delirium comes on. In addition to the symptoms enumerated, we have the ordinary physical signs of pleurisy; viz. in the first moments of the disease, if the pain will allow us to employ percussion, we find a disproportion between the sound it yields in the inferior part of the chest, and the distinctness with which respiration is heard in this situation, the latter being feeble while the former is clear; in the course of a short time the sound here becomes dull, and the respiratory murmur ceases to be heard, and these two phenomena extend upwards in proportion to the extent of the disease. When the effusion takes place into the right cavity of the pleura, it presses down the liver, and causes it to be felt below the margin of the ribs; when it takes place into the left cavity, it produces a similar change in the position of the spleen. The signs which we have just enumerated may be regarded as the most constant and unequivocal of diaphragmatic pleurisy; others are occasionally present, viz. hiccough, nausea,

vomiting, jaundice, &c. It was the presence of jaundice that led Valsalva to regard the accidental complication as the original disease; a mistake which might naturally occur if, as happens in many cases, the features of the preceding pleurisy had not been strongly marked. The risus sardonicus, to which the ancients attributed so much importance as characteristic of this modification of disease, has not been found constant by modern observers.

There is a partial pleurisy which claims our attention, in order to guard against a pathological error into which we might fall did we not conduct our investigation with care. We allude to interlobular pleurisy, in which the cellular membrane, the result of the present or of a former inflammation, connecting the lobes of the lung, may become the nidus of an abscess, which a superficial observer might easily mistake for an abscess in the substance of the organ.

It is almost superfluous to observe that partial pleurisies owe their importance to the extent of surface which they occupy: the more extensive they are, the more serious are the consequences. Preceding pleurisies, in which adhesions have been formed, limit the extent of future attacks; these adhesions, as it were, divide the cavity of the pleura into smaller cavities, and thus circumscribe future pleurisies.

Inflammation may affect either the costal pleura alone, or the pulmonary pleura, or both at the same moment. In the first case, it is not always easy to determine whether the affection be rheumatism of the intercostal muscles, or inflammation of the costal pleura; we have in each the same pain produced by the same causes, and the same modification of respiration, in the performance of which the ribs seem to take no share. When the pulmonary pleura alone is affected, the pain is produced by the air inspired stretching this membrane, and it is the effort to avoid this that gives the short hurried character to the respiration.

There is a neuralgic pain of the side which is sometimes mistaken for inflammation of the pleura, but which differs from it in being unaccompanied with fever, and in the character of the pain, which is represented as a burning or scalding sensation, and not as a sharp lancinating pain. The neuralgic pain differs from the pleuritic in being relieved by pressure.

Causes of acute pleurisy.—These may be divided into the predisposing causes and the occasional or exciting causes. Among the first may be enumerated congenital malformation, consisting in narrowness of the chest; a sanguine temperament; irritability of the system; weakened health from previous disease; convalescence from fever; the puerperal state. The exciting causes embrace all mechanical injuries directly applied to the pleura; such as contusions, penetrating wounds caused either by cutting instruments,* or by sharp spiculæ of fractured ribs; extension of ulceration from a softened tubercle in the substance of the lung perforating the pleura, and giving rise to a complication to which we shall have occasion to advert; cold applied to the surface when the cutaneous capillaries are in a state of excited action, &c. The mode of operation of the cause last mentioned is supposed to be by directing the fluids from the circumference to the centre, and thus determining their afflux to the serous membrane; and as this cause has also the effect of producing a congestion of the parenchyma of the lung, and, in consequence, a tension and stretching of the investing pleura, it was supposed that in this way it contributed to produce pleurisy. The frequent complication of intermittent fever with pleurisy further countenanced this idea. However, we cannot but consider the rationale of this cause as too mechanical, and would rather connect it with some physiological sympathy existing between the skin and serous membrane of the chest. Pleurisy is often found to depend upon a certain *intemperies* of the atmosphere, which causes an epidemic spread of the disease; and like all epidemics, it then assumes a less sthenic type than isolated sporadic cases do; in this modification of the disease, the digestive apparatus is much deranged, and hence it has been designated *bilious pleurisy*. Metastasis of gout or rheumatism, or a repressed cutaneous eruption, may be the exciting causes of acute pleurisy. Pneumonia, by an extension of inflammation, so often induces pleurisy, that, as we before observed, it was long thought that they could not exist independent of each other. While pathology has controverted this error, it has shown us that pneumonia more frequently produces pleurisy than pleurisy produces pneumonia.

Pleurisy is said to be *latent* when it exists unannounced by the ordinary symptoms which usually accompany it, such as pain of the side, hurried respiration, dry cough, &c. We have observed pleurisy supervene in this insidious way in the convalescence from fever: the patient, after having made some advance towards recovery, is observed to fall back again; he makes no complaint of his chest; still on careful examination we observe a slight hurry of the respiration, and hear an occasional dry cough; these direct our attention to the chest, where we find unequivocal evidence of pleurisy with effusion.

Complications of acute pleurisy with other diseases.—We may premise that acute pleurisy is much oftener simple and uncomplicated than chronic pleurisy. The frequency of the coincidence of acute pleurisy and pneumonia *(pleuropneumonia)* claims the first place in the enumeration of the complications of acute pleurisy. The pneumonia may be either the cause of the pleurisy, or it may be the consequence of it; or these two diseases may commence at the same moment, being the independent effects of the same morbid impression. In general, in pneumonia, when the inflammation reaches the surface of the lung, the contiguous portion of the pleura becomes inflamed, and is coated

* We have seen a fatal case of pleurisy produced by perforation of the pleura in passing the needle round the subclavian artery for the cure of aneurism of this artery.

with a layer of lymph, usually thin, and often an exact measure of the extent of the inflammation of the lung. When the entire lung becomes hepatized, we have often observed the whole investing serous membrane covered with a more or less dense false membrane, marked with parallel lines produced by the impression of the ribs upon it. This complication exhibits the most common case of what has been termed *dry pleurisy*. We need hardly observe that the pleurisy here is of very subordinate importance: it is that, however, of which the diagnosis would embarrass us most, had we not seen the case at its commencement. The pressure of the effused fluid may have the effect of exciting inflammation in the lung: the ordinary stethoscopic phenomena will disclose this complication. The inflammation seldom goes beyond the first stage of pneumonia; and from the repeated opportunities we have had of examining the bodies of those who died with pleuritic effusion, and the few specimens we have seen of pneumonia in the compressed lung, we believe this complication to be very rare, and suspect that the carnified condition of the lung has been not unfrequently mistaken for the first stage of pneumonia. Laennec remarks that the pressure of the fluid has rather the effect of placing the lung out of the pale of inflammation. The third complication, or pleuropneumonia properly so called, in which the proper tissue of the lung and its investing membrane are simultaneously affected, is recognised by its exhibiting the stethoscopic phenomena peculiar to each lesion. The case is not very much aggravated by the complication; Laennec even considers the danger less than if either existed alone in a more considerable degree; for he is of opinion, as we above stated, that the pressure of the fluid controls the pneumonia, and that, in return, the absorption of the effused fluid is promoted by its being compressed between the unyielding solidified lung and the sides of the chest. This is a case in which the fluid is interposed between the lung and the side of the chest, in consequence of the lung, from its increased density, not admitting of displacement.

We have before adverted to the frequency of the complication of pleurisy and tubercles in the lungs, in which case there generally existed adhesions between the pleuræ pulmonalis and costalis. However, it will happen that, in some instances, nature will seem as it were to neglect the precaution of establishing an adhesion between the opposite serous surfaces; and softened tubercles situated near the surface of the lung will, in obedience to the pathological principle of purulent matter seeking the easiest and shortest outlet, perforate the pleura, and immediately give rise to a most intense pleurisy, marked by a very acute pain of the side, most distressing difficulty of breathing, and extreme anxiety. When we come to examine the chest, we find all the physical signs which characterize pneumothorax with effusion, (vide PNEUMOTHORAX,) in which case we know the lesion to consist of pleurisy and a tubercular cavity into which a bronchial tube opens. It may happen that the softened tubercle perforating the pleura will only give rise to simple pleurisy, in consequence of its not communicating with a bronchial tube.

Gangrenous ulceration of the lung and pleura will cause either pneumothorax or pleurisy; in addition to their respective signs, the sputa and breath have an insupportable fœtor.

Pleurisy of one side is not unfrequently complicated with some disease of the opposite lung, arising out of the increased duty that has devolved upon it. This lung may either become emphysematous, or the subject of bronchitis or pneumonia. It is frequently attacked with sudden congestion, which produces most urgent sense of suffocation, and renders the patient's situation truly pitiable. We have before alluded to the fact that when pleurisy of one side exists, it seldom involves the pleura of the opposite side, but leads either to pneumonia or bronchitis; and when pleurisy is double, there is a fair start between both sides, and their affections proceed *pari passu*.

Prognosis of acute pleurisy.— Pleurisy is ever a serious disease; in many cases, however, it terminates favourably. The danger is proportionate, 1st, to the cause upon which the disease depends: when it depends upon ulceration of a tubercle, or upon superficial gangrene of the lung, it is always fatal: 2d, to the extent of the inflammation: double pleurisy is attended with more danger than when the disease is confined to one side; and when the whole cavity of the pleura is inflamed, the prognosis is more unfavourable than when only part of it is affected: 3d, to the quantity and nature of the effusion: 4th, to the time during which the effusion has existed: 5th, to the diseases which complicate the inflammation of the pleura, or which exist along with it.

Previously to noticing the treatment of acute pleurisy, we shall give the history of the disease in a chronic state.

II. CHRONIC PLEURISY.—There are two distinct kinds of chronic pleurisy: one, the continuation, as it were, of the disease in its acute form; the other, to use the usual but paradoxical expression, chronic from its commencement; that is to say, at no period exhibiting either the intense fever, the acute pain, or energy of reaction which characterize an acute disease. When the diagnosis of diseases of the chest was less certain than it has been since the acquisition of the stethoscope, the first form of chronic pleurisy was much more common than it is at present, for this reason,—that formerly being without the means of appreciating the physical signs of the disease, when the pain, the most prominent symptom, had yielded to antiphlogistic means, it was then conceived that the inflammation was subdued and the cure complete; the patient then returning to his former diet and resuming his usual occupations, was often surprised by an attack more violent than the former. Our improved mode of examination teaches us that

every symptom of inflammation may have disappeared, every function apparently be restored to its natural condition, and still there may be considerable effusion into the cavity of the chest: until this be entirely removed, we never can feel secure about our patient. Pleurisy, in its essentially chronic form, creeps on very insidiously, without much acceleration of pulse or heat of skin; and when there is any *unusual* sensation in the side, it does not amount to more than a mere soreness: the difficulty or hurry of breathing is sometimes so inconsiderable as not to attract the individual's attention. An observer is struck with the patient's unhealthy pallid appearance; there is a loss of appetite and a languid look, which emphatically tells us of some mischief going on; on close examination we find that the absence of fever is not constant, but that towards evening there is a febrile movement. A dry cough, or one attended with scanty mucous expectoration, and which has existed a considerable time without any apparent dependence either upon crude tubercles in the lungs or upon gastro-intestinal irritation, should lead us to suspect the possibility of chronic pleurisy.

The anatomical characters of chronic pleurisy do not differ very widely from those of the acute form, especially when it has been a mere transition of one form of the disease into the other. In this latter case, no matter to how distant a period the disease may be protracted, the fluid effused retains to the last its primitive character. As in acute pleurisy, it is a straw-coloured serum, but more consistent, apparently owing to its holding in suspension a considerable portion of the fragments of the false membrane, which, on the fluid settling, sink to the bottom. These condensed fragments, which, on opening the chest, are found in its most dependent parts, constitute, according to Laennec, a connecting link between the sero-purulent effusion and the false membrane. In essentially chronic pleurisy the effusion partakes more of a purulent character: in this case the disease closely resembles an abscess, the false membrane investing the pleura corresponding to the cyst, and endowed with the physiological properties of absorption and secretion. If the constitution be imbued with a scrofulous taint, (which is the habit in which we most frequently meet with this morbid condition,) the effusion will exhibit the ordinary characters of scrofulous pus, viz. a thin, whey-coloured matter, with flocculi of lymph floating in it. When the effusion is mainly purulent matter, mixed with a small proportion of serum, it is of a greenish colour, and very much resembles an infusion of tea to which a small proportion of milk has been added. The effusion in chronic pleurisy is not as exempt from smell as that in the acute disease.

The false membrane in chronic pleurisy is not essentially different from that in acute pleurisy; it is only firmer and more condensed, owing, perhaps, to the longer time it has been under the pressure of the effused fluid. It is capable of all the transformations of which we stated it to be susceptible in acute pleurisy; and to its conversion into fibro-cartilage Laennec ascribes a particular change in the configuration of the chest, to which we shall presently have occasion to advert. It is more prone than in acute pleurisy to become the matrix of morbid developments, especially tubercle.

The lung is more compressed than in acute pleurisy; it is often reduced to a thin lamina, not exceeding six lines in thickness, lying down along the spine. There is also a more complete annihilation of its vesicular structure. It was this condition of the organ that led less careful examiners to pronounce upon its entire removal. Tubercles or other morbid growths may develope themselves in it, and, undergoing their proper changes, modify the symptoms of the original disorder.

Diagnosis of chronic pleurisy.—The physical signs of chronic pleurisy differ little from those of acute, except in being more prominently expressed; and apparently for this reason,—that the disease, from its insidious character, has excited little constitutional alarm, and therefore the individual labouring under it has unconsciously permitted it to go on without seeking medical relief. In general, then, when it presents itself to the physician, it has existed for a considerable time. The affected side is more rounded; the intercostal spaces are more dilated, and raised above their natural level, in some cases admitting of fluctuation being felt; the integuments of the side often become œdematous. When the disease has existed for a long time, the spine is observed to deviate from its natural direction, and to form a curve with its concavity looking towards the affected side. If the left side be the seat of the effusion, the heart undergoes the same displacement as in acute pleurisy.

The œdematous state of the integuments lessens, at least, the value of percussion as a means of assisting our diagnosis. There is not only a more complete absence of respiratory murmur, but not even ægophony or bronchial respiration are present. Double chronic pleurisy is a very rare form of disease.

Partial or circumscribed chronic pleurisy is more frequently met with than the same modification of acute pleurisy; and although there are many circumstances connected with it calculated to embarrass the diagnosis between it and pneumonia, especially our seldom having an opportunity of observing it *ab initio*, still the marked expression of the physical signs seldom leaves us at fault. It sometimes happens that the circumscribed nature of the affection shews itself to the eye by a distinct line of demarcation intersecting the side of the chest. If it happens that the pleurisy occupies the inferior part of the side, (which is most frequently the case,) below this line will be found the physical signs of pleurisy, with dulness of sound and absence of respiration; while above it, the only deviation from the ordinary state of things is puerile respiration.

Pleurisy assuming a chronic character from its commencement generally occurs in a cachectic habit of body, or where the health has been broken down by previous illness. We

have met with it more than once after fever, and usually either in scrofulous habits, or in persons much addicted to intemperance.

Prognosis of chronic pleurisy.—The prognosis of chronic pleurisy is, generally speaking, very unpromising; however, if it exist as an isolated affection, apart from any complication, it may go on for months, nay, for years. If, as is often the case, tubercles form and go through their changes either in the compressed or in the opposite lung, the complication will have the effect of precipitating the fatal termination. In the ordinary course of the disease, a slow wasting fever sets in; there is a gradual emaciation; the appetite fails; the pulse is languid, although not much quickened; the legs swell, and the face becomes puffed; the expectoration often has a disagreeable alliaceous smell. Upon these symptoms well-defined hectic fever soon supervenes, and rapidly wears down the patient.

Nature often takes the cure of pleurisy into her own hands, and seeks to relieve herself of the fluid effused into the chest in one of the following ways: 1. by absorption: or, 2, when the fluid is purulent, by making a passage for it through the pulmonary tissue into a bronchial tube, from whence it is expectorated; or through the walls of the chest, from whence it flows immediately out; or in some cases she adopts these two last ways at the same moment.

When the disease has existed a long time, and nature at length takes upon herself a slow, gradual process of absorption, which she takes a considerable time to complete, we observe that remarkable change in the form of the side to which we before made allusion: this side, which was before perceptibly longer than the opposite one, now becomes less; it is diminished in all its diameters, its circumference sometimes measuring less by an inch than that of the opposite side. Its length is not less encroached upon; the ribs are approximated, the shoulder becomes lower, and even the spine in some cases assumes a lateral inclination from the habitually bent position of the patient. The muscles of the chest, especially the great pectoral, seem to have lost half their volume. We shall easily comprehend the nature of this change when we reflect upon the cause upon which it depends. Laennec, who was the first to notice it, charged it upon the fibro-cartilaginous nature of the false membrane, which continued to oppose itself to the lung's being restored to its original condition: it interfered with its vesicular texture so as to render it impervious to the air: the organ had, in fact, virtually undergone a change of dimensions, in consequence of which the relation between it and its containing cavity was lost. The atmospheric pressure acting upon the side, and not counterpoised from within, causes it as it were to fall in and accommodate itself to the altered condition of the lung. We cease to wonder that the unyielding bony case should have its form influenced by this condition of the lung, when we reflect how speedily an opposite state, or dilatation, will succeed to an emphysematous condition of the contained organ. A cause mainly instrumental in the contraction of the side is the atrophy of the muscles from disease, respiration being exclusively carried on by the opposite side.

When nature relieves herself of the accumulated fluid by a passage through the pulmonary tissue into a bronchial tube, the individual, who has been for some time labouring under either a dry cough or one attended with scanty discharge, is suddenly seized with an abundant expectoration of greenish purulent matter, which comes forth with such a gush as to appear to be vomited rather than expectorated. This discharge from the lungs continues from day to day, the quantity gradually diminishing till it ceases altogether. In proportion as the matter is discharged, we perceive the fulness of the side to give way, and to come down to its normal dimensions. In this case a considerable time will elapse before percussion and auscultation yield their natural results, the sound continuing dull, and respiration feeble; still the function of the lung will ultimately be restored, differing from the case of contraction of the side, in which the dull sound and feeble respiration are permanent.

The third expedient which nature adopts for the discharge of the purulent fluid in the chest is to give the pleurisy the character of an abscess, making its way through the walls of the chest, and pointing externally. When the apparently small abscess on the side of the chest either opens spontaneously, or is opened by art, it discharges a quantity of matter quite disproportionate to its size, and this matter is pumped out at each expiration and cough. Sometimes the matter gets vent both through a bronchial tube and through the side of the chest at the same time. It is a singular fact that when the fluid in the chest is discharged through the lung, and consequently through a communication established between a bronchial tube and the cavity of the pleura, pneumothorax does not ensue, although it is previously the same lesion that gives rise to this morbid phenomenon, the difference being only in the mode in which this lesion takes place.

Treatment of pleurisy.—If the energy and activity of our practice in the phlegmasiæ should be in proportion to the importance of the part inflamed, there is scarcely any part in the whole animal machine of which the inflammation demands a more decided and uncompromising plan of treatment than the pleura. If we temporize in the treatment of pleurisy, the least evil we can anticipate is a protracted convalescence; whereas if we meet it, *in limine*, with vigour, we often as it were strangle it in the birth.

I. *Treatment of acute pleurisy.*—The treatment of acute pleurisy comprises all the means usually employed to reduce constitutional fever and local inflammation.

Bloodletting.—In the first stage of the disease, when febrile excitement runs high, and is accompanied with much local distress, we should bleed with an unsparing hand from a large orifice, and in the manner most calculated to make the speediest impression upon the system.

Should a single bleeding conducted in this way fail to afford very decided relief, we should resort to the operation again within a few hours, and repeat it at more or less distant intervals, according to the urgency of the symptoms and the capability of our patient to bear further loss of blood. Some have attempted to fix the precise quantity of blood to be drawn in the cure of a pleurisy; a generalization to which nature will not submit, the effects of bleeding differing in different individuals. It would be to trust to a very fallible guide indeed were we to depend upon the indications of *the pulse*. In this, as well as in the inflammations of all other serous membranes, the pulse, so to speak, as often underrates as exaggerates the extent of the mischief, being rather a measure of the constitutional irritability of the individual than of the actual amount of disease. The usually accompanying *pain* is a symptom upon which we can place more reliance, and the effects produced upon it serve in some measure to guide us as to the extent of depletion; but even it, so far from being proportionate to the extent or intensity of the inflammation, is often absent when the inflammation occupies a considerable extent of surface; and even when both sides are affected at the same moment, if it be present, it is often found not to amount to more than a mere soreness. The *dyspnœa*, or rather the nervous dread of drawing in a full breath, in many cases lasts for so short a time, that we must see the patient in the first moments of the attack to have the value of this symptom. Were we to lay down any general rule, deduced from the common symptoms, as to the limit to which we would carry sanguineous depletion, we should be most disposed to regulate this by the strength of the patient, and the relief of the pain and consequent power of taking in a full inspiration.

While we distrust the indications of the pulse, which, in some cases, from its composure, is calculated to mislead us as to the expediency or necessity of bleeding, so we should be equally on our guard not to be betrayed into the opposite error of considering an accelerated pulse, which may be produced by the depletion we have employed, as the index of continuing inflammation, and be thus led to push depletion still farther, and thereby originate functional disorder ultimately terminating in organic disease of the heart. We have seen this mistake so often committed, that we deem it necessary to subjoin this caution.

While we employ general bleeding, we may at the same time seek to relieve the local congestion by cupping and leeching. In the necessarily protracted operation of topical bleeding, we should manage it with caution, so as not to run the risk of exposing our patient to cold. Venesection does not seem to be equally applicable to every modification of pleurisy. Thus, when it prevails as an epidemic, or developes itself in the progress of fever, or occurs as a puerperal disease,—in all these instances it assumes an asthenic type, when it becomes very questionable if general bleeding be at all admissible, or if we should not rather confine ourselves to local bleeding, with such other resources as art affords. This at least is certain, that in these cases bleeding should be employed with extreme caution. In circumscribed pleurisy, with which the constitution does not seem to sympathise, the application of a few leeches to the seat of the pain will often remove all uneasiness. If, as in phthisis, in which partial pleurisy is so common, the exhausted state of our patient will not bear even so small an abstraction of blood, the temporary application of a hot turpentine stupe will often answer our wishes.

Purgatives.—The saline purgatives are especially suited to this first stage of pleurisy, as they diminish the mass of the circulating fluid by greatly increasing the secretion of the intestinal mucous surface. We follow up this antiphlogistic treatment by other means calculated to reduce fever, by producing diaphoresis, or otherwise, viz. the different preparations of antimony, tartar emetic in very minute doses, James's powder, Dover's powder, &c.

Sedatives.—These are often very useful in quieting the irritation of the cough, and thus procuring the repose of the organ affected. With such a view we derive much benefit from the use of hyoscyamus, conium, lactucarium, &c. Some recommend the use of opium in larger doses after bleeding, by which we continue, as it were, the sedative impression of the bleeding, as well as allay the irritation produced by the pain, and soothe the cough.

Mercury.—The combination of calomel and opium enjoys an established celebrity in the inflammations of serous membranes; and after the use of venesection, and where there exists much pain, the remedy is invaluable. In such cases, our object is to bring the system as speedily as possible under the influence of mercury, by which we as it were supersede the morbid action which is going forward.

The treatment which we have just laid down applies to the earliest stage of pleurisy. However, it often happens that the patient does not present himself till the disease has existed at least for some days, and the intensity of the symptoms has in some degree abated, when the inflammation has assumed rather a subacute character, and has partly terminated in effusion. It is now that we have most reason to complain of the pulse not intimating to us the extent of the mischief. We now come to the long agitated question,—how late in the progress of pleurisy are we warranted in using the lancet? Without attempting to lay down a general rule upon the point, we would say that even now, notwithstanding the tranquillity of the pulse which often exists, we expect decided advantage from bleeding, inasmuch as we thereby, 1. check the further effusion of fluid; 2. promote the removal of the fluid already effused, by increasing the powers of the absorbing system at the expense of the circulation; 3. render the system more susceptible of the influence of the medicines we employ.

When the inflammation has nearly subsided, and the acute pain given way to a mere sensa-

tion of soreness, and we have the physical evidences of effusion, the indications of cure now are different, our main object being to promote the removal of the effused fluid. The means we employ for this purpose are either internal or external; the former comprising those medicines which, acting by way of derivation either upon the kidneys or bowels, thus indirectly affect the effusion; the latter comprehending the different modifications of counter-irritation, which, by stimulating the absorbents, tend to produce the same effect more directly.

Diuretics.—The popular combination of squill, digitalis, and calomel, produces as speedy a diuretic effect as any we can employ. Laennec speaks highly of the infusion of digitalis from experience of its value in the particular case under consideration. It recommends itself to our notice upon the double grounds of its diuretic property and the control it exercises over the circulation; an important recommendation, when we consider the proximity of the organ affected to the source of the circulation, and the advantage from the blood being driven into it with diminished impetus. We may also employ, separately or in conjunction with the above, the saline diuretics, viz. the nitrate, acetate, and bitartrate of potash.

Purgatives.—If the strength of the patient will permit, we may make use of the hydragogue cathartics, viz. elaterium, jalap, scammony, camboge, &c.; but the operation of these medicines is attended with so much exhaustion, that we can only employ them occasionally.

Diaphoretic medicines afford us such very feeble assistance at this stage of the disease, that they scarcely deserve a place among our remedial agents. We have not found tartar emetic to sustain its character of an active antiphlogistic agent in uncomplicated acute pleurisy; but when the lung is involved in the same inflammation, we then find the advantage of associating it with our remedies.

When we are endeavouring to affect the system with mercury administered internally, we may at the same time employ mercurial friction on the side, by which we assist the internal exhibition of the mineral, while we stimulate the absorbents.

Stimulating liniments carry with them the advantages that we can regulate their irritating property *ad libitum*, and that they do not unfit the surface to which they are applied for any future application.

When the milder counter-irritants, as auxiliaries to the internal means employed, have failed to make any impression upon the fluid, we resort to blisters. Andral's work* abounds in cases in which the removal of the fluid seemed to date itself from the application of a blister. A succession of blisters acts more effectively than a single one of which the discharge is continued by an irritating application.

As long as fever and inflammation are present, we of course insist upon rigid abstinence. But when these have subsided, and have left their effects alone behind them, the reasons for continuing the same strict system are scarcely less cogent; for in this way we lower the circulation, and thus establish a physiological ratio between its powers and those of the absorbing system, whereby the latter are much increased, and act with much more avidity upon the fluid in the chest. We find it extremely difficult to carry this part of our treatment into effect; for our patient will regain a degree of health, and feel very little if any inconvenience from the fluid in the chest, and not being able to reconcile our severe restrictions with his sensible amendment, will become impatient of restraint, and, yielding to his improved appetite, will in all probability bring on fresh inflammation.

Sometimes a considerable time will elapse before any impression is made on the fluid, the system seeming as it were to stand out against the operation of our remedial agents up to a certain point, and then suddenly yielding, its removal rapidly ensues. At other times our medicines begin to take effect quickly, and remove the fluid gradually. We recognise the effects of our remedies by the side losing its fulness, by the reappearance of ægophony,* by the return of the respiratory murmur and clear sound to situations where we before sought them in vain. Percussion will continue to yield a dull sound for a considerable time after the return of the respiratory murmur.

It seldom happens that in acute pleurisy we have to resort to the operation of *paracentesis thoracis;* nor should we ever think of it as long as we have any prospect of removing the fluid otherwise; still it may happen, from the other lung becoming affected either with bronchitis or pneumonia, or from having been already emphysematous, that to relieve the urgent sense of suffocation we have no alternative. In almost all these cases we find the operation to be attended with no more than a mere temporary relief, the fluid soon collecting again. It is an ascertained fact that the operation is, in general, less successful in acute than in chronic pleurisy, the reasons for which we shall endeavour to explain when we come to speak of the treatment applicable to the latter form of the disease.

1. *Treatment of chronic pleurisy.*—The treatment of chronic pleurisy, or of that modification of the disease which from its commencement exhibits some of the characteristics of an acute inflammation, is as different from that of acute pleurisy as the respective natures of the two forms of the disease. Antiphlogistic means, whose activity is measured by the intensity of the febrile symptoms and the strength of the individual, constitute the treatment of acute pleurisy; and amongst these means, bleeding, as we have seen, occupies a most prominent place. In essentially chronic pleurisy,

* Sur les Maladies du Poitrine.

* This effect was ascribed by Laennec to the transmission of the voice through a diminished stratum of fluid; but we consider it to be rather due to a less compressed state of the lung from the diminution of the compressing fluid.

we seldom, if ever, have occasion to resort to constitutional bleeding. The weakened, if not the vitiated habit of body in which it generally takes place, will not admit of the exhaustion which this operation would produce; even local bleeding must be employed with considerable caution. The indications of cure are, to remove the fluid from the cavity of the chest, and to improve the dilapidated state of the system. The means by which we try to promote the removal of the fluid may be divided into constitutional and local; the former comprising those agents whose action is directed to some organ or set of organs at a distance from the seat of disease, and which effect the object we contemplate by establishing a counter-irritation and increased secretion at the expense of the diseased secretion, which continues to take place into the chest until it is as it were superseded.

Most of the means which we adverted to as applicable to the stage of acute pleurisy when effusion has taken place, may be seasonably employed in chronic pleurisy, qualified alone by the consideration that in the latter form of the disease the habit of body in general is not such as will bear the operation of active medical agents. When we employ mercury, we must manage its exhibition with caution, and beware lest, in pushing its use too far, we give rise to an irritative fever, which would soon exhaust the weakened constitution in which this modification of pleurisy usually presents itself: we should content ourselves with slightly affecting the gums. When hectic symptoms show themselves, we should cautiously abstain from the use of mercury altogether. We employ the same diuretics as in the second stage of acute pleurisy. We cannot, without incurring the risk of weakening our patient too much, resort to active purgation; we must, therefore, be satisfied with the mildest medicines of this class, and those whose operation draws least upon the stamina, viz. castor oil, manna, &c. Diaphoretic medicines lend us more aid in this than in the second stage of acute pleurisy; for instance, Dover's powder, James's powder, &c.

Constitutional means or internal medicines, we must in candour admit, do not assist very much in the removal of the fluid.

The external applications, and upon which we place our principal reliance, comprehend the different modifications of counter-irritation, viz. blisters, setons, issues, stimulating liniments, &c. Blisters are unequivocally the means most calculated to promote the absorption of the fluid secreted into the chest, as well as to interfere with its further secretion. We employ a blister commensurate with the extent of surface involved in the inflammation, and repeat its application in preference to keeping the blistered surface open by means of irritating substances, each repetition having as it were the effect of renewing the counter-irritation.

The next part of the treatment of chronic pleurisy regards the improvement of the habit of body and relief of the constitutional symptoms which most commonly accompany this form of the disease. We are not obliged to prescribe the same restricted diet as in acute pleurisy, but would admit a certain latitude, always taking care to avoid such substances as are calculated to produce febrile excitement, and consequent acceleration of the circulation; for, as we before observed, the powers of absorption and circulation observe an inverse ratio, and as we require the efforts of the former to remove the fluid, we should defeat our object did we not observe this caution. It is, besides, an object of importance that as little blood as possible should be transmitted through the lung lying under the pressure of the fluid. In many cases chronic pleurisy is attended with such slight constitutional symptoms as scarcely to deserve to be considered more than a local disease; still in most instances hectic fever sooner or later sets in. At this stage of the disease, change of air is productive of the most decided benefit, often effecting an almost instantaneous amelioration in the symptoms: the night perspirations cease, the appetite improves, and sleep becomes refreshing. In the exhibition of tonics we have had reason to prefer the infusion or decoction of bark, combined with sulphuric acid, to the more concentrated sulphate of quinine. We have found much advantage, in these and similar cases, from the mineral acids in decoction of Iceland moss. When our curative means take effect, we recognize their success by the physical signs of the disease gradually disappearing; by the side losing its fulness; by the intercostal spaces sinking down to their ordinary level, and being less dilated; and by the return of a feeble respiratory murmur, and a less dull sound on percussion; and, in case of the left side having been the seat of the disease, by the heart's pulsations being felt in their normal situation; and by the liver ceasing to be felt below the margin of the right false ribs when the disease has occupied this side. But when, instead of these evidences of the efficacy of our means, we find the fluid to increase, and all the sensible signs of the disease more marked, and in consequence the dyspnœa more distressing, the operation of tapping the chest is our last and only resource. We must confess that the results that have usually attended this operation are far from being calculated to inspire us with encouraging anticipations, (see Empyema;) still even the few cases in which either complete recovery or relief for a considerable time has followed it, prevent us from despairing. It is impossible to judge what might be the event were the operation undertaken earlier; this must be a matter of conjecture, as we must ever look upon an operation, the unavoidable consequence of which is the admission of air into the inflamed cavity of the chest, as a serious matter, and only warranted by the failure of other means to produce the object we desire. We have similar effects produced in chronic abscesses when opened. As long as they had no communication with the air, so long they produced no constitutional disturbance; but no sooner is the air admitted than hectic symptoms

quickly supervene. The cavity of the chest affected with chronic inflammation resembles a chronic abscess, both in its physiological and pathological conditions. The failure of success of the operation for empyema may be ascribed to the following causes;—to the irritative fever which often follows immediately upon the operation; or to the condition of the lung, occupied by tubercles in different stages, and giving rise to constitutional symptoms; or to the lung having been so long pressed upon by the fluid as to render its natural elasticity quite irrecoverable. We have before observed that the operation, undertaken under the most auspicious circumstances, is not exempt from a certain share of danger.

We now come to consider if there be any case so hopeless and desperate that we can promise ourselves no advantage from the operation: if such case there be, it is when there is extensive tubercular development in the compressed lung; but even here Laennec does not hesitate to recommend the operation, from his conviction of the curability of phthisis even when there exists unequivocal evidence of a cavity in the lung.

Mr. Crompton has had considerable experience of the operation for empyema and its results; and of ten cases upon which he has operated, three have been attended with complete success. After operation, his practice is to inject a weak solution of chloride of lime, which he finds to have the effect of diminishing the discharge and of correcting its character. (See Empyema.)

We have remarked that the operation of tapping the chest is more likely to be successful in chronic than in acute pleurisy; that is to say, if an untoward combination of circumstances demands operation in the early stage of acute pleurisy, such operation is more uncertain in its result than the same operation undertaken in chronic pleurisy at a period equally distant from its commencement. This fact, established by experience, we would account for in one of two ways; either that the constitution sympathises less, or suffers less irritation from the admission of air into the cavity of the chest, covered with a dense coating of lymph, as is the case in chronic pleurisy, than from letting in the same fluid upon the naked pleura unprovided with any such protection; or perhaps it may depend upon inferior susceptibility of inflammation in one case than in the other. In chronic pleurisy, the older the disease is the less likely is the operation to be successful, because the more chance is there that the lung is disorganised; and the longer the lung has remained under pressure of the fluid, the less likely is it to recover its natural elasticity. The more circumscribed the pleurisy is, the more promising is the prospect of a successful operation.

For further information on the subject of the present article, we refer the reader to Empyema, Perforation, Pneumonia, and Pneumothorax.

(Robert Law.)

PLICA POLONICA, from *plico*, to knit together. This disease derives its name from the manner in which the hair is plaited or matted together, and, as its name also implies, is of most frequent occurrence in Poland. It has, however, been also observed in Tartary, among the Cossacks of Russia, in Hungary, and in a few instances in Switzerland and France. The people of Poland believe that it was carried into their country by the Tartars in the twelfth or thirteenth century. Schlegel, a physician practising in Moscow, who published a work on plica in 1806, gives a singular account of its origin. The Poles on the death of one of their kings, Miceslas II. in 1034, petitioned Pope Benedict the Ninth to release from his vows Casimir the son of Miceslas, who had entered into a convent of Benedictines in France; the request was granted on certain conditions, and one of the conditions required was, that from that time forward the men of Poland should keep their heads shaved. Casimir on his accession enforced the tonsure through all his dominions, and to the present day a part of the ceremony observed in assuming the national costume of Poland consists of shaving the head, a single tuft of hair being left to grow from the top of the scalp after the manner of the Tartar and some Indian tribes. The poorer inhabitants of Poland being wretchedly lodged and clothed, and exposed to the combined injurious influence of a marshy soil and a damp variable climate, the general cutaneous exhalation is at all times below the healthy standard, and the secretion from the scalp being still farther diminished by the custom of keeping the head shaved, there is, according to Schlegel, an increased compensating action thrown upon the bulbs of the hair which has been allowed to remain; and hence arises the greatly increased growth of this portion of the hair, and the unnatural quantity of viscid secretion which is at the same time thrown out.

The hair grows to a very unusual length, and being not only plaited but matted together by a viscid fatty secretion of an abominably fetid odour, resembling the stench of rancid fat, and in most instances crowded with vermin, presents an extremely disgusting picture of filth and disease. The hair of the scalp is that generally affected, but the disease is also seen in the axillæ, on the breast, and the pubes. In a few rare instances the nails are altered in their appearance, become livid or yellowish, long, and crooked, so as to resemble the talons of a bird of prey: this change is generally in the nails of the toes. The length which the hair sometimes attains is almost incredible. Cases are narrated of its reaching to the heels, of its being in such quantity and of such a length as to fall on the floor over all sides of the bed on which the patient lay. In the museum of Dresden there is a specimen preserved nine feet long. Not the least singular circumstance in the history of plica is the extraordinary attachment the Poles entertain for this dirty appendage. If the hair do not become spontaneously matted and filthy, the Poles spare no pains to make t so: the men

put on dirty fur bonnets which have become coated with viscid secretion from being worn by others who laboured under the disease, or they interlace with their own hair masses of old plica steeped in beer! The women wear their hair very long, and, to encourage the growth of plica, refrain from combing it, and fasten it in knots, and make it adhere by glue or rosin. They will for years willingly suffer the greatest torture in carrying or dragging after them a mass of this matted hair, and beggars who are fortunate enough to possess a good plica cherish it with the greatest care as the most certain means of obtaining alms. In some parts of Poland the lower classes look upon plica as a special favour from Providence, which will preserve them from harm and sickness; in other parts it is viewed as an infliction coming from a malignant spirit, but not the less cherished, as it is then considered a protection from all other misfortunes. Lafontaine, a physician resident in Warsaw, who published a work on plica in 1792, relates the case of a pregnant woman who had plica of four months growth on the pubes: during that period the urine was allowed to filter through the matted hair, and after labour commenced she could not be persuaded to permit the plica, which firmly resisted the protrusion of the child's head, to be incised, until her life was in the most imminent danger.

The prejudice in favour of plica is extended even to inferior animals. Horses presenting an appearance of the disease are valued beyond others, and hence the jockeys of Poland have learned to add another to the many arts practised by their brethren of other countries. It is said that in Poland, and in some parts of Russia, plica is occasionally observed in sheep, dogs, wolves, and foxes.

The physicians of Poland have not escaped the contagion of prejudice. Kerckhoff,* whose observations were made during the stay of the French army in Poland, relates a case illustrative of this. The patient, a boy of about fifteen years of age, complained of severe pains of his head. He lay in a most filthy state, and his black hair, knotted long and matted together, gave out an intolerable stench. The Polish physician in attendance strongly opposed Kerckhoff's suggestion of cutting off the hair, on the ground that the humour exuded on the hair might turn in on the brain and cause apoplexy. Kerckhoff entered into a compromise with the Polish doctor; and the hair was cut off in portions of two fingers' breadth at intervals of two and four days. In twenty days the whole scalp was cleared, and then, by simply keeping the head combed and washed, all the bad symptoms vanished.

Stories are related by some writers of the disease appearing very suddenly, and the hair preserving for years the particular form of dressing it possessed at the time of the seizure. These stories are, however, treated as fables by the best informed authors; and a statement generally made and believed in Poland, that the long hairs of plica are acutely sensible, and are the seat of great pain when touched, is equally void of foundation. In some instances the bulbs of the hair and the scalp are very sensible, owing to irritation, and pulling the hair ever so slightly gives acute pain; but Larrey and all modern observers positively assert that the hair may be cut at any part without causing the slightest pain, provided it be done without dragging the bulbs.

Pathology.—On the nature of plica the most opposite opinions are entertained. By some it is pronounced as a disease "sui generis," having its seat essentially in the bulbs of the hair, and requiring very cautious treatment. Others as stoutly assert that plica is merely the product of neglect and dirt, and that it requires for cure nothing but the shears and cleanliness. This difference of opinion is not alone between foreign observers and the physicians of Poland, but the latter themselves are divided on the question. Among those who hold the first opinion are Lafontaine, who asserts that he saw the disease in a new-born infant, and Robin, surgeon to Frederick the Great, who relates the following experiment. He shaved the heads of two boys on whom the disease was just beginning to appear, and then paid particular attention to the hair during its growth. His attention was in vain, for the disease re-appeared. Schlegel agrees with Lafontaine and Robin; and more lately among foreign physicians, Chaumeton and Mouton, who were attached to the French army when in Poland during the late war, hold the same opinion. It is further argued in support of their view, that if plica owed its origin merely to want of cleanliness, it would not be confined to Poland, but should be equally found among the Russian, Prussian, and Spanish peasants, who are as dirty in their habits as the lower classes of Poland; that its appearance frequently constitutes the marked crisis of some other disease; that it is accompanied with a peculiar secretion; that the nails, which are known to be merely a variety of the same tissue as the hair, are in bad cases engaged by a similar diseased action; and that the bulbs of the hair exude a peculiar viscid secretion, and are found swollen and acutely sensible. In conclusion, it is asserted that plica cannot be suddenly removed without great danger to the patient. On the other hand, Davidson, a Scotchman, who was physician to one of the kings of Poland, published a work in 1668, in which he pithily observes of the disease, "Nullus habet, nisi qui non velit carere," and declares that he treated and cured more than 10,000 cases; that he always, without hesitation, cut off the plicæ, and that no injurious consequences supervened. Larrey, Chamsern, Gasc, Kerckhoff, &c. who had opportunities during the late war of investigating the disease in Poland, support the opinion promulgated so many years since by Davidson, and assert with him that the fear entertained of cutting off

* Observations Médicales par Jos. Rom. Louis Kerckhoff, Docteur en Médecine—Médecin de l'Armée des Pays Bas, &c. Published in vol. vi. of Medical Transactions of College of Physicians in London.

plica is a mere chimera. In support of their opinion they point to the facts, that Polish recruits are always cured by their hair being cut and their habits changed after their entrance into the army; that the disease is almost invariably confined to the lowest classes, and principally to the Jews, who form an immense proportion of the population of Poland, and are universally acknowledged to be the filthiest people on the face of the earth. They further state that strangers residing in Poland never contract the disease unless they sink so low as to approximate to the natives in manners and dirt, and that the disease is disappearing just in proportion as improved habits and comforts are extending; moreover, that in cutting off a plica, as in the case related by Kerckhoff, and which we have already noticed, the agglutinated hair is found distinct and round at the roots. To the last argument it is replied, and with justice, that the diseased action which produced the plica having ceased, the hair which has continued to grow will after a little time have pushed out from the scalp the agglutinated mass of hair, and hence that the soundness of the hair at the roots is no proof that diseased action had not previously existed. Larrey is further of opinion that the urgent symptoms, as pains in the bones, joints, &c., which occasionally precede or accompany plica, owe their origin to a complication of syphilis. Jourdan, the translator of Schlegel and Lafontaine's works, and the writer of the article "Plique" in the Dictionnaire des Sciences Médicales, suggests that there should be a distinction made of plica into true and false; true plica being that form of the disease described by Schlegel, in which the bulbs of the hair are inflamed, become enlarged and acutely sensible, produce a rapid growth of hair, and at the same time glue it together by a peculiar secretion which is poured out from the skin and the hairy bulbs, and even forces its way through the substance of the hair near the skin. False plica Jourdan considers as a mere accidental matting of the hair dependent altogether on external causes. This view would probably reconcile many of the conflicting statements, but even in our investigation of the nature of what, according to this classification, we may call true plica, we meet with great difficulties. We have not information before us sufficiently accurate to enable us to say what is the precise source of the fetid secretion which glues the hairs together,—whether it is poured out by the bulbs of the hair, the sebaceous follicles, or the general surface of the skin. The surface of the skin where the hair is affected is described as being in a state of ulceration in some cases, but this may be an effect of the state of the hair rather than a cause of it; and finally, the state of the scalp may, for aught that we yet know, arise from the presence of some ordinary eruption, the matting of the hair and the viscid fetid secretion being complications added by the influence of extraneous circumstances. Lafontaine asserts that hair presenting shades of red is more liable to plica than hair of other colours, but Schlegel states that he never observed any difference of liability arising from colour.

Alibert makes three subdivisions of plica according to the form it may chance to assume. He calls his first species "plique multiforme," where the hairs form a great number of ropes hanging round the patient's face like serpents round the Gorgon's head; his second species "plique à queue, ou solitaire," in which the whole hair is united into one long plica or tail, principally met with among females, and on those wearing their hair after the national Polish fashion. He calls his third species, "plique en masse, ou larvée," in which the hair is all melted into one cake, covering the head like a helmet. These subdivisions are, however, useless; for the varied forms which the hair assumes appear to be merely the result of external accidental circumstances.

The people of Poland believe that plica is contagious, but there does not appear to be satisfactory ground for this belief. Kerckhoff inoculated children and himself with the viscid secretion, and failed to propagate the disease; and Davidson, who had ample experience, is also a disbeliever in its contagion. Alibert, on Robin's authority, states that a Polish nobleman who kept a seraglio, of which four of the inmates had plica, never contracted the disease. On the other side, Lafontaine and some of the French observers of plica believe that it is a contagious disease.

Symptoms.—The premonitory symptoms of an attack of plica, according to those who look upon it as a peculiar disease, are pains in the back and limbs, vertigo, lachrymation, with violent itching, sensation of pricking, and increased sensibility of the hairy scalp, followed by a copious secretion of a peculiar viscid sweat, of the consistence of honey, which speedily glues the hairs together. On the appearance of this secretion the previous symptoms disappear. It is said in Poland that one of the most usual forerunners of an attack of the disease is a perverted appetite, and hence there is a saying, "Sæpe sub pica, latet seu fœtus seu plica." Of all the symptoms, however, none give a certainty of the approach of the disease except the breaking out of the viscid sweat. Cases are given by Alibert, Lafontaine, Schlegel, &c. of plica appearing as a crisis of or alternating with internal diseases; according to their accounts, the internal affection was alleviated when the plica secretion was abundant, and *vice versa*. When the hair is cut very close, in what we may call true plica, a brownish fluid frequently exudes from the bulbs of the hair, and the appearance of this fluid has given rise to the belief that the hair poured out blood.

Treatment.—The directions for treatment, of course, vary as much as the opinions on the nature of the disease; those who look upon the disease as the product of dirt, directing us to cut off at once without dread the matted mass, and afterwards trust for a cure to soap and combing; and on the other hand, those who see in the cutaneous affection the elimination from the system of a poison, which they call

'virus trichomaticus," warn us in the strongest language not to meddle, lest we turn the poison back on the brain or lungs, &c. Lafontaine extends the supposition of the existence of a peculiar virus so far as to direct us, when any symptoms appear which we suspect are premonitory of the approach of plica, to hasten its appearance by warm cataplasms, sinapisms, &c. to the scalp. Under whatever view we regard the disease, the supposition of the existence of a virus is a mere assumption, and the advice to force the eruption is only an illustration of the prevalence of the same bad principle which of old so erroneously directed us to force out the virus of other eruptive diseases, as small-pox or measles. Mouton, to whose opinions we have already alluded, says we may without fear cut off plica if it be dry, and if it be united to the scalp by hair sound near the roots, which he says indicates that the diseased action which had produced the plica has ceased; but that we ought not to interfere as long as the bulbs of the hair are inflamed and sensible, and continue to pour out a viscid secretion, keeping the hair matted at its roots. Various remedies are recommended in Poland. Lycopodium is much used by the people, who use it both as an external application and an internal medicine; but there does not seem to be any settled rule or principle of treatment. Preparations of mercury, antimony, sulphur, zinc, baths, emetics, diaphoretics, and narcotics, have all in turn been recommended. Among these, the golden sulphuret of antimony is probably the remedy on which most reliance is placed. Patients who are debilitated or advanced in life require, it is said, the administration of tonics; and it is scarcely requisite to observe that an occasional application of strong mercurial ointment to the hair is requisite to destroy the vermin, which breed in it with immense rapidity. It is unnecessary to say any thing on the management of false plica, in which the matting of the hair, arising from neglect, is present without any disease of the bulbs.

(D. J. Corrigan.)

PNEUMONIA, (πνευμονία); *peripneumonia*, or *peripneumony*, (περιπνευμονία); *pneumonitis*, *pulmonitis*, *peripneumonia vera*, (from πνεύμων, -ονος, *pulmo*, *a lung*, or *the lungs*;) are names given to an inflammation of the parenchyma of the lung, which is the most common of all the dangerous inflammations.

Peripneumony and pneumonia are the names applied by Hippocrates, Aretæus, Celsus, and other ancient writers on medicine, to most of the acute diseases of the chest without severe pain; those connected with this symptom being termed pleurisies. Many succeeding authors have not admitted this distinction; and inflammations of the lung have been as often described under the name of pleurisy as under that of pneumonia. The earlier cultivators of morbid anatomy, Valsalva and Morgagni, were the first to prove the distinct existence of the two diseases, but they gave no means of distinguishing them before death. Hence Cullen, although he makes pleurisy a species of the genus pneumonia, expresses his belief that the term pleurisy might with propriety be applied to every case of the disease. It is only through the aid of auscultation that pneumonia and pleurisy have been recognized as distinct diseases, and it is therefore only in the writings of those who have employed this method of diagnosis that the truly distinctive characters of pneumonia can be found.

Cullen's generic definition of pneumonia more frequently holds good than his specific distinctions, on the correctness of which, as we have just remarked, he does not insist. *Fever, pain in some part of the chest, difficult breathing, and cough*, which he ascribes to the genus pneumonia, are in the greater number of instances present in both pleural and pulmonary inflammation; but there are cases of both kinds in which each of these symptoms is absent. The specific definitions of pleurisy and pneumonia are still more frequently at fault; thus the *softer pulse, duller pain, constant dyspnœa, and livid face*, are as much the characters of severe bronchitis as of pneumonia, to which he ascribes them; and the *hard pulse, acute pain increased on inspiration, painful decubitus on the affected side, painful cough, first dry and afterwards with expectoration, often bloody*, the assigned characters of pleurisy, indicate pleuropneumonia as much as pleurisy, and are sometimes presented by bronchitis or peripneumony joined with pleurodyne.

The following is the character which we would give as most generally applicable to pneumonia:—*Fever, with more or less pain in some part of the chest; accelerated and sometimes oppressed breathing; cough with viscid and rusty-coloured expectoration; at first the crepitant rhonchus, afterwards bronchial respiration and bronchophony, with dulness of sound on percussion in some part of the thorax.* In this, however, as in many other diseases, pathology is the only sure basis of definition: pathologically, therefore, pneumonia consists essentially of an inflammation of the parenchyma of the lungs, occasionally but not necessarily extending to the pleura investing them; which inflammation, although it usually occasions a certain combination of general symptoms, is not so essentially connected with these symptoms as to receive from them an infallibly pathognomonic character.

The pathological and anatomical characters of pneumonia, as well as its relation to general symptoms, have been industriously and successfully investigated by the French pathologists, particularly by Laennec and Andral; and it is to them we owe the most important matter of the following history. Andral calls the disease pleuro-pneumonia, from the circumstance of some part of the pleural covering of the lung being involved in the inflammation: we do not deem it necessary to deviate from the example of Laennec, who confines this term to that form of the disease in which the pleura is affected in a sufficient degree to modify the pulmonary inflammation. This will be noticed among the complications of the disease.

I. GENERAL HISTORY OF PNEUMONIA.

Symptoms.—Like other severe inflammations, pneumonia is accompanied by a pyrexia, which often commences in a rigor, prior to any other symptom. Sometimes this shivering fit does not occur until after the establishment of pain, dyspnœa, and other symptoms; and in some cases, especially where the pneumonia succeeds to a bronchitis, or when the first attack is felt in bed, it is not observed at all. Frequently a feeling of great depression and languor, with pains in the back and limbs, and a disordered state of the stomach and bowels, precede the attack; then a shivering fit comes on, followed by a violent reaction, with great heat of the skin, and during this hot stage the local symptoms of heat, pain and oppression in the chest, with more or less cough, are developed. The pyrexia is generally very intense, and in plethoric individuals is accompanied by great flushing of the cheeks, injection of the conjunctivæ, headach, and other signs of local determination of blood. This general fever may precede by a day or two the local symptoms, sometimes diminishing in intensity when they appear, and sometimes continuing and masking them. The pain in the chest, which when present is generally an early symptom, varies greatly in degree, being sometimes very intense, sometimes diffused and dull; frequently it is a deep-seated feeling of heat and weight rather than of pain. Most commonly it is deep-seated in the anterior parts of the chest, below the sternum or below the mamma, sometimes under the scapula; acute pains are more common in either of the sides. Andral says that there is never any pain without an extension of the inflammation to the pleura;* Laennec asserts, on the contrary, that there is frequently pain, and sometimes a point of sharp pain when no pleurisy is present;† this is more in accordance with our own observation, and it is remarkable that in several of the cases described by Andral, where there were various degrees of pain, no mention is made of any inflammatory appearances on the pleura on examination after death.‡ There is commonly a cough at this time, which aggravates the accompanying pain, or causes a feeling of pain when none is otherwise present. It is generally at first either dry or accompanied with simple catarrhal expectoration, and short, not occurring in paroxysms, and is by no means proportionate to the intensity of the inflammation; it is sometimes so slight as scarcely to be noticed by either patient or attendants. The shortness of breathing or dyspnœa, which is commonly an early symptom, is a better measure of the extent and severity of the disease; but we should be mistaken if we always trusted to the feelings of our patients as to its presence or degree. In its slighter degrees they are not sensible of it, a supplementary quickness of breathing removing the sensation of dyspnœa; but an attentive observer readily discovers this quicker and shorter respiration, and the more perceptible elevation of the ribs and depression of the diaphragm that attend it. The number of respirations in a minute, which is in health about twenty in the adult, may now be counted at thirty and upwards, and in severe cases it occasionally exceeds sixty. In some examples, especially where the attack has been sudden, the dyspnœa is greater and more obvious, causing the patient to assume one particular posture, on his side, or on his back with his shoulders elevated; and from their sensibly increasing his oppression, he avoids all exertions of movement and speech; this difficulty of breathing continues to increase as the disease advances. The pulse is quick, and in most instances sharp. With respect to its hardness, it is subject to great diversity, but in many cases it is (notwithstanding Cullen's definition) both hard and full at the commencement of the disease. This character, however, rarely continues long, and often the pulse is weak and small from the beginning. Under the febrile excitement the urine is more highly coloured than in most other symptomatic fevers; and there is more or less of the thirst, white or brown fur on the tongue, loss of appetite, pain in the head and limbs, depression of the strength, &c., that usually characterize them, and blood drawn generally exhibits a buffed and concave crassamentum. This fever may affect particular organs especially, with the production of other symptoms; as the brain with delirium, the stomach with sickness, &c.; but these complications will be better considered hereafter.

The symptoms usually continue in this state from twenty-four to forty-eight hours. At a period varying within that space, the cough, which was hitherto dry or with the expectoration of common bronchitis, becomes accompanied by the expectoration of a very characteristic kind of sputa. They are of a yellow-reddish or rusty tinge of various shades, semi-transparent, tenacious, and running together into one mass. At first this expectoration scarcely exceeds the tenacity of the white of an egg, resembling in all but its colour the sputa of acute bronchitis, and, when poured out, falls in glutinous strings; but it often becomes so viscid that inverting the vessel and even shaking it in that position will not detach it. The same tenacity sometimes imprisons in the mass a multitude of little air-bubbles, which may produce a spumous appearance. The colour may vary in numberless gradations from a light reddish or greenish yellow to a deep orange red or rusty hue. All these tints proceed from various proportions of blood intimately combined with the secretion of the bronchial membrane. This new feature added to the other symptoms is quite characteristic of the disease. The dyspnœa is frequently increased at this period, the inspirations being obviously short and quick; and if the disease is extensive, the oppression becomes very urgent. The pain, on the other hand, is commonly diminished; sometimes it remains and prevents the patient from lying on the affected side. The most common posture is therefore on the back, as lying on the same

* Clinique Médicale, tom. ii. p. 327.
† De l'Auscultation Méd. tom. i. p. 432.
‡ Op. cit. obs. 29, 38, 43, 46.

side would restrain the supplementary expansion which is required there. Often, connected with this posture, one of the cheeks is flushed, but there is no constant correspondence, as Dr. Stack has observed, between this and the side affected.

The disease may go on in favourable cases to the third or fourth day, and then decline in consequence of the resolution of the inflammation, which is indicated by a general alleviation of the symptoms. The pain and dyspnœa are considerably relieved; the cough becomes looser and less distressing; the expectoration less viscid and rusty-coloured, more abundant, and resembling the sputa of bronchitis. The pulse loses its sharpness, and more gradually its frequency; the skin becomes cooler, and sometimes moistened with perspiration; the urine is increased in quantity, and deposits a sediment. Sometimes this amelioration is a speedy process, and restores the patient to a state of convalescence in six or eight days; but it is sometimes more protracted, slight exacerbations recurring every evening, and some of the symptoms remaining stationary, and extending the duration of the disease to a fortnight or three weeks. The quickness of the pulse, and dyspnœa, sometimes with cough, are the symptoms most apt to linger, with a temporary recurrence of the sanguinolent tinge of the sputa; and although there is a great improvement in other respects, they are to be regarded as signs of a lurking disease which a slight cause may be sufficient to aggravate into a severe relapse.

The increase of the disease in more formidable cases manifests itself on the third or fourth day by an augmentation of the dyspnœa, which becomes so urgent as to oblige the patient to have his head and shoulders raised; and the inspirations, short, forced, and amounting to from forty to sixty in a minute, are effected by sudden elevations of the ribs and depressions of the diaphragm; in some cases the side not affected obviously partaking disproportionately in the respiratory effort. The cough is sometimes more frequent, but this is not constantly present in aggravated cases. The viscidity and colour of the expectoration more exactly correspond with the increase of the disease; the tenacity reaches its acmé, so as to adhere strongly when the vessel is inverted, and even shaken in that position; and the colour is more deeply tinged with blood. The pulse becomes quicker, and often weaker and smaller. There is great depression of the bodily powers; and the patient's attention is engrossed by efforts to breathe under the weight and oppression which he feels at the chest. The tongue is often loaded and dry: the skin sometimes continues harsh and hot; in other instances there are partial perspirations and coldness of the surface. Occasionally the features are livid; but this is less common in pneumonia than in severe bronchitis. Sometimes there is delirium or coma; these are dangerous symptoms, especially in old persons; and when present, they frequently disguise the character of the disease. We have known a case of delirium occurring in a supposed idiopathic fever, and another of delirium tremens, which proved fatal through an inflammation of the lung, which was only discovered after death. Hippocrates noticed the danger implied by this symptom; and succeeding authors have confirmed his remark. Laennec describes comatose affections, the result of sanguineous congestions in the head, as of much more unfavourable import than fierce delirium.

When the disease terminates favourably, the amendment is generally marked by some critical evacuation, such as perspiration, diarrhœa, expectoration, or a lateritious deposit in the urine. Of these Laennec considered the last to be the most common: Frank and Andral describe perspiration as more frequent; from our own observation we should say that these two are commonly conjoined; and there seldom occurs in pneumonia a perspiration that can be called critical, without at the same time a deposit in the urine. The latter, however, sometimes takes place when there is no manifest increase of the cutaneous perspiration. A copious expectoration does not occur so frequently as it is described by Sydenham and Cullen to have done; and it is probable that the character of the disease has in some measure changed since their time; for, as Laennec remarks, there are some epidemic forms of pneumonia which very commonly terminate by free expectoration, and which generally go on favourably after this is once established. Other critical phenomena happen more rarely; as epistaxis, hematuria or some other hemorrhage, the menstrual discharge, &c. The commencement of the amendment is generally pretty obvious, and usually occurs in the morning. The observations of Andral have in some measure confirmed the opinions of Hippocrates and other authors ancient and modern, that there are certain days in the duration of the disease in which there is a greater tendency to amelioration. Of ninety-three cases, he found twenty-three give way on the seventh, thirteen on the eleventh, eleven on the fourteenth, and nine on the twentieth days. The recoveries in the remaining cases commenced on twelve out of forty-two non-critical days, as many as eleven being ascribed to the tenth day.* Thus the recoveries on critical days averaged as high as fourteen, while those on non-critical scarcely exceeded three.

In cases of favourable issue, after continuing with greater or less intensity for the various periods just mentioned, and generally on the occurrence of some of the critical phenomena before named, the symptoms become mitigated, and a notable amendment takes place. The dyspnœa becomes less oppressive; the cough less constant; the expectoration less viscid and sanguinolent, and more free; and the pulse less frequent, often with an increase of fulness. The fever generally diminishes with the inflammation; if a critical perspiration have not already appeared, the skin soon becomes soft and moist; the tongue gets cleaner, and the thirst

* Clin. Méd. t. ii. p. 365.

abates. Generally the patient is fully sensible of his real improvement; he feels each day a great accession of strength, and advances rapidly to convalescence. Some dyspnœa and quickness of pulse generally linger after the other symptoms; and there is sometimes a cough with an expectoration of bronchitic mucus, which in some cases remains for some time, but more commonly is carried off with those changes in the sputa which are observed in acute bronchitis. The breathing and pulse in some instances do not assume their natural slowness until after the patient has entered on a tonic and restorative method of treatment.

Relapses are by no means uncommon in recovery from pneumonia; and they are marked by a recurrence of the characteristic symptoms, —pain, shortness of breath, cough, and viscid sanguinolent expectoration. The fever has seldom so sthenic a character as at the first attack, and frequently it is decidedly adynamic, the strength having been reduced by the previous disease and treatment. Hence a relapse, if a serious one, is often more dangerous than the first attack.

The progress of fatal cases of pneumonia is marked by a continued aggravation of the dyspnœa, with increasing failure of the strength. The cough becomes less capable of expectorating the sputa, which sometimes retain their viscidity and sanguinolent hue as long as any are voided. In the greater number of instances there is a total suppression of the expectoration for some hours before death; but in others it is still excreted, but of a different character. Sometimes it is merely pituitous, transparent, or of a dirty tinge; sometimes it is a semi-opaque dirty mucus; occasionally purulent specks of a yellowish white colour are visible in it; more rarely it is purulent, with streaks of blood, or in opaque nummulary forms of a yellowish white colour, consisting of pus and a little mucus. Not unfrequently various mixtures of these different kinds are seen together; but the whole sputa in the latter stages of the disease are generally scanty. Andral describes sputa of a very remarkable kind as occasionally occurring in the last stage of pneumonia: they consist of a slightly glutinous liquid of a reddish brown colour, resembling liquorice-water or thin syrup of prunes. Rarely, sputa of a mixed greenish and dirty red or grey colour, and putrid fetor, are the last observed. With any of these changes in the expectoration the state of the patient puts on a worse aspect; the pulse becomes thready and intermittent; the countenance pallid, cadaverous, and bedewed with a cold sweat; the lips livid, the breathing gasping and convulsive, with a rattle in the throat; the sensorial functions, if entire before, now give way, and the patient dies asphyxiated.

Such is the general type of pneumonia as it presents itself to the semeiological observer. This appears to be the proper place to enumerate historically the causes which have been observed to excite the disease, or favour its production; and we shall afterwards proceed to scrutinize more closely the various changes which constitute its pathological history. Unfortunately the principal part of our knowledge of these changes has been derived from a study of their effects in the dead body. It will, therefore, give better ground to our pathology, if, after enumerating the causes, we describe the anatomical characters of pneumonia.

Causes.—The previous occurrence of the disease seems more than any other circumstance to predispose to pneumonia. Rush describes the case of a German living in Philadelphia, who had the disease twenty-eight times. Andral gives a case in which it recurred the sixteenth time within eleven years.* Dezoteux treated seven times a pneumonia in a subject who had suffered from it fifteen times;† and Chomel alludes to its recurrence the tenth time in the same individual.‡ Perhaps the only other circumstance that can be fairly viewed as a predisposing cause, is the presence of tubercles in the lungs. It has been said that the adult age, the male sex, a sanguine temperament, and certain occupations, as those of singers, street-criers, public speakers, &c. predispose to the disease; but if it occurs more frequently in persons under such circumstances, this is to be referred to their being more exposed to the exciting causes, rather than to any constitutional predisposition. With regard to age, it has not been found, since the disease has been accurately distinguished, that any age is particularly exempt from it. The symptoms are generally more prominent in middle life, and it is therefore more readily distinguished; but infancy and old age appear to be equally liable to it. M. Guersent reports the disease to be very common and fatal among children; and that of the deaths among those in the hospital of sick children at Paris, before the completion of the first dentition, three-fifths occur from pneumonia, chiefly latent.§ From our own observation we are inclined to consider young children as more frequently the subjects of pneumonia than adults. Of fifty-five cases attended by Mr. Byam and the writer during one year, at a dispensary in the parish of St. Marylebone, thirty-two were of the age of six years or under. Neither Laennec nor Chomel concurs with Stoll and Auenbrugger in considering persons of sedentary modes of life, such as tailors, the most liable to pneumonia. Masons, porters, out-door labourers, and carpenters, present the greatest number of examples; which is plainly to be ascribed to their being more exposed to the exciting causes. The same circumstance is, as M. Chomel observes, the reason why men suffer more frequently than women. Out of ninety-seven cases which occurred in the wards of La Charité, under his care, seventy-three were men, although the number of patients of either sex was nearly the same.‖

Cold, excessive exertion of the lungs by vio-

* Clin. Méd. t. ii. p. 192.
† Dict. des Sciences Méd. t. xliii. p. 396.
‡ Dict. de Méd. Art. *Pneumonie.*
§ Ibid. t. viii. p. 96.
‖ Dict. de Méd. t. xvii. p. 211.

lent exercise or by the voice, the inhalation of irritating vapours and asphyxiating gases, wounds of the lungs and blows on the chest, the bite of the rattlesnake, and the action of some other poisons, as fungi, may be named as exciting causes of pneumonia. To these may be added several diseases on which this inflammation occasionally becomes engrafted; such are bronchitis, hooping-cough, pulmonary apoplexy, phthisis, the exanthematous, continued, and sometimes traumatic fevers, particularly those supervening on extensive injuries or operations. It is so frequently complicated with hooping-cough, small-pox, and measles in children, that we consider the danger of these affections in a great measure to arise from this complication. In common with other inflammations, it may be occasioned by the suppression of habitual discharges, as the catamenia, hemorrhoids, and other hemorrhages, and issues or ulcers of long standing. The inflammations of gout, rheumatism, and cutaneous diseases, are sometimes transferred to the lungs by metastasis.

The influence of cold in producing inflammation of the lungs is sufficiently apparent in the much greater prevalence of the disease in cold seasons and cold climates. Of ninety-seven cases recorded by Louis in Chomel's wards at La Charité during five years, eighty-one occurred between February and August, and only sixteen in the remaining five months of these years. Of the cases described by Andral, the number occurring in March and April amounted to a third of the whole; the fewest took place in May, October and November, and the remaining months had an equal share. Of two hundred and forty-three cases which were treated at the Edinburgh New Town Dispensary during three years, ending September 1, 1824, sixty-seven occurred from 1st September to 1st December; one hundred and four from 1st December to 1st March; ninety-four from 1st March to 1st June; and sixty-eight from 1st June to 1st September. We have observed in London nearly an equal prevalence of the disease from the beginning of December to the end of April, and a considerably smaller proportion in the remaining months; but it appears generally that the latter winter and early spring months are most fertile in producing pneumonia in these climates. Pinel and Bricheteau consider the most frequent cause of pneumonia to be the sudden exposure of the heated body to cold after violent exertion, especially that of the voice.* Laennec remarks on this point that cold long-continued, or applied when the body is only moderately heated and covered with perspiration, is much more powerful as a cause of pneumonia than when cold succeeds to an excessive heat, and is not long continued: "the Russian who rolls himself in the snow after coming out of a hot bath, or the baker who goes from his heated oven, almost naked, into an atmosphere of a temperature below the freezing point, is not liable to attacks of the disease; while the porters, whose occupation leads them to stand for a length of time at the corners of the streets, are frequently affected by it."* It is certain that cold winds or cooling influences long applied, are more sure to produce the disease than mere changes of temperature; and the perspiring body must obviously suffer more as it is exposed to the additional cooling agency of evaporation. Transitions of temperature of short duration are more effectually resisted by the body; and if the reaction from them produce any inflammation, it is generally one of the mucous membrane, a coryza, a cynanche, or a bronchitis: it is when the cold has penetrated deeply that the parenchymatous inflammations more frequently follow. Hence, besides cold winds, any kind of exposure at a low temperature, as on horseback, sleeping in the open air, &c. occasionally excite pneumonia. Rarely it has been produced by drinking cold liquids when the body is in profuse perspiration, and sometimes by intemperate indulgence in alcoholic liquors.

The cause of the greater number of cases is, however, either unknown, or of the obscure character in which epidemic and endemic influences are involved. Of seventy-nine cases investigated by Chomel, fourteen of the individuals had been exposed to cold; five had taken an excess of wine, one had been over-fatigued, one had suffered great mental excitement, one had breathed for some length of time the fumes of charcoal, and the remaining fifty-six could assign no cause for their complaint.† The epidemic occurrence of the disease is clearly proved; and such has been its extent, that a contagious nature has been ascribed to it. Laennec remarks that epidemic pneumonia is probably often owing to deleterious miasms, suspended in the air, entering the circulation and operating particularly on the lungs, as the poison of the rattlesnake and of some fungi is said to do: hence many persons are seized in their very chambers in spite of the utmost care taken of their health.‡ In many epidemics it is difficult to decide the amount of influence which known physical causes, such as changes of temperature and moisture, may have in determining the production of morbific effects on the body; but no meteorological observations have ever discovered in the physical conditions of the air a sufficient cause for the remarkable prevalence of this disease, which occasionally constitutes a third, or even a half of the acute complaints of our hospitals. In one of these epidemics, it was observed by Huxham that the disease showed itself in the form of bronchitis in low and damp situations, while at a short distance, on elevated spots, it prevailed as a peripneumony. Elevated districts are perhaps the more liable to pneumonia because they are more exposed and colder; whereas the humid air of low valleys, whilst it diminishes the intensity of the cold, relaxes more the mucous surfaces, and renders them the weaker points of the circulation. The account of Hippocrates would not seem to coincide

* Dict. des Sc. Méd. t. xliii. p. 396.

* Dr. Forbes's Transl. 3d edit. p. 225.
† Dict. de Méd. t. xvii. p. 213.
‡ Op. cit. p. 225.

with this statement, as he describes pneumonia as common in marshy districts,* but that he probably includes severe bronchitis also under this name. Hoffmann ascribes to pneumonia an endemic character in some parts of Westphalia, Sweden, Pomerania, Denmark, and Russia; but the physical climate of these countries is a sufficient explanation of its prevalence, and Britain may as fairly be added to the list. Nor are the milder climates free: at Nice, Genoa, Pisa, and Florence, the disease prevails greatly, and cuts off a good many of the inhabitants.† The neighbourhood of Mount Vesuvius is remarkable for the frequency of its occurrence: here it may more properly be called endemic, as it may reasonably be attributed to the noxious exhalations which prevail there.‡

II. ANATOMICAL CHARACTERS OF ACUTE PNEUMONIA.

We owe the most accurate information which we possess on the morbid anatomy of this disease to the researches of the French pathologists, particularly those of Laennec and Andral. There are, however, many doubtful points relating to the essential seat and effects of the inflammation which still remain to be cleared up before our pathology of pneumonia can be considered accurate.

Laennec arranges the general effects of inflammation on the lungs into three stages or degrees, each of which is distinguished by marked characters—the first degree, or *engorgement*; the second degree, or *hepatization*; the third degree, or *purulent* infiltration. These are the common effects which inflammation in its general course produces in the lung. Abscess and gangrene are of uncommon occurrence, and to be viewed as exceptions rather than as regular events.

In the first degree of inflammation, the engorged or obstructed state, the lung is externally of a dark or livid red colour, to which a slight whitish opacity of the pleura sometimes gives a violet hue; it is heavier and more substantial to the touch than a healthy lung: when pressed, it yields less of the crepitating sound and feel, and instead of generally collapsing under the pressure, and partially rising on its removal, it receives and retains the impression of each finger, giving the feeling of a liquid contained in cellular substance, as in an œdematous limb. On examining it closely through the transparent pleura, there are seen numerous little round bubbles of air without the angularity of the natural vesicular structure; and the septa, which are commonly very visible, are scarcely to be discerned. On cutting into the lung in this state, a bloody serum, containing numerous minute air-bubbles, flows from it, sometimes in great abundance and almost clear, sometimes more scanty and sanguinolent or turbid, and with various proportions of the spumous bubbles. The substance thus cut into is of a red colour of various shades, crimson, dark red, brown red, chocolate red, or of a livid puce colour approaching to black. The vesicular texture of the lung can still be discerned, particularly after the serum has drained from it; and by pressing it gently and washing it repeatedly, the natural colour, appearance, and elasticity may in some degree be restored. There are varieties in this state of engorgement, some of which depend on the degree or duration of the inflammation, and others on individual peculiarity. The progress which the inflammation has made is pretty accurately represented by the defect of air in the tissue; in the slightest degree, there being a good deal of air, the lung feels still crepitous, and the serum which flows from it is very frothy. The quantity of serum indicates rather the intensity of the inflammation than its duration; but as far as we have observed, it partly also depends on the coagulability of the blood. In recent severe inflammations, which have proved fatal in the first stage, it is generally very copious; but in those which have endured for several days, it is seldom as abundant even in points where the second stage has not commenced. The progress towards this second stage is marked by a paler colour, a diminished quantity of both liquid and air, and an increasing solidity of the tissue. There is another variety of the inflammatory engorgement, probably depending more on the state of the blood than on the degree of inflammation: the lung presents an extreme lividity, and when cut, instead of yielding serum, exudes slowly a dark grumous blood in greater or less quantity. This appearance is noticed by Chomel,* as occurring particularly in cases of pneumonia complicated with other acute affections, as fevers; and we have repeatedly observed it. The writer, together with Mr. Ryan, recently examined the lungs of a child of eighteen months, affected with chronic hydrocephalus, who was carried off by an attack of pneumonia: both lungs were partly hepatized, and partly of a very dark red colour, appearing of a livid purple through the pleura; some parts of this inflammatory engorgement still contained a good deal of air, and, when pressed, exuded merely a little grumous blood, mixed with bubbles. Other parts of the lung were hepatized. The child had repeated attacks of convulsions during the two days before his death, and between four and five ounces of serum were found between the membranes and in the ventricles of the brain, which was uncommonly voluminous. But what we think most worthy of remark is, that the blood was fluid in all the vessels examined, and this we apprehend to be the cause of the peculiar character of this inflammatory engorgement of the lung. This was probably the case, also, in the complications noticed by M. Chomel, for a fluid state of the blood is very commonly observed in typhoid fevers after death. We consider that these circumstances render it probable that the separation of the serum in the engorged lung is more a cadaveric than a pathological process; and that, as the blood coagulates in

* De Aere, &c.

† Clark on the Influence of Climate, 2d edit. p. 121.

‡ Vivenzi Epist. ad Haller. iv. Bouillet, Mém. sur les Pleuro-pneumonies Epidem.

* Dict. de Méd. t. xvii. p. 235.

the distended vessels, its serum transudes into the vesicular structure. Where, on the other hand, the blood does not coagulate, it is too thick a fluid to exude into the cells, or to flow freely as serum does when the lung is cut. We do not maintain that there is no interstitial serous effusion during life; the analogy of other inflamed parts renders it probable that it does take place, but, we suspect, by no means to the extent which is commonly found in the engorged lung after death. We shall revert to this point when speaking of the pathology.

The colour of the lung inflamed to the first degree depends on the blood in it, in some cases deepened or modified by the black pulmonary matter: in the lungs of old people the abundance of this matter gives the inflammatory infarctus a blacker or more dingy hue; whilst in children the colour of the blood entirely prevails. Although very much heavier than was natural, a portion of lung in this state retains enough air to prevent it from sinking in water. Another remarkable change wrought in the lung by the most considerable degrees of inflammatory engorgement, is a diminution in its molecular cohesion, so that the fingers break through or tear its substance much more readily than in a healthy lung. This effect was first described by Andral,* and afterwards by Chomel.† Andral formerly considered this softening of the tissue a test by which inflammatory engorgement might be distinguished from that produced by gravitation, the mechanical hyperæmia; but he has since abandoned this opinion, and, as did Laennec in his clinical lectures, referred the more easily lacerable state of the lung to the physical effect of an unusual proportion of blood in it. "The reason of this fact will be readily understood if we reflect that when the lung contains a much larger proportion of air than of blood, the parietes of the bronchia, when pressed by the finger, press in their turn on the compressible fluid they contain, and in this way, by compressing or expelling the air, retire before the pressure of the finger, and so escape being ruptured. But when the lung contains a larger proportion of blood than of air, the former fluid being almost wholly incompressible, the pulmonary tissue cannot recede from under the finger, and is therefore easily ruptured."‡ Chomel, however, in his article before quoted, published in 1827, still maintains the applicability of this test; he says that the merely congested lung preserves its natural consistence; but the inflamed lung in great measure loses it, insomuch that it requires very little force to make the fingers break through its substance. Our own examinations have led to conclusions somewhat different from those of both these authors. We are convinced that both inflammatory and mechanical engorgements tend to diminish the cohesion of the parenchyma more than the mere increase of liquid in it can explain, and for the following reasons: 1. if a portion of the healthy tissue adjoining an engorged portion be pulled gently, a laceration takes place in the latter before the healthy portion is stretched to the utmost, and with a much smaller degree of force than is required to tear this healthy portion: 2. the fragility of the tissue is not always in proportion to the quantity of liquid in it: 3. an engorged portion of lung does not lose its greater friability when the blood has been gently pressed and washed out of it. We have never been able to discover any physical difference between the first stage of marked inflammation and that engorgement supposed to be a mechanical congestion in the most dependent part of the lung occurring shortly before and after death; and it would appear, from the observations of Laennec, that the resemblance between the latter state and pneumonia is not confined to the anatomical appearances; for where the agony, or moribund state is prolonged, points of hepatization are formed in the most congested portions of the lungs; so that this author was led to class them as the results of real inflammation, which he called *pneumonia agonizantium*.* In these remarks he is confirmed by Louis.† Whilst, therefore, we are led to recognise softening of the parenchyma as the pathological result of hyperæmia or sanguineous congestion, we find in it no distinction between active idiopathic inflammation and that congested state of lung which supervenes, in some measure mechanically, on an obstructed state of the pulmonary circulation.

The second stage, *hepatization*, (the red softening of Andral,) has very distinctive characters. A lung in this state is solid and inelastic to the touch, of the consistence and weight of liver, and portions of it sink in water: it is no longer crepitous, neither does it, when cut, yield bubbles of air, but when pressed, a bloody fluid exudes sparingly from it. Its friability is generally greater than in the first stage, the fingers readily breaking through its substance; and if a portion be pressed between the fingers, it is reduced to a red homogeneous pulp. A hepatized lung appears to be more voluminous than is natural, but this depends on its being solid, and not collapsing, as a healthy lung does, on opening the thorax. Externally its colour is seldom so deep as in the first stage, and when cut into, it is also lighter, presenting shades varying from a blood or livid red to a light pinkish purple, or colour of muscle, and various degrees of these colours are sometimes seen mottling the lungs, so as to resemble some kinds of marble. Scattered through the hepatized portion various lines are visible, of a lighter colour, and specks almost white; a close examination discovers the former to be portions of the interlobular septa, less affected with inflammation, and the latter sections of bronchi or bloodvessels, whose coats have entirely escaped. There is generally in a hepatized lung another character, which becomes apparent on a close inspection, and more

* Clinique Médicale, t. ii. p. 307.
† Dict. de Méd. loc. cit.
‡ Andral's Pathological Anatomy (*Translation*), vol. ii. p. 510.

* Op. cit. p. 211.
† Recherches sur la Phthisie, p. 30.

plainly with the aid of a lens. On a portion being cut, a number of little points can be distinguished, looking like grains of a somewhat lighter colour than the intervening spaces; and if the surface be wiped or lightly scraped, these grains appear slightly elevated, as if they consist of a more solid material. They may be made still more obvious by tearing the hepatized lung; they are then seen as little ovoid bodies, and may be detached singly from the tissue. In most instances these grains are closely pressed together so as to constitute the chief substance of the diseased part; but sometimes there are interstices of a darker colour, and in some cases the granular appearance is entirely absent. This uniform non-granular solidification of the lung, described by Andral* and Chomel,† is not recognised by Laennec, who considered the granular appearance as an essential character of hepatization; but from having seen the condition observed by the other authors as an indubitable result of inflammation, we do not hesitate to describe it as a variety of hepatization. This state of the lung differs from common hepatization in the absence of the granules, and a consequently darker and more uniform texture: it is sometimes softer, and bears a considerable resemblance to the substance of the spleen, whence it has been called *splenization*. In appearance it resembles that condition of the lung produced in pleuro-pneumonia, called by Laennec *carnification*, which we shall allude to hereafter; it differs, however, from this in being more friable. Andral was, we believe, the first writer who ascribed the granular appearance of a hepatized lung to the individual vesicles; and in this opinion he is followed by Laennec and Louis. In the second volume of his "Clinique Médicale" (p. 312) he describes the inflammation in pneumonia as occupying the air-vesicles, the internal surface of which secretes a viscid mucus, which, accumulating so as to fill their cavities, produces the granular bodies in question. In confirmation of this opinion, Louis asserts that this appearance can be imitated by gently injecting the bronchi.‡ Laennec says that these little bodies "are evidently air-cells converted into solid grains by the thickening of their parietes and the obliteration of their cavities by a concrete fluid."§ Many minute examinations which we have made of hepatized lungs have convinced us that the granulations contain no viscid mucus, nor does their appearance by any means confirm the opinion of Andral. They appear rather to consist simply of the little bunches of vesicles, (in which, according to Reisseissen, each minute bronchus terminates,) whose membranous tunics have become so swelled by the deposition of a soft albuminous matter in them, as well as from the increased size of their blood-vessels, that their cavities are obliterated. Both from the uniformity of their appearance when examined, and from the absence of any such matter in the sputa before death, we have long doubted that there is any effusion into the cavities of the air-cells, as supposed by Laennec; and Andral, in his later work, seems to take a somewhat similar view, which he illustrates by the appearance presented by an inflamed lung when carefully dried. When the lung is in the first stage of inflammation, "the only morbid appearance it presents when dried is a reddish, yellow, or brown tinge in the parietes of its capillary bronchia and air-cells; and in some cases even this shade of colour is wanting, and the lung, which before being dried presented a remarkable degree of congestion, when dried differs in no respect from a healthy lung. When the experiment of drying is tried on a hepatized lung, the parietes of the capillary bronchia and of the air-cells present invariably a red colour, and are, moreover, considerably thickened, so as to cause in some points a remarkable diminution, and in others a total obliteration of their cavities."* The same sagacious pathologist refers the absence of granulations in the variety of hepatization before described to the greater degree of tumefaction which the air-cells undergo, by which they are approximated so closely as to be confounded together. This explanation does not seem to accord well with the darker hue of this variety; and we are inclined to hazard the opinion that the inflammation and swelling are in this case chiefly in the vessels and interstitial tissue between the cells and the bronchi, without involving the membrane which principally constitutes these cells, and which analogy would point out to be of the nature of mucous membrane. We propose this explanation merely as a question, and it is one of some interest; for if it should be confirmed by further observation, it would open a more important inquiry whether such variety in the seat of the inflammation is distinguished by any peculiarity in the pathological history of the disease. The discrimination between the minute elementary tissues of the alimentary canal, in relation to disease, has not been without its practical utility; and there can be little doubt that inflammation of the lungs would exhibit some variation in its signs or course according to the parts of the parenchyma which it affects.

The advance of a hepatized lung towards the third stage is marked by its becoming lighter in colour and less humid. The change in colour seems to be produced by a substitution of more of the yellowish white semi-solid albumen for the red particles in its substance, by which the deep red or dull red of hepatization passes into a salmon-colour or a dingy pink, variously marbled in the degree of its progress, as well as by the mixture of black pulmonary matter. It is at this period that a hepatized lung attains its greatest degree of solidity; when gently pressed, a turbid red liquid exudes scantily from it: very little additional pressure crushes its substance into a thick pulp; for although its compactness is increased

* Path. Anatomy, vol. ii. p. 510.
† Dict. de Méd. t. xvii. p. 237.
‡ Recherches sur la Phthisie, p. 9.
§ Transl. p. 201.

* Path. Anat. vol. ii. p. 511.

by the effusion into its substance, its molecular cohesion is greatly diminished.* A close inspection will generally discover that the granulations are the lighter points, and sometimes minute yellowish white specks can be discerned in them, which are the first development of pus.

The lung affected with the third degree of inflammation, or rather its third effect, purulent infiltration, presents a still further change of character. It generally changes the red tinge for a yellowish drab or stone colour, which is still varied with red in parts less advanced, and with grey, blue, or blueish green, from the admixture of black pulmonary matter.† At first the lung retains the weight, compactness, and granular texture which characterise hepatization, the change being confined to the colour; whence this state has been called yellow hepatization, *hépatisation grise*, and by Andral *ramollissement gris*,‡ from its increased friability. On cutting into it, no matter exudes in this early stage of suppuration, because the cohesiveness of the texture is still sufficient to retain it; but very slight pressure reduces it to a thick purilage, in which pus obviously constitutes a principal part. In a more advanced degree the colour is of a straw or sulphur yellow, which begins in patches and spreads through the mass: on cutting into the lung, no granular texture can be seen; but a yellowish, opake, purulent matter oozes in greater or less abundance according to the progress which the suppuration has made. The solid matter obviously diminishes as the pus is secreted; for after squeezing this out, what remains in the hand is a mere debris of the pulmonary tissue, with a few granulations in which the suppuration has not advanced. Except in particular cases, the matter thus formed has a much fainter odour than that from an ordinary abscess. The softness of the lung in this state is so great, that even the slight pressure of a finger readily makes a cavity, which immediately fills with pus; and both Laennec and Andral remark that this may be inadvertently produced in the course of examination, and mistaken for an abscess. In the most advanced stage of purulent infiltration, a lens will sometimes enable us to perceive that the only remnant of texture is a coarse irregular network, composed chiefly of vessels, bronchi, and the septa of lobules.

The purulent infiltration just described is the form of suppuration to which pulmonary inflammation tends; the matter is rarely collected in a focus, and still more rarely in an encysted abscess. Laennec and Andral have recorded a few instances where the suppuration had in one part become complete, and contained pure pus, whilst the adjoining parts were in a state of purulent infiltration quite diffluent on the margin of this sort of abscess, but firmer as they receded from it. This event has generally occurred in cases of partial peripneumony; and it appears to be no more than a completion of the process of suppuration, of which ordinary infiltration is only the beginning. The reason assigned by Laennec is probably correct;—that abscess of the lung is rare, because cases of partial peripneumony usually yield early either to nature or art, while an affection of greater extent produces death before the tissue can be removed by absorption. He cites a case in which a cavity lined with a strong false membrane, and capable of containing a pint and a half of fluid, existed in the middle of the right lung; the pulmonary pleura was destroyed to the extent of more than six square inches, and the wall of the cavity on this side was formed by the costal pleura, which adhered closely to the lips of the excavation. Several bronchial tubes opened into this cavity.* As there were no signs of tubercles, Laennec considers the cavity to have been caused by an abscess. A similar case occurred to Dr. Chambers at St. George's Hospital, and the lung is preserved in the museum there. A case of encysted abscess was shown to the Academy of Medicine by Dr. Honoré in 1823. It was filled with pus, as large as a middle-sized apple, and surrounded by a hepatized state of the lung. The general testimony of the latest pathological anatomists is in support of the opinion of Laennec, that the termination of pneumonia in abscess is of rare occurrence. Broussais says that he only met with it once; and in this case the inflammation was produced by a musket-ball lodged in the lung for six years.† Andral considers it extremely rare, and questions the accuracy of Laennec's statement, that in the year 1823 he met with more than twenty cases of partial peripneumony terminating in abscess. If we compare these opinions with the writings of Morgagni, Baillie, or, in fact, any writer on morbid anatomy prior to

* This character led M. Andral to call hepatization *red softening*; but the objectionable nature of this term is sufficiently apparent from the fact that Laennec misunderstood its meaning (op. cit. p. 206, note); and Chomel described the state in question as a hardening of the lung (*endurcissement rouge*, Dict. de Méd. loc. cit.) Andral meant *friability*.

† These appearances are beautifully and faithfully delineated in the first number of Dr. Hope's coloured illustrations of morbid anatomy, the inspection of which will be more instructive to the student than any verbal description; see especially fig. 4. From the blue shades which slight admixtures of the pulmonary matter produce, Dr. Hope supposes that this matter is sometimes blue: we believe, however, that this colour depends on a property which all whitish semitransparent bodies possess of transmitting the yellow and red, and reflecting the blue rays, so that, when the light transmitted through a thin transparent film is absorbed by a dark body under it, the blue rays are reflected from the film. Nothing illustrates this more perfectly than opal glass, through which dark objects appear blue and light ones orange; and an example of the same optical effect more in point may be given in the superficial veins, which through the skin appear blue, although they contain nearly black blood.

‡ This word *gris* is not here to be translated *grey*, a mixture of black and white, but *drab* or stone-coloured, like light brown paper, which in France is called *papier gris*.

* Op. cit. p. 206.

† Hist. des Phlegm. Chron. tom. ii. p. 111.

the last twenty years, or with the notions of the less informed of the present day, we shall be surprised at their discrepancy with the frequent mention of abscess of the lungs by these latter. The common error has been to mistake tubercular vomicæ, which are of very common occurrence, for abscess; and it is not easy always to avoid the mistake, even in the present state of our knowledge. Laennec says that tubercular cavities are to be distinguished by their containing some remains of the tubercular matter, or by the co-existence of tubercles in other parts of the lungs; but these remains may have been eliminated; and where a rounded vomica, containing only pus, is found singly in an inflamed lung, it may readily be mistaken for an abscess. Such examples show how uncertain are the anatomical distinctions between vomica and abscess; and perhaps any absolute boundary between these lesions is not to be met with in nature. We may recur to this subject when speaking of chronic peripneumony.

Abscesses of the lungs have sometimes been met with unattended with any marks of inflammation; the pus being apparently secreted in some other part of the system, is merely deposited in the lungs. We remember to have seen several abscesses of this kind in the lungs of a woman at the hospital of La Charité at Paris, who died with diffuse cellular and venous inflammation and suppuration of the leg and thigh. They were small, round, full of pus, and lined by recent coagulable lymph, the adjacent pulmonary tissue being quite crepitant. The liver, the spleen, and one of the kidneys presented similar abscesses in their parenchyma. Many other examples are on record of both circumscribed deposits and infiltration with pus after great surgical operations;* but as these are not connected with pneumonia, we need not describe them here.

Gangrene of the lung is rarely a consequence of inflammation. That it is so at all is questioned by Laennec, who considered this lesion as idiopathic, like hospital gangrene or anthrax, and as exciting rather than following the inflammation, which he says is by no means of an intense kind. It has, however, been fully proved that gangrene of the lung does occasionally succeed to inflammation of the organ, although, as in the case of abscess, it likewise occurs independently of it. Inflammation may be so intense as to destroy the vitality of a part, as mechanical injuries or chemical decompositions do; and of the occurrence of this event in the lung, there are a few instances on record.† As a consequence of acute inflammation gangrene is commonly diffuse, surrounded by purulent infiltration or hepatization, and bounded by a deposit of lymph. The colour of the gangrenous part is a greenish brown, a dirty olive, or a dark brown, which a certain admixture of purulent and black pulmonary matter in some parts changes into a greenish grey. It is about the consistence of the lung in the third stage, except in some points where the sphacelus is more advanced and diffluent, and a turbid or greenish sanies runs readily from it. It is, however, the putrid fetidity which most distinguishes gangrene, and this test enables us to discover the presence of slight degrees of gangrene where it is not sufficiently extensive to affect the colour. Where the tissue is in the third stage, the colour as well as the odour readily characterizes it, but the hepatized lung bordering on gangrene can only be detected by its odour. We have sometimes found portions of hepatized lung very fetid, and although not materially altered in consistence, and only a little darker in colour than usual, we have been induced to think that the gangrenous process had commenced in them. M. Chomel describes a gangrenous condition of the lung, which is seen in the bodies of those who have died after some days' illness in consequence of being exposed to the effluvia of cess-pools or sewers. The lung is found almost black or greenish, full of a sanious, greenish, and extremely fetid liquid, softened in many places, and in some falling into deliquescence. Chomel thinks this lesion marks the passage of the first stage of inflammation into gangrene. The same pathologist supposes the possibility of a whole lung being destroyed by gangrene in the case of its being compressed and rendered impermeable to air by an extensive pleuritic effusion; and he quotes a case, which he conceives to be of this kind, from the *Opuscula Pathologica* of Haller, in which the left lung had entirely disappeared, and the pleural sac was filled with a quantity of fetid albuminous liquid, in which the large vessels and bronchi terminated as if they had been cut off.*

Circumscribed gangrene, if the result of inflammation at all, follows only the chronic kind; being apparently caused by the obstruction to the circulation which chronic inflammation sometimes produces in the lung. This form of gangrene more frequently occurs independently of inflammation, as the result of various septic influences present in the system, and answers more exactly to Laennec's opinion respecting pulmonary gangrene in general. For an account of the relations of gangrene to these causes and to inflammation, we refer the reader to the article MORTIFICATION.

We have hitherto described the general type of the several consequences of inflammation of the lung as detected by anatomical investigation. It remains for us now to notice the different varieties which individual cases present with regard to combination, extent, and complication of these inflammatory lesions.

Pneumonia is called *lobar*, *lobular*, or *vesicular*, according as it affects whole or continuous parts of lobes, or certain polygonal subdivisions of these, or single bunches of vesicles. Lobar inflammation is the most common, and may be limited to an irregular portion of a lobe, or

* *Andral*, Path. Anat. vol. ii. p. 540. Dr. Hope's Illustrations, &c. part i. fig. 10, 11, 13.

† *Andral*, Clin. Méd. t. ii. p. 295. Dr. Hope's Illustrations, part i. fig. 4.

* Dict. de Méd. t. xvii. p. 240.

t may involve a whole lung, or a great part of oth lungs. When the inflammation is extensive, it is commonly found in different degrees of advancement. The most frequent of hese combinations is the engorgement or first tage, with the second, hepatization; and the radual transition of one into the other may here e very distinctly seen. The greatest advancement is commonly at the lower parts and margins of the lobes, (which are, according to Laennec, the most usual seats of peripneunony,) where we have the solid, airless, liver-ike state of the second stage. In receding rom this towards the less inflamed portions, he lung is more livid, softer, and moister, but till does not crepitate on pressure, and, except n some spots, does not pit, but breaks under he finger. Further still, there is some crepiation, but the lung feels heavy and yielding to he touch, and is of a dark red colour. In the lighter degrees of inflammatory engorgement, he colour is brighter and the crepitation more listinct, and the serum that flows on incision is very frothy. There is frequently around the nflamed part an œdematous state of the tissue, he colour of which is natural, but a yellowish rothy serum flows from it on incision. The hird stage can also generally be traced in progressive degrees from the hepatized portions, ightening them by marbled shades of a paler or yellower hue, which sometimes take the shape of the polygonal lobules, and sometimes pass continuously over the interlobular partitions without distinction. Where these transitions of colour are abrupt, and mottled with black pulmonary matter, there is produced that appearance which Laennec compares to some kinds of granite, with its red and yellow felspar, grey quartz, and black mica. Combinations of these three degrees may affect the whole of both lungs; and this to the extent that the whole of one lung, and more than half of the other, are solidified; but it is obvious that they cannot be so far involved in the second or third degrees, as life must be destroyed long before they could be rendered so totally impervious to air.

The anatomical evidence as to the parts of the lung most frequently affected by pneumonia is not entirely in accordance with that furnished by clinical observation. Hence we find Morgagni, Frank, and Broussais, who draw their conclusions from dissections, assign the upper lobes as the most frequent seat of inflammation; while Laennec and Andral, who included cases of recovery in the calculation, found the lower lobes to be most commonly inflamed. The reason of this discrepancy is, that inflammation of the upper lobes is the most frequently fatal; hence Chomel, although out of fifty-nine dissections he found the inflammation occupying the apex in thirteen, the base in eleven, and the whole or central parts in the other cases, does not withhold his assent from the decision of Laennec. That the right lung is more frequently inflamed than the left is agreed on by all writers, and is proved equally by examination of the physical signs and by dissection.

Inflammation not unfrequently attacks single or a few isolated lobules, being abruptly limited by the interlobular cellular tissue, so that lozenge-shaped or polygonal patches of red engorged or hepatized tissue are found in the midst of healthy structure. The same distinction is sometimes exhibited in the degree to which the inflammation has advaneed, some lobules of light purulent infiltration appearing in a livid engorgement. The inflammation in lobular pneumonia seems to originate in several points at once, and not to be sufficiently intense to traverse the barrier of the interlobular membrane. It is this form that supervenes frequently to great surgical operations or severe accidents, and it is common in children.

Andral has distinguished another variety of acute peripneumony, which, as he supposes it to affeet individual air-cells or vesicles, he calls vesicular. This presents itself to the anatomist in the form of little red spots, varying in size from that of a pin's head to that of a hempseed, and in colour from blood red to livid red: they are often more fragile than the rest of the tissue, which is sometimes quite healthy, but in many instances contains the miliary granulations of Bayle. This form of inflammation is not common, and requires a light colour of the lung to make it distinct; but we have observed it sufficiently to enable us to follow M. Andral in recognizing it as a variety.

A considerable variety in the anatomical character of pneumonia is produced by the age of the subject. The lungs of young children are naturally more membranous and vascular than those of adults; and from this circumstance, and because the bronchi and vesicles are smaller, the texture is less light and crepitating to the feel. These characters are to be borne in mind when it is examined in an inflamed state, for they render the absence of crepitation and lightness, produced by this lesion, less apparent than in the adult. On the other hand the colour, naturally light, of a pink buff hue, makes the red appearance of inflammation more visible at this age. Pneumonia is seldom found so far advanced in children as in the adult. After many days' duration it is often found only in the first stage, and its existence for weeks frequently does not bring it beyond the stage of hepatization. The division of the lungs into lobules is more apparent in children and in the young of all animals than it is afterwards; which fact is an example of the progressive incorporation of elementary parts, which marks increasing perfeetion in the seale of organization. This anatomical difference appears to be the cause of the frequency of the lobular form of pneumonia in early life, and of the greater immunity from the inflammation which the interlobular texture often exhibits. The margins of the lobes are not uncommonly the only portions found hepatized in the lungs of children who have died of pneumonia supervening on hooping-cough. In old people the prevalence of the black pulmonary matter, and the rare, light, and often emphysematous texture of the lung, affect the character of the inflammatory appearanees, the

first two stages being darker and more dingy in colour, and the structure more readily disorganized and infiltrated with pus. Hence, whilst in children we see the suppurative process retarded by the density of the structure and the compactness of the effusion, in old people we sometimes find pus secreted in the second and even in the first stage before the red particles are removed; and this confusion of degrees is the more common where the pneumonia is of the congestive kind, as in typhous fever. Dr. Hope has given a drawing of a portion of lung from an old woman who died of typhous fever, which exhibited all the physical characters of purulent infiltration except the colour, which was a deep opaque chocolate. He says that he has frequently met with this state in the peripneumony of exhausted and cachectic subjects, especially after typhous fever.

Before describing anatomically some remarkable complications of pneumonia, we would stop for a moment on the question—what is the essential seat of pneumonia? Some pathologists, and among them Andral, place it in the air-vesicles and minute bronchi; others consider it to be in the interstitial cellular texture between these; whilst a third opinion supposes it to occupy all these indiscriminately. The writer, some years since, thus expressed his opinion: "Our knowledge of minute anatomy does not permit us to specify with certainty the exact and essential seat of this inflammation; but I am disposed, from a consideration of the signs and of the effects on the tissue, to refer it principally to the plexus of vessels and submucous tissue surrounding and uniting the minute extremities of the bronchi. It may, and usually does, extend to the mucous membrane of these extremites, and of the smaller bronchial tubes; but this is, *strictly* speaking, rather a bronchitis attendant on the parenchymatous inflammation, than a part of the pneumonia."* We have, since writing this, made many minute examinations of the lung in various forms of inflammation, and if they tend at all to modify this opinion, it is to the effect that the plexus of capillary vessels rather than any distinguishable texture, is the essential seat of pulmonary inflammation. On inspecting, by the aid of a simple lens, the margin of a slightly inflamed spot of lung, numerous vessels may be seen, distended with blood, passing across, around, and between the vesicles, with very little regard to their form or disposition; and as the scrutiny is extended to a part more inflamed, these vessels are so multiplied and confounded with each other as to be no longer separately discernible. In this state it is impossible to distinguish whether the tunics of the cells, or the tissues which connect them, are most affected, for they all appear one mass of redness, in which are seen the cells irregularly diminished in size, and containing bloody serum with bubbles of air. The interstitial cellular texture, where it can be separately discerned, namely, between the lobules and around the larger bronchi, is generally less vascular and of a lighter colour than the other parts, and in some instances appears to be nearly free from the inflammation. The lining membrane of the minute bronchi, although generally of a deep red colour, is sometimes blueish red, as if from redness under it rather than in it; and on tracing these tubes higher, the presence of this inflammatory character is very uncertain. These examinations and some pathological considerations induce us to consider the capillary ramifications of the pulmonary artery and veins to be the proper seat of pneumonia, and that these may involve more or less of the tissues through and around which they pass. Thus through them the tunics of the air-cells, particularly the sub-mucous, commonly become the seat of inflammation; whence are formed the granulations of ordinary hepatization. When, again, the inflammation is confined more to the inter-vesicular plexus and tissue, which appears to be the case in the more congestive form of inflammation, where vessels larger than capillaries are involved, the uniform non-granular form of hepatization which we have before described, is produced.* If, as is commonly the case, the inflammation extends to the extremities of the bronchial arteries, which are said by anatomists to anastomose with the pulmonary, the mucous membrane lining the vesicles and minute bronchi partake of the inflammatory action, and exhibit it in the manner peculiar to mucous membranes by the secretion of a viscid mucus, and afterwards of pus. So, likewise, when the inflammation reaches the surface of the lung, it is generally, but not constantly, propagated to that portion of the pleura which invests it and derives its vessels from it; and this extension of the inflammation may add another character to such instances of the disease. But it is its seat in these extensive capillaries of the lungs through which the blood of the whole system is continually passing,—it is this affection of so considerable and important a portion of the circulatory system that causes the severe and intense character of pneumonic inflammation; and the more constantly we hold this in view, the better shall we understand the pathological history of the disease, and its important relation to remedial measures.

We have just mentioned the extension of inflammation to the pleural covering of the lung; this occurs so frequently that some writers have used the terms pneumonia and pleuro-pneumonia as synonymous. But in the ordinary

* A Rational Exposition of the Signs of Diseases of the Lungs and Pleura, by Charles J. B. Williams, M.D. 1828. p. 80.

* An uncommon effect of pneumonia has, since writing the above, been brought under our notice by Dr. Stokes, in a recent number of the Dublin Medical Journal. A part of the lung was in the third stage; and the suppuration, instead of prevailing most in the tunics of the bronchi and vesicles, had scarcely affected them, but had destroyed the interstitial tissues, so that the vesicles presented the appearance of bunches of little grapes or berries. We need not remark how much this fact confirms the view which we take of the occasional diversity in the principal seat of pneumonic inflammation.

ses of pneumonia the pleuritic affection is so ight that it scarcely modifies the disease, and, ce the inflammation of the bronchi, which is usual an accompaniment of pneumonia, is to e viewed as incidental rather than essential in e disease. In these cases the pleuritic in-mmation will shew itself to be modified by e seat and extent of the pulmonary disease. hen this is partial, that portion of the pleura hich covers it has upon it an albuminous de-osit, which is generally thin, and if the disease as been of sufficient duration, shews signs of ganization. The corresponding portion of the stal pleura frequently presents a similar de-osit; an instance of that propagation of in-mmation by contiguity which seems to assi-ilate the proximate cause of inflammation to mething more subtle and mobile than the mmon properties of texture, and to bring it to close analogy with electric agencies. These buminous effusions are the basis of false mem-anes, which form adhesions between the lung d the costal pleura. Underneath them the embrane exhibits points and patches of red, in ordinary pleurisy. When the pulmonary flammation is of small extent, there is com-only a small sero-purulent effusion into the eural sac; but extensive hepatization prevents s from taking place, by filling the pleural ca-y with its own unyielding substance, and the ng is then partially covered with a thin false embrane, which is thicker along the edges, in e interlobular fissure, and occasionally at some ints where the inflammation was first extend-to the pleura.* These circumstances prove e greater intensity of the pulmonary inflam-ation, and constitute the reason given by ennec for not calling such a complication a e pleuro-pneumony.

There is another remarkable combination of eurisy and pneumonia, in which the former with abundant liquid effusion has the predomi-nce, and signally modifies the effect of the in-mmation on the tissue of the lung. The pneu-onia is generally circumscribed, sometimes ular, and is often seen in several distinct spots the lower parts of the lung. Laennec describes e hepatization under these circumstances to be uch more flabby and less solid than in simple eumonia. It is of a red or livid red colour, d destitute of granulations or other trace of air-lls; but the vessels and bronchial tubes are ll conspicuous in it. It contains no air, and t more moisture than muscle; from its re-mblance in compactness and suppleness to is tissue, Laennec distinguishes it by the m *carnification*. In a case of this kind, hich we have recently seen, we could not t recognize in this carnified state of the ng the uniform, non-granular hepatization hich we have described as that in which the terstitial plexus and tissue are the only seat the inflammation; and this variety of con-lidation, which is arrested or restrained by e pressure of the pleuritic effusion, appears be another proof that the essential seat of eumonia is not in the air-cells. It exhibits the essential effects of pneumonic inflammation in colour and solidification, without the granu-lations and humidity which are fortuitous and dependent on effusion extending to the walls of the yielding air-cells. As it might be expected, the progress of this form of pneumonia is slow, and rarely reaches the suppurative stage; but Laennec says that in subjects who had died in from one to three weeks after the sub-sidence of inflammatory symptoms, he has found "the affected portions of the lung flabby, dry, and yellowish, with the vesicular texture discoverable in some places, but the vesicles apparently filled with a half concrete pus." It has been remarked by Dr. Stack that this compressed state of the lung is some-times perpetuated by false membranes, the product of the pleurisy, binding it down.* This we have seen exemplified more than once: in one case illustrative of such an effect of a false membrane, a pneumothorax had supervened on the absorption of the liquid effusion.†

Laennec calls that only true pleuro-pneumo-nia in which both diseases are extensive, there being copious pleuritic effusion, with a con-siderable extent of peripneumonia. Such a combination is of rare occurrence, and as there is only a difference of degrees, it does not ap-pear why this alone should be entitled to the compound name.

The anatomical characters of resolution or cure of peripneumony are worthy of remark; they are particularly described by Laennec. When recovering from the first stage, the pul-monary tissue becomes drier and more filled with air, but for some time retains its red colour, as if dyed. Sometimes the texture con-tinues for a while to be œdematous. A hepa-tized portion in progress towards cure assumes a paler hue, passing through shades of red grey and reddish flax colour, until it becomes a little redder only than natural. The texture at the same time becomes more yielding and moister, containing a frothy serum, which abounds more and more in air as the resolution advances, the granulations giving place to the developement of the air-filled vesicles. These changes begin at several points, and, when ad-vanced, often leave others still hepatized. When the tissue resumes its natural dryness and colour, it remains firmer, more elastic, and heavier for some time after. The first signs of restoration from the third stage are the yellow tinge becoming lighter, and the pus more liquid by the intermixture of serum; air-bub-bles afterwards appear and continue to increase, while the pus is reduced to small specks. As the vesicular texture returns, it resembles the first stage of engorgement in all respects but colour, which appears on incision to be dirty yellow or greenish, and this continues even after the complete re-absorption of the serum. The anatomical history of the process of cure of gangrene of the lungs will be found in the article MORTIFICATION.

III. PATHOLOGICAL HISTORY OF PNEUMONIA.

Operation of causes.—Pneumonia is the

* Transl. of Laennec, p. 487.

* Dublin Hospital Reports, vol. iv. p. 90.

† Rational Expos. &c. p. 143.

most frequent of all the parenchymatous inflammations. This in part proceeds from the very vascular structure of the lungs, which renders them very susceptible of inflammation; but we also see a reason in the nature of their function, which peculiarly exposes them to suffer from the various influences that injure the balance of the circulation. Whatever view is taken respecting the generation of heat, it is sufficiently established by experiment that the function of the lungs is intimately connected with it, and that the application of any cooling influence to the body makes a demand on an increased activity of this function. As, under such influence, the blood returns freely to the lungs in a state more highly venous than usual, there is a greater necessity for respiration, and both this increased flux and the consequent augmented activity bring this organ into a condition peculiarly favourable to the development of inflammation. If the application of cold be not long continued, the pulmonary congestion may soon be removed by the due oxygenation of the blood, and consequent restoration of the balance of the circulation before the tonicity of the pulmonary vessels has materially suffered; some minor part of the circulation, as that of the bronchial membrane, occasionally alone being the seat of inflammatory reaction. But if the cold be severe and long continued, if a large portion of the body, especially the chest, be exposed to it, the pulmonary vessels suffer not only from their increased task and the congestion consequent on its imperfect completion, but likewise from the sedative influence of the cold directly affecting them; hence, whenever reaction is established, they are the parts most likely to suffer from its effects. The manner in which excessive exertion and the inhalation of asphyxiating gases and vapours excite the disease is obviously likewise by the congested state which they occasion in the vessels, which, if sufficiently continued, only requires the addition of a subsequent reactive excitement to convert it into inflammation. Alcohol and its various compounds also act as occasional exciting causes of pneumonia by their narcotic influence on the nervous system, by which the sensation of want of breath that excites the respiratory act is blunted, and a congestion of blood takes place in the lungs in consequence of their insufficient action. How far in these several instances the stasis of highly venous blood in the pulmonary vessels may contribute to injure the tonicity of their coats, and thus to render them peculiarly obnoxious to the consequent reaction, is only a matter of conjecture, not unsupported by analogy.

The presence in the body of various poisons, as that of the rattle-snake and deleterious fungi, may lead to the production of pneumonia partly in the same way, but probably also from a specifically injurious influence on the pulmonary vessels. There is no organ in the body so intimately exposed to the influence of the blood as are the lungs; the whole circulating mass passes rapidly through their fine vascular filter, and if there be a noxious ingredient in the blood, it may be reasonably expected here to shew its effects. Hence the origin of pneumonia, not only from the poisonous influences just named, but probably also, as Laennec has surmised, from the more subtle ones of an epidemic nature. The inflammations arising in the course of various febrile and exanthematous diseases may owe their existence in some degree to a similar mode of influence; but the tendency of the phlogistic reaction to localize itself in parts predisposed to inflammation in many of these disorders, is likewise a link in the chain of causes, which must not be withheld from our recollection. In eruptive fevers particularly, it is common, as Andral has remarked,* to see a great degree of dyspnœa precede the appearance of the eruption, and generally cease, as if by magic, when this fully takes place. In some cases, however, and especially where the eruption recedes or is not fully thrown out, the dyspnœa continues, and assumes the character of a more permanent disease. This is obviously a congestion persisting and becoming converted by general vascular excitement into an inflammation. The deficient resonance of the chest, remarked by Avenbrugger and Corvisart at the commencement of eruptive fevers, is a physical indication of this pulmonary congestion.

The intercurrence of pneumonia with other inflammatory diseases of the lungs and neighbouring parts will admit of a more direct explanation: it is an extension of inflammation by contiguity, and arises from some additional external cause, as when bronchitis or pertussis becomes a pneumonia in consequence of exposure to cold; or from an additional internal movement, as when, in consequence of a checked excretion or a too well nourished mass of blood, such slight or membranous inflammations spread and infest the more considerable circulation of the parenchyma. The remarkable tendency which is exhibited among children to such a propagation of inflammation is dependent on the greater proportion of membrane and vascularity of the lungs, as well as on the higher activity of their function at that early age; facts pointed out by Majendie and Laennec, and strictly corresponding with the rapid progress of diseases of these organs at that period. The frequent intercurrence of pneumonia with hooping-cough appears to depend not merely on a propagation of inflammation; the congested state of the lungs induced by the cough and imperfect oxygenation of the blood has likewise its share in favouring the development of inflammation.

The metastasis of the inflammation of gout and rheumatism occasionally falls on the lungs, but seldom without some predisposition to disease in the organ, from previous attacks of inflammation; and there is nothing in these instances which tends to throw new light on this obscure point of pathology. Whether these, and likewise the cases of pneumonia supervening after severe accidents and surgical operations, noticed by Guthrie, Bell, Dupuytren,

* Clin. Méd. tom. ii. p. 287.

and others, are connected with an altered condition of the circulating fluids, is a question which cannot at present be placed on any other than the ground of conjecture.

Tubercles and apoplectic engorgements in the lungs may excite inflammation both by their irritating influence, and likewise, if they are numerous or extensive, by the obstruction which they occasion in the circulation, and which leads to the congested state which we have so frequently observed to favour the development of inflammation. The points adjoining tubercular excavations are likewise occasionally attacked with inflammation. It is to be remarked of these and other inflammations which originate chiefly from mere local irritation, that they are much less severe and permanent than those in which the system at large is more concerned, and the inflammation is as it were the focus of a general derangement. Accordingly it is observed that such intercurrent peripneumonies are commonly slight, and, if recognized, yield readily to treatment. But their latent character constitutes their worst feature, their symptoms being merely a slight exacerbation of those of the pre-existent disease; and unless detected through the aid of their physical signs, they may speedily prove fatal.

In reviewing the pathological relations of the causes of pneumonia, we cannot avoid noticing the important link which congestion of blood in the lungs forms in the development of the inflammation. In by far the majority of cases this congestion is immediately determined by the operation of the exciting cause, and precedes what may be termed the irritative stage of the inflammation. Such we have seen to be the effect of cold extensively applied, of violent and long-continued exertion, of certain poisonous influences, (which, by diminishing the sensibility of the nervous system, impair that sensation of want of breath which excites the respiratory act,) and of the congestive stages of various febrile diseases. The connexion of congestion with inflammation is still more forcibly illustrated in the pneumonia of the moribund, in which the blood, imperfectly oxygenated through the failure of the respiratory forces, accumulates in the pulmonary vessels, which even then become the seat of inflammatory action, and if the agony or change of death be of long duration, produce those changes which are recognized as the results of ordinary pneumonia. This point has been fully established by Laennec and Louis. The latter found signs of partial inflammation in 22 out of 112 cases which died of various chronic diseases, and in which the inflammation could have existed only a few days before death.* Laennec not only found proofs in the dead body, but likewise repeatedly discovered signs of this inflammation supervening during the failure of the powers before dissolution in various diseases. Seeing, then, the close relation which simple congestion, or passive hyperæmia, (as Andral terms it,) of the lungs bears to inflammation, so close that their anatomical distinctions cannot be discerned, it remains for inquiry what is the additional pathological movement which gives to inflammation its character and permanency, and renders it more than simple hyperæmia. In answering this question by asserting that it is a reaction of the neighbouring arteries and of the heart, we only describe a phenomenon which does succeed, and which is the next of a series of actions constituting the disease in question. This is the irritative stage, and is in most examples posterior to the formation of a congested state of the vessels. In some instances, however, as where inflammation succeeds to a wound or other mechanical injury of the lung or other irritation in its substance, the afflux of blood is posterior to the irritation, which is then the starting point of the pathological changes. In the article IRRITATION we have already described an afflux of blood as generally following an excitement of a part, and it does so the more certainly and fully in proportion as the organ is vascular and freely supplied with blood; hence the lungs are peculiarly liable to the congestion of irritation, and if the cause be applied for a sufficient length of time, this congestion may become inflammation. We do not here stop to trace the progressive changes and reactions which accompany the development of inflammation in general; these are sufficiently dwelt upon in the article on that subject; but in considering the lungs as an object of inflammatory action, it cannot escape our observation that their vicinity to the heart, their great congeries of vessels through which the whole blood of the body passes, their spongy and yielding texture,—all tend greatly to increase the delicacy of the balance of their circulation, and render any disorder of this balance peculiarly liable to those reactive processes of the principal circulation which form a part of inflammation and fever.

Physical signs of pneumonia.—Through the aid of auscultation and percussion we obtain a better knowledge of the pathological process of pneumonia than can be obtained in any other way, for through their means we in a measure apply our senses to the very seat of the disease. But there is still some degree of doubt about the precise mechanism of certain of these signs, and this obscurity leaves us uncertain as to some minute points of the pathological progress of the disease, which we have already found not clearly determined by their anatomical history. We shall, however, describe the signs as they have been accurately observed, and afterwards state the view of the pathology to which they, together with the anatomical characters of the disease, appear most rationally to lead.

On the first invasion of inflammation of the lungs, contemporaneously with the earliest of the general symptoms before described, the ear unaided, or through the stethoscope, will perceive in some part of the chest a peculiar sound accompanying the usual respiratory murmur: it is a fine crackling or crepitating sound, like

* Rech. sur la Phthisie, p. 39.

that produced when kitchen salt is thrown on a heated iron; or like the crepitation which occurs when a healthy lung is pressed between the fingers. A pretty correct idea of the sound may also be obtained in a readier manner by rubbing between the finger and thumb a lock of one's own hair close to the ear. This is the *crepitant rhonchus*, and was considered by Laennec to be pathognomonic of the first stage of pneumonia. The space where it can be heard is often at first very limited, sometimes not extending more than an inch or two; but when more advanced, it may occupy nearly a whole lung. The parts where it is most commonly first heard are, below the inferior margin of the scapula, below the axilla, or about the lower margin of the pectoral muscle, —points corresponding with the lower lobes of the lungs, which, as we have before noticed, are the most frequent seat of inflammation; but it is occasionally met with in other parts of the chest. At the commencement of inflammation, the crepitation is merely an *addition* to the ordinary respiratory sound, which is still distinct; but as the disease proceeds, the crepitant rhonchus prevails more and more, until it is the only sound heard in that spot during the respiratory movements.

At this period the part begins to sound a little duller on percussion than the corresponding opposite point, particularly if this be practised mediately, with M. Piorry's plate, or even on one of the fingers of the left hand pressed closely on the chest. The progress of the inflammation is marked by the minute crepitations constituting the rhonchus becoming less continuous and regular, and being confined principally to the end of each inspiration; and as the lung begins to pass into the state of hepatization, they are heard only on coughing or on deep inspiration, and at last cease entirely. If the disease is extensive, in proportion as the crepitant rhonchus diminishes, the respiration in the sound parts of the lungs becomes louder than usual, and like that of children, whence it is called by Laennec *puerile respiration*. In the second stage of pneumonia, if the disease is extensive, the sound emitted on the percussion of the part of the chest corresponding with the hepatized portion, is quite dull, and yields no more resonance than the region of the liver. On applying the ear, neither the ordinary respiratory murmur, nor the crepitant rhonchus of the first stage is heard; but sometimes another kind of sound is substituted for them, and this occurs most commonly in proportion as the hepatization approaches the middle parts and root of the lobes, and extends to the surface. This is a whiffing sound, resembling that produced by blowing through a crow's quill, and it is occasionally so loud as almost to amount to a whistle. This is the *bronchial respiration* of Andral and Laennec, and in its acute and defined character forms a remarkable contrast with the dull diffused murmur of natural respiration. It is often heard most distinctly during the forcible respiration of coughing. A peculiar resonance of the voice, called by Laennec *bronchophony*, is less commonly observed at the same points. The voice resounds at the end of the stethoscope in a modified tone, as if it came through little tubes. It does not, as in perfect pectoriloquy, appear to originate in the stethoscope, and it is not heard in distinct words, but in notes of various continuance, not always synchronous with the words uttered by the mouth, and at intervals is alternated with what may be called whiffs of the bronchial respiration. With these several sounds there is often mixed a mucous rhonchus or fine gurgling, but this seems circumscribed and does not obscure the others. The puffing or blowing sound of bronchial respiration sometimes gives the auditory sensation of a person blowing into the ear through a narrow tube; and as this sound is sometimes interrupted, and occurs in irregular puffs or whiffs, it gives the impression of a moveable veil or loose curtain fluctuating under the impulse of the air.

In the third or suppurative stage, in addition to the dulness on percussion observed in the second stage, there is sometimes a coarse mucous rhonchus, heard especially at the root of the lungs or about the lower axillary or mammary regions: this is the only physical sign of the termination of the inflammation in this stage; and when it is observed to commence in a part where bronchial respiration and resonance have been previously heard, it may be taken as a pretty certain proof of the supervention of this change. Sometimes, however, the bronchial respiration and resonance continue without this sign, and there is then no physical indication of the occurrence of the third stage.

If the suppuration becomes complete, by the formation of an abscess in any portion of the lung, no physical indication of this event presents itself until the purulent matter has been partly expectorated. In that case a gurgling or cavernous rhonchus will be heard in the corresponding point; and when the evacuation of the liquid contents of the abscess has been further completed, this rhonchus will give place to the *hollow cavernous respiration* or *pectoriloquy*, indicating a cavity communicating with the bronchi. If, however, the abscess is very large, it may leave a cavity in which the *metallic tinkling* or *amphoric resonance* is produced, precisely as these phenomena are developed in phthisis after the evacuation of the contents of tubercular vomicæ. The gangrenous termination of peripneumony will announce itself by the putrid fœtor of the breath and of the matter expectorated; and in case the gangrenous portion is detached, whether in a circumscribed slough, or in a diffused deliquium, the same signs of a cavity may be produced as in abscess of the lungs.

Such are the physical signs which the most accurate observers have concurred in attributing to peripneumony and its consequences in their simpler forms. We shall better understand their nature as well as the varieties to which they are subject, if we examine them more rationally, in relation to the other symptoms, and to the effects of the inflammation anatomically discovered in the tissue. With respect to the crepitant rhonchus, there can be no doubt

that its seat is in the minutest order of bronchi and air-cells of the lungs, since it is only diseases which affect these parts that present this or any sound resembling it. But the precise manner in which they are affected in order to produce this sound is not quite so certain, and different opinions upon it have been entertained. M. Andral considers the crepitant rhonchus to be nothing more than a finer modification of the mucous rhonchus; the latter becoming crepitant when its seat is in the minutest bronchi and air-cells, the narrow dimensions of which render the bubbles which compose it finer and more equal. Hence he asserts that the crepitant rhonchus is produced by the intermixture of air and liquid in the air-cells and smallest bronchi in other diseases as well as in pneumonia, and that it occurs in acute bronchitis whenever the inflammation and excessive secretion extend to these parts. Although he absolutely denies the accuracy of this statement, Laennec does not appear to have clearly made up his mind as to the physical cause of the crepitant rhonchus of peripneumony. Speaking of this sound in one place, he says: "Besides the sound of crepitation, a sensation of humidity in the part is clearly conveyed. We feel that the pulmonary cells contain a watery fluid as well as air, and that the intermixture of the two fluids produces bubbles of extreme minuteness."—"The consistence of the fluid appears always greater in the mucous than in the crepitous rattle."—"In respect of the size of the bubbles in the different rattles, they may be estimated as *very large*, *large*, *middling*, *small*. The last term is especially applicable to the crepitous rattle of peripneumony, in which it seems as if an infinity of minute equal-sized bubbles, formed at once, were thrilling or vibrating rather than boiling on the surface of a fluid."* In another place, however, he says that at the invasion of the inflammation, the crepitation "conveys the notion of very small equal-sized bubbles, and seems hardly to possess the character of humidity."† These opinions are equally inconsistent with each other, and with his observation on the certitude with which he strenuously insisted that simple acute bronchitis never presented this sign; for truly, if the intermixture of air and liquid in the minute bronchi were the only elements of the crepitant rhonchus, this disease as well as pituitary catarrh, which certainly present this condition, ought in an equal degree to produce this sound. Such, however, was the fine accuracy of Laennec's observation, (as, during the last year of his life, when he was most perfect in his art, we had personally ample opportunities of proving,) that we do not hesitate to receive his testimony on this point as the most exact, whatever inconsistency may appear in his reasonings upon it; and therefore, although we cannot pretend to such a perceptive acumen as to be able always to distinguish the crepitant from the mucous rhonchus in all their modifications and gradations, we assume the authority of the great auscultator as a proof in addition to others, that these two sounds are essentially different in their nature, and owe their characters to peculiarities in the mechanism which produces them.

It is agreed on by all auscultators, that œdema of the lungs and the margins of hæmoptoic engorgements may produce a rhonchus of the crepitant kind, and it naturally occurs to us that these lesions resemble pneumonic engorgement in the pressure to which they subject the vesicular parenchyma. If we compare with these instances the very close representation of the crepitant rhonchus which the simple pressure of a healthy lung will produce, we are led at once to an explanation of the mechanism of this sign. By this pressure the air is expressed from the tissue, whilst the tubes and cells are so narrowed by the pressure that it can only pass out of them in successive bubbles, the escape of each of which produces a minute crepitation: this sound Laennec tells us differs from the crepitant rhonchus only in being not so strong; here no preternatural fluid is present in the air-cells. In œdema, or in effusion of blood into the substance of the lungs, we have the interstitial effusion and narrowing of the minute air-tubes and cells, and from the nature of the expectoration we may conclude that there is also an increase of liquid within them; the rhonchus that accompanies them is accordingly described by Laennec to consist of moister and somewhat larger bubbles than that of peripneumony, and he terms it subcrepitous. Lastly, we have the peripneumonic engorgement, in which anatomy assures us that there is the same narrowing of the air-tubes and cells by the swelling of the interstitial bloodvessels, whilst the observation of the sputa leads us to conclude that the interior of these tubes and cells is lined with a viscid secretion; this produces the drier and stronger sound of the genuine pneumonic crepitation. This is in principle the same explanation which we advanced some years since in the following passage; "The distended vessels, and the serous effusion in the interstices, press on the minutest bronchial ramifications, and partially obstruct the ingress of air into the cells to which they lead; whilst the viscid secretion of the mucous membrane simultaneously inflamed, filling the caliber of the tubes thus narrowed, only yields to the air in respiration forcing its way through it in successive bubbles. This bubbling passage of air through a viscid liquid contained in an infinity of tubes of equally diminished caliber, causes that regular and equable crepitation which constitutes the true *rhonchus crepitans*."* We were led to doubt the accuracy of the explanation of Andral and Laennec, from the circumstance that the character of the expectoration in pneumonia does not countenance the supposition that there is during life any other secretion into the air-cells than the characteristic viscid secretion of the mucous membrane which

* Dr. Forbes's Translation, p. 52.
† Op. cit. p. 212.

* Rational Exposition, &c. p. 81.

lines them. In a former article we have pointed out the tendency which the natural respiratory movements have to throw all superfluous secretion from the smallest bronchi into the larger, until they are brought under the influence of the act of expectoration. (See EXPECTORATION.) Now if, as those who found their opinions solely on morbid anatomy maintain, there were a serous effusion into the air-cells in the first stage of pneumonia, there ought to be more or less of this serum mixed with the sputa, as in some cases of pulmonary œdema: this is not the case, for the expectoration is a glutinous mucus from the onset of the inflammation, and instead of becoming more serous, increases in viscidity as the inflammation becomes more vehement. Moreover, we venture to follow the example of Laennec in asserting that there is a mucous or liquid rhonchus of the fine bronchial ramifications, the character of which is sufficiently distinct from the rhonchus of pneumonia to merit its separation in kind as well as in degree from the latter sign. This fine mucous rhonchus, which we have observed in pituitary catarrh, and in the general bronchitis accompanying continued fever, occupying the base of the lungs, the common seat of the crepitant rhonchus, is distinguished from this latter in the greater inequality of the bubbles which compose it; they appear to roll through a liquid without breaking with that regularity which distinguishes the crepitation in pneumonia: there are, besides, little hissing or whistling sounds mixed with them, which convey to the mind the impression of a moveable proportion of air and liquid in the tubes. If this mucous rhonchus is to be distinguished from the subcrepitant of pulmonary œdema and apoplexy, it is by the greater irregularity of the minute sounds which constitute it; but we cannot pretend to assert that this distinction is always possible from the nature of the sound, nor can we deny that there are gradations and combinations of the two rhonchi which entirely baffle our power of discrimination. But we do maintain that the crepitant rhonchus of peripneumony is, with few exceptions, sufficiently characterised by its pure equable crepitation, unmixed with hissing or any sounds of liquid, to render it a valuable and available means of distinguishing this disease in its earlier stages.

In conceiving the mechanism of this rhonchus according to the explanation given above, we must take into account the force with which the air passes through the narrowed tubes, and we shall then perceive why the bubbles crepitate drily, and the liquid is not carried before the air passing to and fro, as it would be were its viscidity less and its quantity greater. It has been asserted that the crepitation of peripneumony may be imitated by the bursting of bubbles on the surface of fluids of the tenacity of serum, and hence it is concluded that the crepitant rhonchus depends on the mixture of air with such a fluid in the lungs; but the cases are by no means analogous: in the one, the bubbles rise and burst merely from their own levity; in the other, an active moving force is constantly driving and breaking them through an infinity of minute tubes. On the whole, then, the more we have examined and reflected on the subject, the more we are convinced that the physical cause of the crepitation of peripneumony is the forcible passage of air through narrowed passages lined with a viscid liquid; and if we modify at all the explanation formerly given, it would be that we have not the ground to confine the crepitation to the minute tubes only, but that it probably occurs in the air-cells likewise.

We can readily perceive how the various degrees of this rhonchus become an accurate measure of the progress of the inflammation. Thus, when this is most moderate, the air enters many tubes still without obstruction or crepitation, and the natural sound of respiration is heard together with the crepitant rhonchus; but when the narrowing of the tubes and cells and the viscid secretion lining them, become more universal in the part, no air enters there without this crepitation being produced, and this rhonchus is then heard pure and unmixed. The next change is the gradual diminution of these crepitations, owing to the increased swelling of the coats of the air-cells, or of the interstitial tissues. Anatomical investigation teaches us that at this period there is a deposition of a semi-solid lymph or albumen; this appears to cause such a successive obliteration of the tubes and cells as to entirely obstruct the entry of air into them. Accordingly, as the lung passes from the first stage of inflammation into the hepatized state the crepitations become fewer, are heard only at the acme of inspiration, or during the forcible efforts of coughing, and at length cease altogether.

The physical cause of the bronchial respiration and resonance is more obvious. The deposition of albuminous matter in the parenchyma of the lung has the effect, as we have just seen, of obliterating the spongy structure and converts it into a solid mass. In the healthy state, the different density of its materials (air, membrane, and liquid) prevents the transmission of sounds from the interior to the surface; but now that this density is rendered uniform, it propagates the sound of the air passing to and fro in the larger bronchial ramifications of the interior; and during the exercise of the voice, its resonance also traverses the hepatized substance in a similar manner. It is obvious, therefore, that the extent and intensity of these sounds must greatly depend on the number and size of the bronchial tubes involved in the hepatized portion; hence they are most distinct when the inflammation occupies the summit, root, or central parts of the lung, and extends to the surface; but when the lower, the central, or the superficial portions are alone affected, they may be altogether wanting. When the principal part of a lung is hepatized, including the central portions, which contain many considerable bronchi, a noisy resonance of the voice, almost amounting to pectoriloquy, is heard in the scapular region, in the central parts of the axilla, or about the lower margin of the pectoral muscle, but it may be generally distinguished from imperfect pectoriloquy

its more diffused character, and from that of the perfect kind by the indistinctness of the words uttered. The puffing or fluctuating sound of bronchial respiration and bronchophony, which we have mentioned as sometimes met with, is referred by Laennec to a thin portion of healthy and crepitant lung immediately on the surface and between the hepatized portion; and if this observation is exact, the cause of this irregular puffing seems to be the air entering or leaving this healthy portion, and thereby changing the degrees in which the sound from the interior is transmitted through it.

We have mentioned the supervention of a liquid mucous or gurgling rhonchus as the only physical indication of the occurrence of the third or suppurative stage. This sign is the proof of that softening and deliquescence of parts which mark the process of suppuration in all its forms, but we do not obtain from it any further light on the intimate nature of this termination of inflammation. The more liquid form of the expectoration generally corresponds with the presence of the mucous rhonchus; sometimes, when there is little or no expectoration, the bronchial respiration and brochophony continue in this stage.

The physical signs of abscess and gangrene sufficiently explain themselves; they apply only to the cases where a cavity has been produced by the more or less perfect evacuation of the gangrenous or suppurated parts; and are, first, the coarse bubbling rhonchus, and afterwards, more rarely, the cavernous respiration and resonance, or pectoriloquy, which are described as the signs of tubercular cavities in phthisis. (See Tubercular Phthisis.) In the uncommon case of a large abscess, there may be the metallic tinkling instead of these signs. In the work formerly quoted will be found the only explanation that has been given of this sign, and this explanation has enabled us to generalize with success on the cases of its production, but it has too little connection with our present subject to require an exposition here.* If the abscess or the sloughy portion of the lung has not been evacuated, auscultation teaches us nothing of the presence of either. Fetidity of the breath, especially in coughing, and of the expectoration, is the only physical sign of gangrene of the lungs. This may occur, however, in simple bronchitis, and it is only where auscultation has detected signs of pneumonia that it can be admitted as a proof of the death of a portion of the pulmonary tissue.

We have hitherto considered the general type of the physical signs of pneumonia in its most simple state, and we need say little on the varieties contingent on the situation or extent that the disease occupies. If it be confined to the central part of the lung, the spongy tissue of the surface may prevent the various sounds generated in the inflamed portion from reaching the ear; and this, we apprehend, happens far more frequently to auscultators in general than it did to Laennec, who states that he only met with one case of pneumonia where the stethoscopic signs were wanting; that he could detect a central spot of inflammation, not exceeding the size of a filbert, by the distant deep-seated crepitation, or bronchial respiration, heard beyond the pure murmur of the surface. It requires a very fine ear and considerable experience in auscultation to discover these signs at all in many cases of central pneumonia; and we believe, with Dr. Forbes, who made a similar comment, that it is expecting too much of auscultation to suppose it infallible in detecting every degree of pulmonary disease.

It has always appeared to us, that the more the student in auscultation holds in view the pathological state on which the signs depend, rather than those signs themselves, and habitually reflects on their physical mechanism, as far as it is known, without empirically dwelling on names or bare descriptions of sound, the more surely will he estimate the value of this method of diagnosis, and the more instruction will he receive from it. He will thus see that central peripneumony may be so situated as to yield sometimes no physical symptom, and at others those to be discovered only by a very careful examination; and hence he will see the impropriety of a partial method of diagnosis, and the great importance of attending to the sputa and other indications. When the inflammation is extensive, all these difficulties vanish, and the more intense and puerile respiration in the sound portions of the lung, depending on the more rapid and forcible passage of air in them, further shows the infringement that has been made on the proper function of the organ.

It is not uncommon, especially in partial peripneumony, to observe the signs of the several stages of inflammation co-existent in different parts of the lung. Generally the base or lower lobe, the part most liable to inflammation, presents its greatest degree, being hepatized, and yielding no sound of respiration or resonance on percussion; a little higher are heard the bronchial respiration and resonance, and above that the crepitant rhonchus, which mixes with and gradually gives place to the puerile respiration which occupies the upper parts of the lung. More rarely this order is reversed, the upper parts being the first and most affected. Bronchial respiration is particularly obvious when the hepatization affects the root or middle portions, without extending to the margins of the lobes; and the obvious reason of this is that there is still a passage of air through them to the sound parts.

The resolution or cure of peripneumony is marked by the re-appearance, in a reversed order, of the signs which attended its progress. If the inflammation has reached only the first stage, engorgement, the resolution announces itself by the return of the respiratory sound mixed with the crepitant rhonchus which before prevailed, and this pure vesicular murmur increases, whilst the crepitation diminishes, as the tissue becomes more free to the passage of the air. If the disease has proceeded to hepatization, the same recurrence of symptoms is observed: thus, in a spot where no sound of

* Rational Exposition, &c. p. 136.

the ingress and egress of air had been heard, or perhaps only a bronchial respiration, a slight crepitation begins to be distinguished at the end of each inspiration, apparently produced by the air once more gaining admission through some of the fine bronchial tubes, whose calibers have been partially restored by the re-absorption of matter effused in and around their parietes. This sign, the *rhonchus crepitans redux* of Laennec, increases in intensity as the resolution proceeds; the bronchophony and bronchial respiration are diminished as the lung re-acquires its spongy texture, and becomes a worse conductor of sound: after a while the natural respiratory murmur is heard mixed with the crepitant rhonchus, and as the texture becomes more permeable to the air, this increases as that diminishes, and the healthy state of the lung is thus gradually restored. It must be remarked, however, that this returning rhonchus differs slightly in character from that of incipient pneumonia, in its being less even in its crepitations; and as it increases in intensity, it gives more the sound of bubbles, resembling the mucous rhonchus, with which at this period it often becomes obviously mixed. The nature of the expectoration in retroceding pneumonia explains this difference, for we see in its diminished tenacity and more bronchitic character the reason why the crepitation ceases to be dry; and after a while, when their proper calibers are restored to the tubes and cells, the continuance of this secretion produces a simple mucous or bubbling rhonchus. We commonly, however, hear some crepitation in a part which has been inflamed, for some time after the resolution has apparently taken place; and this seems to indicate an œdematous state of the part, which we know in other instances to succeed to inflammation. If the inflammation has been of long continuance, especially if hepatization has existed for some time, the returning rhonchus is less regularly crepitant in its character; and if there be bronchial respiration present, this, instead of becoming diminished, is sometimes in a measure increased at first by the resolution. This fact, which has been also remarked by Drs. Graves and Stokes,* seems to depend on the increased passage of air attending the re-opening of the hepatized tissue before this has lost its good conducting power. The progressive change which supervenes, however, soon disguises this sound, not only by the tissue again becoming a bad conductor of sounds, but also by the bubbling or mucous rhonchus which generally occurs in a greater or less degree in the tubes which were before the seat of bronchial respiration. This change, compared with the free expectoration which commonly attends the resolution of pneumonia, exhibits a direct evidence of the interesting manner in which nature clears away effused matter from a tissue by free secretion from the adjacent membranes. When the hepatization has continued stationary for many days, the returning crepitant rhonchus is never so regular in its character as in more recent cases; and whilst in some points this rhonchus has appeared and already given place to one of a mucous kind, in others there is only a faint crepitation, indicating a remarkable inequality in the progress of the resolution; some of these we should be disposed to view as cases of lobular pneumonia, in which the inflammation had commenced at several distinct points simultaneously; but in referring to the anatomical characters of the resolution of peripneumony before described, it will be seen that the restoration of the tissue to the healthy state is there seen to be also irregular and unequal, being probably modified by the degree of inflammatory orgasm in the different periods rather than by its absolute duration.

It is less easy to define whether any peculiar sign marks the restoration from the third stage, since we have no certain mark of the supervention of this stage. The coarse mucous rhonchus, which in fatal cases goes on increasing until it becomes tracheal and terminates the existence of the patient, in favourable cases becomes finer and less bubbling, in consequence of the free expectoration of the matter; and as this is secreted and cleared away, the air finds its entrance into the smaller bronchi and vesicles with a mixture of the mucous and crepitant rhonchi; these, in process of time, again yield to the natural vesicular respiration; but as may be expected from the degree to which the disease has attained, this restoration is very slow, and a subcrepitant rhonchus, depending on an œdematous state of the parts, often lingers for weeks after the other signs seem to indicate a removal of the peripneumony. The process of cure, after the formation of abscess, consists in the evacuation of its contents and its subsequent cicatrization. The signs of a cavity, the gurgling or cavernous rhonchus, or respiration, or pectoriloquy, therefore, gradually diminish until they nearly cease altogether; but there is generally left some dulness of the respiratory sound and of the resonance on percussion in the spot, often accompanied with a bronchial resonance, after the signs of cicatrization have appeared to be complete; and this is a natural consequence of the permanent modification which the disorganization has produced in the texture of the part. Laennec states that in several instances of abscess from partial peripneumony, which he observed in 1823, the cicatrization was completed within a period of from fifteen to forty days. In another patient who had pectoriloquy and cavernous rhonchus, over a space of three square inches on the lower part of the right lung, three months elapsed before these signs completely disappeared; and in another case, where a much smaller abscess existed in the top of the left lung, they did not entirely disappear until after six months; long before this, however, both these patients had recovered their flesh and strength, and considered themselves completely cured. In the few instances in which gangrene of the lungs has terminated favourably, similar symptoms have been observed; in fact, after the removal of the gangrenous portion, a cavity is left, which must

* Dublin Hosp. Rep. vol. v.

be cicatrized precisely as that produced by an abscess.

Physical signs of pleuro-pneumonia.—The extension of the inflammation of the lung to the pleura, (an event, as we have seen by the anatomical history, very common in pneumonia,) sometimes adds to the physical signs of the latter disease others of a novel character, which it is of importance to record. They depend exclusively on the presence of a liquid effusion, for as far as we have observed, we have been unable to recognize the affection of the pleura by physical signs, unless where this effusion has taken place. Some recent writers have indeed asserted that a creaking sound of friction is produced when the pleuræ are coated with freshly effused lymph, but this statement we have been unable to verify. The liquid effusion of a pleuro-pneumonia may declare its presence by producing of itself new physical signs, and by modifying those of the inflammation of the lung. Where the pleuritic effusion is not extensive, which is the common case, there may be so little liquid effusion that its presence can scarcely be detected, or it is discovered only by the greater deficiency of sound on percussion in the most dependent parts of the thorax, which parts regain a portion of their natural resonance when a change of posture raises them higher in relative position. Together with such a degree of effusion all the ordinary signs of pneumonia may present themselves without perceptible modification. But if the liquid effusion be greater, and sufficient to cover a considerable portion of the lung, it will disguise these signs, by rendering the crepitant rhonchus less distinct, while the sound on percussion is quite dull wherever the liquid reaches. If the pneumonia have attained the state of hepatization with bronchophony, and the point presenting this phenomenon be covered with liquid, the tone of the local resonance will become changed,—it will assume a cracked or bleating character, or rather a sound of this description will accompany the bronchophonic resonance. This combination of ægophony and bronchophony Laennec compared to the squeaking voice of punchinello; but besides the buzzing and squeaking combination of noises which this comparison represents, there is a tremulous or vibratory character in this morbid sound which seems alternately to approach and recede from the ear in sudden jerks. We have heard the voice otherwise modified by this combination of disease, as if it came through little cracked brazen trumpets; but, as far as we have observed, it is the undulatory or tremulous character which most constantly depends on the presence of the liquid, and is therefore the surest indication of the existence of a pleurisy. The most common seat of this phenomenon is the same as that of bronchophony, in the interscapular regions, but it may extend, especially when the effusion is abundant, through the whole of the ægophonic region, that is, in a band about three inches broad running from below the inferior margins of the scapula, in the direction of the ribs, to the sternum. It is most purely ægophonic in the anterior regions, there being commonly a noisy bronchophony behind. (See Pleurisy.) We have yet supposed the effusion only extensive enough to push aside slightly the lung from its apposition to the walls of the chest, and the sounds of pulmonary respiration are still heard pretty distinctly, modified by the inflammation, in the first stage into the crepitant rhonchus, and afterwards into the bronchial respiration and resonance; but there are some cases which we have described anatomically, and in which a copious pleuritic effusion has suddenly increased during a pneumonia, and has compressed and pushed aside the lung in such a manner that the sound of respiration can only be heard in the form of a crepitant rhonchus towards the root of the lungs, that is, in the scapulary, axillary, and infra-clavicular regions. This is the form of disease which produces the state before described anatomically under the name of *carnification*, and the pneumonia may in most of these cases rather be considered as secondary in existence as well as importance, and it is sometimes confined to a few lobules; but Dr. Stack inclines to the opinion that even in these instances the pneumonia is primary.* The pathological as well as the anatomical characters of pleuro-pneumonia lead to the belief that where one inflammation has greatly the predominance, the other is of trifling import, and that where both exist to a considerable extent, the complication, instead of presenting a more aggravated case, rather mitigates the severity of both diseases, and this from a cause purely mechanical. The pressure exerted by the pleuritic effusion moderates the inflammatory action of the lung; and again, the lung, in some degree consolidated by the inflammatory process, and not yielding to the encroaching effusion, sets limits to its accumulation. If, however, the intensity of a pneumonia is diminished by a coexistent pleurisy, its duration is probably prolonged; for the process of resolution is always much slower in this than in the simple case. This is because the interstitial effusion is more solid, and less mixed with the serous exhalation produced by common inflammation, and which cannot but assist in the discussion of the denser products. On the other hand, a pleurisy coinciding with a pneumonia will be of easier and speedier cure, inasmuch as the effusion is less abundant. The dry state of the carnified lung, taken together with the still constant production of the crepitant rhonchus in the course of the inflammation thus modified, affords an additional proof that this sign owes its existence to interstitial pressure *on*, rather than to any liquid effusion *within*, the air-cells.

Pathology of the general symptoms of pneumonia.—Having made ourselves acquainted with the essential pathology of this disease, we may with advantage review the general symptoms in relation to it; we shall thus complete

* Dublin Hosp. Reports, vol. iv.

the circle of its history, and appreciate only the value and importance of the various signs and symptoms.

In idiopathic pneumonia, arising directly from the application of an exciting cause, the inflammation commences before the febrile process begins; hence, during the period of general uneasiness, langnor, or depression, which are sometimes felt before an attack of pneumonia, the auscultator will generally discover a crepitant rhonchus in some part of the chest; sometimes there is a sense of fulness, soreness, or oppression about this part, or a stitch in the side; but these are often wanting until the supervention of fever, which first disguises, then developes the various general symptoms. At this time the pulse is commonly small, occasionally not altered in frequency, but generally accelerated. This is the latent stage of the inflammation, in which we cannot but point out its resemblance to the first effects of various mechanical injuries on a part of the body, which we have already shewn to be produced according to a general law in the system. (See Irritation.) A cause has here been applied which has destroyed the balance of the circulation, and so affected the vessels of the lungs that their tonic power has suffered, and they become the seat of a congestive load of blood. This is the local injury, and first exerts its noxious or depressing influence on the system precisely as a crushed limb or a severe contusion would do, the local symptoms being more apparent in these latter instances because the animal sensibility of these parts is greater than that of the lungs. Hence the first symptoms of this, as well as of other inflammations, may be those of prostration or irregular reaction; and accordingly we find syncope, pallidity of the surface, vomiting, hiccup, &c., occasionally to precede the febrile stage of pneumonia. Rigor is, however, the more common symptom of commencing reaction, and it is the harbinger of that series of vascular movements which constitute the general and local character of phlegmasial pyrexia. After the rigor, which is accompanied by its usual smallness and frequency of the pulse, contracted coldness of the surface, and general depression of the powers, soon succeeds an increased action of the heart and arteries, indicated by a pulse of greater force and fulness, with more or less of the hard and sharp character of sthenic irritation; the surface becomes flushed and hot; and all the internal organs, the mucous surfaces, and secreting glands suffer from the febrile reaction in the interruption or perversion of their various offices. Under this influence the tendency of particular constitutions, or the morbid disposition of individual organs, is discovered. In some the gastro-enteric mucous membrane especially feels the effects of this vascular excitement, and we have great thirst, scanty and high-coloured urine, tenderness of the epigastrium, irritability of the stomach, with a reddened tongue and fauces, and the various sympathetic signs of gastric fever. In another the fever assumes more of the bilious character, with bilious vomiting, turbid, saffron-coloured, and ammoniacal urine, and occasionally a jaundiced tinge of the skin. It is a rarer case for the head to suffer, but cases are not wanting in which great intolerance of light and sound, with delirium, have accompanied the symptomatic fever of pneumonia. In others, especially those of a plethoric habit, the fever is congestive; and besides the accumulation of blood in the focus of inflammation, there are other local determinations caused by the general vascular excitement; hence the head, the liver, the stomach, and the bowels may suffer, at once or singly, from the irritation extending its influence to a whole system of loaded vessels. It is during the development of this general reaction, which may thus vary in kind as well as in degree in different subjects, that the local symptoms declare themselves in the most prominent manner. Thus the same point of inflammatory congestion, with its crepitant rhonchus, which was perhaps the only local indication of disease, now increased and developed by reaction into active inflammation, becomes the cause of cough, pain, and dyspnœa in the various degrees that accompany the increasing period of pneumonia. It is not easy to define the cause of the variety in these symptoms which different cases exhibit;—why some patients should suffer scarcely any cough, while others are greatly harassed by it; why the breathing may in some be accelerated to a great degree without the patient being sensible of it, while others complain much of oppression when there is but a moderate encroachment on the function; and why some suffer acute and distressing pain, while others are scarcely conscious of any uneasiness. In a general way we must refer these differences to the state of the nervous system, the sensibility of which in these varying instances is sometimes exalted and sometimes depressed, either by individual peculiarity, or by some complication which the accompanying fever may produce. Thus, when there is a congested state of the vessels of the brain, sensibility is blunted, and the patient approaches the verge of suffocation without complaining of either dyspnœa or pain. When, on the other hand, the inflammation is more concentrated within the chest, leaving comparatively free the sensorial functions, the exalted sensibility depending on inflammation is more easily felt, and this more especially when a part liable to tension, as the pleura, is involved in the disease. The urgency of the cough may also in a measure depend on the degree in which the bronchial lining membrane is inflamed; for if it is not affected, its sensibility will probably, through derivation, become lower than usual. Cough is occasioned by affections of the larger order of bronchial ramifications more powerfully than by those of the vesicular structure; and there is often, therefore, little of this symptom until the inflammation is extended to the lining of these tubes. From the absence also of the bronchial inflammation, there is often no expectoration at this early period; and cases occasionally present themselves in which it does not occur throughout

the disease. The pathology of the secretion of the bronchial membrane, those viscid rusty sputa that so signally characterise peripneumony, is interesting. As in simple acute bronchitis this secretion becomes more tenacious in proportion to the intensity of the inflammation, so in this secondary bronchitis, when the vascular action of the membrane is augmented to its greatest degree, being as it were backed by the inflammation of the adjoining important and extensive vascular plexus, the secretion acquires still greater viscidity, and, in addition to this, becomes tinged by colouring matter from the mass of surrounding blood. When it is considered that this secretion proceeds from the immediate vicinity of the diseased part, it would appear that it must tend to relieve the inflamed vessels, and the inflammation, when very slight, may be terminated through this relief; but in the greater number of instances the relief thus afforded is too trifling to arrest the inflammation, and the viscid secretion, by still further obstructing the tubes and aggravating the dyspnœa, augments the danger of the disease, and this it does the more in proportion as its tenacity is greater.

The obstruction which the inflammation thus causes to the functions of pulmonary circulation and oxygenation of the blood now reacts in a new way on the circulating powers; the pulse, which at the commencement of the pyrexia had shown the heart to be vigorously contributing to the reaction, now falls in strength and hardness, whilst it commonly increases in frequency; and the stethoscope often discovers that there is a spasmodic briskness in the heart's contraction which seems to struggle vainly against the obstacle. Frequently this irritable contraction of the heart amounts to palpitation; and when we consider how its compartments must suffer from the injured balance of the circulation, this irregular action is readily explained. Owing to the obstruction in the lungs, the right side of the heart is unduly charged with blood, and subjected to the stimulus of over-distention; while the same obstruction prevents the left side from receiving its proper supply, and that blood which it does receive is but imperfectly arterialized. This pathological view, which is nothing more than a statement of observed phenomena, explains equally the violence and intensity of the inflammation in the pulmonary vessels, which are under the immediate influence of an over-stimulated right ventricle, and the weakness and failure of the general circulation, which depends for its support on the left ventricle. The depression thus occasioned by the failure of the general circulation, and by the imperfect oxygenation of the blood, is sometimes so great as to resemble typhous fever, whence such forms of the disease have obtained the name of *pneumonia typhodes*. Dr. Mackintosh has stated his opinion, in which we partly concur, that these varieties depend on the extent of the inflammation and obstruction to the pulmonary function, or on a complication with local congestions, and not on any thing specific in the pneumonia itself. The same writer thus expresses himself: "There is undoubtedly such a form of pneumonia, but I object to the adjunct *typhodes*, as expressing erroneous ideas of the pathological condition of the body. This form of pneumonia was very prevalent during the war, among troops stationed in exposed situations along the coast, and in large garrisons where the duty was severe. The soldiers were often seized with it when exposed at night as sentinels; instead of walking about they frequently stand shivering in their sentry boxes, the surface continues long chilled, and, with a view to fortify themselves and to produce warmth, they are in the habit of drinking ardent spirits in considerable quantity. In the strongest subjects I have seen the disease under such circumstances run its course to a fatal termination in from forty-eight to sixty hours."* This sketch is well worthy of notice, as it illustrates the powerful effect in aggravating the disease, of two causes already noticed, long-continued cold and intoxicating liquors.

There is another complication of pneumonia which is very apt to give it an uncommonly depressed or typhoid type; this is, with severe bronchial affections, whether of the acute inflammatory character or of the asthenic kind, which goes under the name of peripneumonia notha. We have elsewhere described the peculiar prostration accompanying advanced states of these diseases, and have there referred this feature to the circulation of an imperfectly arterialized blood in the system, (see Bronchitis); and we can readily conceive how serious such a complication must be in pneumonia. In persons advanced in life, and in frames debilitated by excesses or by a cachectic habit, the pneumonic inflammation is often accompanied by an early sinking of the powers; such individuals, after a few hours only of pain, cough, or acute symptoms, become lethargic or insensible, with a weak intermitting thready pulse, pallid skin, partial sweats, cold extremities, and, after lying in that state for some days, sink often without any of the prominent general symptoms of diseases of the lungs. This is a latent form of pneumonia which is far from uncommon; and although after death a large portion of the lung may be found in the second or third stages, none but a very attentive examination could have detected from the general symptoms the real situation of the fatal disease. Auscultation would have indeed furnished a much readier means of discovering such an extensive organic lesion; but we have known cases to have deceived practitioners, competent and versed in the use of this method of exploration, from the circumstance that their attention had not been drawn to the thoracic viscera, all prominent symptoms having ceased before they had an opportunity of seeing the patient. In these and other latent forms of peripneumony, to which we shall presently revert, although no obvious dyspnœa be present, the frequency of the respirations may be detected on a close inspection, and the hand placed on

* Elements of Pathology, &c. 2d edit. vol. i. p. 420.

the chest will often perceive the vibration of a liquid gurgling in the bronchi; these circumstances may lead to a suspicion of the existence of the disease, but it can be recognised with certainty only by auscultation and percussion: it is unnecessary here to detail this class of signs, as their distinctive characters will again come before us under the head of *diagnosis*.

In its simpler forms, when the disease is extensive and has reached the second and third stages, the whole symptoms commonly show an abatement of the pain, fever, and other indications of exalted organic and animal sensibility, whilst there is an increasing injury and embarrassment of the function of the affected organ. The orgasm of the inflammation has in a measure expended itself in the effusion, and the general pyrexia sinks under the depressing influences of an injured function, with which the whole frame sympathises. This change in the character of the symptoms is of the highest practical importance, as it is a signal to modify the treatment in a material degree. The discontinuance of the more intense degree of inflammatory action is moreover evinced by the expectoration, which, losing its extreme viscidity and sanguinolent tinge, now bears more the character of a serous exhalation, or of a disordered mucous profluvium. The purulent and albuminous matter and bloody streaks that are sometimes seen in the advanced stages of pneumonia, are rather to be ascribed to the accompanying bronchitis than to the breaking down of the tissue of the lung: when the latter does happen, in the much rarer case of abscess or gangrene, the expectoration is commonly very copious, that from an abscess being distinctly puriform, whilst that from gangrene contains pus, or mucus with a dirty brownish or greenish sanies, occasionally with portions of sloughy tissue, all characterised by an intolerable putrid fetor. The suppression of the expectoration which commonly occurs in fatal cases arises usually from the failure of the respiratory forces to effect its expulsion, and not from a cessation of the secretion. Hence by auscultation we hear a mucous or bubbling rhonchus, which goes on increasing and extending to the larger bronchial tubes, until it becomes tracheal, when it is audible to the bystanders, and constitutes the *death-rattle*, long known as a harbinger of death. Expectoration, as we have elsewhere shown, (see Expectoration,) so far depends on a free exercise of the organs of respiration, that unless air is carried beyond the accumulated matter, the expulsion of this matter can scarcely be effected. The short gasping breath drawn when a large portion of the pulmonary tissue is hepatised cannot accomplish this: the cough, when present, can scarcely reach the obstructing matter, and not unfrequently the sympathetic sensibilities and muscular powers on which this forcible respiratory act depends, are so much reduced that it ceases altogether.

In reviewing the symptoms of a favourable termination of pneumonia, the first class of phenomena which claim our attention are the critical evacuations. These, together with the preference which they shew for particular days, are among the obscure laws which govern the human frame, and which must be the subject of far more extended observation before we can hope to explain them by reference to any of the simpler vital or physical influences. When Broussais ascribes critical evacuations to a predominance of a secondary irritation in a secreting organ over the primary, he only substitutes a new and unsatisfactory form of words for a simple declaration of the fact; for the salutary effect of the evacuation is much more explicable than the cause which determines its presence and its kind. Besides, the word irritation seems not a very appropriate one to apply to the influence which changes the skin from hot, harsh, and dry, to soft and perspiring, the urine from scanty, high coloured, and scalding, to copious and less acrid, and the expectoration from very viscid and sanguinolent to an abundant, simple, and more liquid mucus. For the present we would prefer viewing critical evacuations rather as signs than as causes of improvement; for although in a free expectoration or a hemorrhage we can at once perceive a rational mode of relief, yet the cases of perspiration, diarrhœa, or a lateritious deposit in the urine, may with equal reason be viewed as a *consequence* of the diminution of the disease, which restores to the skin, the bowels, or the kidneys, such functional powers as enable them to carry off from the system matters accumulated during a period when the powers were more or less paralyzed or perverted by the general febrile derangement; and the fact that such evacuations do sometimes take place without proving critical is another reason for leaning to this view. The subject involves more conjecture than would be consistent with the design of a practical work, and we therefore abstain from entertaining it further than to remark, that no close observer of nature can refrain from the conclusion that, in one way or another, primarily or secondarily, a disordered state of the fluids forms an important link in all extensive febrile and inflammatory diseases.

The tendency to evening exacerbation in this and in other diseases is another phenomenon more observed than explained. We remember to have heard M. Andral cite in his lectures the personal experiments of a physician, which illustrated forcibly the effect of periodic habit on the body: for several nights in succession during the winter, at a particular hour, he plunged into a river, returning immediately to his bed. On intermitting the practice on certain days, a shivering fit came on at the customary plunging hour, and was followed by the usual re-action, as if the plunge had not been omitted. Perhaps the evening exacerbations of this and other inflammatory and febrile diseases may be partly referred to the same law of habit, of which this is merely a prominent illustration. The addition of nutrient matter to the blood, together with the accumulated excitements of the day, produce a tendency to a febrile movement in the evening, and these causes are so regularly applied that their effect

becomes a habit, and persists even when they are removed. With a few, the morning is the time of exacerbation, and with such persons this may be determined by a slight habitual disturbance, which is common at that period in dyspeptic individuals.

The rapid general improvement which commonly attends the progress of recoveries from pneumonia indicates rather the restoration of the healthy balance of functions than the entire removal of all local disease; for some dyspnœa and quickness of pulse often remain up to an advanced period of convalescence, and by means of auscultation we discover a cause in the still diseased state of portions of the pulmonary tissue. A bronchial respiration, a resonance of the voice, or a crepitant rhonchus, with some dulness on percussion, remains as a proof that the effects of inflammation are still present, and, amidst other signs of apparent recovery, these require time and care to secure their restoration. Sometimes, as we have seen anatomically, points of hepatization remain for a considerable time, and may become a focus for the rekindling of the acute disease by any error of diet or regimen; or, if left unsubdued, the inflammation may continue there in a chronic form. It is a commoner case that a crepitating or rather subcrepitant rhonchus persists; this, if there is no lingering fever or considerable cough, and if the expectoration has lost its red or yellow tinge and viscidity, is to be considered as the effect of œdema rather than of inflammation of the tissue, and is removed most effectually by a mild tonic combined with expectorants and diuretics.

Pathological varieties and complications of pneumonia.—We have already noticed the complication of pneumonia with bronchitis, and the effect that it commonly has of increasing the depression attendant on the disease, and thereby disguising its inflammatory nature. Drs. Graves and Stokes* have judiciously remarked that in the treatment of this combination the first remedies and a single bleeding produce such relief to the bronchitis, that a practitioner may be led to suppose that the whole disease is overcome; whereas auscultation discovers, by a remaining crepitant rhonchus, that the most formidable affection still remains to be subdued. There are, however, a few instances in which this combination puzzles even the auscultator. The pneumonic crepitation is sometimes so masked by a loud and general mucous rhonchus that even an attentive examination may fail to detect it: this happens especially when the pneumonia is central and towards the root of the lungs, and does not extend to the surface. Laennec indeed asserts that a deep-seated crepitant rhonchus can always be distinguished, by those practised in the stethoscope, from any mixture of sounds produced nearer to the surface; but we now think that to insist, as we once did, on the possibility of this distinction, would be to reckon too much on the infallibility of auscultation. The presence of a rusty tinge in portions of the expectoration will more frequently declare a latent peripneumony; and in the progress of the disease the extension of the inflammation to the surface will make it more easy of recognition. Pneumonia may arise in the course of either acute or chronic bronchitis, and such an event is of great importance in both cases. Acute bronchitis is most liable to pass into peripneumony in young subjects; and the habitual chronic catarrh of old people sometimes takes a similar course. Andral remarks that this accident is not an unfrequent cause of the kindling up of fever and increase of dyspnœa in aged asthmatic subjects; and these symptoms may erroneously be ascribed to an aggravation of the habitual senile disease; this increases the danger of the complication, and for causes that we have just explained, the diagnosis must often rest on uncertain general symptoms.

There are two modifications of bronchial inflammation which occasionally exhibit a strong tendency to pass into pneumonia, pertussis and the influenza or epidemic catarrh. The violent fits of coughing frequently co-existing in these complaints with considerable fever, appear to us to have a great share in extending the inflammation to the great pulmonary plexus of vessels. These paroxysms of cough determine a great degree of congestion in the lung, and we have already seen how easily such a congestion may become inflammation. Of such a termination of hooping-cough we have witnessed numerous instances, proved in some by anatomical inspection, and in many by the addition of a crepitant rhonchus to the physical signs of pertussis. In many of the latter cases the fever had been so gradually increased, and the general peripneumonic symptoms had been so mixed up with those of the aggravated pertussis, that but for auscultation the more serious disease might have escaped detection. This complication is most common in very young and delicate children, and during winter and spring, the usual peripneumonic season. Of the supervention of pneumonia on influenza we have seen several instances during the epidemic that has lately prevailed to so great an extent, and from the effects of which the country is still suffering (May, 1833). It was at the time of its greatest prevalence, when the weather was cold and changeable, that the disease in occasional examples put on this decidedly inflammatory type. In two instances we resorted to free bloodletting with immediate relief; and it is worthy of remark, that the patients suffered less from weakness than many others where no depletory measures were adopted.

We have before described the combination of pleurisy with pneumonia. Next to bronchitis, it may be said to be the most natural concomitant of the parenchymatous inflammation, for its contiguity exposes it to be involved in an extension of the disease. As we have said before, it may considerably modify its course, but instead of, as bronchitis, disguising the seat of the complaint, it often declares it more openly by adding the prominent symptoms of pain or stitch in the side, and a catch

* Dublin Hosp. Rep. vol. v.

in the breathing. These obvious symptoms are not, however, the constant concomitants of pleuro-pneumonia; and cases sometimes present themselves in which this and every other variety of the disease require the fullest investigation of both physical and general signs to ascertain their nature with precision. As far as we have observed, a pleurisy supervening on pneumonia aggravates the case most when it is attended with a sharp pain and catch in the breathing; for it then keeps the patient in a distressing struggle between pain and suffocation, and unless the pain yield soon, it may in this way prove fatal. Generally it soon subsides, the active orgasm being derived to the pulmonary tissue, which on account of its greater vascularity is more obnoxious than the pleura to the inflammation. For this reason it is not common for the pleurisy to gain on the pneumonia, and it is usually limited to the points where the latter reaches the surface.

Peripneumony frequently attacks phthisical subjects in both the early and the advanced stages of tubercular disease. Miliary tubercles in the lungs may be viewed as causes both predisposing and exciting; they render persons more liable to inflammation on exposure to cold or any other exciting cause; and during a febrile state of the system, their presence and mechanical irritation may localise in this organ a general inflammatory diathesis. In several instances of subjects who have died of continued fever with pneumonia, we have seen numerous tubercles in the inflamed lung, and similar cases are recorded by Andral and others. The liability of phthisical subjects to intercurrent peripneumony has been noticed by Laennec, Louis, and Andral. It is not generally severe, and is often spontaneously cured; which illustrates a remark which we have before made, that pneumonia excited by a local cause is never so severe as that which arises from an extensive impression on the circulation. Nevertheless, the similarity of its symptoms to those of the phthisical disease often screens it from notice, with the effect that its treatment is neglected, and if it does not at present endanger life, it accelerates the progress of the other fatal disorder. Hence, as Laennec recommends, it is important to examine from time to time the chests of consumptive patients, particularly when there is any sudden feverish attack or decrease of the strength. Andral asserts that intercurrent peripneumony, from being overlooked, frequently occasions the death of phthisical subjects.

We have had occasion to speak of the occurrence of pneumonia in the course of various febrile disorders, and it is the more important, as the inflammation here commonly takes a latent form. This is especially the case in severe small-pox and erysipelas, and in fevers of the congestive kind. In a considerable proportion of the fatal cases of these diseases, this inflammation seems to be the cause of death. During the prevalence of a peripneumonic epidemic, and in the winter season, Laennec remarks that in patients suffering under these disorders, any marked increase of fever in the young and robust, and any sudden prostration of strength and loss of consciousness in the aged and debilitated, are generally the result of a pneumonia supervening, and it is frequently accompanied with neither dyspnœa, cough, expectoration, nor any of its usual symptoms. The frequent occurrence of a latent pneumonia in continued fever is a fact too well known to morbid anatomists; it has already been noticed in the article FEVER CONTINUED. A harsh state of the skin, fetid excretions, and sordes on the teeth and tongue coming on in subjects worn out by cancer or other severe chronic diseases, according to Laennec, frequently indicate pneumonia, which soon ends with coma, tracheal rattle, and death. The bronchial affection of measles sometimes passes into pneumonia, especially if the eruption is repressed or disappears suddenly; but in this case the symptoms are commonly urgent, and sufficiently characteristic. Endemic fevers sometimes determine an inflammation of the lungs, which is frequently latent. Broussais records this of the intermittent fevers which attacked the military in the hospitals of Bruges.* The same has been remarked of malaria fevers of other kinds, and of the pestilential cholera. The latter disease sometimes shows a remarkable tendency to pneumonia in the stage of re-action, and this event seems to be favoured by the great congestion which occurs in the pulmonary vessels during the period of collapse. The re-action of intermittent febrile diseases has been sometimes observed to be so regularly accompanied by pneumonic symptoms that some authors have given the name of intermittent peripneumony to these affections. Thus Broussais has noticed the quotidian returns of inflammation both of the lungs and of the pleura at the time of the febrile paroxysm. But it must be remarked that in these cases either the pulmonary affection must have been exceedingly slight, or it must have continued during the apyrectic period, and merely have been more fully developed by the excitement of the paroxysm.

Pneumonia is sometimes produced in gouty and rheumatic subjects, and this may occur either vicariously, so that the limbs are relieved, or conjointly with the affections of these. In the first case, the pulmonary affection is generally apparent; in the latter, it is sometimes latent. P. Frank has remarked that in rheumatic subjects pneumonia sometimes terminates without any expectoration, with a copious discharge of clear urine, amounting to twelve pounds and upwards. This curious fact is another sign of the connexion which subsists between rheumatic and gouty affections, and a diseased state of the fluids of the body.

Hypertrophy of the heart modifies the pulse in pneumonia in a manner that deserves notice. Instead of falling in strength as it generally does, and becoming small and frequent, from the causes that we have before explained, the pulse in some degree retains the hard vibrating character peculiar to hypertrophy. This is the

* Hist. des Phlegmasies Chron. t. 1.

case, however, only when the left ventricle is affected. Hypertrophy of the right ventricle predisposes to pneumonia, and generally aggravates its form. In pneumonia complicated with any disease of the heart, the pulse becomes more fallacious than ever; and neither its frequency nor its strength bears any relation to the extent of the inflammation.

Inflammation of the mucous membrane of the stomach and bowels is by no means an uncommon accompaniment of pneumonia. It generally gives a more adynamic type to the disease, and manifests itself by the peculiar state of the tongue, which is at first very red, and afterwards parched and brown, with great thirst, vitiated excretions, and frequently tenderness at the epigastrium. Various other diseases may combine themselves with pneumonia, and although they may manifest themselves by their peculiar groups of symptoms, yet the complication generally increases the obscurity of the case, and the difficulty of its treatment.

Several surgical writers have noticed the occurrence of pneumonia after amputation and other great surgical operations, and likewise after extensive wounds; and it has been supposed that this disease is frequently the cause of death in these cases. This is a very interesting subject, and one that requires further investigation. The disease of the lungs in these instances appears to be quite of the latent kind, and sometimes it only declares itself by the dyspnœa and rattle a short time before death. We cannot speak from personal observation on this subject; but from the description given, it would seem that these cases of pneumonia may be ranged in two classes; those which partake of the character of the pneumonia of the moribund, which has been often alluded to in this article, and which seems to be a concomitant rather than a cause of the changes of death; and those which supervene during a febrile reaction, and are disguised by other local and general symptoms. The latter class occurs most commonly in the subjects of amputation, or where a great change has been wrought in some part of the circulation, leaving the heart vigorous and disposed to sthenic re-action. The former comprises cases of bad wounds or unfavourable operations, where the powers fail under the local injury, and as a part of this failure, a congestion takes place in the lungs, which is, by a partial re-action, converted into inflammation.

It will be perceived that, in describing these various complications, we have comprehended nearly all the varieties of pneumonia which have been described by authors; and we apprehend that the pathological views of these varieties with which modern researches have so fully furnished us, so clearly expose the real nature of the greater number, that it is unnecessary to consider them further in a separate form. The false or bastard peripneumony, *peripneumonia notha* of Sydenham, does not require notice here, for it has been already described under its proper head, Bronchitis. The bilious peripneumonies described by Stoll and other writers of his time, do not appear to constitute a real pathological variety of the disease; for they were either cases of bronchitis in which the sputa were tinged with bile from a simultaneous affection of the liver; or, what is more probable, they were ordinary cases of pneumonia attended with the characteristic expectoration, which is often yellow or greenish, from the admixture of various proportions of the colouring matter of the blood, and which these writers hypothetically ascribed to an intermixture of bile. Laennec says that he has frequently met with these greenish sputa where there existed no bilious complication: he admits that he has sometimes seen them disappear after bilious evacuations; but this circumstance can be viewed in no other light than that these evacuations were critical, and coincided with a resolution of the inflammation.

Diagnosis of pneumonia.—We have devoted so much space to the consideration of the signs of this disease, that we have now only to recal the most characteristic, and compare with them the distinctive signs of a few other maladies with which they may be confounded.

The manner of attack, the dyspnœa, the pulse, the pain, the cough, and the side of the decubitus, although in the manner in which we have described them, they contribute to form the general character of the disease, yet are quite incompetent to distinguish it with certainty from other acute inflammations of the chest, particularly bronchitis and pleurisy. Still these symptoms are not to be disregarded, for taken in conjunction with the physical signs, they often assist us much in the diagnosis. Of all the diagnostic signs of pneumonia, the characteristic form of the expectoration is the most infallible; and when it does occur, there can be no doubt of the existence of parenchymatous inflammation; but it is sometimes entirely absent; frequently it does not appear until after the disease has existed for two or three days, and it generally ceases as the inflammation reaches the second and third stages. It may moreover pass by such insensible gradations into the colourless form of bronchitic sputa, that it is not always easy to determine whether it partakes of the pneumonic character or not. The crepitant rhonchus, when it occurs distinctly or unmixed, and in conjunction with the general signs of pneumonia, may be considered as quite pathognomonic; and as its presence is much more constant than that of the expectoration, it may be considered as the more available diagnostic sign. Laennec considered it the most important of all physical signs, "inasmuch as it is invariably present, and from the very invasion of the disease; and exists in no other case, except in œdema of the lungs and pulmonary apoplexy, two diseases which are easily distinguished from this by their own peculiar signs and symptoms. M. Andral is mistaken in saying that the crepitous rattle sometimes exists in acute bronchitis, (Clin. Méd. tom. 2. p. 333.) and I think this is evident from his own cases. From its constant presence in this disease, I regard it as the most practically useful of all the stethoscopic signs, inasmuch as it points out, in

its very earliest stage, one of the most severe and most common diseases, and thereby enables the physician to apply his means with much more chance of success than he could have done even a few hours later."* M. Piorry has lately questioned the pathognomonic relation of the crepitant rhonchus to pneumonia, not from observation of disease, but from the circumstance that a crepitation like it may be produced on applying the stethoscope to a lung out of the body.† Such an hypothetical objection cannot, however, be entertained, in opposition to the mass of evidence in corroboration of Laennec's opinion, and we have already explained how the artificial crepitation in question is produced. (See page 419.)

The preceding characters will be quite sufficient to distinguish recent pneumonia from pleurisy. In the latter the sound of respiration is unaccompanied with a rhonchus, and is only rendered weaker, first by the pain restraining the respiratory movements, and afterwards by the liquid effusion pushing aside the lung. There is sometimes dulness on percussion in the early stages of both diseases; but in pneumonia this dulness will be found to be fixed in the spot where the crepitant rhonchus is heard; in pleurisy, on the other hand, it generally occupies the most dependent part, and changes with a change of posture. This last criterion, which is very easily applied, is sufficient to discover moderate pleuritic effusions in every case except in that of the effusion being limited by adhesions of the lung to the ribs. The ægophonic resonance of the voice, when perfect, is another sign equally distinctive of pleurisy; but as for its production there must be only a certain thickness of the layer of fluid, its presence is often of short duration, and it may thus escape detection. The diagnosis between these diseases is much more difficult in their advanced stages, particularly when they are extensive. Thus it may happen that we are called to see a patient who has been ill for a considerable number of days, and who has had more or fewer of the equivocal general symptoms which are applicable to either pleurisy or pneumonia; by auscultation we find no sound of respiration in one side of the chest, which is also quite dull on percussion. The question then presents itself—is the case one of pneumonia, with the whole lung in a state of hepatization, or is it a case of pleurisy, acute or chronic, with a very extensive effusion? These difficulties have been sagaciously pointed out by Dr. Stack,‡ and we admit them to be sufficient to mislead any but a very careful observer. But an attentive consideration of the previous history, and a minute examination of the physical and some general signs, will, we believe, always furnish us with a correct diagnosis. We have in two instances been mistaken, but we refer our error rather to the insufficiency of our examination than to an absence of diagnostic signs; and these cases, which occurred in dispensary practice, presented a rare combination of deceptive circumstances. The most obvious distinction between a hepatized lung and copious pleuritic effusion is the constant occurrence, in the former case, of a loud and almost pectoriloquous bronchophony under the scapula, along the spine, and below the clavicle, and the general absence of this sign in the latter. This test would have been sufficient to distinguish the case cited by Dr. Stack as one of peculiar difficulty; the absence of this resonance clearly proving it to be pleurisy and not pneumonia. The *presence* of this bronchophony is not, however, an equally sure proof that the lung is hepatized. In one of the instances before alluded to, with a perfect deadness of sound on percussion over the whole of the right side of the chest, a bronchophony and bronchial respiration were heard between the scapula and spine and below the clavicle on this side, from which we too hastily concluded the disease to be pneumonia; on dissection it proved to be pleurisy, the right thorax being full of serum and lined with a dense false membrane; the lung was compressed by the effusion into a mass which adhered by solid pillars to the upper part of the cavity under the clavicle, and to the posterior part exactly in the points where the bronchophony had been heard. These adhesions were obviously the cause of the sign which misled us; and as the possibility of their occurrence in other cases must detract from the certainty of its indications, we must seek for further means of distinction. In copious pleuritic effusion there are commonly several signs of displacement, which are absent in hepatization of the lung. Thus the affected side is commonly enlarged, as can be ascertained both by inspection and measurement. By viewing or feeling both sides of the chest at the same time, if there is no obvious enlargement, it may be perceived that the affected side does not partake, equally with the sound side, of the respiratory movements; it remains stationary in a fixed state of distention, and this in a more remarkable degree than occurs with a hepatized lung. The intercostal spaces are also more prominent on the affected side, which gives it a more rounded appearance; this character readily distinguishes pleuritic effusion from hepatization in thin subjects, but it fails where the integuments are fat or œdematous. Dr. Stokes has pointed out some other means of distinction, founded on the same circumstance of displacement, which occurs exclusively in pleurisy.* If the disease occupy the left side, a copious pleuritic effusion will generally displace the heart, which will be heard and felt pulsating, not in its usual place, but to the right of the sternum; in pneumonia the pulsations are not displaced, but they are uncommonly audible throughout the affected side. If the disease be on the right side, an effusion will push down the liver, and make it perceptible below the false ribs; it will also press aside the sternal medias-

* Dr. Forbes's Transl. p. 213.
† Gazette des Hôpitaux, t. 6. No. 116.
‡ Dublin Hosp. Rep. vol. iv.

* Dublin Med. Journal, March 1833.

imum, so that the whole sternum would sound dull on percussion; in hepatization of the whole right lung there is neither displacement of the liver nor of the mediastinum; and as the resonance of the sternum on percussion depends on portions of both lungs beneath, its right half would yield a dull and the left a clear sound. By some or other of these distinctive marks we may venture to assert that a pretty certain diagnosis between pneumonia and pleurisy may always be obtained. For further particulars on this point we refer to the articles Pleurisy and Empyema. The distinction of slight degrees of pleurisy accompanying pneumonic inflammation will depend on the circumstances that change of posture modifies the sound on percussion, rendering the dependent parts the least sonorous, and that the bronchophony is rendered bleating or vibratory whenever a thin stratum of liquid is interposed between the pleuræ. Pleurisies circumscribed by adhesions are scarcely to be recognized unless when sufficiently extensive to cause a fulness of the intercostal spaces. But as we have before remarked, the pleurisies supervening on pneumonia generally are of secondary importance, and their detection is not an object of great interest.

Bronchitis in its severer forms is frequently confounded with pneumonia; it is often by the physical signs only that they can be distinguished with certainty, and even these sometimes fail to detect a latent pneumonia in combination with bronchitis. In pure bronchitis no crepitant rhonchus occurs, but there may be a variety of mucous, sibilant, and sonorous rhonchi. The distinction of these from the pure crepitation of peripneumony is sufficiently obvious, but it is not so easy to distinguish this crepitation when it is mixed up with the other rhonchi. In these difficult cases we must look more to the expectoration, progress of the symptoms, and state of the countenance. With respect to the latter indication, as a diagnostic mean in bronchitis, pleurisy, and pneumonia, we have received some valuable hints from Dr. Stack,* although we can scarcely accede to his opinion that it is generally more sure than the physical signs. In pleurisy, either the face is flushed and the lips are florid, or their appearance is not changed from that of health. In humid or severe bronchitis, the parts of the face usually coloured and the lips are more or less blue or livid, according to the extent of the bronchial membrane affected, and the quantity of secretion in them, which prevents the oxygenation of the blood. The flush of pneumonia is different from either, being an intermediate shade of purplish red. There is no correspondence between the flush often observed in one cheek and the side affected, and the flush often shifts from side to side. In pleurisy and bronchitis, the colour in the lips and cheeks is commonly circumscribed, the other parts being uncommonly pale; but in pneumonia the redness, when present, is more suffused over the whole countenance. These variations of colour, which seem to depend on the degree in which the functions of arterialization and circulation of the blood are respectively affected, may assist us in doubtful cases in forming a diagnosis, but we have seen them fail too often to place implicit reliance on them. In the advanced stages of pneumonia, bronchial resonance and respiration and the perfect dulness on percussion sufficiently distinguish it from bronchitis, in which the mucous rhonchus and a considerable clearness of sound on percussion persist until the last. Dr. Stack, indeed, cites a case of humid bronchitis, in which, a few hours before death, the chest yielded no resonance, but no such example has been elsewhere described, and the anomaly must be attributed to the moribund state of the patient and the imperfect entrance of air into the lungs at that period.

The physical signs of extensive pulmonary apoplexy sometimes approach closely to those of peripneumony, there being in the spot affected a dulness of sound on percussion and absence of the respiratory murmur, surrounded by a crepitant rhonchus. The absence of fever, however, and the presence of hemoptysis will generally be sufficient to characterize the former disease; and by referring to its history, it may be perceived that there is commonly much difference in the origin and progress of the two complaints. An inflammation of the tissue of the lung is sometimes engrafted on apoplexy of the organ, and it will then be more difficult to distinguish; but the access of feverish heat, the increase of the crepitant rhonchus, and the viscidity of some portion of the sputa, will generally give evidence of the complication.

Combinations of several affections of the chest will sometimes, more closely than simple diseases, simulate pneumonia. Œdema of the lungs combined with pleurisy or even pleurodyne, may produce physical signs resembling the first stage of peripneumony, and a similarity in many of the general symptoms increases the difficulty of the diagnosis: the different character of the expectoration, and the history and progress of the case, are the means of distinction most to be relied on, and an attentive examination of these will seldom fail to lead to a correct decision. It is sometimes more difficult to distinguish between chronic induration of the lung, whether from chronic peripneumony, agglomerated tubercles, or melanose formations, and the hepatization of local acute inflammation supervening on phthisical disease. If the case has been watched, the attack of the latter affection must have been marked by some augmentation of the fever and dyspnœa, and the physical signs of the first stage would have further characterized it; but if the hepatization is complete before the first time of examination, we must remain for a time in doubt. These local hepatizations are sometimes formed and reabsorbed without much aid from treatment, and it is therefore less important to distinguish them than the inflammatory stage which precedes them, and which is, as we have just observed, cognizable by its peculiar signs.

* Dublin Hosp. Rep. vol. iv. p. 90 et seq.

In fine, we would recommend the student to found his diagnosis as much as possible on a knowledge of the true characters of disease, rather than on any detailed distinctions which can be comprised in a treatise. The varieties and complications of diseases are too numerous to be capable of adaptation to any fixed rules of diagnosis; but when the mind of the observer is fully imbued with the principles of a true pathology, his judgment will find in any combination of phenomena some means of distinction less fallible than the memory can ever furnish from the most minute exposition of possible cases.

Prognosis.—The remark which we have just made on the subject of diagnosis may with nearly equal force be applied to the prognosis, or estimate of the severity and probable issue of the disease. Our study of the pathology will lead us to form a correct opinion more surely than any enumeration of good or bad signs. The prognosis of this disease is always serious, and even in favourable cases must be spoken of with caution, for cases, which are slight at first, sometimes take an unfavourable turn; and in progress towards recovery, as long as the disease lasts, there is a chance of a relapse, which may throw the patient into new and peculiar danger. The circumstances of the pathology of a case which affect the prognosis, are the degree of the inflammation, its extent, its seat, its complication with other affections, and the condition of the various functions of the body.

As is the case with other inflammations of important organs, the continuance of the disease increases its mischief and danger as it injures the organization of the part; hence the prognosis is more serious if hepatization has taken place, and still more so if the signs seem to indicate the supervention of the third stage. The duration of these stages varies very considerably according to the effect of the treatment and the age of the subject. Laennec states the average proportion to be as follows: "The obstruction, or first stage, usually lasts from twelve hours to three days before passing to the state of complete hepatization; this lasts from one to three days before spots of purulent infiltration make their appearance; and the period of suppuration (from the time when the concrete purulent infiltration is distinctly perceptible until this is completely softened into a viscid fluid) varies from two to six days. Bloodletting, derivatives, and resolvents or stimulants of the absorbent system, obviously retard the progress of the disease, and consequently prolong the period of the first two stages. Convalescence is rapid in proportion as the inflammation is of small extent and has been early checked."*

We have already had occasion to remark that in children the inflammation continues for a much longer period in the first stage; after some weeks' duration, presenting only some hepatized points at the margin of the lung or in isolated lobules. Laennec has observed the same peculiarity in certain epidemics, as in the *grippe* of 1803, when he noticed the first stage to continue for seven or eight days, sometimes affecting the whole of one lung and part of the other, and proving fatal before any distinct hepatization occurred. We have before mentioned, on the other hand, the remarkable tendency of the inflammation in old and debilitated subjects to pass rapidly to the state of purulent infiltration; the author just named describes this to take place sometimes within thirty-six or even twenty-four hours. Recovery is sometimes effected by resolution and re-absorption from every degree of pneumonia, but the chances of this favourable termination are very small when the signs of hepatization have continued for such a length of time that purulent infiltration has probably occurred. Even simple hepatization requires time and favourable circumstances for its removal; for besides that the deposited matter obstructs the due function of the part, and thereby prevents the restoration of the balance of health, it likewise remains as an irritating cause, giving a proclivity to the recurrence or continuance of inflammatory action. Unless, therefore, the tendency to this be kept in a state of subjection, and the process of absorption be perceptibly gaining ground, the prognosis must continue to be doubtful. The supervention of gangrene will always increase greatly the danger of a case. If the gangrene is extensive, it must inevitably prove fatal; and where small and circumscribed, if the powers of the system are weak, they can scarcely be sufficient to support life until the noxious dead matter is thrown off; if, however, the pulse and muscular system show still considerable strength, this process may be happily effected, and there are recorded instances of recovery even from the gangrenous termination of pulmonary inflammation. An interesting case of this kind recently fell under the observation of the writer in conjunction with Dr. Chambers and Mr. Jay of Sloane-street, and was watched with great interest during a doubtful period of several days; the inflammation in the second state affected the right lung, and signs of excavation (concluded to be gangrenous from the odour of the expectoration) were heard at the inferior angle of the scapula; the case was greatly aggravated by the sudden supervention of a pleurisy on the left side, excited probably by the irritation of gangrenous matter in the circulation. This new attack, and the depletions necessary to subdue it, greatly increased the danger; but the powers of life ultimately prevailed; the expectoration became less fetid, more purulent and abundant, and after some time gradually ceased under the influence of a mineral acid; the cavity progressively diminishing was at length cicatrized, and the patient, in three weeks from his worst state, was quite convalescent.

The extent of the inflammation, as may be anticipated, greatly affects the danger of a case. A double pneumonia affecting both lungs at once is frequently fatal, even in the first stage; and whenever the whole of one lung is

* Op. cit. p. 211.

nvolved, there is much peril of an unfavourable issue. Cases do occur, however, although rarely, in which the gravity of the case does not bear proportion to the extent of the inflammation; and these anomalies in great measure depend on the natural capacity of the function of respiration in the individual, and its power to bear abridgement. Thus we sometimes see a pneumonia of small extent occasion orthopnœa and other symptoms of a severe case; whilst in another example auscultation may indicate that nearly a whole lung is involved, yet the patient is scarcely sensible of dyspnœa, and the other functions are not greatly disordered.

Inflammations attacking the superior lobes and root of the lungs are more fatal than those confined to the base or lower lobes; and this circumstance explains the discrepancy of authors, before noticed, respecting the comparative frequency of inflammation in these different parts. The cause of the difference appears to be, that disease of the upper portions and root of the lungs obstructs the passage of blood and of air in the larger vessels, so that the peripheral parts unaffected with inflammation do not receive their due supply.

The complication of pneumonia with other affections generally increases the danger of a case: thus peripneumonies supervening in the course of fevers and the exanthemata are generally of a serious nature; and the more formidable because they are often latent. Inflammatory affections of the gastro-intestinal canal, coinciding with pneumonia, render it less tractable and more dangerous; and the same may be said of bronchial, pericardial, meningeal, and peritoneal inflammations. Pleurisy, as we have seen, may diminish the intensity of the inflammation, if it is on the same side; but if it attacks the opposite cavity, it must aggravate the functional disorder. Pneumonia occurring in the course of phthisical disease is seldom severe in itself, but it has a tendency to accelerate the development and softening of the tubercles. This inflammation is more than usually fatal during pregnancy and in the puerperal state. It is especially dangerous at the extremes of life, more particularly in weakly infants and in cachectic old people, and those exhausted by habitual excesses; and the fatality is much greater among the lower classes than among those well and regularly fed and clothed. M. Chomel observes that the mortality in hospitals amounts to a fourth of the cases, which is considerably more than what occurs in private practice. The same physician gives the following statement respecting the influence of age in the mortality of pneumonia: in seventy-nine cases, of thirty-three at ages between 18 and 30 years, three died; of nine aged from 30 to 40, two died; of eleven aged from 40 to 50, five died; of fifteen aged from 50 to 60, eight died; of eight aged from 60 to 70, four died; and the three cases which occurred beyond the age of 70 all terminated fatally.*

* Dict. de Méd. t. xvii. p. 233.

The state of the functions in pneumonia, although it is not sufficiently constant to be of much use in determining the diagnosis, is often an important guide to the prognosis of individual cases. Thus a severe degree of dyspnœa, when constant, increasing and unyielding to treatment, may justly excite our serious alarm; and the more so as it is conjoined with a state of the circulation which betokens a continued predominance of irritation, or a failure of functional strength. Thus, when in a case with severe dyspnœa the pulse is very quick, as above 120, without much strength, there may be reason to fear that the system may not bear the treatment necessary to arrest the course of the disease, and our opinion must be in a proportionate degree apprehensive: the knowledge, through the physical signs, that the inflammation in its second stage is the cause of this state of the symptoms, will diminish our hopes, as we know it to be then less within the power of medicine; and when the pulse becomes small, weak, and intermitting, the danger may be considered imminent. There may, however, be extensive and serious disease without exciting this combination of symptoms; and although their presence positively indicates danger, their absence does not always represent safety. An obstinate cough, with scanty or difficult expectoration, is an unfavourable symptom, both because it indicates that there is no vicarious relief from the bronchial mucous membrane, and because the very exertion of coughing never fails to aggravate the disease and wear the strength. The character of the expectoration is one of the most valuable indices which we possess for the estimation of the gravity of a case. In simple pneumonia the viscidity and rusty tinge of the sputa are in exact proportion to the intensity of the inflammation, and their increase in quantity and diminution in tenacity and colour are the common attendants of its resolution. Scantiness or absence of expectoration, when other signs prove the existence of a considerable inflammation, is a bad sign, for the reason before mentioned. Dirty or brown watery sputa, and those containing pus, import great danger, inasmuch as they indicate the probable supervention of the third stage; and a gangrenous odour generally implies a state of great peril. The indications of the expectoration are rendered less certain when bronchitic or catarrhal disease is combined with the pneumonia; and the same remark may be applied to the complication with phthisis. The sudden suppression of expectoration is generally an unfavourable symptom; it is peculiarly so when auscultation discovers a general mucous rhonchus in the chest, because it proves that the muscular powers are inadequate to expel the accumulating matter from the bronchial tubes; and a suppressed secretion of sputa, unless it is the obvious result of a diminution of the inflammation, generally tends to increase it. Pneumonia is frequently resolved without any increase of the expectoration; but when this increase does occur, it always has a favorable influence, and contributes greatly to the cure.

A dry harsh state of the skin often attends bad cases complicated with gastric disease, with a loaded parched tongue, great thirst or sickness, and tenderness of the epigastrium. A moderately perspirable skin is the most favorable state; profuse perspirations sometimes occur in fatal cases. The same has been remarked of diarrhœa; yet, as we have before mentioned, both these discharges occasionally prove critical; it is expedient therefore to hold in view, what we have before suggested, that they are to be considered as critical only when they accompany a manifest improvement in the other symptoms. A copious deposit in the urine may generally be viewed as a favorable sign; and the observation of Hippocrates seems to be commonly true, that if, after having been turbid, the urine becomes clear before the fourth day of the inflammation, a fatal tendency may be apprehended. Delirium is generally considered to be a symptom of great danger, and it is the more so when it is constant, and not merely the temporary effect of the nightly febrile exacerbations; but in hysterical females it is often the effect of the treatment, and portends no evil. A comatose or lethargic state is an equally fearful case, as it shows that the functional disorder has already greatly encroached on that strength which is required to bear the treatment necessary for the reduction of the inflammation. The continuance of the various symptoms of inflammation without abatement, notwithstanding the administration of the proper remedies, is always a just reason for apprehension as to the issue.

IV.—Treatment of Pneumonia.

In our examination of the pathology of this disease we found ample proofs that it is an inflammation largely affecting the system of bloodvessels, and that, whatever share nervous irritation may have in exciting or supporting it, these vessels are its peculiar seat, and through them is produced its peculiar mischief. We have moreover seen that in the greater number of cases a congested state of these vessels is the immediate effect of the application of the exciting cause, and precedes that complication of nervous and vascular motions which constitutes reaction and inflammation: we have likewise had many occasions to perceive the serious relations which the disease when formed bears to the two functions most essential to life, respiration and circulation; and the result of all these investigations is to lead us rationally to the recommendation of that mode of practice which the experience of ages has already sanctioned. Pneumonia in its acute form may be called an exquisite type of inflammation, and it is, more than most other inflammations, the proper object for those measures which are called antiphlogistic, and of which bloodletting is the chief. The treatment of other inflammations may require modifications and qualifications because the vessels which they affect may be related to a secretory function, or they may be small and unimportant, or there may be more of nervous irritation than of vascular orgasm, or there may be a coexisting depressing influence in the system; and thus it is that in inflammations of the mucous membranes, of glands, of cutaneous and muscular tissue, of tendons, fascia and nerves, and, in some cases, of serous membranes, bloodletting is less effectual, and requires more limitation than in the disease which we are now considering. This measure it is true, is not all-powerful in pneumonia, but there are few practitioners who do not admit it to be by far the most important in the early stages: we shall see the limits of its efficacy in rationally examining the subject. Every one who has studied the phenomena of inflammation must be aware that they do not depend entirely on the quantity of blood in the system and although we greatly reduce this, we may still leave unaffected the state of the inflamed vessels, which remains as a present cause of disorder to the function of the part, and the focus of a speedy return of inflammatory reaction. This may be said of pneumonia even in the first stage; but the second is obviously still less under the control of bloodletting which, although it may act favourably in preventing an increase of inflammation and in reducing the mass of fluid to pass through the disabled organ, has little or no effect on the solid effusion which now constitutes the organic mischief. Here, then, we have to seek for other remedies to aid the operation of bloodletting, and to resort to where its beneficial operation ceases; and it is an advantage, which modern medicine has to boast of, that it does possess means which are of considerable efficacy in fulfilling these intentions. We are not sufficiently assured of the mode of operation of some of these remedies to be able to class them with certainty as fulfilling specific therapeutic indications, and we shall therefore act more safely by adopting a more empirical course; first describing them under their respective names, and afterwards considering their combined application in the treatment of individual cases.

Bloodletting.—Almost all medical writers ancient and modern, concur in their testimony as to the advantages of this measure in pneumonia; so that even Laennec, who depended on it much less implicitly than most others said that "its employment had been proscribed only by some few theorists and medical heretics."* But there is a considerable diversity of opinion as to the extent to which it ought to be carried, the period of the disease during which it is beneficial, and the best method of practising it. Many ancient physicians, and Galen among the number, recommended the bleeding in pneumonia to be carried to syncope, whatever be the period of the disease; and this practice has been followed by many of the present day, especially in this country. Cullen advises that blood be drawn either until there be remission of the pain and relief of the respiration, or, if these do not appear, until symptoms of a commencing syncope come on. This, we believe, is the plan most commonly pursued in this country, and at this first bleeding a quantity varying from sixteen

* Dr. Forbes's translation, second edit. p. 244.

o forty ounces of blood may be taken before ither of these effects is produced. By some practitioners a much larger quantity has been aken without indueing syncope, even to the mount of seventy or eighty ounces; but we onsider it doubtful whether it is ever advisable o exceed the highest quantity before stated. Cullen observes that a first bleeding, however arge, will seldom prove a cure of the disease; nd as the pain and other symptoms recur, the neasure must be repeated, even in the course f the same day, to as full an extent as before; nd although its greatest efficacy is in the first hree days, this recurrence will make a repeition of the measure proper at any period of he disease, especially within the first fortnight. Vith this practice may be contrasted that of nany continental physicians, who never take nore than twelve or sixteen ounces daily, and imit the bleeding to the first two or three lays. under the apprehension that larger and ater depletions interfere with the natural crises f the disease. We even find Pinel and Brieheteau strongly deprecating the free use of the ancet, and inculcating the precepts of Hippoerates, Stahl, Boerhaave, and Van Swieten, to reat mild peripneumonies only by diluents, expectorants, fomentations, pediluvia, and abtinence; and declaring that one or two bleedngs at the commencement are all that are enerally useful in the severer cases. It is a atisfactory proof of the superiority of the English method of practice to find that the est authorities in France now advocate free lepletions much more than formerly. Andral nd Chomel recommend bloodletting to sixteen r twenty ounces, practised, if necessary, two r three times a day during the first days of he disease, and more moderately afterwards. Some of their countrymen still more recently ave preseribed two or three pounds to be rawn every twelve hours at the commencenent of the inflammation, and if the dyspnœa ontmues, eight to twelve ounces daily afterwards. We may remark, as a partial excuse or the tardy adoption of these more energetic neasures by continental practitioners, that probably many of the *mild peripneumonies*, deeribed formerly as cured without bleeding, were in reality cases of bronchitis, and that an improved pathology and method of diagnosis have proved to them what pneumonia really requires. We now know fully, and we are indebted principally to our foreign brethren for this knowledge, that pneumonic inflammation tends much more strongly to effusion and disorganization than to resolution; and our study of the pathology has pointed out, in a very striking manner, that the spontaneous relief of an extensive plexus of vessels gorged with blood, and under the immediate influence of an irregularly excited heart, is too improbable an event to be thought of otherwise than as an exception, the general rule being to an increase of the engorgement, and a progressive encroachment on the proper state and office of the organ. Expectant medicine, in such a case, is therefore both irrational and dangerous.

There are, we presume, no practitioners in this country who question the superior utility of free bloodletting, as early as may be after the development of the inflammation; and it is generally admitted that the measure is more effectual when the blood is drawn from as large an orifice and as speedily as possible. The impression on the circulation is thus more readily produced, and at less expense of blood, than where the aperture is small and the detraction more gradual, scantier, and more frequently repeated. With a view to this effect, Aretæus advised that a vein in each arm should be opened simultaneously, and this plan was adopted by Huxham and Husson. There is, however, a limitation to the advantage of this sudden impression on the system; and this limit seems to us to depend on the degree in which the disease has become fixed in the pulmonary vessels. In the first hours of the inflammation such a sudden loss of blood in the semi-erect posture as will make the pulse soft and weak, and induce some feeling of faintness, will often restore the balance of the circulation, and enable the inflamed vessels to recover their wonted caliber; so that, although some general re-action follows the approach to syncope, the seat of the disease does not suffer from its effects. But if the inflammation has subsisted longer, the inflammation is rarely thus cured by a single bleeding; the vessels of the lungs remain distended although syncope be induced, the depressing effect of the depletion is of short continuance, and the returning reaction brings back the inflammation in its former character. On this account, when the inflammation has lasted more than twelve hours, we are distrustful of a syncope induced by a small bleeding, and we have generally found it necessary to repeat the venesection sooner and more frequently than where more blood has been drawn at first, and only a tendency to faintness produced. Cullen has justly remarked that many persons faint even upon a small bleeding, and as this may prevent the drawing as much blood at first as a pneumonic inflammation may require, it is the more necessary in these cases to repeat the measure more largely afterwards. Early fainting should therefore be rather avoided than desired, and if the patient feels it approaching when only a few ounces have been abstracted, and little relief is manifested in the symptoms, it is expedient to stop the orifice, and to let the patient lie down for a few minutes, which, with the aid of a little cold water and a smelling-bottle, will restore the circulation to a state in which it will bear the necessary depletion. The quantity to be drawn may vary in different adult subjects according to the age, constitution, extent of the inflammation, &c. from twenty to forty ounces. If it is known that the patient bears bleeding well, the larger the orifice and the speedier the loss of blood the better; but nervous subjects, and those liable to palpitation and fainting fits, must be coaxed more gradually to bear a full depletion, and guarded from a fictitious syncope by the horizontal posture. If these precautions are neglected, the disease will continue to gain

ground in spite of the apparent impression on the circulation, and each hour lost will diminish the beneficial influence of subsequent depletory measures. Much discretion is required in determining the quantity of blood to be drawn, and this determination can never be satisfactorily made beforehand; within the limits just named, therefore, the immediate effect of the operation is the only sure guide. In the first stage of the inflammation, whilst the crepitant rhonchus prevails, and there is little or no dulness on percussion, bloodletting shews its greatest efficacy, and the more so even when this stage is recent. Hence, as we have already remarked, one full speedy bleeding of thirty ounces or thereabout, instituted within the first few hours, will often prove sufficient to destroy the orgasm, and relieve entirely the dyspnœa and pain; the remaining quickness of pulse and cough yield to subsequent milder treatment; and the knowledge of its superior efficacy at this time may authorize us to carry the depletion beyond the point of producing relief to the symptoms, and even to the verge of syncope. After the first twelve hours have elapsed, and when the stethoscope discovers no remains of respiratory murmur mixed with the crepitant rhonchus of the affected part, there is little chance that a single bleeding will prove sufficient; and although, when well borne, it may be carried to forty ounces, more regard must be paid to avoid syncope than in the first instance. This is the more necessary when the crepitant rhonchus is on the decline and becomes mixed with bronchophony, and the part sounds dull on percussion, signs which prove the transition to the second stage. As this becomes formed, as the disease obtains a physical hold of the part, full and sudden impressions on the circulation lose much of their beneficial influence; and they are to be sought for only when the first stage of inflammation still prevails and spreads in another part of the pulmonary tissue. If we are called to a patient with a lung already hepatized, and on whom bloodletting has not yet been practised, it is generally advisable to bleed, but not with an expectation of complete relief to the symptoms, or with a view to reduce the pulse; the solid effusion constitutes a material cause of the dyspnœa, which no bleeding can remove; and the heart, although sometimes quieted by diminishing the load which it has to propel through an obstructed organ, often becomes more irritable, and rises both in force and in frequency. If the bleeding is carried to syncope at this stage, it is commonly succeeded by a re-action, which aggravates the dyspnœa and adds to the disorder of the hurried circulation. Bloodletting is not the chief remedy in this stage, and even where used for the first time, it should be restricted to the object of aiding other measures, and not pushed to the length of inducing syncope.

All the advocates of bleeding in pneumonia admit the necessity of repeating the measure in case of the continuance or recurrence of the symptoms of inflammation, and it is in the steady and discreet perseverance in this measure, notwithstanding a variety of phenomena which may seem to oppose it, that the scientific and experienced physician shews his skill and proper firmness. The temporary relief afforded by the first bleeding may have given place to an aggravated dyspnœa, and the pulse may have become weak, contracted, and very quick; symptoms of great debility may have shewn themselves; and the patient may express feelings of faintness and exhaustion, which seem to be further evinced by his indisposition to any exertion or movement unconnected with his efforts to breathe. This array of discouraging indications deters the timid practitioner from again resorting to the lancet, and he finds in certain authors a sanction for a supine course in their cautions, that if the bleeding be pushed far, the disease will become typhoid, the expectoration arrested, and the frame thrown into a state of hopeless debility. As long, however, as the physical symptoms indicate the continuance of the first stage of inflammation, except in a few cases to be presently noticed, there should be no hesitation freely to repeat the bloodletting any number of times until the symptoms are relieved; and it has been proved by ample experience that this treatment, instead of giving rise to a typhoid state, and facilitating effusion, prevents these events by arresting their real cause, the inflammation and its extensive injury to the respiratory function. These are far more formidable and deadly than the consequences of even an immoderate loss of blood, and we can add our testimony to that of Dr. Mackintosh when, after cautioning against excess in the use of this measure, he says, "nevertheless I am persuaded from experience in treating the disease, and from examinations after death, that much more mischief is done by bleeding too little than by bleeding too much."* It is the delay or insufficient application of this measure at first, that often throws the disease into that apparently typhoid form which has deceived so many as to its real cause; and nothing but the actual experience that the pulse frequently rises in force and fulness, the breathing becomes easier, the lethargy or sinking and the anxiety of the countenance become diminished, and the strength increased, as the pernicious oppression of the respiration is relieved by repeated bleedings, can impress the mind fully with the safety and expediency of the measure. "How often," says Andral, "have we not seen bloodletting employed with the greatest advantage in individuals in whom the pulse was small and contracted, the face pale, the extremities nearly cold, the general debility apparently very great, but in whom at the same time the respiration was greatly oppressed." †

We do not maintain that there are no cases in which the disease is from the beginning connected with a truly adynamic form of fever, and in which bleeding even to a small extent, and however

* Practice of Physic, vol. ii. p. 424.
† Clin. Méd. t. ii. p. 380.

arefully managed, causes faintness without relief. This occurs sometimes in those whose vascular ystem has been greatly debilitated by excess n ardent liquors, and in those of a strongly corbutic diathesis; it sometimes prevails epiemically at the same time as other typhous liscases, and changes the character of the eripneumonies that may then happen to preail. It may be almost a question whether in hese cases the local disease in the lungs is not ather a congestion of blood in an altered tate than an inflammation, and it is very ommonly the sequel rather than the cause of he fever. At all events, the impropriety of he free use of bloodletting is obvious from its ffects, and our chief reliance must be on ther measures.

With regard to the time in which it will beome proper to repeat the measure, much will epend on the severity of the case and the uccess and extent of the first bleeding. If his was copious, and produced signal relief to he dyspnœa and pain, its full effect will not e apparent for four or five hours, during vhich time further benefit may follow from he use of other remedies; at the end of that ime the patient should be seen again, and if e should be found still to suffer, and esecially if there have been any increase of lyspnœa, the bleeding must be repeated with reedom, either until some relief be manifest, r till an impression be produced on the cirulation. If the first bleeding failed from the peedy supervention of syncope before much lood was drawn, it will be necessary to repeat the visit in an hour or two, and again to nake trial of the measure, when the patient vill often be found to bear a much larger bleeding than at first, and with proportionate nd more permanent relief to the symptoms. The pulse furnishes a much less certain indicaion for the use of the lancet than the state of he breathing, which is the function which we should be most anxious to relieve. In the irst stage it rarely happens that bleeding will ot produce some immediate relief of this kind as well as of the attendant pain, and this effect may generally guide us in the extent to vhich we may carry the measure. If, however, although the breathing seems little afected, during the flow of the blood at this epetition of the practice the pulse becomes ery weak, quick, and running, it is expedient o stop the bleeding and trust to local depleion and other remedies. It cannot be denied hat this intolerance of bleeding shews itself in ome rare instances from the very commencement of the disease, giving to it the real typhoid ype; this character, however, has been ascribed to a greater number of cases than deserve it, and we cannot be too careful in our endeavour to distinguish the real from the false cases of vascular debility: the distinction can seldom be so satisfactorily made as by the cautious trial of venesection itself. Laennec has, it is true, pointed out one test, which is sometimes of great use and certainty, in the state of the action of the heart as investigated by the stethoscope: when, amidst symptoms of general debility, the pulsations of the heart are heard and felt more strongly in proportion than the arterial pulse, which they not unfrequently are, especially under the sternum, there can be no fear of bleeding, however weak the pulse may seem; but if they are both weak, the detraction of blood will almost always occasion complete prostration of strength.* There is an exception to this rule in the complication with hypertrophy of the heart, in which the pulsations continue to be apparently strong when the circulation is really very weak. The palpitation of reaction after loss of blood in nervous subjects may likewise be mistaken for the strong pulsations of Laennec; and this error is the more to be avoided as this reaction often accompanies a state of the circulation which will not bear bloodletting.† A good auscultator may distinguish the palpitation of reaction by its louder sound and more abrupt but less forcible impulse than those attending the really sthenic pulsations of the heart; but some experience in auscultation is required to make this distinction available in practice. Although, therefore, this test is very useful in deterring us from venesection in some cases of real debility, yet where it seems to indicate the use of this measure, it must not make us neglect the careful study of the effects as the blood flows from the vein.

In the second stage of inflammation, when dulness on percussion and the absence or the bronchial character of the sound of respiration indicate hepatization of the lung, bloodletting loses that efficacy which entitles it to the foremost place in the remedies for pneumonia. Some writers, indeed, proscribe its use at this period, as injurious and interfering with the curative process. The ancient physicians generally renounced bleeding after the fifth day if the expectoration was abundant, for fear of checking it, and their caution was followed by most practitioners until the end of the last century. We can readily perceive that the efficacy of bloodletting must be very much abridged by the permanent form which a solid interstitial effusion has now given to the organic disease, and therefore it is no longer to be expected that its repetition, however copious or frequent, can at once remove the dyspnœa or lower the pulse; but in a more moderate degree it is still useful, inasmuch as it reduces the quantity of blood which is to pass through the lungs, and tends to prevent the progress of the inflammation to the third and more hopeless state, purulent infiltration. We find, accordingly, many excellent practical writers, Stoll, Cullen, Frank, De Haen, Andral, Chomel, and even Laennec, recommend the repetition of venesection during the second and even the third stage, whenever the state of the

* Op. cit. p. 249.

† In hysterical females especially, this and other symptoms of nervous excitement, as pain, delirium, and convulsions, often occur and deceive the unwary as to their real cause; they are not dependent on the disease, but on the loss of blood, and, belonging to the class of irritations of re-action, require sedatives rather than further depletory measures. See IRRITATION.

breathing, the pain, or the fever seem to require it. Laennec thought that to bleed to syncope might produce the evil effect of checking the expectoration, apprehended by former writers, and in this opinion our own experience disposes us to coincide. If venesection has been freely practised before, the occasional loss of eight or ten ounces from the arm, conjoined with local depletions, is generally as much as is borne well or proves useful, and the further relief of the disease must be left to other means. In some instances this quantity may be exceeded with advantage, even at this period, when the stethoscope discovers the development of inflammation in a new part. If, likewise, bleeding has been neglected or only sparingly used before, a larger abstraction is often serviceable, even in the second stage, to remove that relative plethora into which the obstructed state of the lungs converts the ordinary fulness of the vascular system, and hence the great relief that even at this period general bloodletting sometimes affords. Here, it may be perceived, there is no reason for a large orifice or a speedy abstraction of blood, and these should be the rather avoided, as the syncope which they may induce is not a desirable event.

We have said nothing respecting the buffy coat of the blood as a criterion of the propriety of venesection, because we have not observed any constant relation between this sign and the intensity or even the existence of inflammation. When the crassamentum is buffed, cupped, and firm, early in the disease, it may confirm us in perseverng in the measure; but in the after stages, the separation of the fibrine from the colouring matter may proceed as much from irritation or the use of mercury as from inflammation, and it is at this time only that its indications are wanted.

Local bloodletting.—It is obvious that, in the greater number of cases, the abstraction of blood from the integuments of the chest can produce but little impression on a disease that occupies so considerable a portion of the vascular system as that extensive tree of vessels which conduets the smaller circulation; and accordingly local depletion is but a subordinate measure in the treatment of pneumonia. Many practitioners, however, often employ leeches or cupping as subsidiary to phlebotomy at the commencement of the disease. Thus Andral tells us that Lerminier often ordered the painful side to be covered with leeches during the flow of blood from the vein. This method, it may be remarked, is better adapted to an hospital, where there are plenty of experienced assistants, than to private practice, where one of these operations is enough at a time: but we have found great advantage in prescribing local bloodletting in the space of an hour after general, especially where a stitch in the side indicated the extension of the inflammation to the pleura. From twenty to forty leeches followed by a large cataplasm, or from ten to sixteen ounces of blood drawn by cupping, often not only have the effect of relieving a pain which greatly aggravates the difficulty of breathing and cough, but also in some degree prolong the depression resulting from the general depletion, and prevent the bad effects of a reaction which sometimes succeeds to the depression. In aged and exhausted subjects and in those cases of real adynamic pneumonia which do not bear venesection, this local bloodletting becomes a principal remedy, and although much inferior in efficacy, and less worthy of our confidence, it must often be our resource when the strength would sink under general depletions. In infants the bleeding from leech-bites is equivalent to a general bloodletting, and below the age of two years is very commonly substituted for it. It may be suggested, however, that about and above this age, when, in the early stage of the inflammation, the symptoms are pressing, it is better to use venesection; and if there should be any difficulty in bleeding from the arm, from four to eight ounces may be taken from the jugular vein with great advantage: but if depletion be again necessary, that by leeches will be generally sufficient. It is sometimes recommended to apply a leech or leeches to the foot or arm of infants suffering under inflammatory diseases, because the bleeding can better be controlled in those parts; but the greater benefit produced by the depletion near the affected organ leads us to apply them in preference close to the sternum, or under the clavicle of the affected side; we have never experienced any difficulty, when it became necessary, in stopping the hemorrhage by a compress and bandage or slips of adhesive plaster. In adults, when leeches are used as local depletories, the intercostal spaces nearest to the point of pain are the best place of application, for contiguity, independently of vascular communication, affects the removal as well as the propagation of inflammation.

In the second and third stages of pneumonia local bloodletting may sometimes be substituted for venesection, on any return of pain or slight increase of dyspnœa which seems to demand more immediate relief than can be obtained from the internal remedies or blisters. In slight limited inflammations, such as those attacking phthisical subjects, it is often the only kind of bloodletting that is necessary.

Tartar emetic.—Next to bloodletting this remedy is perhaps the most powerful that we can employ for the cure of acute pulmonary inflammation. Its utility in emetic and in nauseating doses had long recommended it in pectoral complaints, but its power of subduing acute inflammations independently of its emetic, nauseating, or diaphoretic effects, has been only of late years developed. Rasori of Genoa was the first who established it,* and besides

* Although we yield thus much to a foreigner, we must not pass over a just claim to priority in *practice* in favour of Dr. Marryatt of Bristol, who died in 1793. In the last edition of his "Therapeutics," published in 1790, is the following passage, in which both the febrifuge virtue of tartar-emetic, and the *tolerance* of the system in regard to it, are described. "Any fever may be soon extinguished by the use of the following powders:—Take of tartarized antimony five grains, white sugar (or nitre) a drachm; let them be well rubbed in a glass mor-

the testimony of many of his own countrymen in its favor, it has received the highest and most unqualified praise from the illustrious Laennec, whose sanction, after the great light which his labours have thrown on the pathology of this disease, cannot but command our attention. Although it may fall short of the sanguine hopes held out by the advocates of this practice abroad, the experience of many distinguished physicians in this country tells much in its favour, and we believe justifies the opinion expressed at the beginning of this paragraph. The success which has attended the treatment of peripneumony by repeated emetics, as recommended by Riverius and Stoll, probably in part depended on this peculiar action of tartar emetic; under this practice in the hands of Dr. Hellis of Rouen, and some others in France, the proportion of deaths was considerably less than usual, not exceeding one in nine; while the average mortality of the disease, when treated by bloodletting and derivatives, amounts to one in six or eight;* and in hospital practice, and among the lower ranks, it is often greater. The efficacy of the emetic treatment in croup, advised by Dr. Cheyne, and in ophthalmia and in hernia humoralis, probably partakes of the same principle, and is less dependent on the emetic than on the *contro-stimulant* or *anti-inflammatory* effect of the tartarized antimony. As the subject of large doses of tartar-emetic has been already described in the article INFLAMMATION, we shall here only speak of its application in the treatment of pneumonia.

Rasori, with whom the regular introduction of this practice commenced as long ago as the year 1808, gave the medicine in the following manner. Usually after one or more bleedings, but sometimes without this measure, from twelve to twenty-four grains, or in severe and advanced cases, from a scruple to half a drachm were given during the day, and the same repeated in the night; these doses were daily increased until they amounted to a drachm or several drachms in the twenty-four hours. The result of this extraordinary practice was, that out of 832 cases of pneumonia 173 died. Out of 115 cases treated in the same way by Tommasini of Bologna, only 14 died; and several other equally favourable reports are made by other physicians of Italy. There are, however, counter-statements to oppose to these;* and, as we had occasion to observe when speaking of the neglect of bloodletting, we have no certainty that all the cases here enumerated were in reality pneumonic. At all events, later experience has proved that there is no advantage in the excessive doses here used, and, on the contrary, that greater success has resulted from more moderate quantities. The uncommonly small mortality of only two in fifty-seven, which Laennec asserts to have attended his method of exhibiting tartar-emetic, warrants our quoting his own account of his treatment, which will likewise show how much confidence he placed in the measure.

"As soon as I recognise the existence of the pneumonia, if the patient is in a state to bear venesection, I direct from eight to sixteen ounces of blood to be taken from the arm. I very rarely repeat the bleeding, except in the case of patients affected with disease of the heart, or threatened with apoplexy or some other internal congestion. More than once I have even effected very rapid cures of intense peripneumonies without bleeding at all; but in common, I do not think it right to deprive myself of a means so powerful as venesection except in cachectic or debilitated subjects. In this respect Rasori does the same. I regard bloodletting as a means of allaying for a time the violence of the inflammatory action, and giving time for the emetic tartar to act. Immediately after the bleeding I give one grain of the tartar emetic dissolved in two ounces and a half of cold weak infusion of orange leaf, sweetened with half an ounce of syrup of marsh-mallows or orange-flowers; and this I repeat every second hour for six times, after which I leave the patient quiet for seven or eight hours, if the symptoms are not urgent, or if he experiences any inclination to sleep. But if the pneumonia has already made progress, or if the oppression is great, or the head affected, or if both lungs or one whole lung is attacked, I continue the medicine uninterruptedly, in the same dose, and after the same intervals, until there is an amendment not only in the symptoms, but also indicated by the stethoscopic signs. Sometimes even, particularly when most of the above-mentioned unfavourable symptoms are combined, I increase the dose of the tartar-emetic to a grain and a half, two grains, or even two grains and a half, without increasing the quantity of the vehicle. Many patients bear the medicine without being either vomited or purged. Others, and indeed the greater number, vomit twice or thrice, and have five or six stools the first day;

tar, and divided into six powders; one to be taken every three hours, notwithstanding the nausea the first may possibly occasion. If these are taken (which is commonly the case) without any manifest inconvenience, let there be seven grains in the next six powders; and in the next ten. Here I beg to retract what I said in some former edition of this work, viz. that till sickness and vomiting were excited, this noble medicine was not to be depended upon. For I have since seen many instances wherein a paper has been given every three hours, (of which there have been ten grains in six powders,) without the least sensible operation, either by sickness, stool, sweat, or urine, and though the patients had been unremittedly delirious for more than a week, with subsultus tendinum and all the appearances of hastening death, they have perfectly recovered without any medical aid, a clyster every other day excepted. I have lately seen a great many cases similar to the above, and the tartarized antimony has invariably produced the same effect."—See Medico-Chirurg. Review, No. 31. p. 253.

* *Laennec*, p. 261.

* See an interesting and valuable note by Dr. Forbes in his translation of Laennec, third edit. p. 269. It contains a succinct history of the new mode of exhibiting tartar-emetic, and some very judicious comments upon it.

on the following days they have only slight evacuations, and often, indeed, have none at all. When once the *tolerance* of the medicine (to use the expression of Rasori) is established, it even very frequently happens that the patients are so much constipated as to require clysters to open the body. When the evacuations are continued to the second day, or when there is reason to fear on the first that the medicine will be borne with difficulty, I add to the six doses to be taken in the twenty-four hours, one or two ounces of the syrup of poppies. This combination is in opposition to the theoretical notions of Rasori and Tommasini, but has been proved to me by experience to be very useful. In general, the effect of tartar-emetic is never more rapid or more efficient than when it gives rise to no evacuation; sometimes, however, its salutary operation is accompanied by a general perspiration. Although copious purging and frequent vomiting are by no means desirable on account of the debility and hurtful irritation of the intestinal canal which they may occasion, I have obtained remarkable cures in cases in which such evacuations had been very copious. I have met with very few cases of pneumonia where the patient could not bear the emetic tartar; and the few I have met with occurred in my earliest trials; insomuch that this result now appears to me to be attributable rather to the inexperience and want of confidence of the physician, than to the practice. I now frequently find that a patient who bears only moderately six grains with the syrup of poppies, will bear nine perfectly well on the following day. At the end of twenty-four or forty-eight hours at most, we perceive a marked improvement in all the symptoms. And sometimes even we find patients who seemed doomed to certain death, out of all danger after the lapse of a few hours only, without ever having experienced any crisis, any evacuation, or indeed any other obvious change, but the rapid and progressive amelioration of all the symptoms. In such cases the stethoscope at once accounts for the sudden improvement, by exhibiting to us all the signs of the resolution of the inflammation. These striking results may be obtained at any stage of the disease, even after a great portion of the lung has undergone the purulent infiltration. As soon as we have obtained some amelioration, although but slight, we may be assured that the continuation of the remedy will effect complete resolution of the disease, without any fresh relapse; and it is in regard to this point more particularly, that the greatest practical difference between the emetic tartar and bloodletting consists. By the latter measure we almost always obtain a diminution of the fever, of the oppression and the bloody expectoration, so as to lead both the patient and attendants to believe that recovery is about to take place: after a few hours, however, the unfavourable symptoms return with fresh vigour, and the same scene is renewed, often five or six times, after as many successive venesections. On the other hand, I can state that I have never witnessed these renewed attacks under the use of tartar-emetic. In these cases we observe only in the progress towards convalescence, occasional stoppages. And this is more particularly the case in respect of the stethoscopic signs; as we find that between the period when the patient experiences a return of his appetite and strength, and fancies himself quite cured, and the period at which the stethoscope ceases to give any indication of pulmonary engorgement,—more time frequently elapses than between the invasion of the disease and the beginning of the convalescence. It is necessary to observe, however, that this remark is still more frequently applicable to the disease when treated by bloodletting; and moreover, that the patients subjected to the antimonial method never experience the long and excessive debility which too often accompanies the convalescence of those who had been treated by repeated venesections."*

M. Peschier of Geneva appears to have given tartar-emetic much in the same way as Laennec; and with such success that, according to his report, he speedily cured almost every case without the aid of bloodletting, although he never exceeded fifteen grains in the twenty-four hours.† Of those who have written favourably of the remedy on this side of the channel, we may name Dr. Mackintosh of Edinburgh, and Drs. Graves and Stokes of Dublin; but these physicians differ from its foreign advocates in making tartar-emetic a remedy secondary to bleeding. The experience of the former leads him to conclude that vomiting is more speedily produced by a small dose dissolved in a large quantity of water, than a large dose of the drug mixed with a little sugar; but in the latter case the nausea is more severe and of longer continuance than in the former."‡ Drs. Graves and Stokes begin with a mixture containing six grains for the first twenty-four hours, and add to this two or three grains each day afterwards as the severity of the case may require, until fifteen grains are given daily; beyond this quantity they think it unnecessary to go. They use general and local bleeding freely, and in case of an increase of the symptoms, resort to it without trusting to larger doses of the tartar-emetic. They consider the treatment by this medicine as most eligible in strong constitutions in the early stage of inflammation, during the prevalence of the crepitant rhonchus, and before there is any dulness on percussion; when hepatization has taken place, it loses much of its efficacy. Any symptom of gastritic disease they consider as counter-indicating its use; and they find that the *tolerance* of the remedy is sometimes more readily established by applying leeches to the epigastrium.§

Our own experience in the use of tartar-emetic leads us to agree pretty closely with these observations. In truly sthenic cases of pneumonia, we have generally found that it perpetuates the impression produced by the

* Dr. Forbes's Translation, p. 255.
† Biblioth. Univ. Juin 1822.
‡ Practice of Physic, vol. i. p. 426.
§ Dub. Hosp. Rep. vol. v.

lancet more promptly and decidedly than any other remedy, and in a proportionate degree insures the relief of the patient, at a smaller expense of blood and strength than the ordinary method of treatment even with the aid of mercury. But we cannot assent to the opinion of Rasori, in which Laennec seems to join, that the remedy has no depressing effect except in regard to the inflammation, which it directly reduces; for we have very commonly found that it lowers the strength, and sometimes the frequency, of the pulse, before its beneficial effects on the inflammation are perceptible, and occasionally even when these do not ensue. It may have specific effects on the inflamed vessels, but it likewise sometimes exerts a sedative action on the general circulation. This is not always apparent, and its absence may result sometimes from the local irritation of the medicine counteracting its depressing influence, and in some cases from the system being capable of resisting its effects. Certain it is, that in a few instances, principally in children, its administration has been followed by a more rapid sinking, and seemed to hasten the fatal termination. These were, it is true, cases of advanced disease, in which after death the lungs exhibited extensive marks of unconquered inflammation. We think it more necessary to point out this depressing operation of tartar-emetic, because Laennec takes no account of it, but considers cases of debility as particularly adapted for its use. Nevertheless we have seen aggravated instances of pneumonia advanced to the second, if not the third stage, and accompanied with great apparent exhaustion, recover under the influence of tartar-emetic and blisters, when bloodletting had ceased to bring relief, and was no longer practicable. Unless, however, in case of failure of the action of other remedies, we should not be disposed to give tartar-emetic in any case where the circulation is really weak; and it should likewise be withheld where it appears to depress greatly without improving the state of the respiration.

A very important point in the exhibition of this medicine is to establish the *tolerance*, which means an insusceptibility of the stomach and bowels to its emetic and purgative effects. Rasori supposed that the presence of an inflammation in the system is the cause of the drug having a different operation from usual, and that the stimulus of this inflammation must be neutralized by the directly sedative or *contro-stimulant* property of the medicine before the body can be made sensible of its common emetic effects. But, as Laennec has observed, this is not consistent with the fact, that after the tolerance is once established, ten, twenty, or thirty grains may be taken and continued daily throughout the period of convalescence without any sensible effects. We have seen patients recover their strength, appetite, and power of digestion when they were taking twelve grains daily. The experience which we have, that the most inflammatory and plethoric cases are those in which this medicine is most successful, indicates indeed its peculiar power over excited vascular action, but its occasional utility over more advanced forms of pneumonia and in hernia humoralis proves that it likewise possesses a sorbefacient power.* The directions which we have quoted from Laennec with regard to the best mode of exhibition to ensure the tolerance of the medicine, are those which we have generally found most successful. It is desirable to vary the vehicle according to the taste of the patient, and to choose that which is most grateful to his stomach. We have often found the "king's cup," a weak infusion of fresh lemon-peel sweetened according to the liking of the patient, convey the medicine very comfortably, but it is best not to give more than a wine-glassful with each dose, as in our experience a larger quantity is more apt to produce vomiting. The first dose generally produces this effect however given, and frequently the second more slightly: the third commonly merely nauseates, and the tolerance is then established. This is the common average of the operation of the medicine. If the vomiting continue after the second dose, or be very violent then, it will be expedient to take some measures to diminish the irritability of the stomach and bowels. Where there is diarrhœa as well as vomiting, instead of the syrup of poppies recommended by Laennec, we prefer the addition of three or four drops of the liquor opii sedativus, or of the solution of muriate of morphia, to each dose of the medicine, and this may be advantageously given with an effervescing mixture, as recommended by Dr. Tweedie in the article Fever; but it is necessary that the alkaline carbonate should be accurately neutralized, otherwise it would decompose the tartarized antimony. Where the vomiting becomes obstinate and urgent, we can confidently recommend the addition of a drop or two of hydrocyanic acid to each dose of the medicine, as in the following form:

℞. Antimon. tart. gr. iſs. ad gr. iiſs.
Aquæ distill. ℥i.
Acid. hydrocyan. *mi*.
Aq. cinnamomi, (vel flor. aurant.) ℥iii.
Syrup. tolutan. ℥i. Fiat haustus.

This may be given every second, third, fourth, or sixth hour, according to the severity of the case. The draughts should not be made long before they are used, as they soon become decomposed, and the oxyde of antimony is precipitated. For this reason it may be sometimes useful to prescribe the tartarized antimony in a powder, to be dissolved at the time of exhibition in a wine-glassful of lemon-peel infusion, to which, if necessary, the hydrocyanic acid may be added. We decidedly prefer the exhibition of the medicine in a liquid form to that of a powder, as we consider it to be more safe and efficacious. Where, notwithstanding the combinations just mentioned, the vomiting still continues, a few leeches to the epigastrium, or, what is more efficacious, a mustard poultice applied there for a few minutes, will sometimes effect the tolerance of the remedy. If, notwith-

* See Dr. Mackintosh's Experiments, Lancet, vol. ii. p. 536.

standing all these precautions, the vomiting persists, it must be left to the discretion of the practitioner whether the medicine is to be continued or not; and in deciding this he will have to balance between the beneficial influence already produced by it, and the distress and injury likely to ensue from so violent an operation still continued.

It seldom happens, however, that this intolerance of the medicine does remain where its continued exhibition would be safe; and unless the remedy should be producing a marked improvement in the pulmonary symptoms, we may generally consider obstinate and violent vomiting or diarrhœa as an indication to desist from its continuance. We are further warned from its use in all cases where there is a florid red, or brown and parched state of the tongue, with great thirst, and tenderness and tension in the epigastrium, or over the whole abdomen. We do not find that a moist furred tongue, whether white or brown, gives any contra-indication, and we have often seen this state removed by the first operation of the medicine. In continuing the medicine, we must be guided more by the physical than by the general signs of the disease; and it should not be hastily discontinued, for it does not appear, like mercury, to produce a permanent effect on the system. As long as there is a rusty tinge and viscidity in the sputa, and distinct crepitation or absence of the respiratory sound in the seat of disease, the medicine should be continued, three times a-day at least. It is an advantage of this remedy that it may be combined with others, adapted to the various stages of the disease; and, although such combinations speak equivocally as to its individual powers, in some of the severest cases in which the treatment was most signally successful, we have joined the tartar-emetic with general bloodletting at first, with blistering and mercury afterwards, and lastly with the decoction of senega or some slight tonic.

Mercury and opium.—The exhibition of these drugs as an antiphlogistic remedy, first practised by Dr. Robert Hamilton,* and afterwards revived and warmly recommended by Dr. Armstrong,† is now pretty generally resorted to in this country, and as it has been fully noticed in several preceding articles, need not here long occupy our attention. Like tartar-emetic, it is to be generally considered only as a measure secondary to bloodletting, and the salutary effect is particularly shewn when the latter remedy has reduced the inflammatory orgasm, and can be carried no further. The efficacy of this combination depends in a great measure on its being given to such an extent as to affect the gums; but its beneficial operation is often manifest before this effect is produced, and in some cases, especially in children, without its occurring at all. But there is seldom that obvious improvement from the first doses which is often apparent in the exhibition of tartar-emetic; the operation of mercury is more gradual, and, as may be expected, when once the system is under its influence, the effect is more permanent. It is therefore especially adapted to the advanced stages of the disease, in which the continued operation of a remedy is required to resolve a solidification of the lung; and in effecting this, and in preventing those remains of inflammation which lay the foundation for destructive chronic disease, mercury is pre-eminently serviceable. Some doubt has existed whether the mercury or the opium is the principal agent in subduing inflammation. Dr. Hamilton considered it to be the calomel, and he combined opium with it to relieve pain, and to prevent it from passing off by the bowels. Dr. Armstrong held that the opium was a powerful means of subduing inflammation after bleeding had made a decided impression on the general vascular action. In pneumonic inflammation, however, we cannot but admit that both medicines have their beneficial effects, each by its own influence, and by modifying the action of the other. Thus the opium acts as an anodyne in subduing the pain and cough, and as a sedative in relieving that nervous irritation which often follows both bleeding and the free use of mercury, and which tends to the re-establishment of inflammation; whilst the injurious stimulant and restringent operation of the drug is prevented by the previous bloodletting and the mercury. The latter medicine, again, besides this corrigent effect, more gradually exerts that specific antiphlogistic and sorbefacient action which has established its value in many diseases, and of which the treatment of iritis frequently affords a visible illustration. If we adopt this view as a guide in the application and management of these combinations, we shall find that it leads to the rules which experience has already sanctioned.

Calomel is the form of mercury which is generally preferred in acute inflammations, and as its purgative effect is not an object, there is the greater need to combine it with opium. Dr. Armstrong, indeed, considered the purgative operation of a first full dose of calomel to be salutary, by brushing away the coat of mucus from the intestines, and thus opening the absorbents for the specific action of the medicine: this may with advantage be practised in pneumonia, and especially where a disordered or torpid state of the excretions indicates a purgative. With this view, from five grains to a scruple of calomel may be given immediately after the first bleeding; but as a continued catharsis is seldom desirable, especially where there is free expectoration, the opium should be added to the subsequent doses. With respect to the quantity and frequency of these, some difference must be observed according to the form of the disease. In the most sthenic cases, uncomplicated with idiopathic fever or gastric affection, large doses of calomel, of from six to twelve grains, or even more, may be given three or four times a-day with better effect than smaller doses more frequently repeated. The proportion of opium must likewise be varied according to circumstances. Where after a full

* Medical Commentaries, vol. ix. p. 191.

† Practical Illustrations of Typhous Fever, &c. p. 453.

bleeding the pain is considerable, with little fulness in the pulse, and especially if there are signs of nervous irritation, from a grain to a grain and a half of opium may be added to every six grains of calomel; but if the action of the heart is still strong, half or a third of that quantity will generally be sufficient to prevent the mercury from irritating the bowels, which is in that case the principal object of the opium. We have generally preferred Dover's powder, or a simple combination with ipecacuanha to the opium alone; for while the anodyne powers of the drug are not impaired, its stimulant quality is thus considerably diminished. In a few instances the sulphate of morphia has been substituted for the opium, and apparently with good effect, but our experience on this point is too limited to enable us to speak with certainty. In less sthenic cases, and especially where there is much gastric derangement, or a fever which assumes more of the idiopathic character, with a dry loaded tongue, hot skin, and vitiated excretions, the calomel is with greater advantage given in more divided doses, and frequently; as from gr. iß. to gr. iii., with two or three grains of Dover's powder every second or third hour. In some instances, particularly where there is an irritative diarrhœa, the hydrargyrum cum cretâ may be advantageously substituted for the calomel, double the quantity being generally given. The remedy, in whichever of these various ways it is given, should be continued until it either produces a decided impression on the disease, or affects the gums. Generally these effects take place simultaneously, and the improvement is seldom permanent and progressive until the influence of the mercury on the system is manifest in the gums. It is a favourable sign when this takes place readily, for the most obstinate and formidable inflammations counteract the specific influence of mercury; and if, after salivation has been produced, the inflammation becomes rekindled, the gums get well, and the breath loses its mercurial fetor. As soon as the mercury has shewn decided effects, it may be diminished to two or three moderate doses in the day; but when the disease has advanced to hepatization, it is proper to keep up its influence in a minor degree for some days. Mercurial inunction is sometimes practised to accelerate the introduction of the metal into the system, but this is too slow a process to be of material assistance where so much promptitude is required.

Counter-irritants.—It is generally agreed, among medical writers, that blisters are not admissible in the early stage of pneumonia, and not a few deny their utility altogether in the acute disease. There are two objections against their use: one is, that whilst the inflammatory fever lasts, their stimulus adds to it, and thus reacts injuriously on the inflammation; and the other, in our estimation scarcely less important, that they prevent the use of those means of examination of the chest, which, as we have seen, are necessary to inform us accurately of the state of the pulmonary disease, and of the effect of more powerful remedies upon it. The last objection does not apply to blisters on the legs or some distant part, which are recommended by some physicians even in the early stage. M. Lerminier applies two to the legs immediately after the first bleeding; as soon as they are dry, he repeats them on the thighs, and does not use them on the chest until the disease has taken a perfectly chronic character. Unless, however, in case of complications with cerebral disease, in which distant revulsion may prove salutary, the effect of this measure is too trivial to be relied on, and the practitioners of this country seldom trust to counter-irritation on any other part than the parietes of the chest, but reserve its application till the active character of the disease has been subdued by other measures. In slight cases they may often be advantageously applied immediately after the first bleeding; but in the severer disease both the objections which we have just stated would deter us from using them until the pulse is soft, and the heat of the skin moderate. Whilst the disease remains acute, blisters from six to ten inches square are to be preferred to smaller ones, as they scarcely irritate more, and their salutary derivative and evacuant effect is much greater. When the disease, after having reached the stage of hepatization, is proceeding towards cure, smaller blisters, repeated one after another in different parts of the chest, are of considerable utility, and enable the patient to bear a slightly tonic treatment, which is often very salutary at this period. It is at this time only that other means of counter-irritation can well be substituted for blisters. The friction necessary for the application of the tartar-emetic ointment or solution constitutes an objection to its use during the pain, cough, and oppression of the acute stage; but as a safeguard against relapse, and as a means of countervailing the internal irritation and of promoting the sanative process, this method of counter-irritation reaches deeper and is more permanent than repeated blistering. (See Counter-irritation.) Rubefacient plasters, as those containing a small proportion only of cantharides, are sometimes sufficient, and produce considerable benefit on the same principle; but they should be of full size, and renewed with sufficient frequency to insure their continued activity.

Evacuants.—We may comprehend, under this title, emetics, purgatives, diuretics, and diaphoretics, all of which are occasionally useful, but it is generally agreed that they are remedies of minor importance, and require some judgment in their application. From the success which has attended the treatment of pneumonia by emetics, in the hands of some physicians, as Stoll, Riverius, Dumangin, Hellis, and Good, we cannot doubt that these remedies are sometimes decidedly useful; and probably they may be so, in the early stage of the disease, by breaking that chain of morbid action by which the incipient congestion becomes converted into inflammatory fever, as well as by their relaxing and derivative effect. They are, however, generally considered as violent and uncertain remedies, and enough of their pe-

culiar effect may be obtained in the ordinary operation of the large doses of tartar emetic, of which the ulterior action has a higher claim to our confidence.

Much difference of opinion exists as to the employment of purgatives in pneumonia; some practitioners, particularly those of this country, using them freely, not merely to evacuate the bowels, but also as depletories to reduce the action of the heart and arteries. Dr. Pring recommends them with this view, and considers them of equal power with bloodletting in subverting inflammatory action.* The general objection against their use is that they tend to check the expectoration, which is a natural means of relief to the disease; but probably they are likewise injurious in exciting in the mucous membrane of the alimentary canal an inflammatory state, which gives to the disease that typhoid tendency in which we have recognised one of its most dangerous forms. These considerations deter us from exciting any thing like a continued discharge from the intestines, but we consider that their daily evacuation is a safe and expedient measure, and if this is not effected by the medicines given with another object, it must be excited by a colocynth pill or senna draught, or, where there are signs of gastric excitement, by castor oil or a laxative enema.

Diuretics are indicated chiefly where there is a simultaneous effusion into the pleura; but we have likewise found them useful in combination with tonics in the decline of the disease, to remove the œdema which commonly lingers in the lungs and sometimes affects other parts of the body after the active inflammation has subsided. Nitre, in doses of a scruple or half a drachm in the former case, and the same, or the spirit of nitric ether in the latter, generally answer as well as any other medicine, and their effect is commonly increased by the mercury, digitalis, squill, or other medicines given to fulfil other indications. A diaphoretic operation also often results from the use of the tartar emetic or calomel and opium when these are given; when they are not, a great heat of skin often renders it expedient to give James's powder, or antimonial or ipecacuanha wine, with a view to determine to the skin; and in children especially, the warm bath sometimes proves useful in the same way; but these remedies are too uncertain and trivial in such a disease as pneumonia to withdraw our principal trust from other more important measures. In some cases profuse sweats come on, which weaken the patient without relieving the symptoms, and require the exhibition of a mineral acid to restrain them.

Sedatives.—The remedies of this kind which have been held in greatest repute in pneumonia are opium and digitalis. We have already noticed the former in conjunction with calomel, but it is likewise employed alone with a view to quiet vascular action. Dr. Armstrong recommends at least three grains of opium to be given immediately after bleeding to syncope or approaching syncope, and its effect is to preserve the reduction which the loss of blood has already effected in the pulse. This is a point particularly to be observed in the administration of opium. As long as the vascular action is strong, this drug will stimulate and prove injurious; but when reduced by a full depletion, it seems to paralyse those powers of reaction by which, after this temporary reduction, irritation and inflammation are rekindled. We have repeatedly seen the utility of opium in this way; but it has been generally in the first stage of the inflammation; and although we do not hesitate to give it in the full dose recommended, we judge it to be always safer to combine it with calomel and ipecacuanha. Where there is much pain, from twenty to forty minims of the liquor opii sedativus, given immediately after the bleeding, act more speedily and satisfactorily than solid opium. In the after-stages, when the antiphlogistic remedies have reduced, as far as may be, the inflammatory action, opium often proves of the greatest benefit in relieving the cough, which frequently continues troublesome and obstinate even in the decline of the disease. With this view it is generally combined with expectorants, which we shall presently have occasion to notice. Hyoscyamus, conium, extract of lettuce and of belladonna, are sometimes used with the same intention, and, where opium is ill borne, may prove serviceable; but, although they may at all times be given with less risk, they are generally much inferior to it in efficacy. These medicines, besides reducing the excess of irritability on which the act of coughing depends, seem in some degree likewise to relieve the oppressed state of the breathing, which occasionally remains after the active disease is subdued, and this they probably effect by diminishing those changes in the blood by which it is rendered venous, and thereby lightening the task of the function of the lungs. (See Dyspnœa.) The action of digitalis is considerably different, being principally on the vascular system, and it does not possess any anodyne qualities. It has been much extolled as an aid to bloodletting in reducing inflammatory action; but although it occasionally shews considerable efficacy, its operation is far too uncertain to entitle it to our confidence. Its exhibition is moreover not unattended with danger, for when given largely to affect the pulse, it sometimes developes its effects suddenly in syncope and extreme reduction of the heart's action. We trust to it more in the decline of the disease; and in the dose of ten to twenty minims three times a day, combined with an opiate in an expectorant mixture, we have found it of great use in reducing the pulse and easing the respiration. Some practitioners speak highly of larger doses, frequently repeated, until an impression is produced on the circulation; but we have not seen enough advantage in this plan to induce us to recommend it, and unless watched with the closest attention, we cannot consider it a safe practice. Colchicum may be used with the same intention, but it is more apt to pass off by the bowels, and should

* Principles of Pathology, p. 208.

therefore be combined with opium. It is most suited to the pneumonia of rheumatic and arthritic subjects, and may be given in the dose of ʒi of the wine with a few grains of carbonated alkali. Hydrocyanic acid does not appear to deserve the encomiums that have been passed upon it, and except to quiet an irritable state of the stomach, we have not seen it useful in pneumonia.

Expectorants.—During the active stage of the inflammation, whilst the pulse is sharp and the skin hot, the secretion of the bronchial membrane is not within the influence of any of those medicines which are called expectorant. The general measures which reduce the inflammatory orgasm of the great pulmonary vessels are then the best means of relaxing those of the bronchi, and this effect may afterwards be kept up by small doses of antimony or ipecacuanha. In an advanced state of the disease, however, the promotion of expectoration becomes an object of great importance, as on its accomplishment may depend the life of the individual. Where the inflammatory symptoms have entirely given place to those of weakness with a great embarrassment of the breathing, the carbonate of ammonia becomes a most valuable remedy, and we have more than once seen it apparently turn the scale in imminent cases. It may be given in doses of five grains or more every hour or every two hours, or more frequently if the sinking state of the patient seem to require it. The decoction of senega is in these cases a good vehicle for it, and great advantage has sometimes resulted from the addition of the tincture of the *lobelia inflata*, which, although an uncertain remedy, often shews great powers in facilitating expectoration and relieving dyspnœa in several advanced forms of pulmonary disease. The first dose of the medicine should not exceed ten minims; but unless it produce sickness, it may be increased by three or four minims in each successive dose. Different individuals bear it very variously; we have known a drachm taken at a dose, with great relief to the breathing and without inconvenience; in another instance eight minims produced such sickness and giddiness that it became necessary to discontinue its use. When the urgency of the symptoms which indicated the use of ammonia has ceased, it may be of importance to keep up a free secretion from the bronchi, in order to assist in the resolution and dispersion of the solid effusion in the tissue of the lungs, and for this purpose expectorants of less stimulating quality are to be preferred. We have generally found a combination of tincture of squills and ipecacuanha, in the dose of ten minims of each, answer very well; if the cough is troublesome, a few drops of liquor opii sed. or forty or more of the compound camphor tincture should be added. The vehicle for these medicines may be the almond emulsion, with a little liquor ammon. acetat. when the expectoration is thin and scanty; but when it continues viscid, we have found great benefit result from the exhibition of expectorants in an alkaline vehicle, which is the only form in which the alkaline treatment, so much extolled by Sarcone and Mascagni, has appeared to us useful in peripneumony. Ten or twenty minims of liquor potassæ, or the same number of grains of a carbonated alkali, may be given with the above-named expectorants in water, camphor julep, or any simple vehicle, or in the more asthenic cases, with decoction of senega. In the course of recovery from pneumonia we often find it useful, whilst any pulmonary symptoms remain, to join some expectorant with the tonic that is employed.

Tonics and stimulants.—In ordinary pneumonia this class of medicines is out of the question as long as any signs of active inflammation remain. When, however, depletions do no further good, and the pulse is weak, the skin cool, and the expectoration no longer rusty and tenacious, then, although some dyspnœa and cough still remain, considerable benefit is sometimes derived from the exhibition of a mild vegetable tonic, such as the decoction of senega, or a weak infusion of calumba. We have already named the first of these as a vehicle for carbonate of ammonia to promote expectoration, but it seems also to prove useful from its slightly tonic property, and as a stimulant to the absorbent system. In the state which we have just described, we have often seen the symptoms remaining stationary, without tendency to improvement, until this medicine was given, and then in a few hours the pulse has become slower, the breathing more free, the tongue cleaner, and the strength somewhat improved. By auscultation, also, we have found, in a returning crepitant rhonchus or other vesicular sound, a proof of the impulse which this treatment gives to the absorption of the effused matter. When the active stage of the inflammation has been subdued by tartar emetic, it is a good plan to continue to give it three or four times a day in this decoction, as there is nothing inconsistent in the action of the two medicines. After the mercurial treatment it is even more useful, and may generally be given soon after the gums are decidedly affected. The infusion of calumba we have thought better adapted to cases in which there had been much accompanying gastric disorder, and in these it has sometimes cleansed the tongue, which had continued foul in spite of the prevalence of mercurial action in the system. In the exhibition of either of these tonics, however, a close attention must be paid to prevent the rekindling of the inflammatory disease, and they must be discontinued on the appearance of any sign of reaction. They are most safely employed in conjunction with an external counter-irritation on the chest; and it is under these combined measures that the most rapid recoveries take place. In the more typhoid forms of the disease, especially those complicated with adynamic fever from the beginning, tonics and even stimulants are required more frequently, and with less limitation. In some of these cases, where bloodletting is not borne, bark and camphor may be given even in the early stages of the disease, for the pneumonic affection is really more a passive congestion arising from an extremely

atonic state of the vascular system, with probably an altered state of the blood, than a true inflammation. Laennec says that he has, with success, given both bark and wine in certain epidemic peripneumonies, particularly in one which prevailed among the troops in 1814. He also recommends these to be administered towards the termination of the disease in old persons, and in debilitated and cachectic subjects, when, after the suppurative stage, the fever passes off and resolution goes on very slowly. He considers cinchona the best remedy in gangrene of the lungs, even when there is extensive hepatization around the eschar; but to be effectual it must be given to the extent of an ounce of the powder daily, or an equivalent portion of sulphate of quinine. Except in case of complication with intermittent fever, where the specific operation of bark is required, we are disposed to trust at first to opium, camphor, and ammonia, in the typhoid pneumonia, combining them with calomel, and to resort to the bark only if the general strength seems to require it afterwards.

Application of the treatment.—We have only to point out here the manner in which the several remedies which we have described may be combined in the treatment of individual cases. Where the case is at all severe, the treatment with tartar-emetic, or with calomel and opium, should be commenced immediately after the first bleeding, and continued uninterruptedly until an impression shall have been produced on the disease. It is not safe, however, with either of these remedies to lay aside bloodletting; if sensible relief does not ensue in the course of five or six hours after the first full bleeding, this measure must be repeated as before recommended. In the most acute and inflammatory cases, uncomplicated with gastric disease, we have sometimes combined the mercurial with the antimonial treatment, by giving a pill containing from six to ten grains of calomel, with from half a grain to a grain and a half of opium every four or six hours, and the tartar-emetic draught before prescribed, in the middle of that interval; and where the tolerance is established soon, the effect of this treatment is very powerful. If the bowels are too much acted on, the hydrargyrum cum cretâ in double quantity may be substituted for the calomel. When an amelioration takes place in the symptoms, the mercury may be omitted, and the case left to the tartar-emetic and whatever depletion or counter-irritation may be required. If the attack of pneumonia is very recent, and accompanied with a sharp stitch in the side, or catch in the breathing, a full dose of opium immediately after a large bleeding, as recommended by Dr. Armstrong, will sometimes be found sufficient to cut short the disease. This plan can only be adopted where the bleeding has been so copious as to produce a great and real impression on the heart's action, almost, if not quite, amounting to syncope. The dose of opium should be large; three or four grains of the aqueous extract, or if the pain and tendency to reaction are urgent, from 30 to 60 minims of the liquor opii sed. are the preparations to which we give the preference. Even in this case we think it advisable to give from six to twelve grains of calomel, or from ten to twenty grains of blue pill with or soon after the opium; the mercury does not interfere with the sedative operation of the latter, and by preserving the balance of the secretions, it prevents those functional derangements which sometimes follow the use of opium even in this way. If the disease has in any degree passed into the second stage, and even if the first has lasted more than twenty-four hours, there can be little hope of stifling it with opium, and we must then resort to the alterative powers of tartar-emetic or mercury, with whatever bloodletting the case may bear. Blisters can seldom with advantage be resorted to, until all fulness and hardness of the pulse and heat of skin have subsided; and either these symptoms, or even the continuance of a fixed pain, would counter-indicate the use of the decoction of senega or any of the mild tonics which prove useful in the decline of the inflammation.

If from the copious expectoration of pus and the physical signs of a cavity in the lungs, it is probable that an abscess has been formed, it may be necessary to support the strength by a stronger tonic, as the sulphate of quinine or bark with a mineral acid; but the expediency of this must depend on a complete predominance of the symptoms of weakness over those of inflammation. In case of gangrene, some of the medicines of a supposed antiseptic power may be given. Drs Graves and Stokes, in a case of this kind, gave the chloride of lime in the dose of three grains with one of opium three times a day, with the effect of removing the fetor from the expectoration, and for a time improving the symptoms. We have seen the same medicine in solution apparently produce the same result; but we cannot expect much from the operation of such agents. The principal object in case of gangrene is to support the general strength, and counteract the noxious influence of the dead matter, until it can be thrown off from the system.

The great fatality of pneumonia among children renders it necessary that its treatment should be directed with the greatest care and promptitude. This fatality does not arise so much from the course of the inflammation, as we have seen that this is less rapid than in adults; but from the latency of the local symptoms, and the tendency of the disease, under this disguised form, to pass the period in which bloodletting is most effectual. Hence many of the cases of infantile pneumonia which we have to treat, especially in the lower classes, are already in a sinking state: the depressing influence of the injured function of the lungs, which at this age ill bears any abridgement, having already removed the sthenic character of the disease. This circumstance represents to the mind the importance of physical examination of the chest in all the febrile diseases of children, in order that if any crepitant rhonchus be discovered, the fit remedies may be promptly applied. In this early stage bloodletting is highly efficacious, but when used after the dis-

case has lasted for several days, it sometimes produces convulsions and sinking without relieving the respiration. The same observation may in some degree be applied to tartar-emetic, and yet these are the most effectual remedies which we possess for infantile pneumonia, and if used together at the commencement, seldom fail to subdue it. Mercury with difficulty produces its specific action on infants, but it is still of great effect as a purgative; and when bloodletting is no longer borne, calomel, in doses of half a grain up to two grains, according to the age of the child, every hour or second hour, is the remedy on which we have principally to depend. Unless where there is an irritative diarrhœa, opium can seldom be used with advantage; in that excepted case Dover's powder is the best form. Although mucous or bloody stools imply an undue irritation from the calomel, and ought to be checked, yet copious evacuations of green bile are essential to the success of its operation, and seldom produce in the pneumonia of children the bad effects which result from purgation in the adult. It would seem that expectoration, as it is a less natural process in early life, so its importance as a vicarious discharge is of inferior moment, and does not prohibit purgatives and other measures that may arrest it. Counter-irritation with tartar emetic ointment or solution is of great efficacy in the after stages of pulmonary inflammation in children, and should especially be persevered in where there is any sign of a phthisical tendency. This, together with a sedative linctus to quiet the cough, and a light tonic if required, constitute the chief part of the treatment most eligible in the decline of the disease.

In aged persons the disease is often very intractable in consequence of the great debility which accompanies it. The mere circumstance of age should not, however, restrain us from the use of the lancet, where the state of the breathing and pulse, and heat of skin seem to indicate it. Frank bled an octogenarian pneumonic patient nine times with a happy effect. It must be confessed, however, that the period in which bleeding is useful in old people is short, and the frequent complication of a pituitous catarrh with pneumonia still further restricts its utility. Expectoration is in these cases a most important process, and when bleeding weakens so much as to be likely to interfere with the performance of this act, it must be abandoned. In some cases cupping may be substituted, but blisters of ample size are more effectual, and may be employed much earlier than in younger subjects. The internal remedies may be administered as usual, but it is often necessary to resort soon to the tonics and stimulants before described.

We know of no reason why the sex of the subject should materially modify the treatment of pneumonia. The presence of the catamenia ought never, in cases of any severity, to interfere with free depletory measures, for the influence of this relief on the system is trifling compared with the progress of a dangerous inflammation. The case may be different in slight examples and towards the decline of the disease, and stimulating pediluvia may be used, if the circumstances indicate it, to promote a natural crisis of this sort.

The complications of pneumonia with other diseases will require that the treatment should in some measure combine the indications of these various affections. Thus in the complication with bronchitis the power of bloodletting will be more contracted, whilst the antimonial treatment of blistering will claim more confidence. In pleuro-pneumonia, local bleeding, in addition to venesection, becomes a very useful remedy, and if the pleuritic affection be extensive, or accompanied by much pain, calomel and opium will form the most eligible remedy. In the treatment of pneumonia occurring in continued fever, the probable duration of the latter affection must be held in view, and depletions practised in a more cautious manner. The mercurial treatment is generally the best here likewise, especially if the fever partakes much of the gastritic character; and the hydrarg. cum cretâ, with ipecacuanha or Dover's powder, is the preferable preparation. When any of these fevers take on the typhoid or adynamic form, stimulants and tonics will sometimes be required, and must be given notwithstanding the pulmonary disease. It must be confessed that medicine has often very little power in these cases; but as far as our experience goes, stimulants judiciously given when the heart's action is very feeble, and the muscular powers are very low, have appeared to relieve the pulmonary affection, as well as for a time to restore a portion of strength; and it is only by over-stimulating the heart that there is a risk of aggravating the inflammatory disorder. They must, therefore, be carefully watched, and diminished or withdrawn as soon as any sharpness or hardness is perceptible in the pulse. Besides those before enumerated, we may mention musk, which is highly recommended in the typhoid form of pneumonia by M. Recamier, who gives it in doses of from 21 to 30 grains, with an effect which he considers almost specific. It seems to us questionable whether the affections which have been called intermittent peripneumonies, and said to have been cured by bark, are really inflammations: it is more probable that they consist in a simple congestion of the lung determined by the febrile paroxysm, just as simple congestions are more familiarly known to take place in the spleen, liver, &c.; and from the near pathological affinity between the two, it is not surprising that such a congestive state should produce many of the local phenomena of pneumonia. Although there can be no doubt of the power of bark and arsenic over these intermittent diseases, yet even here the oppression of the affected organ during the paroxysm is occasionally such as to require the aid of bloodletting. Neither should this measure be withheld, from fear of suppressing the eruption, in the pulmonic affections coming on at the commencement of the exanthemata; the internal affection is a present and dangerous evil, not to be neglected on account of other imaginary ones.

In the peripneumonies supervening on hoop-

ing-cough and influenza, it is sometimes a chief indication to give sedatives to allay the cough, which appears often to have a considerable share in producing the parenchymatous inflammation. Besides bleeding, therefore, to the extent that the case may require, large doses of the tincture of hyoscyamus (3ij. and upwards), or, in hooping-cough, the extract of belladonna, in doses of half a grain to the adult, and one-sixteenth to children below two years (these being gradually increased), will be found of much efficacy in counteracting the inflammatory tendency of these affections. Local depletions and counter-irritation will generally be sufficient to arrest the inflammations intercurrent on phthisis; and we have found the tincture of digitalis very useful in these cases. Where an inflammatory state of the mucous or serous membranes of the alimentary canal accompanies pneumonia, it is of great moment that the treatment should extend to these complications, for they greatly aggravate the case, and render it less tractable. Free leeching of the abdomen must be included in the depletory measures, and the hydrargyrum cum creta with Dover's powder will be the best antiphlogistic alterative. Purgatives must be at first rigidly proscribed, and the bowels merely evacuated by laxative enemata or suppositories. In the progress of recovery, a teaspoonful of castor oil daily, and infusion of calumba with dilute nitric acid, or some such light tonic, will often contribute greatly to restore the healthy functions of the membrane.

Diet and regimen.—No one can question the propriety of a strictly antiphlogistic regimen in ordinary cases of pneumonia. A total abstinence from all solids must be enjoined during the inflammatory stages of the disease, and the liquids taken should be of the mild mucilaginous kind, such as barley-water, tea, lemon-peel, and other simple vegetable infusions. It is generally recommended to give these beverages warm; but unless large draughts are taken, we see no objection to their being given cold if the patient prefers it. We have heard Professor Hamilton of Edinburgh express his decided belief that liquids are injurious in pneumonia by adding to the mass of blood, and thus counteracting a principal good effect of bleeding; and so far does he carry this opinion, that he considers that even pediluvia may do harm by throwing more liquid into the system through the absorbents. Although a zealous advocate for a dry diet in some other complaints, the writer is not persuaded of its utility in the present disease, except in cases where the dyspnœa is urgent. In such cases we have seen the breathing distinctly become worse after copious draughts of liquid, and with a view to keep the mass of blood which passes through the lungs as rich in quality and as small in quantity as possible, a paucity of drink may here be reasonably recommended. The antimonial treatment generally requires a certain degree of abstinence from liquids; for until the tolerance is completely established, a large draught is almost sure to produce vomiting. M. Chomel has pointed out a very important exception to the utility of an absolutely antiphlogistic regimen, in the case of those addicted to excess in wine or spirits. The great fatality of pneumonia in these subjects when treated in the usual way is well known; and observing that one man accustomed to such excess, who continued to take a pint and a half of wine daily throughout his illness, speedily recovered from the disease after only one bleeding, M. Chomel afterwards prescribed a certain quantity of wine in similar instances, and with a success that encouraged him strongly to recommend the practice. These may probably be included in the class of malignant cases, in which Laennec says that both wine and bark are beneficial. After the active stage of inflammation has been subdued, the moderate return to nourishing food, as the appetite craves it, is desirable. It should, however, be confined at first to farinaceous liquids, light puddings, and the weakest chicken or veal broth; these may be gradually improved in nutriment, and in the course of a few days a little white fish may be allowed; and the return to ordinary animal food made by degrees and with circumspection. In case of gangrene or extensive suppuration, as manifested by fetid or copious purulent expectoration, with great prostration of strength, a more nutritive diet, such as beef tea and animal jellies, will be required; and these are cases in which wine may sometimes be cautiously administered; but too much attention cannot be paid to watch lest this regimen should re-excite an active state of inflammation.

In the progress of convalescence from pneumonia, we may say of nutritious food what we have remarked of tonics, that it must be watched in its effects, and that its tendency to rekindle the local disease may be safely restrained by the simultaneous use of counter-irritation on the chest.

Patients labouring under peripneumony should be kept in an airy room of moderate temperature, (about 60°,) being protected on the one hand from an accumulation of heated or impure air, and on the other from draughts of cold air. These points require the physician's attention, and are too important to be left to the sole discretion of the attendants. Much covering can seldom be borne, and it is therefore the more necessary to guard against the effects of accidental cold; whilst the oppressed state of the breathing still requires that the air should not be close or impure. It is of some importance likewise, in the severer cases of inflammation of the lungs, that the chest should be raised above the level of the lower part of the body. The best method of doing this is by a bed chair, which by means of a notched rack can be raised to different angles with the level of the bed; but the same object may in a measure be attained by propping the back with pillows. This posture, besides that it facilitates the breathing and expectoration, prevents the gravitation of the blood to the lungs; and from the close connection which we have frequently noticed between the mechanical and the active hyperæmia of the lung, the importance of this last point is obvious. The exertion of the lungs required in talking

s injurious, and must be avoided, and the odily efforts should be confined to necessary cts. Muscular movement hurries the cir- ulation, and that which does this in the dis- bled state of the lungs necessarily causes that njurious congestion in the organ which we ave so frequently noticed in its connection vith inflammation.

In enumerating the causes of pneumonia, ve had to remark that nothing so strongly pre- lisposes to the disease as its previous occur- ence in the individual. Hence *prophylactic neasures* become of great importance, and the nore so in proportion as the attack has been requently repeated. The necessity is obvious n such cases, of protection from the various xciting causes, by warm clothing, by avoiding xposure, exertions of the voice, and violent xercise of any kind, by abstaining from excess n diet, and by living on that quantity and uality of food which support the strength vithout inducing repletion, and by such diet nd regulated exercise, or if necessary by pro- er medicines, ensuring the due performance f the secretory functions. Among the most ssential articles of warm clothing, we may nention a flannel waistcoat next the skin, and luring the prevalence of cold weather, a wash- eather vest over it: these will be found more ffectual and less cumbersome than a larger uantity of outer clothing, and should never be eglected by the pulmonary invalid. We can- ot inveigh too strongly against the pernicious ractice of females liable to pulmonary inflam- nations subjecting themselves with their necks nd chests bare to the trying changes of tem- erature inseparably attendant on evening vi- iting. In cases where, in spite of all precau- ions, the complaint recurs repeatedly at every eturn of cold weather, and renders the indi- idual a constant invalid, a change of residence luring the winter and spring months to a more enial climate becomes a desirable measure. Torquay and the Undercliff of the Isle of Vight in our own country, and the south west f France, the coast of Egypt and Barbary, Madeira, and some of the West India Islands nay be named as generally the most eligible places of resort; but the circumstances of the ndividual case must in great measure deter- mine the choice. (See Climate.) The most fficacious remedial measures which we know f to counteract this tendency to the reproduc- ion of pectoral inflammation, is a continued ounter-irritation, by means of tartar-emetic or seton or issue, on the chest. We give the preference to the former; and we have seen atients under its influence regain a degree of obustness and hardiness which they had not nown for months. When this measure seems o be no longer necessary, the mild irritation of pitch plaster may be substituted. Those ersons in whom there is only a proclivity vithout any symptoms of real disease, should abituate the pulmonary circulation to regu- ated impressions of cold and healthy reaction, y sponging the chest with vinegar or salt vater, at first tepid, and afterwards cold, and using vigorous friction with a rough towel af- terwards.

v. chronic peripneumony.

Laennec commences a section under this head, with a question as to the existence of such a disease; and although he adduces a few exam- ples, which he admits to be of chronic inflam- mation, he views it as "hardly probable that an organ so vascular, so mobile, and so essen- tially living as the lungs, can remain long in such a state of slow and inactive inflammation, as we know to be the condition of organs less necessary to life."* But this argument is hardly tenable on a comparison with other organs equally vascular, and is inconsistent with the existence of chronic pneumonia to the extent in which he admits its existence. The form of disease considered by him to be chronic peripneumony is a hard compact kind of hepatization, sometimes found around gan- grenous excavations and hæmoptoic engorge- ments, and very rarely also around tubercular cavities and between tubercles. The lung thus affected creaks when cut, is more livid or grey than ordinary hepatization, and presents a more distinctly granular form, so that it resembles the eggs of certain insects closely pressed toge- ther, without any intervening substance. This may reasonably be considered the chronic form of granular hepatization. But as we have found the acute disease occasion a consolidation of the lung without the appearance of granules, so it may be reasonable to expect that the chronic inflammation may present us with a corresponding uniform kind of induration. Accordingly, we find Andral, Chomel, and Louis, describing other non-granular forms of chronic solidification. It is sometimes found of a bright red or a buff colour, but more frequently it is livid or grey, being variously modified by the quantity of blood and the black pulmonary matter in it. It exudes little or no fluid when pressed, and is quite solid, sometimes approaching to cartilage in density. The red kind is most commonly a sequel of the acute disease imperfectly cured; the grey kind is more frequently found in the lungs of phthisical subjects, with miliary tubercles scat- tered through it, or surrounding tubercular vomicæ. The resemblance between the sub- stance of the miliary tubercle and this grey uniform induration, and the circumstance that yellow tubercular matter is frequently found in the tissue thus indurated, led Laennec to the belief that this induration was only a diffused form of the same accidental tissue which he called a first stage of tubercle. The resem- blance is certainly very strong, and as we often see an indurated hypertrophy of the in- terlobular septa,† so a close inspection will generally detect that the solid state of the lung is owing to the same deposition in the inter- stitial tissue of a matter more or less dense, which we know in other parts to follow chronic inflammation. As far as it is connected with

* De l'Ausculr. Méd. t. i. p. 475.

† See Dr. Hope's coloured illustrations, fig. 3 and 5.

phthisical disease, this matter will be fully treated of under the head Tubercular Phthisis; but we cannot refrain from repeating the opinion (which is nearly that of Andral also,) that the miliary and diffused indurations considered by Laennec as the first stage of tubercle, are the effect of chronic inflammation of the interstitial tissues of the lung. The length to which this article has extended prevents us from entering on the question of the relation of inflammatory to consumptive disease; but we cannot refrain from expressing our belief, that if tubercle is not generally produced by chronic inflammation terminating in an irregular form of suppuration, extended pathological research proves more and more that an absolute line of demarcation cannot be drawn between the indubitable result of inflammation, and the various forms of what is now called tubercle. We have just adverted to the resemblance between the texture of miliary granulations and certain forms of chronic inflammation; and those familiar with pathological anatomy will acknowledge that there is no constant line of distinction between purulent and tubercular matter; and that, although they are generally different, yet cases frequently present themselves in which they so completely pass into each other that no physical characters appropriate them to either kind of lesion. That tubercle may sometimes be developed without any inflammatory process, is sufficiently proved by the examples in which it occurs in various parts of the body at once, apparently as a modification of the ordinary nutritive secretion of the part under the influence of a peculiar diathesis; but the prevalence of this diathesis in a lower degree, although insufficient in itself to produce tubercle, may give a tuberculous character to the products of any inflammation that may arise, and this the more effectually as the inflammation is asthenic and defective in the energy of its orgasm. Although we thus express our conviction of the connection of this subject with that of pulmonary consumption, we must not entrench on the article devoted to that disease, and we will close these remarks by quoting from the little work before noticed the conclusions to which we were then led, as they develope what we consider still to be the full extent of the relations of inflammatory to tubercular disease. "The lungs may become infested with tubercular matter:—1. by the tubercular suppuration of the indurations, whether granular or diffused, which we have been induced to consider chronic inflammations of the pulmonary tissue, this being the natural termination of such inflammation: 2. by tubercular suppuration of other inflammations of the tissue; this effect being determined by the prevalence of the tuberculous diathesis:* 3. by secretion in tissue bearing no marks of other lesion, the tubercular matter being here deposited through excess of the tuberculous diathesis," modifying the common nutritive secretion of the part.*

The symptoms of chronic pneumonia supervening on an acute attack partake of the general character of this modification of inflammation. Thus, although the general fever abates, and the functions are in some degree restored, yet the pulse is still quick, the breathing short, the cough remains, the expectoration often assumes the characters of that of chronic bronchitis, and the patient, although he recovers in some degree his appetite and strength, looks ill, and does not advance beyond a certain degree of amendment. Percussion and auscultation will discover the remaining disease by the dull resonance of the corresponding part of the chest, and the absence or bronchial character of the respiratory sound. The solid state of the lung which causes these signs, if it be not removed by the sanative processes of nature aided by remedies, will gradually induce other disorder: either it may terminate in suppuration, and, if extensive, it will endanger life by the unmanageable decay in which it involves the lung, and which, if not identical with tubercular disease, bears to it a strong resemblance in its symptoms and course; or remaining a solid obstruction to the circulation and respiration, it occasions dropsy and that cachectic state which we find induced by chronic pleurisy, pulmonary emphysema and other local diseases which permanently infringe on these vital functions; and here again a condition is produced which is on all sides admitted to be most favourable for the development of genuine tubercular consumption. In fact, however we study the relations of inflammation and tubercle, whether rationally or from evidence, whether at the bedside or in the dissecting-room, we are continually meeting with proofs of proximity between them, which are far too constant and regular to be ascribed to accident. Were we to describe the symptoms of pneumonia originally chronic, we should only have to state phenomena which are detailed in another article. See Tubercular Phthisis.

Treatment of chronic peripneumony.—If this disease is so exceedingly rare as it is supposed by Laennec to be, we might pass over the subject of the treatment entirely as he does; and if, as we believe, it constitutes a form of consumptive disease, we must refer to the article on Tubercular Phthisis for its fuller consideration. We would, however, make one remark to reconcile views which may otherwise appear conflicting; that because tuberculous disease may be developed and hastened by a form of inflammation, it does not follow that consumption is to be treated by depletions and abstinence. We have often seen that these measures do not restrain the asthenic and chronic forms of inflammation, while they may injure the general power of the constitution, and that the combination of treatment most useful in these cases is a mild tonic and nutritive regimen, with external counter-irritation, and whatever altera-

* See *Dr. Alison*, on the Origin of tuberculous Diseases, Trans. of the Medico-Chir. Soc. Edin. vols. i. and iii.

* Rational Exposition, &c. p. 160.

ive the case may suggest. We believe these o be the most successful measures in the disease n question, which may in addition require expectorant and other remedies for particular symptoms, and the removal of the occasional anses by resorting to another climate. We ave known a case of chronic solidification of he lung, which had already begun to exhibit he commencement of a phthisieal career, cured nder a course of iodine internally, with exernal counter-irritation, and careful protection rom transitions of temperature. The prospect f a cure will be in proportion as the disease s limited in extent, and the constitution strong nd free from that diathesis which we have oticed as the cause of the worst form of conumptive disease.

(C. J. B. Williams.)

PNEUMOTHORAX.—This term, (compounded of πνευμα, ατος—θωρηξ.) signifies a collection of aëriform fluid in the cavity of the pleura. As such a pathological state had not attracted notice till modern times, it remained undistinguished by any proper appellation till the beginning of the present century, when the word pneumothorax, invented by M. Itard, was adopted to designate it. It has been objected at various times to this term that its etymological composition is incorrectly formed, but closer examination into the analogies of Greek derivatives proves this to be unfounded; and, moreover, it appears now to be so well established on the basis of authority and general adoption, that any change would be both improper and impracticable.*

Gaseous collections have been frequently noted as occurring in some of the serous cavities as well as the other tissues of the body. It had been often observed that air escaped on opening the thorax in necroscopic examinations, and the attention of surgeons was occasionally arrested, during the operation for empyema, by a rush of air through the canula preceding the flow of matter. The effusion of air consequent on laceration of the lung by fractured ribs was known, but was classed with emphysema, and called *emphysema thoracis*. Those casual observations had not been reduced to any digested form, nor did they lead to investigation of the true origin of the elastic fluid, as it was universally assumed that the latter was extricated by decomposition from the purulent matter. It was not, therefore, till 1803, when M. Itard published his dissertation, that air in the pleura came to be considered as not a mere accidental complication in some rare cases of empyema, or as only occurring after death, but to constitute in itself an important pathological condition. Although thus much appears to have been established by the researches of this author, the insufficient advances which morbid anatomy had made, and the incorrect notions which prevailed as to the pathology of thoracic diseases, prevented him from going much further. His views corresponded with the old crude idea of the chemical decomposition of pus. He regarded it as always consequent to and depending on a latent phthisis, and ascribed the production of the air to the decay of the lung by means of a chronic suppuration, and the long retention of the pus in a shut cavity, which caused a partial absorption of the stagnant liquid, and its decomposition into an aeriform fluid. This was the state of knowledge on the subject till the time of Laennec, for whose labours it was reserved to investigate its true nature, and to give it its proper place in nosology. His researches have attached to pneumothorax the highest degree of importance, and we do not think that the genius and industry of this great physician have been more signally displayed in any of their achievements for thoracic diseases, than in the comprehensive illustration which he has given of the pathology and diagnosis of this affection.

Two sources are recounted by which air in the cavity of the pleura may originate. It has been said to be generated within that membrane, and it may be introduced from without. The former, we have seen, is the origin to which M. Itard ascribes it in every case, and Laennec assents to this manner of explaining the six cases which he cites. In all these instances the pneumothorax was accompanied by a pleuritic effusion, the consequence, as they relate, of phthisis; and the latter author is of opinion that the gaseous development was caused by a decomposition of part of the albuminous matter suspended in the puriform effusion. This, he adds, is rendered probable by the odour of sulphuretted hydrogen which the air exhaled. Neither this nor any of the other circumstances

* We find that Dr. Elliotson, in his lectures, has reproduced the objection of Piorry to the term pneumothorax (Lancet, 1 Dec. 1832, p. 305). He states that these compounds are always made from the dative singular, and that the word should be *pneumatothorax*. With unfeigned deference we would submit that the majority of these compounds are not formed from the prolonged dative, as αιματι, υδατι, but from the nominative αιμα, υδωρ, by changing its termination into ο,—for example, hemorrhage, hydrothorax, &c. Pneumothorax, formed according to this analogy, is a more perfect hellenism, and (as will be easily conceded) much more euphonious than the other formation. Its true signification also is "air in the thorax," and not "lung in the thorax;" for it will be observed that if this were necessarily its meaning, it would follow, by the same analogy, that hydrothorax, signifies, not "water in the chest," but "hydra in the chest," and to represent the former it should be *hydatothorax*. Professor Elliotson has permitted himself to overlook his own principles in saying that pneumothorax means "lung in the thorax," for even if, as he insists, the formation from the dative were followed (as we acknowledge it has been in a *few* instances), it is immediately apparent that "lung in the thorax" would be *pneumonothorax*, πνευμων, pulmo, ονος, ονι. In arranging the terminations of these compounds the ancient Greeks paid especial regard to the euphony, but this does not seem to have been the case with their successors who lived at the decline of the language, for to these are certainly to be referred the few compounds in *ato*, as hæmatocele, pneumatocele. The last word was even changed from the original pneumocele: vide Laennec, de l'Auscultation, tom. ii. p. 241, note. Edition 1826.

by which they were attended would incline observers at the present day, furnished with precise and more extended information on the subject, to agree to this method of explaining it. On the contrary, the examination of their details exhibits sufficient evidence to authorise us in referring them to a cause (the admission of air from without) which will be hereafter mentioned, as by far the most frequent of all. It has never been satisfactorily proved, and it seems to us an extremely problematical circumstance, that pneumothorax ever occurs by the putrefactive decomposition of a pleuritic effusion. The other processes by which air may be developed within the pleura, as recounted by Laennec, will be afterwards adverted to. It may be here stated that some of them are only conjectural; for the experience of one individual could not supply well ascertained facts sufficient to establish by observation all its causes and their relative frequency, particularly as he had to bring to maturity his own discovery of the method of exploring them.

It may be laid down as proved by the recorded experience of medical men, that where pneumothorax exists the air has been introduced from without; for cases of an opposite description are so rare that they must be considered as exceptions to the rule. This position will not be called in question, we apprehend, by any one who has devoted some attention to this subject. Air, then, may enter the serous membrane and form a lodgement in the sac of the pleura, either from the lung and bronchial tubes, or by the thoracic parietes through the skin and intercostal spaces. An example of the former is afforded by the rupture of the pleura from the bursting of a tubercular cavity communicating with the bronchial tubes, and of the latter by the opening of an anthrax of the intercostal spaces through the costal pleura, or by the pneumothorax consequent on penetrating wounds of the chest, whether accidental or artificial. We proceed now to expose the phenomena of this affection; but as most of these are common to it from whatever source it arises, it will be found advantageous to consider them in a description of it as resulting from one particular cause; namely, the first which we shall mention.

Pneumothorax produced by the bursting of a tubercular abscess into the pleura.—This species of the affection is, beyond all comparison, more frequent than all others. If we were to conclude from the experience of the medical men in Dublin who have given most attention to the subject, it might be asserted that it constitutes fully nine-tenths of the cases of pneumothorax, with the exception of the traumatic variety; and this, or even a greater proportion, is established by the cases found in medical writings since the publication of Laennec's work. This great comparative frequency, together with the importance which it derives from its connexion with the history of phthisis, have concentrated upon this form nearly the whole interest which the malady possesses.

Pathology.—The cavities which the progressive stages of aggregation and softening of tubercles form in phthisis are situated almost invariably in the superior lobe of the lung, and it is at the very summit of this that in general the excavation is largest. While the pulmonary parenchyma disappears before the expanding walls of the abscess, a remarkable circumstance is observed in examining the manner in which this tissue is destroyed, which shews that nature was making at least some struggle against her too powerful enemy. It is found that the bloodvessels are not engaged in the ulceration, but become obliterated, and traverse the empty cavity as solid chords. The bronchial tubes, on the contrary, are involved in the destruction, and their divided ends preserved open, levelled to the surface of the parietes of the sac, and forming a part of them. This double provision has obviously for its ultimate end to prevent sudden hemorrhage, and to allow of the evacuation of the tubercular matter. (See Phthisis.) While the latter is accomplished, it is manifest that the same passage which permits the matter to escape admits the inspired air to fill the space which it occupied. If life be prolonged, the parietes are always enlarging their limits, and thus, although slowly, marching towards the surface of the lung. Those centrally situated do not often arrive at the surface, but others, originally developed more superficially, extend in their progress to the serous membrane, which at length becomes in contact with the membrane forming the wall of the cavity. Here the spreading further is generally restrained by the throwing out of lymph and the formation of adhesions, but not uniformly, for in many instances the pleura is perforated. The immediate consequence of this is that the contents of the tubercular abscess, including softened tubercle, muco-purulent matter, and air, are precipitated into the cavity of the pleura. The reception of these contents into the pleura could not take place if the lung were to remain as in its natural state, in perfect apposition with the costal parietes, but a new condition is induced on the occurrence of perforation which permits it. In the physiological condition the lung is retained in a state of distention beyond its mean capacity by the expansion of the thorax, a condition which its highly elastic structure allows. It is, even at the extremest expiration, we believe, still kept more expanded than its elasticity would allow if left to itself, and not counteracted by the atmospheric pressure. The latter force, however, certainly stretches it during inspiration, when the capacity of the thorax is much enlarged; but when perforation of the pulmonary pleura takes place, the pressure becomes equalized on the external and internal surfaces of the lung, and now the elasticity is permitted to act, which it immediately does by producing the recession of the lung from the costal pleura. By this means a space is left and instantly filled with air from the bronchial tubes, which have now, by the intervention of the phthisical cavity, a free communication

with the sac of the perforated pleura. Such s the mechanism by which the atmospheric ir gets ingress in this variety of pneumothorax.*

To physicians who have opened many subects that have died of phthisis, it would at irst only seem a surprising circumstance that neumothorax is not a more frequent occurence. They are accustomed to find very frequently at the summit of the lung phthisical avities, bounded merely by the pleura itself, r with so thin a plate of lung interposed that t is scarcely any protection to it. Yet it is vell ascertained that perforation rarely or ever akes place at the summit, where we so frequently meet with so slender a barrier to prevent it. The explanation of this is found in he fact that the summit of the lung in which arge cavities exist is always covered by a lense cap of false membrane, which effects its irm adhesion with the opposed costal pleura. t would seem that, as the parietes of the cavity pproach the surface at the summit of the lung, n effort of nature is made to intercept the scape of the contents of the tubercular cavity y the formation of these adhesions. A chronic nflammatory action in the pulmonary tissue lways surrounds the cavity for a lesser or greater xtent, and, as it were, precedes its progress owards the surface. The effect of this is visible n the plates of lung often found to intervene etween the cavity and the surface, which are enerally in a state of dark-grey hepatization. t is by this same inflammation that the false membranes are thrown out which effect the adhesion of the pleural surfaces,—those, we mean, which are met with covering the summit of the ung in phthisical patients. It is found that in he same proportion as the cavity advances to he summit, the cap of false membrane becomes nore strongly organized and thicker, and forms hus an effectual protection against perforation s far as those adhesions extend.

It is important to remark, with respect to those lense membranous cases, that as it is in the ummit of the lung that cavities usually exist, o this part is much more favourably circumtanced for adhesion than any lower part; or the sliding motion of the lung on the costal pleura is greatest at the diaphragm, nd diminishes in proportion as we ascend to the summit, where it is little if at all moved by the respiratory action. A constantly quiescent apposition of the two surfaces is that which most advantageously promotes the formation of adhesions, and, as we have just stated, this is possessed only by the summit, and decreases as we descend from this. These considerations explain the observation, well known to all conversant with phthisical dissections, of the existence of the membranous coverings at the summit of the lung. They moreover shew the reason, that while it is in this place tubercular cavities generally first attain the surface, perforation of the pleura most seldom occurs here, and they also lead us to anticipate the fact that the perforation *does* generally take place just below the line to which the adhesions extend.

The rupture may occur in any of the lobes of the lung, but the inferior part of the upper lobe, and the superior part of that beneath it, is the place where it has been most usually observed. In a great majority of cases it has been found to happen on a line with the third rib, posteriorly about the costal angle, and, as we have said, just under the reflection of the false membrane by which the superior lobe is so generally adherent. But although this is its usual situation, it is obvious that it may happen at any part of the pulmonary surface. It has even been known to happen at the base of the lung lying on the diaphragm; but this must be a very rare situation, both because adhesions are common here from the apposition being little disturbed, and because tubercular cavities are uncommon at the base of the lung.

The existence of a large cavity, or even of numerous tubercles, is by no means necessary to the production of pneumothorax. We have known it to occur where the cavity which caused the perforation was smaller than a nut. Andral and others have met with cases where only five or six tubercles existed in the lung in which it happened, and Dr. Townsend had one remarkable case where it followed on the bursting of one single tubercle, which was unfortunately developed immediately under the pleura, while the whole of the lung beside, as well as the other lung, was perfectly free from them.

The inevitable consequence of the escape of the contents of the cavity and of the air into the pleura is the immediate accession of an acute pleuritis of a more or less intense character. This supervenes when scarcely any thing but atmospheric air is received into it, for this proves as decidedly irritant to the membrane as any other of the foreign substances which enter together with it, a fact which appears demonstrated by viewing the false membrane which follows the pleuritic effusion. The latter is found to be as thick and well organized at the superior and middle parts of the pleural sac (where it could only receive the irritant impression from the air,) as the base of the sac upon which the fluid contents of the cavity are emptied. The lung being separated from the costal pleura at the first moments of the perfo-

* It will be observed that we have adopted Dr. Larson's views with respect to the agency of the elasticity of the lung in respiration. We think that, so far as we have stated them, they are consistent with our experimental knowledge on the subject, but we are not ignorant that many think them contradicted by the phenomena of wounds of the chest, where *hernia* of the lung succeeds. It is almost certain that the latter is caused by a vital irritability, and not by mere elasticity, as we see that the invariable action of the latter in the dead subject is to contract the lung when the internal pressure is removed. The forces which act on the lung are by no means sufficiently investigated: the experiments which have been made on the eighth pair seem quite inconclusive on this subject, and until it be further elucidated, many phenomena connected with asthma, hysteria, protrusion of the lung, and its re-expansion after collapse, must remain unexplained.

ration, (as we have described,) becomes now compressed both by the air and the pleuritic effusion, so that, unless it be retained in points by old adhesions, the compression against the spine and mediastinum leaves a large proportion of the pleural cavity filled with air and fluid, constituting the double lesion of empyema and pneumothorax.* (See Empyema.) If the consequences of the perforation be not speedily mortal, the lymph effused by the pleuritis soon becomes organized, and forms a factitious membrane overlaying the whole surface of the compressed lung and costal pleura where the air has been able to penetrate. This false membrane is not to be described, as some have done, as a thickening of the pleura. Even in its most perfect state of organization it may be perceived to be a deposition *upon* the pleura, which membrane lies under it, (although incorporated with it,) of its natural thickness. The lung itself lies compressed and flattened against the spinal column and mediastinum. In cases which have lasted some time, its diminution of volume proceeds generally till it is reduced to about one-fourth, and then, if its substance be cut into, the bronchial tubes and vessels are so matted up in its condensed tissue as to present the appearance called carnified lung. (See Empyema.)

While the false membrane forms a general lining for the sac of the pleura, the orifice of the perforation is spared, and the communication between the bronchial tubes and this cavity preserved. The perforation becomes converted into a fistulous opening with a smooth round edge. This orifice has a tendency to increase in diameter, and often attains the size of the tubercular cavity which originated it, but it rarely passes the size of a shilling. We lately had an opportunity of examining three fistulæ which afforded exquisite examples of the state of those perforations when they attain to a chronic condition. Their surface extended nearly across the cavity whose bursting formed them, and was covered with a smooth membrane of a serous aspect similar to that forming the general empyematous sac. They had the appearance of a shallow *cul-de-sac* about a line in depth, and the largest of them had the diameter of a shilling. On examining a little closely, a probe passed under the circumferential rim of the apparent cul-de-sac into a bronchial tube which communicated with a larger cavity. The disposition of the fistulæ here described is very common, viz. the perforation formed by the remains of a very small tubercular cavity, and the latter connected with other larger cavities by means of bronchial tubes.

The closer anatomy of these fistulæ presents circumstances which are particularly worthy of attention. The bronchial tube by which communication is maintained between the orifice and larger cavity is almost invariably found to open upon the face of the fistula towards the sac in an oblique manner from above downwards. This disposition is noticed as occurring in some of the cases detailed by Dr. Duncan in the 28th number of the Edinburgh Medical and Surgical Journal, and we have witnessed it very strikingly displayed in cases which lasted for a certain period after the perforation. The effect of this is to convert the orifice of the opening into a valvular structure, and as it were to aid in the accomplishment of this object, the superior rim of the opening is sometimes observed to be prolonged downwards for a short space over it. The method by which this structure is produced it is difficult to explain, but the end which it is intended to accomplish appears more obvious: at least an attentive examination of it in a strongly marked instance satisfied our minds that it results from an attempt at obliteration of the fistula by a process of nature. On the smooth face of the opening in the case alluded to, there were five small depressions which appeared to be stopped-up bronchial tubes, and the fistula which remained at the upper part was far advanced in the valvular structure. It seemed to us that those tubes were obliterated whose smallness and direction afforded the greatest obstacle to the entrance of air, while that which remained pervious was of the largest size; but what we would particularly advert to as explaining its resisting the process of obliteration, is the nearly vertical direction which it had with regard to the lung. According to our view, this position favours remarkably the entrance of air in such a case, as it lies directly in the line of the action of the diaphragm, by the contraction of which, almost solely, the air is drawn into the cavity in pneumothorax. Another circumstance bearing on this subject which was noticed in the same dissection* should not be omitted. The lining of the bronchial tube which formed the fistulous communication, a track of about two inches, was quite changed from the character of mucous membrane; it was no longer pulpy and soft like the latter, but partook more of the serous character, and there were remarked all along it firm granulations of considerable size. The same change was observable in the large excavation from which the fistula led; its lining was more like the lining membrane of the heart than the usual soft membrane which forms the secreting surface of phthisical cavities. (See Phthisis.) These observations go some length in explaining the mechanism of these oblique fistulæ, and we think they furnish also an intelligible and just account of the object which they are intended by nature to subserve, which we are led to conclude is an attempt to obliterate the fistulous orifice.

The general membrane of the sac is a highly organized secreting surface, and appears to be peculiarly susceptible of inflammation and its

* This constant complication of pleuritic effusion with pneumothorax has given occasion to some to denominate it pleuro-pneumothorax.

* For an account of this dissection we refer to the May number of the Dublin Journal of Medical and Chemical Science.

onsequences. It must, indeed, be supposed
be in a continual state of chronic irritation,
om the presence of the atmospheric air to which
is constantly exposed. There are frequently
ound upon it more or less organized albumi-
ous concretions, the result of acute attacks of
nflammation. These exudations are either ge-
eral over the whole sac, or partial. They some-
mes surround the aperture in the lung so as
narrow it, and cases have been observed
here it has been closed altogether by them.
he latter event would be most likely to occur*
here the fistula is small and recent, or, on the
ther hand, where the valvular structure is far
dvanced. Another result of inflammatory
ction which it is not uncommon to find on the
ac, is the existence of small erosions with a
ark and irregular base and circumference,
hich resemble small gangrenous eschars more
an they do common ulceration. These ex-
ale generally a fetid odour which gives them
lso the character of spots of gangrene; and it
s a fact which is confirmed by experience, that
he sac is much more liable to gangrenous in-
lammation in empyema with pneumothorax
han in simple empyema. The erosions just
lescribed sometimes penetrate the sac and
leura, and at other times they are not so deep,
ut go no further than the thickness of the false
nembrane. Their existence cannot but sug-
est the idea that perforation may occur by the
lcerative process originating in the pleura,
nd being propagated to the lung and bronchial
ubes, as well as the contrary way, which we
re considering in this section. The occurrence
f pneumothorax originally in this way is,
owever, extremely rare; but we believe that,
hen it has already for some time existed, ad-
litional fistulæ are occasionally formed in this
ay.

The contents of the sac are in every case
ir and purulent matter. In the early stages
f the affection the latter fluid is the secretion
f the pleura itself, the effect of the acute
leuritis which follows the irruption of the
ir. When it has advanced to a more chronic
duration, the adventitious membrane thrown
ut by the pleuritis becomes itself the secre-
ing surface whence the fluid is derived. Its
haracters vary considerably, (see EMPYEMA, PLEURITIS,) and are influenced by the dura-
ion of the disease, vigour of the patient, and
other circumstances. For the most part it is
found to be a greyish turbid serum, through
which homogeneous pus is mixed, and having
n abundant stratum of soft albuminous coagula
at the bottom.

We have already marked the error which
prevailed long after the discovery of pneumo-
thorax, in supposing that the air was formed by
the putrefactive decomposition of the pus.
Such a decomposition of this fluid does not
take place, but, on the contrary, it is generally
remarked that it is inodorous, and free from
any evidence of such a process. It is true
that in some cases both air and fluid exhale a
fetid odour, but in these we must search for
other causes than the putrefaction of the fluid;
for if this happened in one instance, it should
happen in all, as the laws of chemistry do
not alter or suspend their action, which would
be implied by this hypothesis. In the in-
stances in which we have noted the contents
of the sac to be fetid, there was always a gan-
grenous state of the pleura to which the fetor
was evidently to be ascribed; and as we have
shewn that gangrenous ulcerations of the sac
are not uncommon in pneumothorax, we are
inclined to believe that they will be always
found where the putrid odour is exhaled by
the purulent matter.* The absence of the
chemical decomposition of the pus is a fact
which is now fully proved by experience; but
when we consider the conditions to which it
is subjected, it appears to be nothing won-
derful that the idea was so long entertained,
but rather remarkable that it does not invariably
happen. It is constantly exposed to a warm
temperature and to atmospheric air, which,
together with moisture, are the essential pro-
moters of the decomposition of organic com-
pounds. Yet we have witnessed a case where
these conditions existed for a year and a half,
in which the pus was quite free from odour,
and in all its qualities unchanged by the at-
mospheric contact. We are unable at present
to go any length in discussing the cause of
this curious circumstance, but we would ob-
serve that rest is a condition favouring chemi-
cal decomposition, which is absent in the pre-
sent case. Some have considered that it is
sufficiently explained by the fresh supply of
animalised fluid, which the surface of the sac
is supposed to maintain, by a continual secre-
tion and absorption. The blood, when effused
into the pleura, has been sometimes ob-
served to remain fluid. We are ignorant, as
we have said, of the explanation of these facts,
but they seem to prove that animal fluids have
some power of resisting the laws of chemistry
while preserved in contact with the living
solid.

The air enters the sac through the fistulous
opening during inspiration. When allowed to
escape by a puncture of the thorax, it generally
proves to be an inodorous gas, or possessed of
a slight sharpness, but, generally speaking, it
differs little from the atmospheric air whence it
was originally derived. The same gaseous
elements have been found to make up its che-
mical constitution, which has been examined
by Dr. John Davy† and Dr. Apjohn.‡ The
following was its composition in Dr. Apjohn's
analysis, which is the more recent of the
two.

* We are persuaded that this has been the state of things in many of the cases of pneumothorax on record, where it has been reported that examination failed to discover any fistulous communication.

* The fetidity which the bronchial mucus is often known to possess in phthisical patients may be another cause imparting bad odour to the contents of the sac in pneumothorax, as it has generally free access to it through the fistula.

† Philosophical Transactions, 1824.

‡ Transactions of Association of College of Physicians, Dublin, 5th vol.

Carbonic Acid..	8
Oxygen	10
Nitrogen	82
	100

This coincides nearly with the composition of expired air as deduced from the investigations of Allen and Pepys, and it is by no means improbable that the surface of the sac acts on it in a similar manner with the air-vesicles of the lungs. Such an action has been, indeed, proved to have existed in Dr. Davy's case, in which analyses of the air were made at different periods. By a comparison of the latter, an interesting fact was deducible. It was found that the quantity of carbonic acid increased as the strength of the patient decreased, and the air which was collected twelve hours after death contained a double proportion of this gas.

In the great majority of instances the air, although free to enter the cavity, is either partially or totally prevented egress during expiration, owing to the valvular disposition of the fistulæ which we have adverted to above. When expiration takes place, the air of the cavity, compressed by the contracting thorax, forces the sides of the fistula together, and thus closes it, exactly in the same manner as the valve of the bellows prevents the air from going out by the aperture through which it entered. The consequence of this is, that the air exerts a pressure within the sac which is always increasing as long as the communication remains open. This compression is fully sufficient to account for the reduced size and flattened appearance of the lung which has been described above, and for the dilatation of the intercostal spaces, which is equally a phenomenon of pneumothorax. It has been a debated point, what part the air, and how much the fluid, contributed to the production of this internal pressure. To us it seems evident that the compression must be nearly altogether attributed to the air, and that the purulent matter exerts pressure only as it is itself acted on by the elastic fluid. The force with which the latter escapes when a small puncture is made in the parietes of the thorax, even some hours after death, (when a diminution of the pressure certainly takes place,) is well known. A fact which occurred in Dublin illustrated in a decisive manner the pressure which the fluid receives from the air. Paracentesis was performed on a man who laboured under pneumothorax with empyema, and the puncture of the chest was made below the level of the fluid, the evacuation of which was considered the chief object. Immediately on the entrance of the canula, the matter was projected through it with surprising force and to a great distance. Its forcible exit continued until it was nearly all evacuated, diminishing, however, towards the end of its flowing. This projection of the matter was undoubtedly to be ascribed to the great compression under which the elastic fluid existed. With respect to the relative proportions of the air and fluid there is the greatest variety. In the majority of cases the space filled by the air is much greater than that which the fluid occupies. The nearest ratio might be set down as two-thirds air and one fluid. These proportions, however, vary not only in different cases, but also in the same at different periods. We are enabled often to ascertain that the fluid gains on the air, and sometimes, though seldomer, that the air increases at the expense of the fluid. In an interesting case detailed by Mr. Smeal,* the fistula became obliterated from the formation of a coagulum, and speedily afterwards it was observed that the air became absorbed, and the fluid pari passu increased. This fact proves the manner in which the proportion of the elastic fluid is preserved, and moreover shews the power which the adventitious membrane possesses of absorbing air, as Nysten's experiments had already done for the pleura.

History and diagnosis.—As the species of pneumothorax which we now describe is the consequence of phthisis, the history of an individual case, if it be investigated with due precaution and diligence, will almost universally demonstrate that cough, hemoptysis, emaciation, night-sweats, &c. (see Tubercular Phthisis,) have existed before the signs peculiar to pneumothorax betray its presence. It happens generally that phthisis has gone on to a very advanced stage ere this distressing complication is brought under the observation of the physician. This is, however, not entirely owing to its invariably occurring at a late period. Somewhat of it is attributable to the circumstance, that the means of its diagnosis have been hitherto scantily disseminated amongst the mass of practitioners, and to their not being used with sufficient confidence by those whose education has embraced them. Auscultation and percussion are now, indeed, daily becoming more practised and relied on, and as this advances it is accordingly found that many more cases are discovered, and moreover it is occasionally detected in the comparatively earlier stages of phthisis. From what has been related in the foregoing section as to its being known to result from very minute cavities, or even from a single tubercle, it follows that it is an accident which may occur in the earliest periods of the history of phthisis, even when the phenomena of the latter are so transiently marked as to be doubtful and to allow of fallacious hopes of recovery. This, which we should anticipate from acquaintance with its pathology, has been observed in actual practice; its supervention has been witnessed at the very commencement of phthisis as well as at its close, so that what experience teaches is, that while the later stages are more exposed to its occurrence, it may happen at the period at which only the faintest suspicion of phthisis has as yet existed.

The means for the diagnosis of pneumothorax are the rational symptoms and the physical signs. We shall consider these separately, comprehending under the latter the signs derived from succussion, percussion, and auscultation. In the first place it is to be remarked

* Med. Chir. Review, July 1831.

at at the first occurrence of the pneumothorax striking change takes place in the entire class f symptoms and physical signs. Before this vent there have been present, in a more or less erfect state, the phenomena of phthisis, but terwards those which we proceed to describe the characteristics of pneumothorax. This hange, then, we would call attention to as in self an important commencement of the chain f symptoms. The moment of this change is enerally perceptible to the patient himself, and hen this is the case, he dwells much upon it in is description to his physician. He sometimes els, in fact, the air passing into the pleura at ie moment of the rupture, as also the rupture self. This sign did not escape the observaon of our older physicians, although they were nacquainted with the pathological conditions hich gave rise to it. Morgagni recites a case which this sensation was accurately deribed as observed by Willis and Lower: Casum habes in sepulcreto descriptum adoscentis qui se Willisio ac Lowero curandum adidit. Is post immodicas equitationes, aliasue corporis diuturnas exercitationes eum liquandiu in sinistrâ thoracis parte eum sennm habuisset, qui esse sine internâ compresione non poterat, ibi tandem *sensit disrumpi uasi vas quoddum; indeque per scuithoræ spuium in regione istâ ab alto in pectoris fundum ulentis stillicidium non tantum ab eo percipi, d etium ab adstantibus audiri potuit.*"* This ensation has been, if possible, still more appotely depicted since the pathology of pneumonorax has been cleared up. We find the folowing description in Louis's forty-first case: La malade éprouva *tout-a-coup*, du côté gauche e la poitrine, une sensation pareille à celle qui ût été produite par un gaz qui aurait circulé le bas en haut dans toute cette partie du thorax."† This actual perception of the perforation y the patients is an element of the diagnosis hich it is so desirable to possess that the practitioner should never omit to inquire after it, et it is one which he must learn to dispense vith, as many cases occur in which no such ensation has been felt, while in others, in which certain period has elapsed, it escapes the paient's memory.

Empyema being invariably an accompaniment of this variety of pneumothorax, the symptoms of the latter are necessarily mixed up with those of the former. This circumstance lemonstrates the insufficiency of the rational ymptoms in detecting it, and partly accounts or the long ignorance which reigned on the ubject. We find the symptoms of empyema et down as dyspnœa and pain, cough and expectoration, decubitus on one side, dilatation of the side, displacement of the heart and depression of the diaphragm, hectic fever. These are found amply discussed as constituting the disease of empyema under its proper head. (See Empyema.) The same catalogue precisely makes up the rational symptoms in pneumothorax. It now devolves on us to consider them in this regard, and we shall find that accurate observation has been enabled to discover several peculiarities in them as belonging to pneumothorax, which render an account of them quite indispensable to its history, and give them some importance as auxiliaries in its diagnosis.

a. Dyspnœa and pain.—These symptoms are to be considered at two periods. First, as they exist immediately on the occurrence of pneumothorax, and secondly, as present during the whole of the remaining duration of the disease. The dyspnœa and pain which follow immediately on perforation are nearly simultaneous with the sensation which we have above described, but they are still more constantly present, and therefore of more value in its diagnosis. The researches of Louis* have called attention in a particular manner to these circumstances. He regards the sudden supervention of acute pain and overwhelming dyspnœa as a constant attendant on perforation of the lung, and as always indicating the period of its occurrence. They are, indeed, symptoms which are so rationally suggested by a knowledge of the new pathological conditions (viz. the sudden perforation of the lung, its collapse, and the effusion of air, &c. into the pleura) which ensue, that they might have been anticipated by *a priori* reasoning, " et à raison de la similitude qui existe entre les circonstances qui accompagnent la perforation de l'intestin grêle, et celle des poumons, on aurait encore pu, ce nous semble, les soupçonner par voie d'analogie."† Louis relates seven cases, in all of which they were present; and we know that in one of them at least they occurred in the presence of the medical men, who were enabled to pronounce on the supervention of pneumothorax from this single circumstance. Their value has been also confirmed by the reiterated observation of them in the experience of others since his publication. We are, then, to regard a sudden access of violent pain in the chest, and of greatly aggravated dyspnœa, as symptoms of the greatest weight, and wherever they supervene in the course of phthisis, the occurrence of pneumothorax should be suggested to the mind of the attendant physician, who should immediately have recourse to other and less fallible means of exploration. Louis observes that the pain, although generally very acute, yet admits of varieties of intensity, and that it is not always in proportion to the sudden breathlessness which the perforation induces; and we find that in one of his cases he notes that the pain was entirely absent.

But here we must not omit to state that instances are not wanting which prove that neither singly nor collectively can these signs be referred

* De Sed. et Causis Morborum, Epist. xvi.

† Recherches Anatomico-Pathologiques sur la Phthisie, p. 461. The sensation, as related in a case of Dr. Stokes's, strikingly resembled the description of Morgagni; the patient, " while in the act of coughing, had a sensation as of a sudden crack, extending from the shoulder downwards, and felt as if a quantity of liquid was shed out into the left side of the chest." Trans. of Assoc. Dublin College of Physicians, vol. v. p. 337.

* Op. citat. † Ibid. p. 476.

to as decisive tests of perforation. Dr. Townsend records a case of pneumothorax from this cause, the commencement of which was marked by neither violent pain nor sudden dyspnœa.* We have also had a case in which the most careful investigation of its history could not determine the period of perforation from the sudden supervention of these symptoms.† In estimating them, it is moreover to be remembered that the dyspnœa of phthisical patients is not uncommonly increased by other obscure causes; and, also, we should be on our guard against mistaking for such an occurrence pleuritic pains, which are so common in phthisis, and sometimes are of more than ordinary sharpness, without being by any means connected with perforation.

The dyspnœa which exists during the general duration of pneumothorax is deeper and more distressing than that of simple chronic empyema. This is, doubtless, partly occasioned by the coexisting sources of irritation of the pulmonary circulation which phthisical patients possess. A cause of equal efficacy and more uniform existence is found in the resistance which the elasticity of the air affords to the great pressure under which it exists in pneumothorax. This causes such a condensation of its volume before it produces the compressing effect of a liquid effusion, that even the greatest expansion of the thoracic parietes can but partially overcome its reaction, so that the dyspnœa resulting from their compression is but partially mitigated by the deepest inspiration. Such a condition is not present in simple empyema, as it is obvious, from the non-elastic nature of the fluid, that deep inspiratory efforts may expand the thorax beyond the limits of its compressing action, which therefore does not maintain a constant embarrassment of breathing, as it does not react (like the elastic fluid) on the immediate compression being temporarily withdrawn.

This appears to be the rationale of the aggravated character which the dyspnœa of pneumothorax possesses. The slightest exercise produces great oppression if the patient be able to walk, but ascending stairs causes particular distress. Even the motion of turning or raising himself in the bed leaves him often speechless from breathlessness for a short time. In the latter case we might conjecture that the fluid is in large proportion, as its mere weight has great influence on the breathing in changing the posture.‡ If the duration of the disease permits it to assume a chronic character, the dyspnœa rather diminishes than increases, although the internal compression shall not be mitigated. This is attributable to that surprising power of adaptation to circumstances which the animal economy enjoys, and which is possessed in an especial degree by the respiratory and circulatory organs. However, whatever fluctuation it may undergo during the course of the affection, as in all thoracic diseases, it becomes aggravated at its close.

The acute pain which ushers in its commencement generally subsides in a short time, and afterwards it runs its course without marked suffering from this cause. But more usually, if the patient lasts, he is subject to violent recurrences of pain which have been traced in some instances to recent inflammations of the sac, and also to the establishment of new fistulæ. These attacks of pain are in themselves additional sources of the dyspnœa; it follows, however, of course, that no secondary occurrence of inflammation, nor opening of new fistulæ, can produce the same degree of pain or overwhelming dyspnœa which ensues upon the original perforation.

b. Cough and expectoration.—These symptoms, which are more or less present in every pulmonary disease, form no essential accompaniment of pneumothorax. No case indeed is altogether free from them, but they are rather to be classed with the signs of phthisis which has preceded it, or with those of the pleuritis which accompanies it, than to be referred to the affection itself. On more than one occasion we have been enabled to mark their connection with bronchitis supervening in the opposite lung. Even a slight degree of cough is harassing to the patient, and in the rare cases where it remains frequent it causes extreme anguish. It is performed in a very laborious manner, in which an instinctive endeavour to refrain from agitating the contents of the thorax is perceptible to the medical observer. This gives to it a peculiar expression, so that we find sometimes set down, in accurately taken cases, "dry, husky, ringing," as the character of the pneumothorax cough. It has occurred to us, while observing it, that it resembled very closely the cough of a broken-winded horse. The distress which it occasions makes it important to attend to this symptom, and an acquaintance with its peculiar character may assist in distinguishing the affection. It is, however, sometimes nearly entirely absent. In a case of Dr. Stokes's, the dissection of which we attended, a complete cessation of both the cough and expectoration took place simultaneously with the occurrence of pneumothorax, but they returned with severity when tubercles in the other lung began to soften.

The expectoration is for the most part scanty, and possesses no peculiar characteristic, but in some rare cases it happens that the fluid contents of the pleural cavity make way through the bronchial communication. When this occurs, the evacuation of the matter is attended with terrible dyspnœa, threatening, when it is copious, sudden suffocation.

It is known that the patients who are ope-

* Trans. of Assoc. of Dublin College of Physicians, vol. v.

† Dublin Journal of Medical and Chemical Science, No. 3.

‡ This remark as to dyspnœa produced by sudden change of posture, is a valuable diagnostic of fluid effusions of any kind in the chest, particularly where these complicate pneumothorax. The description which Morgagni gives of it in what was anciently called convulsive asthma, must be appropriated to such cases, and particularly to that which we treat of. "*Statim anheli fiebant, ac velut moribundi respirabant*, cum retrorsum caput moverent, aut supini," &c. De Sed. et Causis Morb. Epist. xv.

ed on for empyema sometimes acquire a wer of assisting the expulsion of the matter ich collects posterior to the operation, through wound of the side, by forcible expiratory orts and coughing. We mention this to no- e the case of a porter at the Meath hospital, ected with pneumothorax and empyema con- quent on perforation by a tubercular abscess. is man possessed an analogous power of *ex- lling at will* the fluid of the cavity through e fistula in the lung. He was accustomed to ert this whenever it accumulated to a certain antity, by leaning over the bedside so as to vert the thorax, and thus decant it through e mouth, aiding its escape by some efforts of ughing. Another singular circumstance worth ticing was remarked in Dr. Stokes's case just ferred to. When the irritation of the oppo- e lung caused a return of the expectoration, e patient was sometimes unable to raise it out the trachea, but was sensible of losing com- and over it when it ascended as far as the top the sternum. In fact he felt convinced that used to drop down the bronchus leading by e fistula to the pneumothorax cavity.

c. Decubitus.—If the fluid contents of the eural cavity be very small in quantity, the tient may recline indifferently upon either de or upon the back; but in the majority of curately observed cases he has been found to in preference on the affected side. This is e conclusion that our inquiries have led us ; but different statements are found in an- iors on this subject. It is stated by Schmalz* d other writers that the decubitus is invari- ly on the sound side in pneumothorax, and at this affords a striking mark of distinction etween it and empyema. We cannot help specting that this opinion has been originally ther conceived from theory than deduced om observation, and we the more readily ake this remark from observing the occasion nd the manner in which Dr. Duncan† an- ounces it. "The change of decubitus," says e, describing a case, "*is exactly the reverse f what it ought to have been,* for in empyema ne patients commonly lie on the affected, and pneumothorax on the sound side." The easoning, too, with which this has been ad- anced‡ is only applicable to the infinitely rare ase of simple pneumothorax, and not to that vhich results from perforation, for this is always ccompanied by empyema. It is true that in mpyema the dyspnœa is caused by the pres- ure of fluid alone, and it is chiefly for the urpose of relieving the mediastinum and pposite lung of its weight and pressure that ecubitus takes place on the affected side. (See Empyema.) But in pneumothorax the ompression of the internal organs is as com- plete, if not more so, although caused by air, nd if the *weight* of even an inconsiderable quantity of fluid should be added to them lready suffering under this great compression, it will be an object with the patient instinctively to obviate this by lying on the affected side. As far as our experience goes, this position has been, *cæteris paribus*, always preferred. However, it not unfrequently happens that the violence of the pleuritic pain forces the patients to turn to the sound side in spite of the increased oppression which the change induces. We have witnessed a case in which the struggle between the pain augmented by lying on the affected side, and dyspnœa aggravated by changing to the opposite, was extremely distressing; but here the want of breathing triumphed over the pain, and compelled the poor patient to endure the latter as the lesser evil. When the intensity of the pain has passed, if a change has taken place during its continuance, decubitus on the affected side is usually resumed.

d. Dilatation of the side.—On a comparison of the two sides of the thorax, it is observed that the side in which the pneumothorax exists is faintly or not at all elevated during inspiration, and on being measured it is generally found to be larger than the opposite. These differences may be observed at a very early period after the perforation, but for the most part they are greatest at the advanced periods of the affection. The average amount of the dilatation is from one to two inches, as in empyema. The enlargement of the intercostal spaces and their occasional protrusion beyond the level of the ribs are also observable in both, so that, from the mere contemplation of the phenomena of dilatation, there exists no distinctive mark between them. It is said, however, that where they are very conspicuous in pneumothorax, the side is more what the French denominate "bombé" than in empyema. The œdema of the integuments of the side which sometimes attends the latter is not observed, although Louis and others have remarked an œdematous state of the corresponding arm.*

Many instances of pneumothorax are on record in which no difference whatsoever existed in the dimensions of the two sides of the chest. It may be observed that in cases where the air can pass out during expiration from the non-existence or imperfect formation of the valvular arrangement of the fistula before described, the chief source of dilatation, namely, the accumulating pressure of the air, is absent. This valvular structure has not been hitherto much attended to; it has, however, been remarked that in some of the cases where there was no dilatation, the fistulous orifice was very large, rendering it probable that egress from the cavity as well as ingress remained unobstructed. But it must be acknowledged that this sug-

* Versuch einer Medizinisch-Chirurgischen Diagnostik. Dresden und Leipsig, 1825, p. 99.

† Edin. Med. and Sur. Journal, No. 28, p. 327.

‡ See Med. Chir. Review, July 1830, p. 455.

* It appears, from Morgagni, that this œdema of the arm has been frequently noted by the older physicians in pneumothorax. "Verum præterquam quod brachium alterum, quod dolebat, œdemate habebat tumidum (qualem tumorem in thoracis hydrope Fantonus pater, et Buchnerus, aliique, et in his Valsalva noster interdum adnotarunt) *cum ad thoracis motum diceret fluctuationem in eo sentire,*" &c. Morgagni de Sed. et Causis Morb. Epist. xvi. s. 36.

gestion is by no means sufficient to explain the absence of dilatation of the side in many well authenticated cases, in which the air was proved to have been subjected to very great pressure, evidenced by displacement of the thoracic viscera and other phenomena.*

We had an opportunity of demonstrating that the dilatation of the side varies considerably, and that it may even give place to contraction. At an interval of six months between two measurements of a case, it was found that the pneumothorax side (measuring from the centre of the sternum to the spine of the vertebræ), from being one inch wider, had become half an inch narrower than the other. And further, on measuring five months afterwards, it was found to have returned to its former dilated dimensions. We believed that we were enabled to connect this temporary decrease of dilatation with a partial closure of the fistulous communication, and an attempt at cure, as happens when empyema is removed by absorption. The progress of the case, however, (during which other fistulæ formed,) and its termination, did not allow us to confirm this anticipation; but notwithstanding this, the nearly total departure of the tintement coinciding with the contraction and other phenomena left little doubt that such was really the case.†

Schmalz says,‡ "If both sides be engaged, the chest exhibits nearly a cylindrical form." Of the recurrence of double pneumothorax the only two cases recorded that we know of are those in Laennec's work. In the first of these, observed by M. Recamier, the chest is described as "vaste, bombé," terms which have probably suggested the description of Schmalz. Notwithstanding the extreme rarity of both sides being involved, it may not be useless to retain in memory this symptom of general dilatation, as in such a case many of the other signs must be of no avail, inasmuch as they require the contrast which is afforded by the opposite side remaining sound, and it is of the greatest importance to be able to recognize this terrible affection at once, in order to attempt the relief of the dyspnœa by performing paracentesis, the only means which art suggests to prevent speedy suffocation.

c. Displacement of heart and depression of diaphragm.—It appears that less compression is requisite to effect these conditions than to produce dilatation of the side, for the latter has been absent in cases where the heart has been thrust considerably out of its place, and a sensible fulness produced in the corresponding hypochondrium by the depression of the diaphragm. It is here a proper place to remark the singular fact that perforation of the lung and its consequences, in the great majority of cases happens on the left side. Seven of eight cases, which occurred to Louis, were on this side, and we believe that in the cases which have come to our knowledge nearly an equal preponderance existed. So great a disproportion must have been in some degree accidental, for in eight cases described by Laennec, the number on each side was equal. However this may be, it is certain that it occurs oftener on the left, and this circumstance makes displacement of the heart a very common and striking feature in pneumothorax. In cases of extreme displacement, the heart's action is both felt and seen beyond the cartilages of the opposite side, but the average extent is not further than the opposite half of the sternum, or below the ensiform cartilage; for it is found to move downwards as well as laterally when the displacement occurs from left to right. When the pneumothorax exists in the right side, the heart's displacement, for obvious reasons, will be less, but the depression of the diaphragm will be more easily perceived from the protrusion of the liver which follows it. This prominent state of the liver is as truly an effect of depression of the right side of the diaphragm by an aëriform collection as by an empyema; and, as in the latter, it might at first view lead the observer to conclude that the oppression of the respiratory organs was connected with a visible hepatic enlargement. This has been adverted to in the article Empyema; but in a paper on the diagnosis of the latter* by Dr. Stokes, since published, there are some additional signs furnished, which contribute much to the elucidation of this point of diagnosis. We shall notice here but one of these, which is as applicable in pneumothorax as it is in empyema. It has, moreover, a peculiar propriety in the former, as it is a palpable sign, and addresses the eye at the first examination; because we apprehend that the effects of pneumothorax and enlargement of the liver could be confounded only where a defective exploration had at first produced an erroneous impression, unless the air be very small in quantity and the fluid copious, in which case the difficulties connected with empyema recur. Dr. Stokes, however, has observed, that where the diaphragm, depressed and rendered convex downwards by the contents of the pleural sac, causes the descent of the liver, there is a sulcus evident to the sight and touch in the right hypochondrium. This is produced by the two convex surfaces of the diaphragm and liver, respectively terminated anteriorly by the edge of the latter and by the

* See Dr. Duncan's tenth case, Edin. Med. and Sur. Journal, No. 28.; Dr. Stokes's case, Trans. Assoc. Dublin College of Physicians, vol. v.; and five of Louis's cases, marked "Etat extérieur, rien de remarquable," which amounts to evidence of no dilatation, for this exact observer has noted it particularly in the cases where it was present. In Dr. Duncan's case a method of opening the thorax was practised by Dr. Cullen, which is worth relating. Instead of penetrating the sac at once, which is usually done, he dissected back the ribs and intercostals for a considerable space, so as to expose the external surface of the pleura, which rose up distended and elastic. This way is somewhat more troublesome, but it is very advantageous for estimating and displaying the pressure which the air exerts.

† Dublin Journal of Med. Science, No. 3 and 8.

‡ Op. citat. ibid.

* See seventh number of Dublin Journal of Medical and Chemical Science.

erior margin of the false ribs. It is manifest
t such a sulcus cannot be present in the
re enlargement of the liver, let it take place
any extent, as it requires the opposed con-
xity of the diaphragm for its formation, and
s condition is only produced by a liquid or
seous effusion.

f. Fever.—Whatever has been the condition
the circulation before the escape of the air
perforation, the fever of pleuritis sets in
eedily after this event takes place. Its cha-
ter is necessarily modified by the previous
te of the patient's system, but it always con-
res to aggravate his sufferings. Much, in-
ed, of the dreadful distress which ensues is
be ascribed to the increased febrile action
hich occurs almost simultaneously with the
cident. This will be conceived when it is re-
llected that while one of the lungs is by rapid
mpression nearly deprived of its function of
spiration, the excitement of the heart's action
creases the demand for aeration, so that this
mbination of circumstances often produces a
gree of dyspnœa under which the patient
pidly expires. Such an effect of the fever is
t more likely to occur in debilitated indivi-
uals than in those of robuster stamina; for in
e former, although the constitution be more
hausted, this seems fully counterbalanced as
gards the effects in question, by the dimi-
shed quantity of blood which circulates in
e system of emaciated phthisical patients.

If the immediate consequences be not fatal,
e fever subsides into the same type which
isted before perforation occurred. This is
e hectic of phthisis, in which the pulse seldom
nks below 110, and is exacerbated in daily
roxysms. We are, however, led to believe,
at if the opposite lung be not already the seat
tubercular deposition, or even if this be not
an advanced or progressive state, the phthi-
cal hectic which attended the disease of the
ng that has suffered perforation, is diminished
the supervention of pneumothorax. We
ve witnessed one case and heard of another
which the hectic pulse and night sweats
uld be traced to have actually ceased from
is period. In both instances, it is true, the
ssation was but temporary, but we had une-
uivocal evidence that their return was cotem-
oraneous with the occurrence of disease in
e opposite lung.

The foregoing is a detailed account of what
re called the *rational* symptoms. Their study
s of great importance in understanding the
isease, and it must be acknowledged that
everal amongst them are valuable diagnostic
igns. We proceed now to describe the *physical*
igns. It would be a needless task, at the
resent day, to use much earnestness in in-
isting on the importance of these in the explo-
ation of any thoracic disease, for it is fully
ecognized. We must remark, however, with
espect to pneumothorax, that just in proportion
s the practitioner has attained to a masterly
acility in their application, will he be enabled
o decide with certainty as to its presence or
bsence. The very existence of this affection
n nosology is so intimately connected with its physical signs, that until these were discovered it lay still unnoticed, and correct notions on the subject advanced as they were developed and improved. Hippocrates laid the foundation for its future diagnosis by the practice of succussion, and had he pushed its application a little further, he must himself have arrived at its real signification, as it appears, from some of his remarks on its use, that he was partially aware of some of the conditions necessary for its production. Corvisart and Bayle, masters of percussion, had glimpses of its nature, and remarked its existence in the dead body. Laennec, whose merit in this instance was as great in perfecting and applying the other two signs as in adding his own famous discovery, was the first who detected it on the living body. He brought its diagnosis to perfection by assigning to the physical signs their value separately and in combination; and if any additional light be thrown on its history or symptoms since his time, even this must be ascribed almost wholly to the greater facility and confidence with which it is now recognized by the employment of these means. These considerations are sufficient to shew the great importance which attaches to these physical signs in pneumothorax: upon them, in fact, rests its diagnosis, and he who is skilled in their application may truly pronounce upon this affection, which has remained for so many ages of medicine in obscurity, in as positive a manner (as Andral speaks of these principles applied to thoracic diseases in general) as the surgeon can "of the least complicated dislocation, or the simplest fracture."*

a. Succussion.—Whenever air and fluid exist together in the sac of the pleura, if the trunk be shaken abruptly, the splash of the liquid against the walls of the thorax is often distinctly heard by the patient, or by any one who places their ear on or near the chest. There is no stronger evidence of pneumothorax than this sound, for it is only produced where both air and fluid are present; if either be absent, no splashing sound is heard.

In the writings of Hippocrates this method of exploration was taught as a means of ascertaining the existence of purulent matter in the pleura. Distinct directions are enjoined as to the manner of performing the succussion, and even observations added from which it is apparent that the author could estimate by this means the quantity of pus contained in the pleura: "Among the patients affected with empyema, those who produce most sound, when shaken by the shoulder, have less pus in the chest than those who yield less sound, and who are more flushed and breathless: in respect of those who do not yield any sound, but who have the nails livid and a great dyspnœa, they are full of pus, and their case is desperate." These remarks contain much truth, and implying as they do considerable acquaintance with the phenomena, it is a most remarkable circumstance that they did not conduct their author, or his admiring commen-

* Clinique Médicale, Avantpropos, p. 6, tome ii.

tators for so many ages afterwards, to the knowledge of the real condition which they indicate. Laennec points out the reason why, while such close approximations as that quoted from Hippocrates appeared as it were to leave only another step to unfold the truth, they remained as far removed from it as ever until a very late period. It consisted in a fundamental error as to the natural state of the lungs and pleura. The early notions were a mass of confusion on this subject, but for the most part it was conceived that a vacuum existed in the thorax. This absurd hypothesis precluded the necessity for the presence of air to cause the sound of fluctuation, and being handed down from age to age prevented the truth from reaching the mind even of such men as Morgagni. It is obviously inferrible, from the quotation which Laennec makes from the latter, that this great pathologist believed that the fluid of an empyema was poured out into an empty space in the pleura, which, after a certain quantity of effusion, became filled. In the quotation which we now insert, this opinion is not left to inference, but alleged in the most explicit terms, and even adduced as the only way of explaining the sound of the fluid in a case of pneumothorax. Referring to the "stillicidium cadentis humoris," which we formerly quoted from him, Morgagni says, "Res non ita facilis explicatu iis *qui inter pulmones, et thoracis parietes negant spatii quidquam intercedere; vera tamen, ut postmodum comprobavit humoris, in eo latere congesti, cum fluctuatio in agitatione corporis ab ipso, ab aliisque evidentissime percepta*," &c.* On such an hypothesis the sound of fluctuation should have been heard in every case of empyema, instead of being, as we now know it to be, confined solely to the case where this is combined with pneumothorax. It is very probable, then, that its abandonment is to be attributed to its having failed to detect simple empyema, which it could never have done. It is moreover certain, from the description, that the cases designated by Hippocrates as "full of pus," and which Morgagni would have embraced under those "qui ad summum pervenerunt," were cases of simple empyema, and it shews that, although these great physicians were prevented from seeing its true cause by a false hypothesis, they observed with accuracy and fidelity; as in such cases no sound of fluctuation is heard, the "*space being filled up*," as Morgagni said.

Thus this invaluable diagnostic fell into neglect; there is no evidence of its having been used after the time of the Aselepiades; and even the commentators appear to have esteemed it as useless, and to have alluded to it, as Laennec remarks, merely out of respect to Hippocrates. It was not revived till the true causes which produce it became fully explained, but since that period it has been ranked as one of the most infallible signs by which any internal disease can be recognized.

The Hippocratic method is still generally used in the employment of succussion. While the physician places his ear to the side of the thorax, an assistant shakes the patient smartly by the shoulders, and thus the dashing of the fluid is heard. It frequently happens that the patient is the first to call attention to it by mentioning that as often as he turns over in the bed he is sensible of this sound himself. It is felt by him on descending a stair, or, as we have known, when he makes a forward step with greater quickness than usual. Besides the little confidence which Morgagni placed in it as an indication, he objected to the Hippocratic method that many patients would not suffer willingly the concussion of the trunk. While this remark cannot have the effect which he intended, yet it is worthy of attention. Laennec denies that it is attended with any inconvenience, but in the cases in which we have seen it employed, a very considerable commotion was caused to the patient before the fluid could be heard. An intelligent man, who was under our care for a very long period, was accustomed to produce the fluctuation himself by making a jerking rotation of the trunk on the spinal column. He was enabled to produce the sound with much facility, and greatly preferred doing so himself in this manner to being succussed in the ordinary way by the hands of another. We can conceive that in certain cases such a method would be as impracticable as the former; we leave them both, therefore, at the option of the practitioner, who will of course choose that which causes least disturbance to the patient.

This fluctuation might be also produced by an enormous phthisical abscess half full of matter and air; but such a cavity as would be sufficient to give rise to it is scarcely ever met with, having occurred but once in the large experience of Laennec. There is also a possibility of being deceived as to the source of the fluctuation, if the stomach contain much flatus, and the patient has recently taken drink. The other physical signs will easily preclude the latter error; but its infinite rarity alone seems to be the only protection from the former.

b. Percussion and auscultation.—Laennec has demonstrated, from a review of the knowledge which Avenbrugger, Corvisart, and Bayle possessed on this subject, that percussion alone was insufficient for the diagnosis of pneumothorax. When the side affected is percussed, an unnaturally clear or tympanitic sound is returned, and if this coincide with dilatation of the same side, the evidence for pneumothorax is very strong. From these data Bayle was enabled to recognize it in the dead body in two or three cases; and doubtless, if its pathology had been understood in his time, he would have detected it from the same evidence on the living. But even in the hands of the most experienced master of percussion these signs might lead to a deep fallacy, for it might be thought that the clear-sounding side was in a healthy condition while the other was the seat of either pulmonary engorgement or a pleuritic effusion, which produced the comparatively dull sound; and as to the dilatation of the

* (Prænot. Coac. ii. 432.) Forbes's translation of Laennec, p. 507.

side, it is liable, when considered only in connection with percussion, to lead to the same error; that is, the dilated side might be mistaken for the sound, and the latter regarded as in the state of contraction which results from chronic pleurisy (see PLEURITIS); and again, the converse of this error is also possible, in which the contracted side should be mistaken for the sound side, and the latter considered as dilated and too resonant. That these difficulties of diagnosis from these means are not imaginary our own experience has convinced us as well as the warnings of Laennec;* they are, however, quite removed by adding to percussion the results of auscultation. On applying the stethoscope to the pneumothorax side, it is found that the respiration is as completely absent as if it was an empyema; but percussion has already proved that, instead of the perfectly dull sound, which a collection of liquid in the chest causes, we have now a preternatural clearness of sound, which two conditions, viz. nullity of respiration and clear sound on percussion, never co-exist except in the case of air in the cavity of the thorax.

Although we have indicated the percussion sound of pneumothorax to be exceedingly clear and tympanitic, occasional deviations to a certain extent from this general rule are met with. It will be recollected that when pneumothorax takes place, the expansion of the air-vesicles of the opposite lung becomes much increased from having to perform the compensatory respiration, and consequently the clearness on percussion of this side is simultaneously increased. This is one cause why the *contrast* on percussion is not so striking as might be anticipated, and it suggests how much more valuable this sign would be were it possible for us to contrast the sound of the *same side* before and after the period when pneumothorax was supposed to occur. Another circumstance which occasionally prevents the drum-like resonance peculiar to this affection from being produced, is the existence of partial adhesions, which sometimes retain the lung in spots still in contact with the costal pleura. In the points corresponding to these the sound on percussion will still be dull, while the clearness will be perceptible in the intervening spaces. It is also to be remarked that, although we have laid down nullity of respiration as the rule, this is seldom absolute. Close attention will almost invariably discover a feeble bronchial sound at the root of the lung along the spinal column, which may sometimes lead the observer to imagine that he hears the puerile respiration of the opposite lung conveyed across the spine. But besides this, if there be any points of adhesion, they may cause a faint murmur to be heard. These adhesions may exist at any part of the lung, but as we have in a preceding part shewn that they are very common at the summit, so we are not unfrequently enabled to discover, immediately under the clavicle or in the supra-spinal region of the scapula, the sound of respiration generally of a cavernous character, and mixed with a single bubble of gargouillement. These latter signs may be considered as marking the remains of a cavity (see TUBERCULAR PHTHISIS), and this is sometimes confirmed by the co-existence of an obscure pectoriloquy.

The fluid which is contained in the cavity is recognized by these signs with the same facility as the air. By the absence of respiration we learn that the lung is now displaced by either fluid or air. This being established by auscultation, the results of percussion enable us to appreciate the space in the thorax which is occupied by the liquid and gaseous fluid respectively. As percussion is performed from above downwards, the tympanitic resonance is perceived to give place at a certain level to a total dulness of sound, and where this change abruptly occurs is the line of demarcation between the air and fluid. By marking from time to time the situation of this line, it is manifest that we can ascertain whether the proportion of the air and fluid remains stationary, or if either of them increase at the expense of the other. Finally, it may be instructive to examine their relations under changes of posture, to observe how the liquid obeys the law of gravity, and the tympanitic sound shifts as the air moves to occupy the space vacated by the heavier fluid. Such investigations furnish data from which an acute observer may form a conjecture as to the existence of adhesions, the size of the cavity, and even the amount of the compression sustained by the viscera; upon which points it may be of the highest importance to obtain any additional light, particularly if the idea of paracentesis be entertained.

The signs of pneumothorax derived from auscultation and percussion, so far described, are almost purely of a negative character; but even were the diagnosis necessarily confined to them, there is but one disease for which it could possibly be mistaken; this is emphysema of the lung, or dilatation of the air-cells, many of the characters of which are, however, so clearly distinguished from it, that it could only be confounded with it by a very inattentive examination. They resemble each other in the clear resonance which percussion gives out, and also in the negative results of auscultation. But the respiration is never totally absent in emphysema of the lung, as in pneumothorax; it is only much weakened, and is moreover accompanied by its peculiar râle, which strikingly opposes them. The history and general phenomena are quite distinct; the emphysema is always a chronic malady, and the patient is able to go about; although complaining much of difficulty of breathing, it is more because it interferes with his occupations than from the deadly anguish which overwhelms the patient in most cases of pneumothorax. If these considerations be not sufficiently convincing, the presence of pneumothorax (from perforation at least) may be decisively determined by succussion and the metallic tinkling.

The inventive genius of Laennec was not

* Forbes's Translation, p. 497.

content with these negative results of auscultation. Apparently not long after he had laid the foundation of its diagnosis in these, his perseverance was enabled to add to them a positive sign, the *tintement metallique*. This is a metallic tinkling or ringing sound, heard in the pneumothorax cavity at intervals. It is discerned equally well by the naked ear or by means of the stethoscope, but to examine it accurately and to mark its limits, the latter instrument must be employed. It is so accurately represented by the dropping of a pin into a large wine-glass, or touching gently a sonorous porcelain vase with a quill, that it may be recognized without the observer having previously heard it; by keeping this comparison in mind, having been once heard, it is always remembered.

The metallic tinkling is audible during coughing, speaking, and sometimes during respiration, or it might be more correct to say after these actions. Besides this, it is often heard independently of these, observing a certain periodicity, and finer in its tone. That the finer tone which we have just alluded to is the echo caused by the occasional fall of a single drop of fluid from the summit of the cavity on the surface of the liquid, we only require to imitate it by letting fall into a large wide-mouthed bottle, one-third full of water, one drop of any liquid, to be fully convinced. This variety of the tinkling is explained in this manner by Laennec, who has also proved demonstratively that the sort which results from speaking, coughing, and inspiration, is produced by the air entering through a fistula into the pneumothorax cavity. He did not announce more particularly its proximate cause, and where this master did not speak it might become us to be silent. We may state, however, without presumption, that we never had any hesitation in explaining this variety of the tintement on the same principles as the other. It appears to us to be manifestly the echo of the air forced into the cavity reverberating against its hollow parietes, and that the sound is more particularly caused by the bursting of minute air-bubbles at the orifice of the fistula, formed as the air traverses the latter, by its entanglement with mucus. It is more clearly audible in proportion as the cavity is empty of fluid; but its distinctness and loudness are chiefly dependent on the size of the fistulous communication. We have been enabled to follow the gradual narrowing of the latter by the diminution of the tinkling in one remarkable case. It became so minute that it was by the greatest stretch of attention scarcely perceptible on respiration, and at length became inaudible, but it still persisted on speaking and coughing. At an after period the whole train of symptoms became exacerbated, and the tinkling was again manifest on respiration; and by degrees, as the malady grew worse, it increased to a louder and graver pitch than ever. This is indeed the ordinary change which it undergoes; in most cases the fistulous orifice rapidly enlarging in size, the tintement is heard more and more plainly on respiration, and at length it becomes so deepened in tone as to assume quite a different character.

To the metallic tinkling altered thus by the deepening of its sound, the name of *bourdonnement amphorique** has been given. It is so called because it exactly resembles the sound produced by blowing into a decanter or large bottle. When this sound becomes evident, it is a sure indication that the fistula is growing larger, and consequently that the case is more hopeless.

In exploring for the metallic tinkling, there is a source of fallacy which the physician should be aware of. When the stomach is flatulent, it lies high under the false ribs, and if in this state the patient has lately taken drink, the tinkling may be produced in the stomach, and lead the observer to think he hears it in the chest. On the other hand an incident occurred to the writer of this article, which shews that this source of deception may be held too strongly in view. In examining a case which at first view he had imagined was empyema, the tinkling was evidently perceived; but finding the epigastrium tympanitic, it was disregarded, from the conception that it was produced in the stomach. On the second or third examination the sound was again heard, and now recognized to be the true metallic tinkling.

The only other conditions besides pneumothorax which can give rise to this sign, is the existence of a vast phthisical abscess, such as also produces the sound of fluctuation. Laennec relates its occurrence in a phthisical abscess of such a size that the whole lung was nearly involved in it; but such instances are so infinitely rare that they will never embarrass the diagnosis.

The production of the metallic tinkling in a phthisical cavity, we would remark, is a circumstance quite inconsistent with the views on the subject which Mr. Guthrie has lately published. This gentleman states that Laennec and all who hold with him that it "depends entirely on the passage of air through a hole in the lung into the cavity of the thorax," were mistaken; and in opposition to this he maintains that for its production the air of the cavity must necessarily be compressed. "I do not," says Mr. Guthrie,† "deny the facts of the air, the hole in the lung, or the fluid; but I believe that, to produce the sound of the Jew's harp (the metallic tinkling), the air in the cavity must be greatly compressed, and that it essentially depends upon it." That this latter opinion is un-

* We would gladly use English words, but cannot devise any that would justly anglicise the above; we have, therefore, thought it better to leave the expression which the discoverer applied. Nothing can be better than metallic tinkling, but it appears to us that "utricular buzzing," which is used in the valuable translation of Dr. Forbes, although a correct synonym, is scarcely less foreign than the original.

† London Med. and Surg. Journ. for Jan. 12, 1833, p. 747.

founded, its occurrence in large tubercular cavities, which has been observed by most who are much conversant with phthisical auscultation, sufficiently proves. In such the air can suffer no compression. It is besides well known to exist after the operation for empyema; and we have never heard it more audible than in a case of pneumothorax caused by the bursting of an anthrax of the intercostal spaces into the pleura, in which the external fistula remained open.

We have now concluded the account of the diagnosis, but as we have been necessarily diffuse on some of the points, we think it may not be superfluous here to recapitulate, so as to give at a glance the principal diagnostic signs. By subjoining to each a word of valuation, the reader will be able to calculate the amount of evidence implied by the presence of any one of them.

1. The sensation of something giving way in the chest, and of air entering the pleural cavity.—Very valuable, but often absent or unnoticed.
2. In a phthisical individual the sudden supervention of overwhelming dyspnœa and pain.—Rarely absent, therefore very valuable; still more so if succeeding last sign.
3. Comparison of auscultation and percussion. Nullity of respiration over one side, together with tympanitic clearness of sound, which below terminates abruptly in complete dulness.—If accurately established, amounting to positive certainty, but sometimes not easy to establish. Ægophony rare.
4. Fluctuation on succussion.—Positive certainty, but should be unquestionably verified.
5. Metallic tinkling.—Positive certainty, but should be unquestionably verified.

Prognosis and treatment.—On casting our regards back on the pathology of this affection, we cannot be astonished at any thing which experience can teach us, as to the rapidity and certainty with which it is followed by a fatal result. When we consider the prognosis of phthisis, and add to this the aggravating circumstances of perforation and acute inflammation of the pleura, together with the simultaneous privation of the function of one lung, the consequences will appear to be so inevitable and immediate, that our review of its pathology and symptoms may seem to be a dissertation on a nice point of morbid anatomy and diagnosis, or only useful so far as an acquaintance with it may prevent the physician from being taken by surprise by the supervention of its fearful indications in a case of phthisis. And, indeed, if all knowledge were useless that did not immediately lead to practical benefit, this would be in a measure true; for it must be confessed that at present it does little more than unfold to us how soon we may expect a period to be put to the patient's sufferings. The result of Laennec's experience of it is more fairly drawn from the statement which he makes for the purpose of contrasting it with emphysema of the lungs, than where he specially speaks of its prognosis. "The effusion of air," he says, "comes on suddenly, and cannot exist for any length of time without giving rise to severe symptoms, and even death. I have never seen pneumothorax in any person who was not confined to bed."* Louis only speaks of the result with a view of calculating the time which elapses between the period of perforation and death.† Dr. Stokes relates his case, which lasted five months, as the longest at that time on record;‡ and in upwards of twenty cases witnessed by Dr. Townsend, none, we believe, lasted so long a period. In Louis's seven cases the fatal termination took place at intervals of from sixteen hours to thirty-six days after the perforation occurred; and this author adds, "it is difficult to give an account of the circumstances which produce this difference, and it is in vain to seek for the explanation in the greater or less strength of the patients at the time that the accident took place."§

The only question, then, which the prognosis admits of is, whether recovery in pneumothorax from perforation by tubercle is barely possible. Laennec, arguing from his observation of the cicatrisation of tubercular cavities, is of opinion that it must not be regarded as impossible even in the severest cases. This opinion is shared by some others, but it is to be regretted that the few facts which are produced in its favour are drawn from the older writers, who were ignorant of its production in this manner. Some of them were evidently, at first, cases of empyema, which, by opening into the lung, gave rise to the pneumothorax: and we believe that most pathologists consider even the case related by Laennec, in which the pneumothorax existed for six years, was of this nature. But the progress of a case detailed in the third number of the Dublin Journal of Medical and Chemical Science (which has been more than once adverted to in this article) has induced us to believe that this case of Laennec and some others may probably have resulted from tubercular perforation, and to adopt his opinion as to the possibility of recovery. In this case the individual lived a year and a half after the establishment of the fistula, during which period the dilated side became contracted, but ultimately resumed its former dilatation. The patient's general health and strength became so much improved as to permit him to work as a bricklayer for some months of this period, but this labour exhausted him very much. His own imprudent perseverance in working under exposure produced an attack of severe and general pleuropneumony in the opposite side, which his extraordinary vigour enabled him to outlive, but he ultimately sank under the effects of repeated acute inflammation of the other lung as well as of the pneumothorax sac. The other medical men who saw it with the author agreed with him in thinking that this case might have lasted for a very long time; in fact that the

* Forbes's Trans. p. 499.
† Recherches sur la Phthisie, p. 487.
‡ Trans. Association, &c.
§ *Louis*, op. cit.

contraction of the side, the improvement of health, and the disappearance of the tintement metallique indicated a spontaneous attempt at cure which was counteracted by the reckless neglect of proper caution on the part of the patient. The contemplation of this case, with some observations suggested by it, has, as we have said, induced us to admit the possibility of recovery, which, however, we by no means wish to inculcate in a positive manner: before this can be done by any one a more enlarged experience must be possessed, and the observer who is desirous of deciding the question by facts, has to set out with the melancholy knowledge that not one case proved by auscultation to have been of this nature is on record in which ultimate recovery took place.*

The resources of the healing art, it will be anticipated, can contribute little of a positive nature, if anything, to promote a cure in this calamitous affection. Yet, as in all such extremities the aid of the medical man will be eagerly sought, he should be prepared to do something, although he may regard it as ultimately certain to triumph over human efforts. Few cases will present themselves where some symptoms which aggravate the patient's sufferings may not be removed or alleviated by appropriate means. Proud science may draw back from what seems to be beyond her realm, but the physician has higher instincts to obey and duties to perform here as in other hopeless diseases, in attempting even the mitigation of the pain and anguish which science informs him he cannot altogether remove; and this reflection may be added, that where such motives actuate him to exertion, he is seldom left entirely without means, and never without the satisfaction which obedience to them brings.

We would consider, then, whether any thing can be done to allay the urgency of the symptoms by which the patient is so usually oppressed immediately on the occurrence of this species of pneumothorax; the dreadful dyspnœa, sinking, and pain. We find on this subject no assistance from books, for as the affection itself has been but recently clearly understood, its detection at this early period has been extremely rare; and this, we think, should suggest to all practitioners having the care of phthisical individuals, the utility of keeping in mind their liability to this event, in order to be able to afford assistance with promptitude should it occur. The indications for practice appear to be sufficiently clear. If it has supervened in the last stage of phthisis, when the patient is much emaciated, and already nearly spent by hectic, the treatment must be little energetic. Leeches should be applied in small number to the part where the pleuritic pain is most acute. Afterwards a fomentation of strong decoction of poppy heads, or an anodyne poultice should be used, and in twelve hours another application of leeches might be had recourse to with advantage. The exhibition of a strong narcotic internally will also tend to relieve the dyspnœa as well as the pain, for this class of medicines has the power of diminishing the sensation of want of respiration as well as of lulling the general sensibility of the brain. The use of anodynes may have probably been habitual with the patient before this occurrence, and in this case the usual dose should be increased. We need not specify the particular preparation, but may mention that the "acetum opii" and the "black drop" are often preferred by phthisical patients, and that it is prudent to vary by times from one preparation to another, by which means narcotics do not lose their effect so soon, when the dose is not augmented. If the individual be yet in the very early stages before the perforation, then it would appear to be a very rational proceeding to bleed him copiously, and to treat him with an especial regard to the pleuritis, which speedily ensues. A large bleeding seems to be a very proper measure in such a case for the purpose of diminishing the mass of blood in the circulation; by this means the opposite lung will be less oppressed by the additional influx which takes place from the compressed side;* and this might be confidently expected to alleviate the aggravated dyspnœa of which the latter condition is a principal cause. The leeches can be used here in large number, and the anodyne will follow the bleeding with great propriety, co-operating to the same effect. An assiduous application of these remedies, and watching their effects, might do much to relieve the urgency of these symptoms, which, if they be not by some means arrested, grow hourly worse.

But cases will occur where these means will be insufficient to prevent the dyspnœa from in-

* For our opinion, as above stated, we have not adduced arguments where facts are wanting; but a consideration which weighed with us much, suggested by the above case, may be mentioned here. If the first effects of the perforation be outlived, (which is rare,) it does not appear that a worse condition exists in pneumothorax than in empyema, *provided the opposite lung remains free from tubercles.* It may be objected that there remains the tubercular state of the compressed lung. It is true; but we believe that the conditions which make tubercles so fatally progressive in the lung are absent in the latter; we allude to its constant motion and its great supply of blood. The motion and consequent friction which the action of respiration constantly maintains around a tubercle, appear to us to be a principal cause of the irritation which it produces, and consequently of the increase of its own bulk. Developed in organs whose function does not submit them to motion or friction, their progress is incomparably slower than in the lung. Moreover, the great quantity of blood which circulates in this organ, probably contributes to its rapid progression. We would now observe, that in the lung compressed by pneumothorax the influence of these causes is absent, as it lies against the spine in a state of nearly perfect quiescence, and of comparative anæmia. We would remark, also, that in the above case the hectic sweats ceased almost entirely from the time of the perforation, and we refer to its dissection for some particulars of the compressed lung.

* We find this argument used by Andral in recommending copious bleedings in the case of pleuritic effusion. "Lorsque l'epanchement existe, on doit encore avoir recours hardiment aux saignées, dans le double but de s'opposer aux progrès ulterieurs de l'inflammation, et de diminuer la quantité du sang, qui dans un temps donné doit traverser le poumon comprimé." Clin. Méd. t. ii. p. 582.

creasing to such a pitch as to threaten imminent suffocation, and then the operation of paracentesis is the only resource by which a longer space may be added to the life of the patient. The escape of the air effected by this means is almost always followed by great relief of the symptoms, abatement of the dyspnœa, and lowering of the pulse. This is only temporary. After a period, which is seldom long, although different in each case, the patient sinks, being only saved from suffocation to die of the consequences of the operation. It is, however, justified in such extreme cases by the prolongation of life which it effects, and the alleviation of that most distressing of all suffering which results from extreme dyspnœa.

In such a case, where the only question is whether life shall be allowed to be extinguished, the medical man has no alternative to balance; but if the urgent dyspnœa and pleuritic symptoms have already passed over without destroying the patient, and the case has attained a certain degree of chronicity, is paracentesis advisable? This question is at once set at rest if the existence of tubercles be proved in the other lung, as in such a case not a shadow of hope could be entertained of its success. Since Monro and Hewson advised the operation, it has been occasionally advocated without discriminating between the varieties of pneumothorax; but although the latter of these writers made a sharp conjecture on the subject, it is evident that neither of them had any adequate notions as to that species of which we treat. The chief, if not the only authority by which its performance in pneumothorax from such an internal cause can be supported, is a passage in Riolan, and the case in which Monro advised it. On referring to the former it is impossible to form an idea of what species of it his observations include; but it is very plain that he speaks only of the present relief which paracentesis procured, and not of the ultimate consequences. The following are his words: "Interdum flatus tam violenter distendit pulmones, ut præfocationem adferat, ni succurratur aperto thorace per ipsam paracentesim, quod sæpius factitatum *Parisiis*, magno ægrorum emolumento, et thoracis levatione, etiamsi aquæ nullæ effluxerunt, sed flatus cum violentiâ displosus."* Monro's case, in which the operation was successful, is recorded with considerable accuracy; and we think that any one conversant with those matters, who examines it, will at once deny that it belongs to this class: it seemed, in fact, very probable that the air escaped into the chest by the rupture of some of these distended subpleural vesicles, which are not uncommon in emphysema of the lung, under which apparently the patient laboured for many years.† Universal experience of its failure, as well as the great weight of authority, is against the operation; for no case has recovered after it, of this variety of pneumothorax, since it has been possible to recognise it by auscultation. Its failure appears to have for its cause the readiness to take on a bad inflammation, which the false membrane and pleura possess in this species, in consequence of which it is very common to find a gangrenous state of these membranes occurring after the wound, propagated originally from its edges. Notwithstanding its not having succeeded hitherto, there is still a decided leaning to perform the operation whenever a case occurs. This in some measure is caused by the fact, that the old ideas which connected fluctuation and simple empyema are not yet perfectly exploded, and partly from the too generally applied notion, "melius est anceps experiri quam nullum,"—an adage which is sometimes erroneous, and founded on a forgetfulness of the part which nature takes in the removal of morbid action. The writer confesses it to be his own opinion that the possibility of cure which he has above professed to believe in, lies not in the appliances of art, but in the operations of nature.*

This terminates the subject of pneumothorax from perforation of the lung by a tubercular abscess. We have purposely devoted the bulk of this article to the consideration of this one species for the convenience of arrangement, as well as because it is incomparably more frequent than the whole of the other varieties. To have discussed the latter separately would have involved us in a mass of tedious repetitions; and it seems certain that he who is acquainted with the species which we have chosen for its description, can be at no loss fully to comprehend its pathology and diagnosis, should he meet with it arising from other sources; or at least we trust that the foregoing account of it will place him in such a position that he will be enabled to investigate them for himself. In conclusion, we shall now briefly mention the other methods by which authors have described it to arise.

Pneumothorax from gaseous secretion of the pleura.—The pleura, according to Laennec, in very rare cases takes on the secretion of air like the other serous membranes. This may take place singly, or the elastic fluid may accompany an aqueous or puriform effusion. This variety has not been decidedly established by the observation of other pathologists since the time of Laennec, and we record its existence merely on his authority, and on that of Andral, who relates a case of it, in which, however, this origin was not unquestionably proved.†

Pneumothorax from the opening of an empyema into the lung.—The bursting of an empyema into the lung is not a very unfrequent occurrence; and yet this is an extremely rare source of pneumothorax. When it takes its origin in this way, the empyema has generally been circumscribed. This variety of pneumo-

* Riolan, Encheiridion Anatomicum. Lib. iii. cap. 2. (Med. Obs. & Enq. p. 394.)

† See Halliday on Emphysema, p. 49.

* If ever the perfecting of diagnosis shall arrive at distinguishing the cases where pneumothorax is caused by the bursting of a single tubercle, or of a small mass, we conceive that in such a case the operation may be yet practised with success.

† Clinique Méd. t. ii. p. 512.

thorax is that in which the operation is fairly entertained (see Empyema); and we believe that the cases which recovered after it, where it was proved by the fluctuation to have existed, must be referred to it. We allude to the remarkable cases of Dr. Archer* and Dr. Hawthorne,† &c.

Pneumothorax from gangrenous perforation, and from rupture of the pleura in emphysema of the lung.—The first of these cases has been occasionally remarked, but the latter is extremely rare. Monro's case of successful operation was, as we have before stated, very probably of this nature. In it the rupture took place during a fit of coughing, and it was succeeded by general emphysema of the cellular tissue as well as pneumothorax. Laennec thought that he observed its origin from this cause in one case.

Pneumothorax from lesions of the thoracic parietes.—We should mention under this head, 1st, that consequent on penetrating wounds and lacerations of the lung by fractured ribs, called hitherto by surgeons emphysema thoracis. Dr. Hennen remarks that the fears which exist as to its arising from these causes are greatly exaggerated, as it is in fact a very rare occurrence in military surgery.‡ 2nd. Where it is consequent on the opening of an anthrax or abscess through the intercostal spaces. Of the former we witnessed an interesting case in the Meath Hospital, in which all the phenomena were remarkably perfect. To the latter belongs the singular case described by Dr. Duncan, in which a diffuse abscess spread from the arm to the chest, and penetrated the costal pleura and lung, upon which a circumscribed pneumothorax formed, communicating with the external abscess, and producing elastic tumours on the side.§ 3rd. The species which succeeds to the evacuation of the purulent matter after the operation of empyema. This is an invariable consequence, but we believe that its prejudicial effects are too much insisted upon, as patients sometimes live many years with a fistulous opening in the side, and enjoy a tolerable state of health. The case of longest duration which we are aware of is that related by Dr. Otto, in which the individual daily discharged a small quantity of purulent matter through the aperture formed by the operation for seventeen years, and was enabled for nearly that period to take part in social life.‖

(James Houghton.)

POISONING.—See Toxicology.

POLYPUS OF THE UTERUS.—See Uterus, Diseases of.

PORRIGO.—See Ringworm.

* Trans. Dublin Association.
† Edinb. Med. and Surg. Journal, No. 61.
‡ Hennen's Military Surgery, third edit. p. 380.
§ Trans. Med. Chirurg. Society of Edinb.
‖ Acta Nova Reg. Soc. Med. Havniensis, vol. vii. p. 79.

PREGNANCY AND DELIVERY, SIGNS OF.—Few questions in legal medicine, whether considered in a merely professional point of view, or in reference to their relations with criminal or civil law, impose on the medical examiner a more delicate duty, or a more trying responsibility, than the determination of the existence or absence of pregnancy; placed before him, as the question generally is, under circumstances by which all its natural difficulties are increased an hundred fold. It usually happens in such cases that he cannot rely on a single statement made by the individual who may be the subject of examination; but, on the contrary, he must be prepared for every species of falsehood and misrepresentation. And yet on the correctness of his opinion frequently depend the claim to fair fame, virtue, and honour;—the succession to property, and the rights of legitimacy;—the judicious treatment of disease;—and, in criminal cases, the preservation or destruction of the unborn innocent.

The instances which present themselves are unfortunately but too frequent, in which the unmarried female, either yielding to the influence of passion, or made the reluctant victim of the unprincipled seducer, and becoming pregnant, an investigation as to her real state is sought for, in the hope of inducing marriage, or perhaps for the purpose of influencing a jury in the assessment of damages.

An attempt may be made to *conceal* pregnancy by the unmarried, or even by the married under certain circumstances; as in the case of a wife's separation from her husband or his casual absence, in order to avoid disgrace in society, or to enable her with impunity to destroy her offspring. On the other hand, pregnancy may be *feigned* in order to gratify the wishes of a husband or relatives, to extort money, to compel marriage, to deprive the lawful heir of his just rights of succession, or to delay the execution of the sentence of death.

By the law of this country, a woman condemned to death may plead pregnancy in bar of execution, and medical men are appointed to determine the question whether the culprit is really with child or not; and if she is, whether she be *quick with child*, for pregnancy alone will not save her. This rule, we may observe in passing, is one of the most monstrous and barbarous features of our penal code.* Infinitely superior both in morals and in mercy is the law of France, which ordains that if a woman be pregnant at all, she shall not be executed until after her delivery; and

* Pregnant women have always been objects of much regard and reverence. The Roman laws allowed them the same privilege as those of France. The ancients even spared the life of the murderer who took refuge under the roof of a woman with child. The kings of Persia used to present two pieces of gold to each pregnant woman. The Jews, who observed so rigorously the Mosaic law, allowed them the use of forbidden meats, lest the child might suffer from their longings.

formerly the privilege allowed under such circumstances was even greater: in 1795 a law was passed which ordained that no woman accused of a capital crime should be *brought to trial* until it was properly ascertained *that she was not pregnant*,* and in conformity with this, several decisions were reversed where it appeared that the female had not been properly examined; and in more than one instance the sentence of death was annulled, because after the trial it was discovered that the woman was pregnant at the time of being put upon her trial.†

Connected with such investigations, some very melancholy mistakes have occurred, by which the lives of unborn infants have been sacrificed. Riolan relates the history of a woman named Genevieve Supplice, who, after being hanged for robbery, was publicly dissected by him at the school of medicine, and was found pregnant of a child of five months, contrary to the opinion of the surgeons and midwives who had examined her.‡ Mauriceau also mentions having seen at Paris in 1666 a miserable example of this kind in a woman who was hanged and afterwards publicly dissected: she was found to be pregnant four months, notwithstanding the report of the persons who had visited and examined her by order of the judge before her execution, and pronounced that she was not pregnant, being deceived by the fact of her continuing to menstruate. This matter caused a great sensation of disgust and horror, and was reported to the king and his court, and in consequence a severe censure was passed on the persons who, by their ignorance, had caused the untimely execution of the unfortunate woman, with whom had perished also her infant, innocent of its mother's crime.§

A proceeding may also take place at common law, "where a widow is suspected to feign herself with child in order to produce a supposititious heir to the estate, and defraud the lawful heir. In such case the heir presumptive may have a writ *de ventre inspiciendo*, to examine if she be with child or not, and if she be, to keep her under proper restraint until she is delivered. But if the widow be, upon due examination, found not pregnant, the presumptive heir shall be admitted to the inheritance, though liable to lose it again on the birth of a child within forty weeks from the death of the husband."‖

A celebrated case of this kind, which attracted great attention, occurred in the family of Sir Francis Willoughby, who died seized of a large inheritance. He left five daughters, (one of whom was married to Percival Willoughby,) but not any son. His widow at the time of his death stated that she was with child by him. This declaration was evidently one of great moment to the daughters, since if a son should be born, all the five sisters would thereby lose the inheritance descended to them. Percival Willoughby prayed for a writ *de ventre inspiciendo*, to have the widow examined, and the sheriff of London was accordingly directed to have her examined. He returned that she was twenty weeks gone with child, and that within twenty weeks *fuit paritura*. "Whereupon another writ issued out of the Common Pleas, commanding the sheriff safely to keep her in such an house, and that the door should be well guarded; and that every day he should cause her to be viewed by some of the women named in the writ, (wherein ten were named,) and when she should be delivered, that some of them should be with her to view her birth, whether it be male or female, to the intent there should not be any falsity. And upon this writ the sheriff returned, that accordingly he had caused her to be so kept, and that on such a day she was delivered of a daughter."*

There is another case where the court has interfered on proof of the existence of pregnancy being brought before it, and that is, where a female in this situation is imprisoned. Thus in the case of Elizabeth Slymbridge,† "upon suggestion that she had been imprisoned for divers weeks and was with child, and would be in danger of death if she should not be enlarged," Sir Edward Coke, the Chief Justice, admitted her to bail to prevent the peril of death to her and her infant, and in giving his opinion he quotes a similar case which happened in the 40th of Edward III. The editor remarks that these cases are cited as extraordinary instances. The last case is mentioned in Coke upon Littleton, 289 *a*. The record states, "Quia eadem Elena pregnans fuit, et in periculo mortis, ipsa dimittitur per manucaptionem ad habendum corpus," &c.

When proceeding to an investigation of this kind, we must recollect that the signs or proofs of pregnancy are to be collected from various and very different sources, and, moreover, that of some of them we can have no evidence except from the report made to us, while of others we can judge by the changes existing before us, and cognizable by our senses. The following are the chief of these signs:—

1. Certain affections of the constitution induced by pregnancy, which are the result of the new action which has commenced in the uterus; such as suppression of the menses, generally increased irritability of the nervous system, evinced in capriciousness of temper, or perhaps in the production of erratic pains, as in the face and teeth, greater activity in the circulating system, and especially in the exhalents, giving rise to œdema and other forms of

* See observations on *Quickening* in the present article.

† *Foderé*, Méd. Lég. vol. i. p. 428, et seq.

‡ Anthropog. lib. 6, ch. 2.

§ Maladies des femmes grosses, tom. i. p. 71-2.

‖ *Blackstone*, vol. iv. p. 394-5.

* Croke's Elizabeth, p. 566. See also in the matter of Martha Brown *exparte* Wallop in Brown's Chancery Cases, vol. iv. p. 90: and *exparte* Aiscough, Peere Williams' Reports, vol. ii. p. 591.

† Croke's James, p. 358.

dropsical effusions; alterations in the countenance from absorption of the fat, &c.

2. In consequence of the irritation induced in the uterus, there are a train of sympathies excited in other organs, affecting either their physical constitution or their peculiar functions: such, for instance, are the changes produced in the breasts by which their size is increased, with tingling pains, the areola formed, and milk secreted; the stomach is irritable; vomiting ensues; the appetite becomes variable and capricious, and sometimes the salivary apparatus participates so decidedly in the irritation that complete salivation takes place.

3. The altered condition of the uterus itself, which, increasing in size, ceases to be a pelvic organ, and rises into the abdomen, which in consequence becomes enlarged and prominent, and a corresponding change is effected in the state of the umbilicus; while at the same time certain alterations take place in the os and cervix uteri, affecting their form, texture, &c. which we can recognize by touch.

4. The contents of the uterus so enlarged; the presence of a fœtus therein, and its motions, which we endeavour to ascertain by manual examination, both *externally* through the abdominal parietes, and *internally* per vaginam; and also by the adoption of auscultation to discover the pulsations of the fœtal heart and the placentary sound.

5. Certain organized substances may, under suspicious circumstances, be discharged from the uterus, by a proper examination of which we may be enabled to determine whether they are the product of conception, and of course proofs of pregnancy.

6. After death we may be called on to make an investigation for a like purpose, and, by examination of the uterus and its appendages, to determine the question of actual pregnancy, or of previous impregnation. We shall notice the principal of these signs in detail.

Suppression of the menses.—This is one of the symptoms of pregnancy our investigation of which must almost always be encumbered with this difficulty,—that our knowledge must be derived from the statement of the female herself, nor can we have in general any certain means of disproving or confirming her assertion. It is moreover a circumstance which, notwithstanding its general subjection to a fixed law, has been fully proved by experience to be liable to very many exceptions and deviations.

We are indeed quite justified in adopting as a general rule that in healthy women, whose menstruation has been established and continued regular, and who are not nursing, conception is followed by a suppression of the menstrual discharge at the next return of its period; but then this suppression may not so occur, and on the other hand it may happen from a variety of other causes altogether unconnected with pregnancy: for these reasons we ought, whenever we come to consider this sign, to weigh very fully all the possible circumstances of the individual case before us, and view it in relation to the various exceptions which experience has from time to time shewn to exist. Thus we must recollect that cases have occurred in which conception took place previous to menstruation. One instance of this happened under our own observation, and a very remarkable one is mentioned by Morgagni in these words: "I was acquainted with a maiden of a noble family who married before menstruation took place, though the menses had been expected for some years; nevertheless she became exceedingly fruitful. We were the less surprised at this circumstance because the same thing had happened to her mother."* Frank had a patient who gave birth to three children without ever having menstruated or had lochial discharge, and he saw three others who never had the catamenia, but were not deficient in lochia after delivery.† A woman, 55 years of age, very lately resided in Cornwall, who had borne several children and always enjoyed good health, but had never menstruated or had vicarious discharge of any kind.‡ Capuron quotes several cases of fecundity without menstruation,§ and Foderé assures us of the fact.‖

Some women are very irregular in the returns of their menstrual periods, having them prolonged much beyond the usual interval. The writer lately attended an unmarried woman of 40 affected with polypus uteri, who assured him that the returns of the catamenial discharge with her had been frequently deferred for more than six months without any accompanying circumstance of ill health: instances of habitual suppression for shorter periods are frequently met with. Zacchias mentions that he attended a patient who used to menstruate regularly, but who never conceived until the discharge had been suppressed for three or four months previously. A case somewhat similar is related by Mauriceau,¶ who very justly remarks that such cases not unfrequently give rise to the supposition of protracted gestation.

At the period which is usually denominated *the change of life*, it is very usual to have the menses suppressed for two or three months and then return profusely, giving rise to the idea of pregnancy and abortion, both suppositions being equally unfounded.

On the other hand cases occasionally occur in which women have conceived after menstruation had apparently ceased.

In married women, and others who have

* De Causis et Sedibus Morborum, Epist. xlvii. 3. See also Foderé Méd. Lég. tom. i. p. 395, and tom. ii. p. 437. Desormeaux, Dict. de Méd. tom. x. p. 393. And Mauriceau Obs. 393, vol. ii. p. 326.

† De Morb. Hom. Curand. art. *Amenorrhœa*.

‡ "Ego habui amicam laudabilis temperamenti et complexionis quæ octo filios tulit consequenter, id est omni anno unum; nunquam tamen visa una gutta sanguinis menstrui." Low, p. 523.

§ Méd. Lég. relat. à l'accouchement, &c. p. 96-7.

‖ "J'ai eu occasion de m'assurer complétement de ce fait." tom. i. p. 395.

¶ Observation 556, tom. ii. p. 461.

been incurring the risk of pregnancy, suppression may arise from a variety of causes altogether independent of conception, such as different forms of disease, exposure to cold and hardship, mental emotions, particularly that of fear, the effects of which latter we have had an opportunity of observing in very numerous instances in some of our prisons, where young women constantly apply to the physician in consequence of their menses being suppressed, which they very often, and apparently with great reason, ascribe to the alarm and terror which they suffered when arrested and carried to prison.

A woman may conceive while she is nursing, without any previous return of the catamenia, which, however, very usually happens in such cases, as observed by Denman.

Here, then, we have a variety of cases in which the absence of the menstrual discharge could not be made a means of diagnosis, or, if assumed as affirmative of pregnancy, would lead us into absolute error.

It now remains to view the matter in another light, and inquire how far the presence of the catamenia can be considered as evidence that the woman is not with child.

We have met with several instances of menstruation occurring *once* after conception, and at this moment we are in attendance on two ladies to both of whom it happened; and one of them, who has borne three children and is now a fourth time pregnant, assured us that she always knew when she had become with child by the unusual profuseness of the next period. This is distinctly taken notice of by Johnson, who says, "some have the menstrua copiously at the first period."* A diminution in the quantity under similar circumstances has, however, been more frequently observed. "I have seen," says Desormeaux, "some cases in which the appearance of the menses in small quantity and at an unusual time, was almost a certain sign of conception."† A similar remark is made by Puzos, Stein, and Gardien.‡ An interesting case, which confirms this remark, is detailed by Dr. Dewees.§ A gentleman, who had been obliged to absent himself from his family for many months, returned secretly and spent one night at home with his wife, in consequence of which she conceived, as the event proved, although the regular return of her catamenia a week afterwards, in their usual quantity, had led her to expect that she had escaped with impunity.

Again, there are individuals who menstruate with regularity *for more than one period* after conception. "It is well known," says Burton,‖ "by experience, that the menstrual discharge sometimes continues in its usual regularity for two or three months after conception without any dangerous consequences." Instances of this are not at all unfrequent, and are quoted by all who have written at large upon this subject.* It has been asserted as an objection, that these discharges are not truly menstruation; but the discussion of that question does not concern us here. We have only to consider whether there does not frequently, during pregnancy, take place a coloured discharge from the vagina, so closely resembling menstruation in its periods, quantity, and duration, that neither the woman herself nor the medical inquirer shall be able to detect any difference between them; and of this we must declare with Dewees and Gooch, "there can be no doubt."

In still more rare instances, of which we have ourselves never met one, but which are recorded by writers of credit, women have continued to have these discharges through nearly the whole period of pregnancy.† Dewees mentions an instance in which this happened to both mother and daughter,‡ who were in the habit of menstruating up to the seventh month. "On a vu," says Gardien, "chez des femmes jeunes et plethoriques l'evacuation menstruelle continuer pendant les trois ou quatre premiers mois, quelquefois même pendant tout le cours de la grossesse."§

The last, and perhaps most remarkable exceptions to the general rule, to which it appears necessary to allude, are those very singular cases in which menstruation has either appeared for the first time after conception, or in which it continued only during pregnancy. Perfect's eightieth case‖ affords a very satisfactory instance of the former; and Daventer, Dewees, and Baudelocque¶ furnish us with examples of women whose habit it was to menstruate *only* during pregnancy, and who did so through the whole period of that condition, though never at any other time.

There is a source of deception against which we can hardly guard, and which we know to have been resorted to by a young woman in one instance. She apprehended that she was pregnant, but deceived those about her by staining her linen at the usual periods of menstruation: this completely lulled the suspicion of her friends for two months, but in the third a circumstance was discovered which proved that she had incurred the risk of pregnancy, and the writer was requested to see her. On looking at her breasts the areolæ were so

* System of Midwifery, p. 100.
† Dict. de Méd. vol. x. p. 394.
‡ Traité des Accouchemens, vol. i. p. 489.
§ Compendium of Midwifery, p. 165.
‖ New System of Midwifery, p. 285.

* *Capuron*, Méd. Légale, p. 63. *Belloc*, Quest. Méd. Lég. p. 62. *Mauriceau*, vol. i. pp. 72, 155. *Dewees*, Compendium, p. 93, et seq. *Desormeaux*, Dict. de Méd. vol. x. p. 394. *Gardien*, vol. i. p. 489. *Gooch*, Diseases of Females, pp. 202-3. *Van Swieten*, Commentaries, vol. xiii. pp. 379, 468. *Beck*, Principles of Med. Jurisp. p. 76. Van Swieten supposes such discharges do not proceed from the same source as the regular menses, "but from the vessels distributed about the vagina and the external surface of the neck of the womb." A similar opinion is maintained by Hoffmann, Med. Ration. et Syst. tom. iv. part 9. cap. 623, and by Frank.

† *Foderé*, vol. i. p. 437.
‡ *Dewees*, Comp. Mid. p. 96.
§ Traité des Accouchemens, tom. i. p. 489.
‖ Cases in Midwifery, vol. ii p. 71.
¶ *Daventer*, Novum Lumen Art. Obst. cap. xv. p. 54. *Dewees*, Comp. Mid. p. 97. *Baudelocque*, Art d'Accouchement, vol. i. p. 197-8. Ed. 1822.

distinct, and exhibited their proper characters so perfectly, that he felt persuaded she was pregnant; and perceiving that her breasts were marked with the silvery lines observable on parts formerly much distended, he told her his opinion that she was then with child, and moreover that she certainly had been so before. This completely took her by surprise, and she acknowledged that she had given birth to a child about two years before, and had suffered much from the distension of her breasts during pregnancy. The event also proved that we were correct in supposing her pregnant then, as she was afterwards in proper time delivered of a full-grown child.

Belloc, p. 65, takes notice of this kind of imposition, which he informs us was attempted on himself by a girl three months advanced. "Il faut alors exiger que les parties soient lavées avec de l'eau tiède; si le sang ne reparait pas, le cas est suspect."*

We should not forget that there are cases occasionally met with, in which suspicions arise in connexion with a non-appearance of the menses, the elimination of the discharge being prevented by some adventitious structure or imperforate state of some of the natural parts, especially of the hymen. In such a case the secretion takes place, but being prevented from leaving the body, accumulates within, distending the vagina and the uterus, and so giving rise to several of the sympathies usually accompanying pregnancy. We had very lately an instance of this under our care in a girl of 17, who between the age of 15 and 16 began to exhibit the signs of puberty. When we saw her, suspicions had been excited of her being pregnant. The abdomen was enlarged, and the uterus could be felt as high as the umbilicus, the breasts were painful, and she had occasional vomiting, and pain in the back and along the thighs. Complete inability to pass water was the cause of our being requested to see her, and on hearing the above detail of symptoms we confess we had our suspicions too, but did not express them: on attempting to pass the catheter we encountered a soft elastic tumour protruding from the external parts, displacing the urethra, and concealing its orifice. This rendered a closer examination necessary, which detected the hymen attached completely all around, and distended by fluid from within: having relieved the bladder, we punctured the opposing membrane and gave exit to about three pints of a dark chocolate-coloured fluid, without smell and uncoagulated.

Frank† mentions two such cases, in one of which the abdomen was as much enlarged as at the sixth month of pregnancy, and the girl herself thought that she felt a foreign body in the uterus, which, however, was found to contain five pounds of a dark and thick blood, without any offensive odour: in the other case the girl was believed to be with child, and in consequence suffered temporary loss of reputation, but the hymen was found imperforate, and, when punctured, gave passage to several pints of blood.

Madame Boivin‡ has collected the details of ten such cases, among which are two much in point. In one from Denman the girl was submitted to examination from a belief that she was with child; the uterus was as high as the navel, and contained no less than four pounds of blood of the colour and consistence of tar.† The other case occurred to Dr. Macaulay, in a young woman of 19, whom he supposed to be not only pregnant, but in labour, as she had pains, and he felt what he thought was "the membranes with the water pushing low down."‡ On puncturing the hymen there came away two quarts of thick black blood. In a case of obstruction related by Dr. Dewees, he mentions that he was fully impressed with the belief that pregnancy existed, as he could distinctly feel the enlarged uterus, and even thought he felt the motion of a fœtus.§

Such exceptions should always be taken into account to guard us against error, but on the other hand absence of the menstrual discharge in an otherwise healthy woman is always a circumstance of great importance, concerning which the remark of Belloc is deserving of great attention. "When a female," says he, "experiences suppression along with other symptoms of pregnancy, we may consider her situation as yet uncertain, because these signs are common to amenorrhœa and pregnancy. But if towards the third month, while the suppression continues, she recovers her health, and if her appetite and colour return, we need no better proof of pregnancy. Under other circumstances her health would remain impaired, and even become worse."‖

Nausea and vomiting.—In general, when pregnancy has occurred, the stomach becomes irritable, in consequence of which the woman is distressed with nausea and vomiting, especially in the early part of the day: in some this commences almost immediately after conception. We had once a lady under our care, in whom there was reason to believe it began the day after marriage, and the date of her labour corresponded to such a belief: most frequently it occurs for the first time between two and three weeks after conception, in others not for as many months, and in some not at all: of this we have now seen several instances.

On the other hand, irritability of the stomach may occur from a variety of causes totally independent of pregnancy, and connected with disease or disordered function, such as suppressed menstruation, so that we must be slow to draw an inference merely from the presence of such a symptom: at the same time a proper degree of inquiry will generally enable us to distinguish between the two kinds. The vomiting of

* *Capuron*, p. 81. See also *Beck*, p. 76, and *Mahon*, Méd. Légale, vol. i. p. 153. *Fodéré*, tom. i. p. 438.

† Epitome de Morbis Hominum Curandis. Art. *Amenorrhœa*.

* Mémoire sur les Hemorrhagies internes de l'uterus, p. 73.

† Introduction to Midwifery, p. 87. 5th ed.

‡ Smellie's Cases in Midwifery, vol. ii. p. 15.

§ Essays on several subjects, &c. p. 337.

‖ Cours de Méd. Légale, p. 60.

pregnancy is not accompanied by any other symptom of ill health; on the contrary, the patient feels perhaps as well as ever in other respects, and may even take her meals with as much appetite and relish as at other times, but while doing so, or immediately after, she feels suddenly sick, and has hardly time to retire when she rejects the whole contents of the stomach, and presently feels quite well again: in some instances, however, the woman is distressed by a perpetual nausea, and in a few rare cases vomiting has been so excessive as to endanger the life of the woman from inanition.*

Salivation.—By an extension of the sympathetic irritation which in the stomach causes nausea and vomiting, the salivary apparatus is in some persons excited to such a degree as to produce complete and copious salivation. This fact was expressly noticed by Hippocrates as one among the symptoms of pregnancy,† and has been observed by many others since.‡ Dr. Dewees records a well-marked instance of the kind,§ and the writer of this article was consulted about another in which it occurred profusely in two successive pregnancies, but ceased immediately on delivery.

Affections of the mammæ.—When conception has taken place, and the menses have been suppressed for one or two periods, the woman generally becomes sensible of an alteration in the state of the breasts, in which she feels an uneasy sensation of throbbing, or of stretching fulness accompanied by tingling pains felt about the centre of them and in the nipple. The breasts themselves grow sensibly larger and more firm; a circle around the nipple becomes altered in colour and structure, constituting the areola; and as gestation advances, milk is secreted. But there is considerable variety in the period of gestation at which these changes may occur, as well as in the degree of their development; for while in some instances they may be recognized very soon after conception, in others they are hardly perceptible until gestation is far advanced, or even drawing towards its termination. In general, however, we may expect to find these sympathies (except the secretion of milk) established when two months of pregnancy have been completed; but any opinion deduced from their existence must be modified by several considerations. We must recollect that these changes of form and size may be the result of causes unconnected with conception. In many women the breasts enlarge merely in consequence of marriage and the habits thence arising; in others it may happen from the person becoming fat; it may be caused by accidental suppression of the menses, or their retention by an imperforate hymen,‖ or by any cause capable of distending the uterus. The enlargement from pregnancy may, however, in general be distinguished from that produced merely by fat, by the greater firmness of the breast, which also feels knotty and uneven when pressed by the hand. With some women of an irritable habit, swelling and pain of the breasts accompany each return of the catamenia, especially if they are the subjects of dysmenorrhœa; but under such circumstances the tension and uneasiness subside in two or three days, whereas that caused by pregnancy continues to increase, except when the ovum happens to be blighted, in which case the breasts become flaccid, and lose the characters which they had previously assumed. On the other hand it not unfrequently happens that in women of weakly and delicate constitution very little change can be observed in the breasts till pregnancy is far advanced. Gardien* asserts that the swelling of the breasts is not observable in women who menstruate during the early months of pregnancy; and Mahon† makes the same observation. It should also be recollected that such a condition of fulness of the breasts may be natural to the individual, or it may take place at the turn of life, when the menses becoming naturally suppressed, the person grows at the same time fatter, and the breasts under such circumstances become full, and are not unfrequently painful,—which circumstances concurring are often improperly considered in the light of cause and effect, and irritability of the stomach being at the same time experienced, the woman believes herself pregnant. There is, however, one of those changes which, if carefully observed, is of the utmost value as an evidence of pregnancy, which, according to our experience, can alone produce it,—we allude to the altered condition of the areola.

The areola.—The alteration which takes place in that part of the breast which immediately surrounds the nipple, and is called the areola, appears to us not to have received that degree of notice which its importance merits, as being one of the most certain external indications of pregnancy, arising from the operation of sympathy. On this, however, as on almost all other points connected with this investigation, a very marked difference of opinion exists; for while some suppose, with Denman, that the alteration in the areola "may be produced by any cause capable of giving to the breasts a state resembling that which they are in at the time of pregnancy," many others of equal authority maintain the opinion of Smellie and William Hunter, who regarded it as the result of pregnancy only; an opinion in which we entirely concur, and think we shall be able to shew that much of the discrepancy of opinion on this subject has arisen from want of sufficient care in observing and accuracy in describing the essential characters of the true areola.

Most of those who have noticed this change

* See Mem. Lond. Med. Soc. vol. ii. p. 125. Med. Chir. Trans. vol. iii. p. 139. Ashwell on Parturition, p. 194.

† The passage is quoted by Van Swieten, vol. xiii. p. 371.

‡ See Gardien, vol. ii. p. 32. Burns, p. 237.

§ Compendium of Midwifery, p. 115.

‖ See cases noticed under the preceding section.

* Traité des Accouchemens, tom. i. p. 490.

† Médecine Légale, tom. i. p. 151.

appear, from their observations on it, to have attended to one only of its characters,—namely, its colour, which is, in our opinion, the one of all others most liable to uncertainty. We should here perhaps except the description by Rœderer, which is by far the most accurate we have met with: "Menstruorum suppressionem mammarum tumor insequitur; quocirca mammæ crescunt, replentur, dolent interdum, indurescunt: venæ earum cœruleo colore conspicuæ redduntur, *crassescit papilla, inflata videtur, color ejusdem fit obscurior, simili colore distinguitur discus ambiens qui in latitudinem majorem expanditur, parvisque eminentiis, quasi totidem papillulis, tegitur.**

The several circumstances here enumerated at least ought in all cases to form distinct subjects of consideration, when we propose to avail ourselves of the condition of this part as an indication of the existence or absence of pregnancy. One other we shall add as equally constant, which is a soft and moist state of the integument, which, together with its altered colour, gives us the idea of a part in which there is going forward a greater degree of vital action than is in operation around it; and we not unfrequently find that the little glandular follicles are bedewed with a secretion sufficient to damp and colour the woman's inner dress. We must recollect also that these changes do not take place immediately after conception, but occur in different persons after uncertain intervals: we must therefore consider, in the first place, the period of pregnancy at which we may expect to gain any useful information from the condition of the areola.

We cannot speak very positively as to what may be the earliest period at which this change can be observed, but we have certainly been satisfied of its existence at the end of the second month, at which period the change of colour is by no means the most distinct character to be observed, but the turgescence of the nipple and the development of the little glandular follicles are the objects which should principally engage our attention; the colour at this period being in general little more than a deeper shade of rose or flesh colour slightly tinged with a yellowish or brownish hue. During the progress of the next two months the changes in the areola are in general perfected or nearly so, and it then presents the following characters: a circle around the nipple, whose colour varies in intensity according to the peculiar complexion of the individual, being generally much darker in persons with black hair, dark eyes, and sallow skins, than in those of fair hair, light-coloured eyes, and delicate complexions. The extent of this circle varies from a diameter of an inch to an inch and a half, and increases in some as pregnancy advances, as does also the depth of colour.†

In the centre of this circle the nipple is observed partaking of the altered colour of the part, and appearing turgid*and prominent; and the part of the areola more immediately around the base of the nipple has its surface rendered unequal by the prominence of the glandular follicles, which, varying in number from twelve to twenty, project from the sixteenth to the eighth of an inch;† and, lastly, the integument covering the part is observed to be softer and more moist than that which surrounds it, and the breasts themselves are at the same time observed to be full and firm, at least more so than was natural to the person previously. Such we believe to be the essential characters of the true areola, the result of pregnancy, and that, when found possessing these distinctive marks, it ought to be looked on as the result of that condition alone, no other cause being capable of producing it.

But we cannot stop here and rest satisfied with the knowledge of the distinctly affirmative part of the question only, without also looking to certain circumstances which will most materially modify the certainty of our conclusions.

In the first place, then, pregnancy may exist and the areola remain deficient in at least one of its usually essential characters, and that, the one too generally supposed to be its most important distinctive mark,—namely, the colour. Within the last few months the writer saw two well-marked instances of this; one in a lady of very fair skin, blue eyes, and light hair; the other in a lady of fair skin, but with black hair and very dark-brown eyes: in both, the colour of the areola was so slight as hardly to differ from that of the surrounding skin, and certainly was less distinct than we have frequently seen it in the virgin, but all the other changes which we have enumerated were well developed in both.

Again, we must recollect that a woman may be presented to us for an opinion, who having perhaps very recently miscarried, her breasts may exhibit all the true characters of the areola, combined with several other circumstances really indicating a state of pregnancy; but if we do not use great caution in giving our opinion, it will in such a case appear falsified by the event, although really correct. In nurses, also, the characters of the areola are kept up and continue in a state of considerable perfection.

Now, as to the colour alone, we may adopt this belief—that where we find it of a deep and dark brownish shade, forming a circle round the nipple, even though unaccompanied with the other changes natural to the part, it affords very strong presumptive evidence of a former state of pregnancy; but when so accompanied, it is a mark of great value, and in our experience has never yet deceived us: and we certainly never saw any other condition of the part produced by disease which could possibly be mistaken for it. At the same time it

* Elem. Artis Obstet. pp. 46, 47.

† We lately saw the areolæ on the breasts of a young woman, of dark complexion, at the time of labour; they were of a very deep shade, and exceeded three inches in diameter. In negro women the areola is almost jet black.

* Crassescit papilla, inflata videtur. *Rœderer.*

† For a very full account of the structure of this part of the breast, see Meckel's Anatomy, vol. iii. p. 652.

ld be observed that the areola does not ays, in pregnant women, present all the acters we have described as belonging to We have seen it at the time of labour pre- ing the dark circle alone without the pro- ence of the glandular follicles, but we r saw an instance of their development, as dy described, without the concurrence of nancy: their absence, therefore, ought not ecide our opinion against the existence of condition, though their presence would be us a very convincing proof of previous ception: we should also be cautious in g influenced by the condition of this part, re the period at which its characters are in ral developed and perfected, as already ribed.

case which occurred recently, while the er was lecturing on this subject, afforded a satisfactory illustration of the value to be ched to this evidence of pregnancy. A young man came a considerable distance from the ntry to be admitted into Sir P. Dunn's spital, the medical men in the country not ing succeeded in affording her relief or re- ing her health. A very prominent sym- m of complaint was amenorrhœa of four nths' duration, accompanied by uterine n, want of appetite, &c. A very intelligent il suggested to the writer, after lecture, he thought we must be mistaken in our ount of the subject, as there was then in house an unmarried patient, labouring only ler amenorrhœa, whose breasts presented areola with all the characters we had de- bed. We immediately saw her, and on mining her breasts we pronounced at once t there was the true areola of pregnancy— announcement which she heard with the st fiery indignation, declaring that she would mit to any thing rather than lie under so unnious an aspersion, and even consenting permit an examination per vaginam, when posed to her as the only thing which could e her character. On making the examina- n we were distinctly able to feel the fœtus *ballottement*. She afterwards acknowledged t she had been "walking by moonlight h a young man who had a great regard for her." If a woman has been pregnant before, and ticularly if she suckled or is nursing, it y greatly embarrass our investigation. The our of the areola depends on the deposition an actual pigment between the cuticle and jacent skin. Of this we have satisfied our- ves by making preparations of the part, one which, shewing this very distinctly, is pre- ved in the writer's museum. In some per- ns of fair complexion especially, this co- ring matter is removed in some time after livery, and the breast resumes its virgin ap- arance; in others the colour remains perma- nt, and there is even a slight prominence of little glands to be observed sufficient to ceive an inexperienced eye. It is also to be collected that it is peculiar to some young fe- ales to have the areola assume a shade of co- ur resembling that which we so frequently serve around or under the eyes.

The conclusion which Gooch came to on this subject was, that "darkness of the areola rarely depends on other causes (than pregnancy), and that, when it exists, it may generally be looked upon as a sign either that the patient is pregnant or has been so formerly."* It seems remarkable that so accurate a writer as Gooch should have confined his description to the colour alone. Smellie's account is more accurate, and he considers it as the result of pregnancy only.† William Hunter has not, as far as we are aware, left us any description of what he considered the true areola, but he professed such faith in this sign as to assert that he could always judge by it whether a woman was pregnant or not, and on one occasion gave a remarkable proof of his accuracy. Happening to examine the breast of a subject brought to him for dissection, he immediately pronounced from the appearance of the areola, that the woman had died pregnant: however, on examining the genitals, the hymen was found entire, but Hunter persisted in his opinion, declaring that the areola was more convincing than the presence of the hymen. The body was opened, and an impregnated uterus confirmed the justice of his assertion.

Since writing the above, a case has come under the writer's observation which greatly strengthens his reliance on this sign. We were requested to see a patient affected with menorrhagia, arising, as was supposed by her medical attendant, from disease of the uterus. The history of the case was briefly this:—the patient was near forty years of age, and had borne five children; in the May preceding she had miscarried in the fifth month, and the placenta was retained eight weeks. In July she returned to her husband's bed, but her health continued feeble, and she had at irregular intervals of one, two, or three weeks, profuse and foul uterine discharges, but had none of the usual symptoms which used to accompany her pregnancy in former instances, so that she utterly disbelieved in the possibility of being then with child. For two months previous to our seeing her, her fears had been much augmented by the presence of a tumour in the centre and lower part of the abdomen, which was almost constantly the seat of severe pain; and she had still the foul uterine discharges. Under such circumstances we entertained little idea of the existence of pregnancy, but on seeing her breasts we were rejoiced to find them full, and exhibiting a very perfect example of the true areola, with all its characters so well marked that we did not hesitate to declare our belief that she was pregnant, though every other circumstance conspired to render it more than improbable. The uterine tumour felt as hard as cartilage, and knotty all over its surface, was very painful, and exquisitely tender to the touch; but the condition of pregnancy was put beyond a doubt in less than a week afterwards by her expelling a fœtus of five months, and along with it its placenta quite

* Account of Female Diseases, p. 205.
† Treatise on Midwifery, vol. i. p. 191.

perfect, and afterwards several pieces or fragments of a substance resembling decidua, mixed up with what appeared to be portions of placenta and membrane, but altered in their texture and consistence so as to possess the toughness of leather.

Could these have remained in utero from the time of the former miscarriage? They certainly were totally different from any of the parts of undoubtedly recent formations. The expulsion of them went on for fully half-an-hour after the rest of the process was completed, and portions continued to be discharged for some days; after which the patient recovered well, and at the end of a month there was not a trace of uterine irritation or discharge, and she considered herself in better health than she had been for a year before.

Milk in the breasts.—The secretion of milk in the breasts is popularly esteemed as an infallible proof of pregnancy, but nothing can be more erroneous than such a presumption, which is contradicted by facts, recorded on the best authority, proving the possibility of its formation under circumstances totally independent not only of pregnancy but even of intercourse, and at ages antecedent to puberty, and after the cessation of the generative faculty.

Perhaps the most remarkable case on record is that of the little girl of Alençon, who was produced by Baudeloeque* before the Royal Academy of Surgery on the 16th Oct. 1783, where she milked her breasts in presence of the members. This girl was only eight years old, and the secretion was caused by the repeated application of an infant which her mother was suckling at the time.

Belloc† mentions a servant girl, who, being obliged to have sleeping in her chamber an infant which was being weaned, and which by its crying disturbed her rest, bethought her of giving it her breast to appease its clamour; and the result was that in a short time she had milk enough to satisfy the child. Foderé mentions having seen a lady, who, in order to escape being imprisoned, pretended that she was a nurse when she was not, and she succeeded in producing milk from her breasts.‡

The same phenomenon has occasionally occurred in women advanced in years. The following case is related by Mr. George Semple.§ "Mrs. B. wife of John Breward, Simpson Green, near Idle, aged forty-nine, the mother of nine children, the youngest of whom is twelve years old, lost a daughter-in-law about a year ago, who died in about a fortnight after giving birth to her first child. On her death, Mrs. B. took charge of the infant, a little puny, sickly baby. The child was so fretful and uneasy, that Mrs. B. after several sleepless nights was induced to permit the child to t her nipple into its mouth. In the course from thirty to thirty-six hours she felt very well, her breasts became extremely pain considerably increased in size, and soon af to her utter astonishment, milk was secre and poured forth in the same abundance as former occasions after the birth of her o children. The child, now a year old, is a fi thriving, healthy girl, and only a few days I saw her eagerly engaged in obtaining an parently abundant supply of healthy nourment from the same fountain which nea twenty years ago poured forth its resources the support of her father." Several otl instances still more remarkable are on cord.*

Another source of deception might arise fr the fact that women sometimes after nursing ret milk in their breasts for a great length of ti The writer is at present in attendance on lady, who, after weaning her last child, whi she nursed for fifteen months, retained *nearly three years* so much milk in her brea that she was obliged to adopt precautions prevent her dress being wet by it. The chi is now five years old, and she can still expre a little milk from the nipples; she has not co ceived since the birth of that child, but h always menstruated regularly. Dr. Franc in his edition of Denman,† mentions, on t authority of Professor Port, that "a lady this city (New York) was almost fourteen yea ago delivered of a healthy child; since th time her breasts have regularly secreted mil in great abundance, so that, to use her ow language, she could at all times easily perfor the office of a nurse. She has uniformly e joyed good health, is now about thirty-fiv years of age, and has never proved pregna a second time, nor had any return of he menses."‡

"We see," says Foderé, "women who hav milk in their breasts from one pregnancy t another, and even for whole years togethe although they have not nursed." And he add that he has had repeated opportunities of ob serving the secretion of milk take place o the cessation of the catamenia at the turn of life, of which fact he quotes two strikin instances.§

It has been already remarked that morbi causes capable of distending the cavity of th uterus may excite the sympathetic changes i the breasts, and it appears that even the se cretion of milk may be thus induced, as hap pened in two cases mentioned by Frank, wh it occurred in one in consequence of physo-

* Art d'Accouchement, tom. i. p. 188. ed. 1822.

† Cours de Méd. Légale, p. 52.

‡ Traité de Méd. Lég. vol. i. p. 440.

§ North of England Med. and Surg. Journ. vol. i. p. 230.

* See Smith, Forensic Medicine, p. 484; Beck p. 75, note; Philos. Trans. vol. ix. and vol. xxxi. Capuron, p. 126.

† Francis's Denman, p. 229.

‡ The last mentioned particular in this case is in accordance with the aphorism derived from Hippocrates: "Si mulier, quæ nec pregnans nec puerpera est, lac habet, ei menstrua defecerunt," which is, however, shewn to be incorrect by the perfect regularity of the catamenia in the case under the writer's observation.

§ Médecine Légale, tom. i. p. 440-1 and note.

a,* and in the other from hydrometra.† withstanding, however, the exceptions esta- ied by such facts as the foregoing, we ild attach great consequence to the pre- e of milk in the breasts, and if found in nexion with others of the rational sym- ns of pregnancy, it ought to go a great way confirming our belief in the existence of condition, especially if occurring in a an who had never borne a child or been nant before.

Quickening, and motions of the fœtus.—By kening is generally understood the first ation experienced by the mother, of the of the child within her womb; and a no- is very generally entertained in society it is on the occurrence of this phenemenon the child becomes for the first time en- ed with life.

t appears very unaccountable that such an rdity should have received not merely the tion of popular belief, but that it should the grounds of law in most civilized tries, our own not excepted; for the lish law adopts the distinction, and con- rs the fœtus before quickening as inanimate, merely as *portio viscerum matris*, but as rwards endowed with life; and on this ciple acts in the award of punishment for ne. Thus in a law enacted in 1803, called Ellenborough Act, it is ordained that if any on shall wilfully or maliciously use means ause or procure abortion in a woman *not k with child*, he shall be declared guilty of uy, and may be fined, imprisoned, set in pillory, publicly whipped, or transported my term not exceeding fourteen years; but ne offence be committed *after quickening*, all be punishable with death.‡ In like ner, when a woman pleads pregnancy in or stay of execution, the court orders an stigation as to whether she is *quick with d* or not, for being merely pregnant will be sufficient;§ and if she be pronounced *k with child*, execution shall be stayed l either she is delivered, or proves by the of nature not to have been with child at all. In France the law is at once more mer- ciful and more consistent with the laws of nature and with common sense, when it pro- vides that "if a woman condemned to die states that she is pregnant, and if it be proved that she is so, she shall not suffer punishment until after her delivery."*

It is perfectly monstrous and absurd to sup- pose for a moment that the fœtus does not en- joy vitality from the first moment of its ex- istence, and of course long before the sensa- tion of quickening is felt by the mother; and if it be asked why no indications of life are given before the time at which quickening ge- nerally takes place, the obvious answer is, that the absence of any consciousness on the part of the mother relative to the motions of the child is no proof whatever that such motions do not exist.† Of this fact the writer can speak with certainty. A married lady, who menstruated for the last time on the 10th of November, came to Dublin in March, on the 21st of which month a consultation was held to determine whether she was labouring under a disease of the womb or not, as she had been previously assured by her medical attendant that she could not be pregnant because she had not sick stomach, nor felt the child. On ex- amination the writer distinctly felt through the abdominal parietes the limbs of the fœtus in motion, as did also Mr. Cusack and Dr. Marsh, and yet the lady herself had no consciousness whatever of any such sensation, nor did she *quicken* till the second week of the following month, April, and was delivered of a healthy boy on the 9th of August.‡

In attempting to make a knowledge of this phenomenon available in any inquiry as to the existence of pregnancy, even where there can- not be supposed any intention or motive on the part of the woman to deceive, we obviously labour under this disadvantage, that except we are at the time able to feel the motions of the child, we can have no evidence except her state- ment as to the fact of quickening or otherwise; and nothing is more certain than that she may be completely mistaken on both sides of the question. We have just mentioned a case in which motion of the child perceptible to the hand of another was not felt by the mother; and a second instance of the same kind has occurred to us lately in the wife of a medical friend. On the other hand, the examples of women who have supposed and firmly believed that they had quickened when no such thing had occurred, are numerous even to notoriety. We remember being some years ago called in great haste to see a lady, the mother of seven

Vol. iv. p. 50. French translation.

P. 182, ibid.

This law has been, and I think justly, designa- as immoral, unjust, and irrational; as tempting ne perpetration of the same crime at one time ch at another it punishes with death; while, he words of the admirable Perceval, "To ex- uish the first spark of life is a crime of the same ire both against our Maker and society, as to roy an infant, a child, or a man; these regular successive stages of existence being the ordi- ces of God, subject alone to his divine will, and ointed by sovereign wisdom and goodness as exclusive means of preserving the race and tiplying the enjoyments of mankind."—Perci- s Works, vol. ii. p. 430, 1.

"Here again the law of the land is at variance i what we conceive to be the law of nature; and at variance with itself, for it is a strange ano- y that by the law of real property, an infant *entre sa mère* may take an estate from the mo- nt of its conception, and yet be hanged four nths afterwards for the crime of its mother." is and Fonblanque, vol. iii. p. 141, note.

* Code pénal, art. 27. See Foderé, tom i. p. 428. See cases already detailed under the first sec- tion of this article.

† Vide Beck's Medical Jurisprudence, p. 137. Gardien, Traité des Accouchemens, tom. i. p. 508.

‡ It may be observed here that the facts of this case are completely in opposition to the explanation of quickening given by Dr. Royston and others, who suppose it to be coincident with, and resulting from, the sudden ascent of the uterus out of the pelvic cavity.

children, who was said to be in premature labour at seven months and a half, accompanied with hemorrhage. On our arrival, her husband, who was a physician, mentioned among other things that she had quickened at four months and a half, and had from that time continued to feel the child as distinctly as in any of her former pregnancies, adding *that he had himself repeatedly recognised its movements also*; on examination, however, we could discover no child in utero, and the case terminated in the expulsion of a few coagula from the uterus without any fœtus whatever. We do not, however, mean to have it inferred that we should not pay attention to the statements of married women on this subject: on the contrary, we should attach great value to the assertion of a person who has already, and perhaps repeatedly, experienced the sensation, and has at the same time no conceivable reason for wishing to deceive; but for the reasons already stated, we cannot yield implicit credence to such representations; they may be mistaken, or they may have strong and powerful motives to misrepresent, known only to themselves. In cases of criminal, or even ordinary legal investigations, there is always a motive to influence the representations made by the woman, and we can only give credence in proportion as the account may appear to us to correspond to other circumstances or conditions of the case, of which we are satisfied. Should we be able to feel the movements of the fœtus, of course we could have no doubt on the subject; but it must not be forgotten that such an examination is liable to be unsatisfactory, or even lead us into error if great caution be not observed. It may be unsatisfactory, because it not unfrequently happens that even in women who have really quickened, and have been for several weeks conscious of the motions of the fœtus, we are unable either to feel the child or recognise its movements. The writer is at this moment in attendance on a lady who quickened more than six weeks ago, and is now in the sixth month of pregnancy, and after repeated examinations neither we nor her attendant physician have been able to feel the fœtus. In another case, in which ascites was combined with pregnancy, which had advanced to the seventh month, it was found impossible to feel the child by any mode of examination that could be adopted, though it was made with great care, both internally and externally, by the writer, and by one of the most experienced practitioners in Dublin. This case gave rise to great embarrassment, and recourse was repeatedly had to the application of the stethoscope in the most skilful hands; but neither the pulsation of the fœtal heart nor the placentary murmur could be heard, though it happened that several times during our examinations the woman assured us that she was at that moment sensible of active movements of the child. Desormeaux tells us of a patient of his who felt her child at the ordinary period, and its movements continued remarkably strong for three weeks, after which they ceased for a whole month, and nothing could excite them: the child was born alive and healthy.* On the other hand we may fall into the error of supposing we have felt these movements, when in reality the woman is not pregnant at all. One such instance we have already detailed, and more recently we met with another. Dewees relates a very marked instance of such an error occurring to himself. A young lady had her menses suppressed for several months, her belly swelled very much, her breasts became enlarged, she had nausea and vomiting in the mornings; in short she had all the usual symptoms of pregnancy. "Examining the abdomen carefully," says Dr. Dewees, "I found it considerably distended; there was a circumscribed tumour within it, which I was very certain was an enlarged uterus. While conducting this examination, *I thought I distinctly perceived the motion of a fœtus.*"† Another source of error would of course be found in a power which it is asserted some women possess of simulating the motions of the child by certain actions of the abdominal muscles. We never met with any such case; but Dr. Blundell, who mentions the fact, tells us of "a woman who was seen by the late Dr. Lowe and other eminent accoucheurs, who simulated these movements so exactly, that, had they judged from this sign alone, they would have pronounced her pregnant."‡

We must now turn our attention to the period of pregnancy at which we may in general expect that this phenomenon shall have occurred. Experience has shewn that it happens from the tenth to the twenty-fifth week; but according to the writer's experience, the greatest number of instances will be found to occur between the end of the twelfth and sixteenth weeks, or, adopting another mode of calculation, between the fourteenth and eighteenth week after the last menstruation. And under ordinary circumstances, when quickening does occur, but especially if it happens in conjunction with the sudden ascent of the uterus out of the pelvis, the woman is apt to feel an unusual degree of nervous agitation, which not unfrequently ends in faintness or even complete syncope, after which she is sensible of a slight fluttering sensation, which from day to day becomes more distinct, until she fully recognizes the motions of the child. The earliest instance of which we were certain was in the case of a lady, who must have conceived on the 10th of November, and she quickened on the 28th of January, the interval being eleven weeks and two days; delivery occurred on the 17th of August. A very general impression prevails in society, that quickening takes place exactly at the end of four calendar months and a half, whereas in fact the greater number of instances occur two or three weeks before that time has arrived, and many also not till long after. We have already mentioned one such case, and have by us notes of several others. At this moment

* Dict. de Médecine, tom. x. p. 399.

† Essays on several subjects connected with Midwifery, pp. 337-8. The case eventually proved to be one of accumulation of menstrual fluid in the uterus.

‡ Lectures on Midwifery, p. 251.

e are in attendance on a lady who has in seven uccessive pregnancies felt the child for the rst time in the sixth month, and once in the eventh. Baudelocque mentions that some of is patients did not quicken until after the ixth or seventh month, and, "in one of these omen," he adds, "whatever we could do, nd notwithstanding the very obvious ballottenent of the child in utero, which we could erform by a finger introduced into the vagina, s motions could not be ascertained either y the mother or the accoucheur who exained her, till the end of the seventh month."*

"There are some cases," says Johnson, where the motions are not felt till near the nd of the reckoning."†

A fact much more remarkable than the ocasional postponement of this change is its otal absence during the whole period of gesation, notwithstanding the subsequent birth of iving and healthy children. Two instances of his came under our own observation, and the act is mentioned by several writers of authoity. Levret speaks of a woman who felt no notion of her child in two successive pregnanies. "I was several times consulted," says Baudelocque, "about a woman whose pregnancy appeared doubtful to her till the last moment, as well as to the physician, because the notions of the child could not in any way be perceived; and nothing that we could do even t eight months and a half could excite them: he child, however, was born healthy, and as strong as usual." Gardien met with two such nstances;‡ and Gooch says on this subject, 'there are cases, though rare, in which the child has not moved during the whole of pregnancy, although it has been born alive and vigorous: of this I have known one instance, nd read of others."§

When we wish to feel or excite the motions of the child in utero, we may expect to succeed by adopting either such a manual examination of the abdomen as we are accustomed to make when examining for a tumour in that cavity, pressing with the fingers backwards towards the spine, or from each side towards the centre; or applying one hand firmly against the side of the uterine tumour, we impress the opposite side quickly with the fingers of the other hand.

Sometimes the simple application of the spread hand over the front of the abdomen is sufficient for our purpose; at other times we shall best succeed by the sudden application of the hand previously rendered very cold by immersion in water, or contact with a marble chimney-piece: this frequently has the effect of making the fœtus as it were start, and communicate a very distinct sensation of its movements.

It is obvious that there are two species of movements of the fœtus which may thus be recognised, one of which depends on the exertion of its muscular power, and of course implies life; the other, the result of mere change of place or situation, effected by some external agency, and capable of being recognized equally in the dead and the living fœtus: this latter, which is more properly mobility than motion of the fœtus, may be most effectually ascertained by a manœuvre, which has been named by the French ballottement, and which we shall describe fully under the section which treats of the state of the uterus.

Size of the abdomen and state of the umbilicus.—An increase in the size of the abdomen being the necessary result of the development of the uterus from pregnancy, a careful examination of that part will be essentially required in every instance of an investigation as to the existence of that condition.

When conception occurs, and the ovum is received into the cavity of the uterus, the organ increases considerably in weight; and its fundus becoming at the same time developed, and so presenting a broader surface for pressure from the superincumbent viscera, it descends lower into the cavity of the pelvis, and so will not, for the first two months, or sometimes more, produce any enlargement of the abdomen by its increased bulk. Such an enlargement, however, is frequently observed at this early period, but it will be found on examination to arise from an inflated state of the bowels, which very generally takes place soon after the commencement of gestation, and continuing for some weeks will cause the patient to look as large or even larger in the second month, than she will afterwards appear in the third or fourth. This inflated state of the bowels generally subsides after a month or six weeks, and then the patient will not appear enlarged at all, but, on the contrary, the abdomen may be found flatter than is natural to the patient, and the umbilicus under such circumstances will sometimes be found more depressed,* and as if drawn inwards and downwards, in which condition it is occasionally the seat of an unpleasant and rather painful sensation of dragging, the part being also at the time somewhat tender on pressure.

This state, however, soon begins to alter, and before the end of the third month the enlargement of the abdomen becomes obvious to the eye, and from this period continues to increase gradually from month to month in the same proportion as the development of the uterus proceeds. In the fifth month the depressed condition of the umbilicus begins to diminish, and by the end of the sixth month it is generally raised to a level with the surrounding integument, and afterwards it in many persons projects above the surface.

Such is the history of this change in the perfectly natural and healthy condition of the pregnant woman; but as there is, on the one

* Art d'Accouchement, ed. 1822, pp. 205-6.

† New System of Midwifery, p. 102.

‡ Traité des Accouchemens, tom. i. p. 509.

§ Account of Diseases of Women, p. 203. Dr. Dewees also relates a similar case, "where the motions of the child were never perceived during the whole period of utero-gestation." Compendium of Midwifery, p. 105.

* This change is noticed by Velpeau, vol. i. pp. 175-6, and also by others. The French have a proverb which says, "en ventre plat enfant il y a."

hand, a host of causes which may produce enlargement of the abdomen, and be accompanied also by several others of the symptoms of pregnancy when it does not exist; so also, on the other hand, a woman may be with child, and yet the development of the abdomen not correspond to the period which has elapsed since conception.

When the enlargement proceeds from a gravid uterus, and four months of pregnancy have elapsed, if the patient be placed lying on her back, with the shoulders a little raised, and the limbs at the same time drawn upwards, so that the thighs shall be in a state of semiflexion on the trunk, and the abdominal muscles thereby relaxed, if the woman be not very fat we shall be able to feel and trace the outline of the gravid uterus, at a height in the abdomen proportioned to the period of pregnancy, as stated in the preceding section; and even though we should not be able, from the fatness of the woman, the tension of the abdominal parietes, or any other cause, to feel distinctly the uterine tumour and define its circumference, we shall at least ascertain that the cause of the enlargement is something which renders the abdomen much more solid to the touch than is natural to that part, and an examination per vaginam detects the co-existence of the changes in the uterus, already described as necessarily accompanying gestation; while at the same time the general health of the woman is found unimpaired or unaffected by any symptom of disease.

When the increased volume of the abdomen is the result of morbid conditions, not affecting the uterus, as disease of the liver, spleen, &c., an ovarian tumour, or ascites, we shall, in general, without much difficulty form our diagnosis from the history of the case, the length of time the enlargement has existed, which may have greatly exceeded the whole term of gestation, the general diseased condition of the system, the total want of correspondence in the symptoms and conditions of the case if it were pregnancy; and, lastly, a vaginal inquiry assures us that the uterus is not enlarged.

When the abdomen is distended by the accumulation of fat in the omentum or in the integuments, or by the inflated state of the bowels, the very soft and yielding condition of the part under the hand when pressed backwards towards the spine, and the total absence of any solid tumour, together with the non-existence of the ordinary symptoms of pregnancy, will form a sufficient basis for an opinion. Should there exist ascites, that condition can hardly be overlooked or mistaken; but it must not be forgotten that pregnancy and dropsy may exist together, and, when they do, they may present a combination of circumstances of the most embarrassing description.*

Again, we must remember that there are women who, from their height or some peculiarity of form, exhibit their increase of size much less than others, so that the abdomen will appear less at seven months than it generally does in the fifth month.* And it is still more important to recollect, that although pregnancy should exist, if the child die the development of the uterus will be arrested, and the enlargement of the abdomen will not continue to increase, but, on the contrary, will sometimes diminish, the dead fœtus being retained in utero for several months, and the patient, although really many months pregnant, may not exhibit any increase of size beyond what is natural to her; or being near the end of her nine months, may not be larger than she was at four or five. The writer lately saw a case of this kind, which gave rise to great doubt. In the month of May he was requested to see a lady who considered herself in the eighth month of pregnancy, and was rendered miserably solicitous about her condition because she had irregular discharges from the uterus, and felt no motion of the child. On examination, her abdomen was found perfectly flat and even depressed, and no tumour of any kind could be detected in its cavity; but the uterus felt per vaginam was evidently enlarged and soft, and the os and cervix uteri had undergone the changes which accompany early pregnancy. The lady had begun to experience the symptoms of that condition in October, which continued till the beginning of January, when they suddenly ceased, and she became liable to vaginal discharges. All doubt about the case was solved shortly after the writer's visit by the expulsion of an ovum with a blighted fœtus, which had evidently not arrived at three months' growth, and during its long stay in the uterine cavity as an extraneous body had become encrusted with a reddish calcareous deposit.

With regard to the changes which take place in the state of the umbilicus, it is to be observed that any solid tumour enlarging the abdomen will also be capable of effecting the elevation of the umbilicus, which circumstance, therefore, of itself can afford us no certain information that the distending agent is a gravid uterus; but if, in a case in which pregnancy is supposed to be advanced to the seventh or eighth month, we find the umbilicus depressed and the belly flat, it will prove certainly that gestation has not advanced to such a period, although it will not be, as asserted by Dr. Gooch, decisive evidence against the existence of pregnancy, which may be present, but not sufficiently advanced to effect the change, or the uterine development may have been arrested by the death of the fœtus.

State of the uterus.—Having thus carefully investigated the circumstances of the case as far as we can discover them either by the report made to us, or infer them by the presence or otherwise of the sympathies already enumerated,

* See case related in the section on *Quickening and motion of the fœtus* in the present article.

* The writer was once called on to attend a young unmarried female of respectability, whom he found in labour, and he was assured by her mother that up to the hour of her labour she never suspected that her daughter was pregnant, not having perceived any alteration in her size; and the young lady had danced all night at a ball about a week before her delivery: she had completed seven months.

we proceed in the next place to an examination of the uterus itself, having for our object to ascertain the following points:—the state of the os uteri and cervix; the condition of the organ with regard to development, and the degree to which it may be enlarged; the correspondence of such degree of enlargement with the other circumstances of the case; the cause of its increase, and the nature of its contents.

1. *State of the os and cervix uteri.*—In the unimpregnated condition of the uterus, its mouth and the lower section of the neck, when examined by the finger introduced into the vagina, can be felt projecting into that cavity from a quarter to half an inch. The part so projecting feels remarkably firm, and about as large as the end of a man's thumb, having in its termination in the vagina a transverse opening, whose lips or margins feel firm and well defined. This may be so far open as to allow the extremity of the finger to be insinuated between them to the depth of an eighth of an inch, sometimes a little more, sometimes not so much; or it may merely communicate a sensation of a slight depression almost without a cavity, such as is felt when the tip of the finger is pressed between the lateral cartilages at the extremity of the nose. Sometimes the os uteri differs very considerably from this description, being almost imperceptible from its diminutive size, and perfectly circular.

When conception has taken place, all these characters begin to alter; the change from the natural condition above described being distinct in proportion to the period of gestation at which the examination is made. In order to fit the uterus for the reception of the ovum and its support, there is, very soon after impregnation, a greater supply of fluids directed towards it; its vessels, which before crept almost imperceptibly through its dense structure, and with their calibre completely constringed, become distended and carry blood; the cellular texture is loosened out, and its interstices are infiltrated with a greater quantity of fluid, and in consequence the organ becomes not only altered in texture, but increased in size and weight. At this time, when the finger is applied to its vaginal extremity, the cervix is felt fuller, rounder, and softer or more springy and elastic under the point of the finger; and the same alterations having taken place in the labia of the os uteri, this part communicates a corresponding difference in the sensation received by the finger of the examiner: the margins of the orifice feel tumid, but softer and much less distinct, having lost the well-defined edge which in the unimpregnated organ is natural to them; while the orifice itself, instead of seeming transverse, feels as if it were circular, and admits the tip of the finger more readily and to a greater depth than in its former state. As pregnancy advances, other changes in these parts may be appreciated. During the sixth month, for instance, we ascertain that the cervix has not only undergone the changes of structure already detailed, but that it has lost somewhat of its length, owing to a portion of its upper section, or that which unites it to the body of the organ, becoming dilated, and taken up as it were to form a part of the distended cavity containing the child; and this obliteration of the cervix from above downwards continuing to be gradually effected, we find, if we examine towards the close of gestation, that the projecting cervix is no longer to be felt, but in its place there is detected, at the upper extremity of the vagina, a globular tumour, which is the enlarged uterus, with the head of the child to be distinctly recognized through its parietes. In like manner also the os uteri undergoes great changes of form, structure, and position, as pregnancy advances.

During the greater part of the first three months, besides the alteration already mentioned, it is felt lower in the vagina, and not unfrequently projecting a little forwards; but as soon as the uterus begins to rise into the abdomen, and leaves the pelvic cavity, as it does by the fifth month at farthest, sometimes a month earlier, its fundus leans forwards, and in consequence the os uteri is directed backwards; its margins are now felt very soft and relaxed, and we distinguish very generally within the circle of its orifice the cervical glandulæ slightly projecting, and feeling like little firm smooth vesicles rolling under the point of the finger. We can now also introduce the finger with great ease to a considerable depth into the cavity of the cervix, owing to the very yielding condition of the labia of the os uteri. From this period, in consequence of the rapid development of the uterus, and the shortening of the cervix, the os uteri rises in the pelvis, and is of course removed farther and farther from the external parts, while, at the same time, the anterior projection of the uterus increasing, its mouth is in the same degree directed backwards, so that, if we examine in the eighth or ninth month, we reach it with difficulty, and must expect to find it in the direction of the upper part of the sacrum. If gestation be drawing to a close, the orifice will often be hardly distinguishable, and when felt gives only the impression of an opening in a nearly flat surface, without any elevated margin, or at most very little, and feeling as a mere rugous opening in the mucous membrane of the upper part of the vagina.

But we must recollect, when we come to form an opinion from the existence of such changes in the os uteri, that there are other conditions of the uterus besides pregnancy by which they may be produced so as to assume almost exactly the characters of those that accompany the earlier periods of gestation. Thus, for instance, the near approach of menstruation and the accompanying irritation of the uterus may (and we have had repeated proofs from examination that it does) effect such a change in the form and texture of the os uteri. The same thing will happen in a more marked degree, when the organ becomes from any cause enlarged, either by an increase of its substance, or, still more remarkably, when its cavity becomes distended by an accumulation of fluid within it, as of blood or water, or the presence of a diseased growth, such as a poly-

pus or hydatids.* Moreover, in some women, especially those who have borne several children, the condition of the os uteri is at all times such as may but too easily impose on us. On the other hand, however, there is one fact on the subject on which we may rely,—viz. that inasmuch as pregnancy must always be accompanied with the physical changes of structure in the uterus already mentioned, should we find in a suspected or doubtful case, especially if supposed to be of some months' duration, the os uteri retaining distinctly the characters which belong to it in its unimpregnated state, that is, its transverse orifice with well defined and firm margins, we may conclude with certainty that the woman is not with child.

2. *Size of the uterus, &c.*—When conception has taken place, the uterus almost immediately begins to increase in size, generally in every part, in consequence of the new action already described, but especially at the fundus. Here the cavity begins to increase its capacity, to enable it to receive and accommodate the ovum, which being accomplished, the upper part of the organ continues to increase in size in proportion to the growth of its contents. The fundus is first developed, then the body, and lastly the cervix; the latter part not being affected by the process of expansion until about the sixth month, as already stated. During the earlier months, therefore, the finger introduced per vaginam cannot reach sufficiently far to arrive at and detect the development which has taken place in the upper part of the uterus; and as the increase of size in the organ is not as yet such as to prevent its being still accommodated within the pelvis, it cannot be detected by examining through the parietes of the abdomen; wherefore, during this period, which extends through at least the first three months, the development of the organ or its degree will be difficult to ascertain, but will become gradually more easy of detection as pregnancy proceeds and the uterus enlarges. In general, by the end of the fourth month, the fundus of the uterus may be felt, especially in a thin person, overtopping the anterior wall of the pelvis. During the fifth it rises to half way between the symphisis pubis and the umbilicus; and if an examination be made per vaginam, we can detect the enlarged uterus, which we encounter when we attempt to pass the finger between the anterior part of the cervix and the inside of the symphisis pubis,—a situation in which, when a woman is not pregnant, and even during the earlier periods of pregnancy, we are not able to feel any thing. At this period, also, we may at the same moment feel the fœtus by ballottement, as described in another section. In the sixth month the uterus rises as high as the umbilicus, which is now for the first time sensibly affected, and begins to rise to a level with the surrounding integuments. In the seventh month the fundus uteri may be felt halfway between the umbilicus and the end of the sternum; and if an examination be made per vaginam, the finger readily detects the globular tumour of the uterus resting on the symphisis pubis, and within it the child's head; but the os uteri is now reached with greater difficulty, both because it is raised absolutely higher in the pelvis, and also because it is removed farther from the external parts by being projected more towards the promontory of the sacrum.

By the end of the eighth month the uterus has risen as high as the ensiform cartilage, and fills the whole abdomen, which is now very prominent and tense, and the umbilicus is in general not merely on a level with the integuments, but projects a little beyond them.

In the ninth month the uterus continues to enlarge, but the degree of its increase is not very observable by an increased elevation of its fundus, which on the contrary very generally falls lower towards the close of the month, so that for a week, or even two, before labour, the woman will appear and feel smaller than she was previously. If at this period we examine internally, the os uteri will in most cases be touched with great difficulty from its situation towards the upper and back part of the pelvis; there are in general no remains of the cervix; and the margins of the os uteri are felt thin, soft, and so relaxed that the orifice would receive with perfect ease the end of one's thumb, and within its circle we may feel the membranes.

Now it is important to notice the different degrees of distinctness with which these changes in the uterus may be recognized in different individuals, or in the same individual at different times, and to speak of the best method of conducting the examination.

In some women there is a natural stiffness and tension of the muscles of the abdomen, which is a great obstacle to an examination; and this they can produce or increase at pleasure, if they wish to baffle us in our investigation. In this, however, we may defeat them, by engaging them at the instant in conversation on some subject connected with their case which will be likely to set them talking. In other cases a similar difficulty will arise from inflation of the intestines or their distention by an accumulation of fœces; or a still more formidable bar may be found in a general condition of *embonpoint*, when the omentum and abdominal integuments may be so loaded and thickened with fat, that we can no more feel any thing through them than if we had a folded blanket between our hand and the patient's abdomen. This is so remarkable in some fat women, that we have found it impossible immediately after delivery to ascertain by external examination the degree of uterine contraction, although there were other satisfactory proofs of its perfection. We should not forget that this is a state of the abdomen very apt to occur at the turn of life, when, from the cessation of the catamenia, women very often fancy or affect to think themselves with

* In introducing hydatids here, we do not mean to be understood as considering them distinct from pregnancy, from which we believe they always arise, but as distinct from the natural conditions of that state, and from the presence of a fœtus.

ild. On the other hand, the examination ill be most satisfactory in women of a spare abit, and who have the abdominal parietes laxed.

It was before stated that during the first ree months we cannot expect much infor- ation from the altered size of the uterus, but at, after the lapse of another month, the ange might be ascertained both externally d also per vaginam; and it may be here lded that in a case of doubt we may make esc two modes of examination mutually con- mative of each other, by applying the finger one hand to the os or cervix uteri, and shing that part upwards, and then with the her hand gently pressing down the tumour lt in the abdomen. If we thus feel its scent upon the finger in the vagina, it affords most certain proof that the tumour is the erus in a state of enlargement. But we must gain recollect that a certainty even of this will t be sufficient to assure us of the existence pregnancy, because the enlargement may ise from other causes than the presence of a tus, such as hydatids, polypus, dropsy, or cumulated menses within the uterus, or scir- ous thickening of its substance. In the case polypus or scirrhus, the great solidity of e organ would at once undeceive us; but in her circumstances we might be able to ascer- in merely that the cavity of the organ was creased in capacity without being able to termine the exact course of its enlargement. t the same time the presence of several of the mptoms of pregnancy might afford a very rong moral conviction of the existence of that ndition; while, on the other hand, we may iscover such a want of correspondence be- ween the state of the uterus and the other mptoms apparently indicating a certain pe- od of pregnancy, as would be sufficient to ecide our opinion on the negative side of the uestion.

We have already spoken of the mode of ex- mining externally to discover the presence of fœtus in utero, and alluded to another form f examination per vaginam, to which we ught to resort for this purpose. As we have o English name for this mode of examination, is still designated by its French name.

Ballottement.—This mode of examination thus to be instituted. The patient may be xamined in the upright position, or placed ing with the shoulders much raised. One or wo fingers are then to be introduced into the agina and carried upwards until their points re applied to the anterior section of the cervix teri, and as high up on that part as they can e conveniently made to reach without using orce, and they must be carefully kept in con- tant contact with the part to which they have een applied. The other hand of the examiner s to be placed on the abdomen over the terine tumour, which should be pressed lownwards towards the cavity of the pelvis; nstantly on our doing this, the fingers which ave been kept applied to the cervix should be mpressed against it with a quick and slightly erking motion upwards, when something will be felt to have bounded away from the fingers, upon which it will, in the course of three or four seconds, be felt to drop again with a gentle pat.

Should this be distinctly felt, it is proof positive of a fœtus in utero, there being no other condition or disease of the organ in which a solid body can be felt in this way floating in its cavity; and it possesses this great advantage over many other modes of investigation, that it is equally applicable to the dead as to the living fœtus. But we must be prepared for occasional disappointment in this test as in others, inasmuch as the most carefully conducted examinations of this kind have failed of success when there was really a fœtus in the womb of sufficient bulk to be thus felt, as we have ourselves experienced. This difficulty may arise in some cases from the fœtus being unusually small, or from the cervix being unusually long; and in some instances we were satisfied it has arisen from the uterus lying too much beyond the reach of the finger at the time of the examination.

The time at which we may resort to this examination with the best prospect of success is generally said to be from the fourth to the sixth month. Our experience leads us to say that it is not likely to be satisfactory until after the end of the fourth month, but from that till the end of the sixth it will be found most available, and often completely decisive.* In the earlier periods of pregnancy the fœtus is too light to be felt, and in the more advanced its presence is ascertainable by other means, and besides it is then too large and too much confined to be made to float or move about thus freely.

It is desirable that the bladder and rectum should be quite empty when we make this examination, that the uterus may have as much space as possible for its descent into the pelvis, and so be brought as much as possible within reach of the examiner's finger. We must be careful not to mistake the movement of the uterus for that of the fœtus, an error into which we shall be particularly liable to fall if we remove the fingers from their contact with the cervix while making the examination. In one instance of enlarged uterus we knew the pulsation of one of the arteries to be mistaken for the drop of the fœtus on the finger.†

Application of auscultation.—Since the appearance of the memoir of Dr. Mayer‡ of Geneva, in 1818, and the subsequent observations of Kergaradec and Laennec, the application of auscultation as a means of detecting pregnancy has been much cultivated, and with results highly beneficial to the interests of science and our powers of making a correct diagnosis.

* Gardien specifies four months and a half; Gooch from the fifth to the seventh.

† On this subject see *Baudelocque*, tom. i. p. 206.—*Desormeaux*, Dict. de Méd. tom. x. p. 400.—*Velpeau*, Traité des Accouchemens, tom. i. p. 185.—*Gooch*, On Female Diseases, &c. p. 215.—*Gardien*, Traité Complet, &c. tom. i. p. 507-10.—*Mahon*, Méd. Lég. tom. i. p. 160, note by Fautrel.

‡ Vide Bibliothèque Universelle, Nov. 1818.

The phenomena thus ascertainable are, the pulsations of the fœtal heart, and a peculiar sound audible in that part of the uterus to which the placenta is attached, and hence called the placental sound or murmur *(bruit placentaire)*. We shall first consider the modes of investigating these, and then state the advantages which this mode of examination enjoys above others, and the defects under which it labours as a general means of diagnosis.

The placentary sound is the one first capable of being examined, and may be heard as soon as the uterus has become sufficiently developed for its fundus to arise above the anterior wall of the pelvis: this happens in the fourth month of gestation, before which period we do not believe the placental sound can be ascertained. We are aware that cases are recorded in which it was supposed to have been heard so early as the tenth week. If so, we have not been so fortunate as others, although we have very many times indeed carefully repeated our examinations, but never succeeded until four months of pregnancy had been completed.*

The characters of this phenomena are, a low murmuring or somewhat cooing sound, resembling that made by blowing gently over the lip of a wide-mouthed phial, and accompanied by a slight rushing noise,† unaccompanied by any sensation of impulse. This sound is in its returns exactly synchronous with the pulse of the mother at the time of examination, and varies in the frequency of its repetitions with any accidental variation which may occur in the maternal circulation. Its situation does not vary during the course of the same pregnancy; but in whatever region of the uterus it is first heard, it will in future be found, if recognized at all, for it is liable to intermissions; at least we shall occasionally be unable to hear it where we have already heard it a short time before, and where we shall shortly again recognise it. In relation to the regions of the abdomen, its seat will of course vary in proportion to the progressive advance of the pregnancy. According to our experience it will be most frequently heard about the situation of the fallopian tube of the right side, but it may be detected in any of the lateral or anterior parts of the uterus.

The other phenomenon differs in every one of its circumstances from the placentary murmur. It results from the contractions of the fœtal heart, which, when conveyed to the ear, are heard as rapid pulsations without any of the murmuring sound of the *bruit placentaire*. These pulsations vary in number from 120 to 160 in the minute, while the mother's pulse at the same time may not exceed the usual standard; and should it happen to do so, the pulsations of the fœtal heart will not be found similarly affected. By this want of correspondence and permanently greater rapidity, they are distinguished from the pulses of the mother. The impulses of sound communicated to the ear are in general very delicate and feeble, resembling very much the ticking of a watch heard through one's pillow at night.* This phenomenon is not ascertainable, according to the writer's experience, until five months of pregnancy have been accomplished,† and then requires for its recognition very great attention on the part of the examiner, and also a practised ear. As pregnancy advances, the sound becomes more distinct. Its seat or source being the heart of the fœtus, and the fœtus having in most women a great disposition to change its posture, the situation of the sound will consequently be different at different times, especially from the sixth to the eighth month. It is, however, most frequently and most readily heard on one or the other side, and at about the middle of a line drawn from the umbilicus to the anterior and inferior spinous process of the ileum, and more frequently on the left side than on the right.

This mode of ascertaining the existence of pregnancy has this great advantage over almost every other, that it detects not only the presence of a fœtus, but proves its life also. On the other hand, however, should life be extinct, auscultation cannot possibly afford us any information; and here lies the great defect under which its application labours when compared with other modes of examination, to which also it is inferior in not being available during that period of pregnancy which is most obscured by doubt. Again, from the fact that both phenomena are occasionally inaudible‡ even in the case of a living and healthy fœtus, it will not justify us in giving a negative opinion. The bruit de cœur once heard is of course decisive, because there is no other sound which can be mistaken for it; but not so with the placental murmur, which may be so imitated, either artificially, as by pressure, or by disease, that the nicest and most practised ear cannot detect any difference. A case most strikingly illustrative of this statement was not long since under the writer's care, in which enormous enlargement of the uterus, of that kind which has been called vascular sarcoma, was accompanied by this phenomenon in its most perfect condition; and in another case of abdominal tumour (supposed to be of the spleen) pressing on the aorta, this sound was equally distinct: moreover, it may at any time be imitated by pressing the end of the stethoscope over the region of the iliac vessels.

At all times this kind of examination requires great care and nicety on the part of the examiner, and complete silence around him, for the sounds are very often almost imperceptible. We have the very highest authority for be-

* "Je ne l'ai rencontré que dans la seconde moitié de la grossesse. Si Laennec et M. de Leus, qui disent l'avoir reconnu avant la fin du troisième mois, ne se sont pas mepris, il me parait par cela seul impossible de l'attribuer à la circulation utero-placentaire." *Velpeau*, Traité des Accouchemens, vol. i. pp. 190-1.

† "Battement simple avec souffle." *Kergaradec.*

* "—semblable à celui que font entendre les battemens d'une montre enveloppée de beaucoup de linges." *Velpeau.*

† "Ces pulsations s'entendent distinctement dés le sixième mois, et quelquefois même un peu plus tot." *Laennec*, tom. ii. p. 457.

‡ See case related in the section on *Quickening*, &c.

lieving that the formation of a correct judgment by their means requires more care, and is beset with greater difficulties than are found in investigating all the diseases of the chest.* We must recollect that, from their occasional intermission, it may happen that we shall not be able to give a satisfactory opinion until we have several times repeated our examination. To make this examination, it is by no means necessary that we should be practised stethoscopists, or even use the stethoscope at all, since the naked ear will detect the sounds sought for with perfect accuracy; but the use of the tube is for many reasons preferable.

It appears not unimportant to mention here, that our success will sometimes depend on our making a proper degree of pressure with the end of the instrument, since the seat of the sound which we seek to discover may not, and very often is not, in contact with the surface on which we apply our ear or our stethoscope; and under such circumstances the intervention of a fluid, such as the liquor amnii, will effectually prevent the transmission of the sound, until, by gently increasing the pressure on the integuments, we carry them inwards, and by displacing the intermediate fluid, whether air or water, we bring them into more immediate contact with the source of the sound, and obtain a solid medium for its transmission.†

Substances expelled from the uterus.—The expulsion from the uterus of solid or organized substances, presenting occasionally very unusual or anomalous characters, excites not unfrequently suspicions of the existence of pregnancy in the unmarried, and perhaps the perfectly chaste. Under such circumstances we may be applied to for an opinion as to the nature of the substance expelled, and are expected to declare whether it is or is not the product of conception. Inasmuch as character and fair fame of the individual depend on our answer, the greatest care will be required in making such an examination, and the utmost caution in forming or pronouncing an opinion. To this duty no person can possibly be competent if he have not previously made himself intimately familiar with the appearance and structure of the ovum, particularly in the earlier periods of its formation; and this knowledge he may take it for granted he never will attain to by descriptions in books or plates, nor by any means except repeated examinations of the structure itself, under every circumstance and condition in which it may be found: more especially when it is altered in its characters, as it usually is, by abortion.

The substances thus expelled may be, 1. an early ovum; 2. a mole; 3. uterine hydatids; 4. the membrane produced in dysmenorrhœa; to each of which we shall now turn our attention.

1. *An early ovum.*—When the product of

* "L'étude des phenomènes dont nous venons de parler dans cet article demande incomparablement plus d'attention que celle de tous ceux que presentent les maladies de la poitrine." *Laennec*, tom. ii. p. 466.

† The author of the article AUSCULTATION in the first volume of the present work, gladly avails himself of the present occasion to correct some mistakes which he has committed in respect to the appropriation of certain opinions therein advanced.

In treating of the utero-placental circulation, with reference to the variety of sounds which accompany it, we gave it as *Dr. Ferguson's* opinion that "the most constant variety is a combination of the bellows or sawing with the hissing sound, commencing with one of the former and terminating with the latter;" and in another place we stated that "*Dr. Ferguson* had not observed any variety of the sounds to be peculiar to particular stages of pregnancy." Now the fact is that both these remarks belong to *Dr. Kennedy*, and are taken from an excellent paper by this gentleman, published in the fifth volume of the *Dublin Hospital Reports*. In transcribing the extracts which we had made, we inadvertently inserted Dr. Ferguson's name in place of Dr. Kennedy's, and referred to a paper by the former gentleman in the *Dublin Medical Transactions*, from which we also had been making extracts. We are much obliged to Dr. Kennedy for having enabled us to correct our mistake.

In respect of certain other statements made by us in the same article, we most readily afford Dr. Kennedy the opportunity of giving his own explanation by extracting a passage from a communication with which he has favoured us.

Extract of a letter from Dr. Kennedy to Dr. Forbes:

"You appear to have misunderstood me when you state, 'there seems little ground for believing with Dr. Kennedy that the placental arteries themselves have a share in the production of the sound any farther than by their action promoting that of the uterine arteries.' Now if you will refer to p. 241 of my paper you will find that I merely deem it possible that the passage of the blood through the arterial tubes and cells of the *maternal part* of the placenta may have *some effect* in producing it; and in p. 244, speaking of the *possibility* of its operating so, add that the point *still admits of doubt*. From this it will be seen that I by no means commit myself, either in the manner or to the extent that your statement implies. The fact is, that although my explanation may not have been sufficiently explicit on this point, yet the manner in which I endeavoured to explain the maternal part of the placenta's assisting in producing the soufflet, (if it did so at all,) was that which you more distinctly state, namely, by promoting the action of the uterine arteries. But even of this I was not, nor am I as yet quite satisfied. I however thought myself called upon candidly to state facts and inferences as they presented themselves to me on my investigation, leaving it to others to draw what conclusions they thought proper from them.

"There is still another point to which I wish to draw your attention, as, from the manner in which you quote me, my meaning is very equivocally conveyed. You say, 'Dr. Kennedy denies M. Ollivry's statement, that the soufflet is immediately extinguished on the removal of the placenta, the death of the fœtus, and the tying the cord, the sound becoming abrupt,' &c. From this it might be concluded that I stated the soufflet always to continue after delivery, death of the fœtus, &c. an inference widely at variance with the fact, and such as was never intended by me. You will find, p. 244, Dub. Hos. Rep. vol. v. the passage which you quote; it runs thus: 'Neither does the sound (the soufflet) *invariably* cease, as we might be led to conclude on the authority of Dr. Ollivry, on the separation or expulsion of the placenta; but provided the uterine arteries at this part, from imperfect contraction of the uterus, continue pervious to blood, a soufflet will still continue,' &c. Here you will at once perceive how much the words 'immediately extinguished,' in place of 'invariably cease,' effect the nature of the statement."

May 1833. J. F. *Edit.*

conception is expelled within a month from the time of conception, the most careful and skilful examination may fail in detecting its true character. After this period its structure is sufficiently distinct to be recognized by any one well acquainted with it, and who will take *sufficient time* to examine it; for this also is absolutely essential to the formation of a correct opinion. The ovum, when thus expelled, is generally infiltrated with firmly coagulated blood, and the pressure which it sustains while it is forcing its way through the contracted and rigid cervix of the uterus, so condenses its texture as to reduce it apparently to the condition of a solid homogeneous mass. The real structure of the body cannot be ascertained by any examination instituted at the moment, but must be gradually made out by first immersing the substance in water for a day or so; and then, by agitation and washing, the coagulated blood must be removed, while with delicate blunt instruments we gently separate the component parts of the mass *under water*, until at length we ascertain its real character. This process may occupy us for a time varying from three or four days to a week, before we are able to satisfy ourselves perfectly. Haste may completely defeat the object of the examination.

If in the progress of such an investigation we discover a fœtus, or even a part of one, it would of course be decisive; but this may not be the case, and yet we may recognise all the other component parts of the ovum presenting several structures which are never produced by disease.* First, we may have the decidua covering either partially or completely the substance under examination, distinguished by its soft, rich, pulpy appearance and strong red colour, its external or uterine surface rough and unequal, and, when well freed from the coagulated blood, exhibiting numerous small round foramina,† capable of admitting a pin: its internal surface is smooth, and exhibits little or no appearance of these openings. This coat may be found attached to the ovum, or entirely torn away and separated from it during its expulsion; but in either case these characters mark the true decidua, and are not found in the products of disease. Within this outer coat another is found immediately investing the membranes of the ovum, the outer surface of which is smooth, and its inner completely filamentous, receiving the beautiful arborescent villi which cover and shoot from the surface of the chorion, forming the bond of union between it and this inner decidua. The discovery of these arborescent villi or capillaries is proof positive of the nature of the product, as they are never found presenting like characters, except upon the chorion or uterine surface of the placenta.

2. *Moles.*—With regard to those solid fleshy masses called moles, which are occasionally expelled from the uterus, there is a great discrepancy in the opinions of writers of authority, some of whom maintain, with Mauriceau, that they are the result of conception alone, and of course positive proofs of pregnancy; while others either think this very doubtful, or deny it altogether, and suppose that they are merely accidental formations of a morbid character. "By the term *mole*," says Denman,‡ "authors have intended to describe very different productions of, or excretions from, the uterus. By some it has been used to signify every kind of fleshy substance, particularly those which are called *polypi*; by others, those only which are the consequence of imperfect conception when the ovum is in a morbid or decayed state; and by many, which is the most popular opinion, every coagulum of blood which continues long enough in the uterus to assume its form, and to retain only the fibrous part as it is properly called, is denominated a mole." "True moles," says Voigtel,§ "are distinguished from the false and other growths of the uterus by their not deriving their origin from the substance of the womb or its membrane; but by their being always the consequence of conception." This is at once assuming that conception is the sine-quâ-non without which a mole cannot exist,—an opinion which is supported, to a certain extent at least, by the experience of Mr. Burns, who says, "It is the opinion of many that these substances are never formed in the virgin state, and no case that I have yet met with contradicts the supposition."‖ Foderé¶ thinks that the true mole is always the result of intercourse between the sexes, and that those substances which are discharged from the virgin uterus are merely condensed coagula of blood, which of course may form in the chaste as well as others. Baudelocque** considers the mole and the false conception as one and the same.

On the other hand, we find the matter thus stated by Dr. Smith: "Moles are disorganized masses that form in the uterus; and continuing for some time to increase, cause some of the symptoms of pregnancy. They have been found in females who never had any intercourse with the other sex."†† Ruysch makes a similar assertion, and adds that he has seen them in women so advanced in years as to be beyond the reach of suspicion. A case came before the parliament of Paris in 1781, in which the female sued for damages for seduction. Twenty months after this was alleged to have been committed, she brought forth a mole. The parliament decided against her on the score of character, and they added that "the causes of

* See a case related by Mr. Lemon in the Edinburgh Medical and Surgical Journal, vol. xi. p. 96. The writer has in his museum more than one specimen illustrative of this absence of the fœtus where the other parts of the ovum exist.

† See Hunter's plates of the gravid uterus, xxix, fig. 11, and also plates xxviii, xxx, xxxiii, xxxiv.

* Il est très certain que les femmes n'engendrent pas de moles ni de faux germes, si elles n'ont usé du coit." Maladies des Femmes, tom. i. p. 109. "Massa carnea, vasculosa, ex utero excreta. Ovum deforme." *Vogel.*

† Introduction to Midwifery, p. 124.

‡ Handbuch der Pathologischen Anatomie, vol. iii. p. 501.

§ Principles of Midwifery, ed. 7, p. 111.

‖ Médecine Légale, vol. i. p. 468.

¶ Art des Accouchemens, tom. ii. p. 367.

** Principles of Forensic Medicine, p. 298.

moles were as uncertain as the time of their gestation, *and that there were instances of girls, and even of nuns, who had produced moles without any previous criminal connexion.*" Foderé, who quotes this case, disapproves altogether of the view taken by the court.*

It is to be observed here that this is a mere question of fact, of which different views have been taken, and opinions formed by authors or practitioners according to the opportunities afforded them of judging. The writer does not feel prepared to undertake to reconcile these conflicting opinions, but it appears to him almost certain that much of the discordance has arisen from substances of very different characters having been indiscriminately classed together under the general term of moles, some of which were undoubtedly neither more nor less than diseased ova or remnants of such, while others were as certainly either merely condensed coagula, or perhaps uterine polypi. Hence Mahon† appears perfectly justified in making the following remarks:—"The existence of moles properly so called is extremely doubtful, since they may all be referred to some one or other of the substances of which we have spoken, viz. a placenta, which had continued its growth, the fœtus having perished; the degenerated remains of the after-birth; coagulated blood; sarcomatous tumours or polypi of the uterus. The two first cannot exist except after sexual intercourse; the other three may be found independently of it.‡ This is the distinction which it is of the greatest importance to make in questions of legal medicine, that we may not without cause compromise the reputation of the unmarried girl or the widow of irreproachable life and conduct."

In this view the writer entirely coincides, and thinks the medical jurist would not be justifiable in pronouncing any such mass expelled from the uterus as proof of pregnancy, except he can detect in it either the fœtus or a part of it, or some other of the component structures of the ovum.§ In the instances which have come under our immediate observation, the women were all either married or avowedly indulging in sexual intercourse, and the masses expelled, when examined, were found to contain the product of conception degenerated or greatly altered by disease. The last of these substances which came under our observation was expelled from the uterus immediately after the discharge of a healthy ovum, containing a well-formed fœtus of four months, at which period of pregnancy the woman, according to her own account, had arrived. The substance had the external characters usually considered as those of a mole, and was of the form and size of a large orange. When opened, no trace of a fœtus could be discovered, but there was a small remnant of an umbilical cord, which was ragged at its unattached extremity: the fleshy envelope varied in thickness from an eighth to half an inch, the thickest part being that where the placenta was situated, the internal surface of which exhibited very remarkably the tubercular disease represented in Denman's ninth plate.* Morgagni† relates a similar case, and quotes Hartman and Gutterman. Mr. Lemon's case has been already referred to.

3. *Uterine hydatids.*—Of the nature of these productions, and their necessary connexion or otherwise with conception, there exists, as in the case of fleshy moles, a complete want of accordance in the opinions of authors. Some maintain that they are not necessarily the result of conception, while others as strongly, and, as it appears to us, with much greater reason and truth, consider them as the product of disease attacking the ovum. Without entering into lengthened details on this subject, it appears proper to quote a few of the most respectable opinions on each side of this question before stating the result of our own experience on the subject. Dr. C. M. Clarke‡ thus expresses himself:—"It is probable that the existence of pregnancy is not necessary for the production of this disease. It has been believed to exist independently of this state; and perhaps a morbid condition of organized lymph may have the power of originating this disease under certain circumstances, but what these circumstances are is not known." Gardien's opinion is that "hydatids may be met with in girls as well as women; however, although they are independent of sexual intercourse, they are much more frequently met with in women who have borne children, and especially when they have arrived at the turn of life."§ Denman says, "These have been supposed to proceed from coagula of blood, or portions of the placenta remaining in the uterus, and this opinion is generally true; but there is sometimes reason for thinking that they are an original production of the uterus independent of such accidental circumstances, and sometimes the precursors of organic disease in that part."‖ Of these opinions we think we are justified in saying at least that there is so much of conjecture in them that they weigh very little in the determination of this point; and it is, moreover, to be observed that these writers admit elsewhere, as indeed do all who have written on the subject, that the existence of hydatids in utero is

* Médecine Légale, t. i. p. 478.

† Mahon, Médecine Légale, t. i. p. 274.

‡ "Aussi sont-ce les seules productions que l'on rencontre chez les filles, et chez les femmes vivans dans l'état de chastité." *Mad. Boivin*, sur la Mole Vesiculaire, &c. p. 18.

§ It has been already remarked that these are not unfrequently found without any part of a fœtus. This is noticed also by Voigtel in describing different species of moles. "In others," he observes, "from an originally imperfect development of the ovum, or an injury to the fœtus at its first formation, it appears either as a shapeless mass, or *the fœtus itself is completely destroyed*, and *only its membranes and the placenta* continue to grow for a time and get thickened and fleshy, or filled with fluid only, or form membranous, fibrous masses, or hydatids, or assume other unnatural appearances." Voigtel, op. cit.

* It is preserved in the writer's museum.

† Epistles 48-9.

‡ Observations on the Diseases of Females, part ii. p. 115.

§ Traité complet, &c. t. i. p. 559.

‖ Introduction to Midwifery, fifth edition, p. 121.

always accompanied by the ordinary symptoms of pregnancy. The weight of authority appears to us very decidedly in favour of the necessary connexion between these substances and previous conception. Beck declares that he "can find no case on record where hydatids of the uterus have been formed *independent of sexual conaerion*."* Baudelocque and Voigtel consider them merely as a variety of the mole, and as such the result of impregnation.† Desormeaux thus speaks of them: "It is superfluous to say that the development of these masses of hydatids is most frequently, if not always, the result of conception: at first it is impossible to distinguish this affection from pregnancy, *or, to speak more correctly, pregnancy exists* with all its phenomena, and it is impossible to discover when the degeneration into hydatids takes place."‡ Velpeau is perhaps even more decisive on the point: his words are, "the mole and hydatids of the uterus being but the products of conception degenerated, give rise to the same phenomena as true pregnancy."§ We shall quote only one other authority, to which, however, we attach very considerable value. Madame Boivin has published a very ingenious and satisfactory pamphlet‖ expressly on this subject, and she brings forward a vast quantity of information connected with this affection, which she appears to have studied with unusual attention; and the result of her observations she announces to be that hydatids in the uterus are in all cases the result of conception.¶ She notices the fact that these formations are not attached immediately to the internal surface of the uterus, but are surrounded by an investing membrane having all the characters of the *decidua vera*; and she maintains that the hydatids originate in the filamentous vessels which spring from the external surface of the transparent membranes of the ovum; in regard to both which points we coincide in her views, and have in our possession preparations shewing both facts. Our own belief, then, is that uterine hydatids do not occur except after sexual intercourse, and as a consequence of impregnation. We never met or heard of a case in which their presence was not accompanied or preceded by the usual symptoms of pregnancy;** and in every instance under our immediate observation, the women supposed themselves with child, and when the contents of the uterus were expelled, there was found either a blighted fœtus or some other part of the ovum.

It may not be amiss to notice here an argument from analogy which has been brought forward against this view of the question, viz. that hydatids being formed in other situations, as the brain, &c., why may they not occur in the uterus also, independently of any such circumstance as intercourse or conception? To this we would reply, first, that the hydatids produced in the situations alluded to differ, *toto cœlo*, in their characters from those of the uterus; and, secondly, that whenever hydatids are formed, it is always in connexion with serous membranes, which do not exist in the uterus until the ovum is deposited there, whose membranes are essentially serous. Still it must be confessed that our knowledge on this point is by no means sufficiently precise, nor our collection of facts sufficiently extended, to warrant us in pronouncing positively on the question, or asserting decidedly, in a case of suspicion, that a woman was pregnant merely because she discharged hydatids from the uterus, except we could detect along with them some constituent part of the ovum, or in an examination after death find in the ovary the true corpus luteum, which ought to put an end to all doubt. It would be presumptuous and absurd to maintain that, because we had always found them in connexion with one particular cause, there might not be some other also capable of producing them; and as there may be a doubt, we must let the accused have the benefit of that doubt. Again, in giving an opinion we should be prepared to make allowance for such a case as this:—a woman loses her husband by death or departure, when she is, perhaps, in the third or fourth month of pregnancy; shortly afterwards she miscarries, and the placenta or some other portion of the ovum is retained, and gives rise to the production of hydatids. This new product may be retained for many months,* and being then expelled, might very unjustly excite suspicion against a perfectly chaste person; for, although the result of impregnation in such a case, they might obviously be no proof of a pregnancy occurring subsequently to the absence of the husband.

4. *Membranes expelled in dysmenorrhœa.*—The circumstances attending dysmenorrhœa have sometimes given rise to a suspicion of pregnancy and early abortion, because the female may have pains resembling those of labour, accompanied by red discharge, and followed by the expulsion of a substance somewhat resembling the decidua. But it only requires a little examination and inquiry into circumstances to detect the difference between these two products and the real nature of the case. In the first place, we learn that such occurrences are habitual with the person at every menstrual period; the symptoms of pregnancy have not been observed; nor does the state of the breasts correspond to the existence of that condition. Again, the substance expelled in such cases will be found deficient in several of the characters of the true decidua: it is thin, flimsy, and very unsubstantial in its texture,

* Elem. Med. Jurisp. p. 102.

† Locis citatis.

‡ Article "*Œuf humain*," Dict. de Méd. t. xv. p. 387.

§ Traité Elem. de l'art des Accouch. t. i. p. 217.

‖ Nouvelles Recherches sur l'origine, la nature, et le traitement de la Mole Vesiculaire ou Grossesse Hydatique, 1827.

¶ Vide pp. 15, 24, and 56, op. cit.

** Such also was the experience of Dr. Gooch. See Account of the Diseases of Women, &c. p. 242-3.

* In Madame Boivin's work, p. 74, there is a table shewing the number of months which intervened in thirty-two cases between the commencement of pregnancy and the expulsion of the hydatids. Some interesting cases are detailed by Nauche in a well written article on this subject. See Maladies propres aux Femmes, partie i. p. 182.

nd has not the vascularity, nor the foramina r the reception of the nutrient vessels from the erus, which are so distinctly observable in the ecidua vera; and lastly, the most accurate xamination will not discover within it any of ie transparent membranes of the ovum. We nmot more appropriately close our observaons on this membrane than by quoting the pinion of Denman, who, of all the moderns, as best described it. "As the first cases in hich this membrane was discharged were iose of married women, a doubt arose in my ind whether it was not really a consequence f early conception; but I have lately had the ost undoubted proofs that it is sometimes ischarged by unmarried women, and may be rmed previous to and without connubial comunication; and that the uterus has occaonally or constantly, in some women, the roperty of forming it at or in the interval etween the periods of the menstrual disharges. It seems particularly necessary to stablish this fact, as the appearance of this embrane has more than once given rise to rroneous opinions and unjust aspersions. Nor this the only circumstance in which some omen, at each period of menstruation, have ymptoms like those which accompany pregancy or parturition."*

Accidental circumstances.—Under this head it is intended merely to notice certain peculiarties sometimes observable in pregnant women, which, although generally deserving but little ttention in such an investigation, may still be emembered with advantage on account of the onstancy with which they occur in particular ndividuals, and the assistance which they may onsequently afford in confirming or modifying ur opinion. Such is, for instance, the alteration so often observed to take place in the eatures and expression of the face, which has een made a subject of remark since the days f Hippocrates, who mentions it. The features f the face in general become sharper, especially the nose, which seems as if it were lengthened, and the mouth appears larger; the eyes re sunk, and often surrounded with a brownish r livid areola, and assume a languid expresion. A marked change in the temper is very ommonly observed also, so that a woman who was under ordinary circumstances extremely mild and sweet-tempered, becomes, when pregnant, irritable and capricious. Strange appetites and antipathies are well known as frequent attendants on pregnancy in many persons, some of whom will long to eat unusual and even revolting articles, while others, immediately after conception, are seized with an unconquerable aversion to species of food which were previously particularly agreeable to them. We have seen several well-marked instances of this, and in particular one, in the case of a lady who assured us that she always knew when she was with child by feeling a violent antipathy to wine† and tea, which at other times she took with pleasure. We had an opportunity of observing the accuracy of this indication in three successive pregnancies of the lady alluded to.* The occurrence of pains in the teeth, face, and other situations, are with some the invariable accompaniments of pregnancy. In some women the same condition developes very singular idiosyncrasies, such as the occurrence of dark blotches over the face and other parts of the skin, an instance of which is at present exhibited in a patient under the writer's care. Lecat relates the case of a woman whose face in three successive pregnancies became quite black.† Camper observed the same circumstance. The occurrence of salivation in consequence of pregnancy has been already noticed. Some women always have varicose veins during gestation, who are not subject to such an affection at any other time. Mr. Ashwell mentions that in some individuals frightful dreams have been found a very good diagnostic sign; and he informs us that Dr. Haighton used to relate the case of a lady under Dr. Lowder's care, who was compelled to hire a nurse to awake her when her countenance became very much discomposed.‡ A very curious case is recorded by Dr. Bennewitz in Osann's Clinical Report for 1823, of a young woman who in three successive pregnancies was affected with diabetes mellitus, which completely ceased after delivery, but always returned when she again conceived.§ In first pregnancies we can gain little or no information from such accidental peculiarities, but their constant occurrence in successive instances ought to give them value in our eyes; the degree of value, however, must depend altogether on the distinctness with which we can ascertain their existence, or the reliance which we can place on the sincerity of those who report them to us.‖

The blood, urine, and pulse.—It is very generally asserted that the blood of pregnant women *always* presents the buffy coat and other characters of inflammation,¶ and this change in that fluid is even noticed by authors as one among the rational evidences of pregnancy.** The very general belief in this as a fact established, has probably arisen from the circumstance that pregnant women are seldom bled except when labouring under some form of inflammatory disease; but experience has fully taught us that no reliance whatever can be placed on the condition of the blood as an evidence of pregnancy. It is quite obvious that a woman exhibiting many of the symptoms of pregnancy, and yet not with child, may have her system under the influence of inflammatory action sufficient to cause the appearance of the blood frequently noticed in

* Introduction to Midwifery, pp. 161-2.

† This particular aversion is expressly noticed by Hippocrates as a sign of pregnancy, "vinum odio habent, cibos aversantur." *De Infecundis*, cap. 6.

* *Gardien*, tom. i. p. 485. Burn's Principles of Midwifery, p. 231. Denman, p. 232.

† See other instances by Gardien, loc. cit.

‡ Treatise on Parturition, &c. p. 171.

§ Edinburgh Med. and Surg. Journ. vol. xxx. p. 217.

‖ *Mahon*, tom. i. p. 162.

¶ *Blackall* on Dropsies, p. 279-80. *Scudamore*, on the Blood, p. 148.

** *Gardien*, vol. i. p. 487.

pregnancy; and on the other hand the blood of pregnant women will be very often found not presenting the characters supposed to be peculiar to it. This we have seen proved in several instances, and perfectly recollect the first case which particularly arrested our attention on this point; it was that of a very fat and robust woman who was seized with puerperal convulsions, and her blood exhibited not the least trace of inflammatory character. We have observed the same absence of such an appearance in blood drawn in the earlier periods of gestation to prevent abortion; and within the last few days we witnessed a very satisfactory instance of the same kind in the case of a lady in the ninth month of pregnancy, whom we judged it expedient to bleed for a very distressing cough, accompanied with pain in the chest and great irritation of the bladder: the abstraction of blood gave her the most immediate and decided relief, but it appeared in every respect perfectly natural and healthy.

A peculiarity in the urine of pregnant women has long been a matter of popular belief; and Savonarola, who wrote in 1486, gives a minute detail of the changes which that secretion undergoes in the different periods of pregnancy: up to about the sixth month, according to this writer, "the urine is clear, and of a pale citrine colour, with a cloud on its surface; and about the middle of the fluid, a deposit like carded wool; but as pregnancy advances towards its close, the urine becomes redder and turbid when stirred." This condition of the urine Foderé thinks entitled to consideration, having, as he says, "verified the accuracy of the observation."* Still more recently M. Nauche has brought this subject before the profession.† He speaks of it as a discovery of his own, and does not appear to be aware of the observations previously made by others: his words are: "By allowing the urine of pregnant women or of nurses to stand for some time, in thirty or forty hours a deposit takes place of white, flaky, pulverulent, grumous matter, *being the caseum or peculiar principle of milk formed in the breasts during gestation.* The precipitation is more readily procured by adding a few drops of alcohol to the urine." To this observation he subjoins a very strong case, in which he ventured to affirm the existence of pregnancy in a woman who was subsequently examined, both per vaginam and with the stethoscope, by several medical men, and pronounced not to be with child; but her delivery shortly afterwards evinced the accuracy of his previous diagnosis. The editor of the Lancet informs us in a note, that he had "applied the test in one case, and found it perfectly correct." We have ourselves tried it in several instances, and the result of our trials has been this: in some instances no opinion could be formed as to whether the peculiar deposit existed or not, on account of the deep colour and turbid condition of the urine; but in the cases in which the fluid was clear, and pregnancy existing, the peculiar deposit was observed in every instance; and we think its appearance would be best described by saying that it looks as if a little milk had been thrown into the urine, which having sunk through it, had partly reached the bottom, while a part remained suspended and floating through the lower part of the fluid, in the form of a whitish, semi-transparent, filmy cloud. And in some cases in which pregnancy was suspected, but did not exist, no such deposit was observed; but it is superfluous to say that there is such a host of accidental causes capable of altering the condition of the urine as ought to make us very cautious indeed how we ventured to attach credit to a symptom so equivocal.

We may apply the same observation to the state of the pulse, which has been made a subject of remark since the days of Galen. We shall only observe that in pregnant women the pulse is almost always stronger and more rapid than is natural to the individual at other times; but we cannot tell in a particular instance what may be the exciting cause of the increased action; we cannot even be sure that it is not natural to the person, and at all events we are certain that there are a thousand circumstances of disease or accident which may equally produce it.

Unusual conditions of the female.—Before entering on the last division of our subject, which will treat of the post-mortem examination, it appears necessary to advert to certain conditions in which a female may become pregnant, and her case be thereby rendered more obscure; as when, for instance, conception takes place,—1. in early youth or advanced age; 2. during the existence of disease, especially of a kind calculated to prevent conception, or to render its occurrence very improbable; 3. without the woman being conscious of having incurred the risk; 4. under circumstances not likely to be followed by such a result, as where copulation was only partially accomplished, &c. &c.

1. *The age of the individual.*—This may be such as, judging from what we observe in the ordinary course of nature, would appear either to preclude the idea of impregnation, or at least to render its occurrence extremely improbable. The limits of the generative faculty in women are generally those of the function of menstruation, but in some rare instances women have been known to conceive before the catamenia had begun to appear,* and after their cessation.

Conception before the age of fourteen is very rare, but it appears that instances of it have occurred. Bruce mentions that in Abyssinia he has frequently seen mothers of eleven years of age; and Dunlop witnessed the same in Bengal.† La Motte delivered a girl who had not completed her thirteenth year.‡ Instances of conception at nine and ten years of age are recorded by Joubert Schwrigius § and others,

* Méd. Légale, tom. i. p. 435.

† See the Lancette Francaise; also the Lancet, No. 417, p. 675.

* See cases referred to under the second section of this article.

† Beck's Jurisprudence, page 82, note.

‡ Traité d'Accouch. obs. xxiii. p. 52.

§ *Smith*, p. 493, note, and Ballard, note on Metzger, p. 485.

but they scarcely appear deserving of credit; yet we find Dr. Good expressing his assent to such relations, and quoting Haller* and Professor Schmidt† in support of them.‡ The earliest instance of pregnancy known to the writer was that of a young lady who brought forth twins before she had completed her fifteenth year. Sir E. Home knew two instances, in one of which a girl of thirteen, and in the other a girl of twelve, gave birth to children.§

So also pregnancy very seldom occurs after fifty, especially in women who have not previously borne children; but instances have from time to time occurred at unusually late periods in women who had formerly conceived. In the statement sent to parliament by Bartholomew Mosse when endeavouring to procure a grant for the Dublin Lying-in Hospital, he mentions that eighty-four of the women delivered under his care were between the ages of forty-one and fifty-four; four of these were in their fifty-first year, and one in her fifty-fourth.‖ The succession to an estate was disputed in France because the mother was fifty-eight years old when the child was born: the decision was in favour of the fact.¶ Colomb adduces a similar case, and Knebel** two, one of fifty-two years, and the other of fifty-four. "In May 1816, Mrs. Ashley, wife of John Ashley, grazier, of Firsby near Spilsby, at the age of fifty-four was delivered of two female children, which with the mother were likely to do well."††

While writing these observations, an eminent accoucheur of Dublin (Dr. Labatt) informed us that he some time since attended a lady who was married when forty years of age, and that after remaining barren for ten years, she conceived for the first time when she was past fifty, went to her full time, and after a difficult labour bore a living child.

Capuron‡‡ quotes several cases of child-bearing in advanced age, among which are the following:—Pliny records the case of Cornelia, of the family of the Scipios, who at the age of sixty bore a son who was named Volusius Saturninus. Marra, a physician of Venice, mentions that he treated a woman for dropsy who was really pregnant, and he was deceived by her age, which was sixty. La Motte tells of a woman who refused to marry until she was fifty-one, in order that she might escape child-bearing; but she was disappointed, and bore a child. Valescus de Tarenta mentions a woman who continued to menstruate beyond sixty, at which age she bore her last child: Capuron adds that it was generally believed in Paris that a woman in the Rue Harpe bore a daughter at the age of sixty-three, and nursed it.

The occurrence of such cases, however rare, should at least have the effect of making us extremely cautious in pronouncing against pregnancy, merely because the individual may have exceeded by ten or fifteen years the period of life after which the generative faculty ordinarily ceases to manifest itself; or because the woman may have lived for many years a married life without conceiving, and then shew symptoms of pregnancy. A highly interesting case of this kind is, at the moment of writing this, under our care. A lady now in her forty-third year, who was married to her present husband twenty years ago, remained without any promise of offspring until within the last few months; but having missed her menstruation in September last, and finding her size increasing, the writer was requested to see her in January, when she exhibited evident symptoms of pregnancy: she has since under the writer's care been delivered of a healthy boy after a natural labour of about *four hours*. Dr. Gooch relates a case almost exactly similar, which occurred in "a woman of forty-two years of age, and who had been married twenty-two years without ever being pregnant," when she at length conceived, and brought forth a child at the full time.*

2. *Complication with disease.*—Pregnancy not unfrequently takes place in diseased states of the system, which would, *à priori*, render its occurrence very improbable, and which, when it does occur under such circumstances, give rise to an unusual difficulty in recognizing its existence. From this circumstance have from time to time arisen some very lamentable mistakes in practice. Thus women who have been long labouring under a general infirmity of health and with very irregular menstruation, or even a total suppression of that discharge, may conceive, and under such circumstances the phenomena of pregnancy are likely to be much obscured, or even their existence at all rendered very doubtful. Such a case is mentioned by Professor James of Philadelphia, in which a woman conceived after having had the menses suppressed for nearly two years before.† Diseases which increase the size of the abdomen, as they on the one hand often induce the supposition of pregnancy when it does not exist, so on the other hand they sometimes render its detection a matter of great embarrassment. Several instances have occurred in which women labouring under dropsy, even when the complaint was the result of serious organic disease, and had existed for a long time, have proved with child, and from the

* Vide Blumenbach, Bibl. i. p. 558.

† Act. Helvet. iv. 162. Eph. Nat. Cur. dec. iii. ann. ii. obs. 172.

‡ Study of Medicine, vol. v. p. 157.

§ Philosophical Transactions, 1819, p. 61.

‖ Case of Bartholomew Mosse presented to the House of Commons, 1755.

¶ Mém. de l'Academie de Chirurgie, tom. vii. p. 27.

** V. pol. ger. ek. i. p. 161.

†† Edinburgh Annual Register, vol. ix. part. 2, p. 508.

‡‡ Médecine Légale, &c. p. 92-3, and 98.

* Diseases of Women, p. 220. The following incredible announcement is inserted in the Scot's Magazine for the year 1769, vol. xxxi. p. 279, under the head of "Births:" "May. At Doncarney in Ireland in the 85th year of her age, the wife of one Rogers, a labouring man, of a boy."

† Hosack's Med. and Phil. Register, vol. iv. p. 422.

combination of circumstances thus produced great doubt and difficulty are likely to arise, especially when the woman is not herself aware of her condition, as happened to the wife of the king's counsel mentioned by Mauriceau, who was treated during seven months of her pregnancy for dropsy, and then brought forth a child.* In some instances very grievous errors have been committed. Mauriceau relates two cases of this kind, in one of which the woman had been nine years affected with dropsy in an extreme degree, but had during that time given birth to four children.† M. Chamsern had a patient who was tapped one hundred and sixty-nine times, and during the course of the disease she bore and suckled two children, though during each pregnancy it was found necessary to tap her three times.‡ Foderé mentions two women who, being pregnant, were tapped under the idea that they had dropsy:§ the uterus fortunately was not wounded; but in another case of distended bladder accompanying pregnancy and mistaken for dropsy, the practitioner tapped the patient; "death was the consequence, and on examination it appeared that the trochar had passed through both sides of the bladder, through the uterus, and even into the head of the child."‖ Capuron mentions that Marsa, a physician of Venice, treated a woman for dropsy, who was pregnant, being deceived by her age, which was sixty.¶ In a case which occurred to the writer, pregnancy remained a matter of the utmost doubt until the seventh month; the woman died two days after delivery, and the liver was found tuberculated, hard as cartilage, and diminished to about one-third of its natural size. "The bare possibility of such cases," says Gooch, "is a strong reason for never tapping a married woman without having the uterus previously examined by a person skilful in such examinations." Beck makes the following observations on this subject: "The most difficult case of concealed pregnancy that probably can occur, is when it is accompanied with ascites. The motion of the fœtus cannot be perceived, and it is added by Foderé, that the uterus does not take on its ordinary development. Yet many cases are on record where females with this disease on them have been delivered of healthy children. In suspected cases the practitioner should weigh the symptoms and ascertain whether they are all referable to the disease. His medicines should be mild, and patience exercised as to the event."*

Enlargement of the ovary is another disease which may either simulate pregnancy or co-exist with it,† and the abdominal enlargement increasing may be mistaken for the progress of the disease; when both ovaries are affected, pregnancy is of course much more improbable, yet it has occurred. Morgagni declares that even in disease of both ovaries, if there remain healthy a portion containing one vesicle, the woman may conceive.‡ A case very lately occurred in this city, in which a lady with ovarian enlargement on both sides, and of considerable size, became pregnant, and her true condition was not recognized until pregnancy was very far advanced, when the application of the stethoscope detected the pulsations of the fœtal heart. Under such circumstances a proper examination of the uterus per vaginam ought to enable us to detect the nature of the case. On the other hand, the existence of such a disease has repeatedly given rise to the suspicion of pregnancy. In the celebrated case of the Demoiselle Famin, published at Berlin and Paris by Valentin, in 1768, a charge of pregnancy and child-murder was erroneously instituted in consequence of an extreme case of ovarian dropsy.

The writer had once an opportunity of examining a very remarkable case, which presented a combination that could hardly fail to be attended with infinite doubt. A woman was received into the Cork-street Fever Hospital in 1828, with considerable enlargement of the abdomen. Her history, as far as it could be learned, was, that eight years before she had been in labour, which, after continuing for two days, suddenly ceased, and the child, as she expressed herself, rose up into her stomach: no delivery followed. After remaining in bad health for about two years, she again experienced the symptoms of pregnancy, and gave birth to a child, which did not survive; but the former child still remained in the cavity of the belly, and during its continuance there she bore three children, the last of whom lived. Ultimately a fistulous opening formed near the umbilicus, which was enlarged, and the original child removed; it was in a state of wonderful preservation, measured twenty-two inches in length, and had attached to it about two feet of the umbilical cord.§ Some of the most formidable diseases of the uterus have been found not incompatible with conception, and even the completion of the full term of gestation. Thus, instances of the concurrence of polypus uteri, and pregnancy have been several times witnessed;‖ and in some cases

* Tom. i. p. 73.

† Maladies des Femmes grosses, tom. ii. obs. 70 and 249.

‡ Quoted by Foderé from the Bullet. des Sciences Méd. d'Evreux, 1810, No. 18, p. 135. See also Mr. Langstaff's case, Med. Chir. Trans. vol. xii. p. 372, and another by Scarpa in the Quarterly Journ. of For. Med. vol. i. p. 149.

§ Médecine Légale, tom. i.p. 463-4.

‖ Lowder's MS. Lectures, quoted by Gooch, on Diseases of Females, p. 240 and note.

¶ Avenzoar has left a confession that he was deceived about his own wife, whom he treated as dropsical, though she had passed her fourth month of pregnancy. See Paris and Fonblanque, vol. i. p. 288.

* Elem. Jurisp. p. 81.

† *Gooch*, p. 239. Merriman's Synopsis, pp. 58 and 228.

‡ See case by Mr. Hewlett, Med. Chir. Trans. vol. xvii. p. 226.

§ A notice of this case was published by Dr. O'Reardon in the Medico-Chirurgical Review for October, 1828.

‖ See Gardien, tom. i. p. 443.—Gooch, Dis-

the placenta has been found attached to the polypus.* The writer has a preparation in which an early ovum is thus connected. Levret,† Bach, Joerg, and Dr. Maclarlane have recorded cases in which the fœtus reached its full time under such circumstances. Even cancer and fungoid diseases of the uterus have been proved not to prevent the occurrence of pregnancy,‡ and a scirrhous cervix has been found an obstacle in the time of labour.§ Gardien expressly states that numerous facts within his knowledge have proved to him that women may carry their children to the full time although labouring under cancer in the ulcerated state.‖

Women have been impregnated although afflicted with complete external prolapse of the uterus. M. Guillemot has written a very interesting paper on this subject, in which he has collected from various sources nine cases of the kind, the first two of which are particularly remarkable as examples of gestation accomplished where the prolapse was complete.¶ In the third case impregnation occurred while the uterus was completely external.** Another of the cases happened in the practice of the great Harvey, who gives us the following account of the matter: "And now at this time it was large and dangling between her leggs. It grew at last bigger than a man's head, being then a hard tumour, and hanging downe to her knees did much pain her, so that she could not goe but upon all foure. I did suspect it to be a cancer of the wombe, and therefore did bethink my selfe of a ligature and cutting it off: but the following night an infant perfectly shaped, of a span long, was cast out of that tumour, but it was dead."††

We have thought it advisable to enter thus fully into the statement of such unusual conditions, lest a prepossession on our part against the possibility of such occurrences should act unfavourably, either by closing our eyes against the evidence before us in extraordinary cases, or making us less careful in their examination from a pre-conviction that pregnancy could not under such circumstances exist.

3. *Conception without the knowledge of the woman.*—That a married woman, or any female who has indulged in sexual intercourse, may become pregnant without being aware of her condition, is a fact too notorious to require further observation than the mere mention of it: the question which we propose to consider here is,—can a woman become pregnant in consequence of intercourse, of the occurrence of which she was not conscious, and so find herself with child without being aware of having incurred the risk? Improbable or even absurd as such a supposition may at first sight appear, the possibility of such an accident is established by too many facts testified by high authority, to permit incredulity on the subject. The belief that consent and pleasurable sensation on the part of the woman are conditions necessary to conception is now universally known to be without foundation in nature, and of course no longer influences legal decisions: formerly, however, it was otherwise, so that in case of rape, if pregnancy followed, it was presumed to prove consent, and it was so laid down by Dalton;* but Lord Hale says that this opinion of Dalton seems to be no law.† "That so absurd a notion as that conception evidenced consent should in modern times have obtained amongst any whose education and intellect were superior to those of an old nurse is indeed surprising; at this day, however, facts and theory concur to prove that the assentation of nature in this respect is no ways connected with violation of mind."‡ "It is a fact," says Capuron, "which experience has more than once confirmed, that a woman may become with child while in a state of hysteria, under the influence of narcotics, during asphyxia, drunkenness, or *deep sleep*, and consequently without being conscious of it, or sharing the enjoyment of the man who dishonours her;" and in proof he mentions having attended a young woman who was got with child while totally unconscious, being buried in a deep sleep produced by punch given her by her paramour.§ She became aware of her condition for the first time when she felt the sensation of motion in the fourth month. Foderé expresses a similar opinion, and quotes several instances in which the occurrence took place, one of which is particularly remarkable.‖ MM. Marc¶ and Raye

eases of Females, p. 290.—Dr. Beatty in Trans. Assoc. Coll. Phys. Ireland, vol. iv. p. 1.—Lond. Med. and Phys. Journal, vol. xxvi.

* See Glasgow Medical Journal, vol. i. p. 422. Bach. Mayor de Polypis, quoted by Cooper in the Surgical Dictionary, article *Polypus*.

† Mém. de l'Acad. Chir. vol. iii. p. 543.

‡ See case by Dr. Beatly, Trans. Assoc. Coll. Phys. vol. i. New Series, p. 116-7.

§ See Burn's Principles of Midwifery, 7th edit. p. 96, note, and p. 401.—Clarke on Diseases of Females, part i. p. 213.—Denman's Introduction, &c. ed. 5. p. 363. A most remarkable case of this kind has been recorded by M. Neyzonis, in which the woman died undelivered; the parietes of the uterus were found carcinomatous, and three inches thick near the fundus. Dict. des Sciences Méd. tom. iv. p. 237.

‖ Traité d'Accouch. vol. i. p. 430.—See Raye Delorme, Dict. de Méd. tom. x. p. 464.

¶ Quoted from, 1. Archives de la Soc. d'Emulation. 2. Journal de Méd. et de Chirurgie for 1775.

** From Chopart, Malad. des Voies Urinaires, vol. i. p. 389, note. The circumstances of this case were very remarkable. The woman was married at twenty years of age, and during twenty-one years "son mari fit des tentatives infructueuses pour la rendre mère; enfin au bout de ce tems là, il parvint à dilater l'orifice de la matrice qui étoit hors des grandes levres, et consomma l'œuvre de la génération." The account of the labour and delivery, &c. are full of interest.

†† Anatomical Exercitations concerning the Generation of living Creatures, p. 494.

* Dalton, c. 160. See also, 2 Just. 190.

† 1 H. H. 131. See also, MSS. Sum 334.

‡ Burn's Justice, tit. *Rape*.

§ See Méd. Lég. relat. aux Accouchemens, pp. 57, 84.

‖ Médecine Légale, tom. i. pp. 497 et seq.

¶ Dict. de Méd. tom. xxi. p. 358-9.

Delorme* speak of such a fact as established by experience. Dr. Gooch says, "it is not necessary that the woman should be sensible at the time of impregnation," to which observation the following case is subjoined: "A maid at an inn, who was always thought to be virtuous and bore a good character, began to enlarge in a way which excited suspicions of pregnancy; she solemnly declared that she never had connexion with any man. At length she was delivered, and was afterwards brought before a magistrate to swear to the father; but she repeated her former declaration. Not long afterwards a postboy related the following circumstances: that one night he came late to this inn, put his horses into the stable, and went into the house; he found all gone to bed except this girl, who was lying asleep on the hearth-rug, and without waking her he contrived to gratify his desires." "This shews," he adds, "that impregnation may take place without the knowledge of the female."†

In reference to this question Beck remarks, "In females habituated to sexual connexion, or where sleep is unnaturally produced, there is no doubt of its occurring; whereas in the opposite cases the probability is greatly lessened;"‡ and in a note on this passage he quotes the following case: "A pregnant female in her last moments solemnly declared that to her knowledge she never had connexion, but that a person in the family some time previous had given her some wine to drink, after which she fell into a profound sleep. She was not, however, conscious of any thing having occurred during that state, but mentioned the circumstance as probably explaining her situation."§ A case very much resembling that related by Dr. Gooch has just been mentioned to the writer by Mr. Cusack, which occurred under his own observation. A servant woman at an hotel in Nenagh proved pregnant, and solemnly declared that she was not conscious of having had intercourse with any man. Suspicion, however, fell upon an ostler in the establishment, who subsequently acknowledged that he believed he was the father of the child; that having found the woman in a deep sleep from fatigue, caused by long-continued exertion and being kept out of bed two or three nights in succession, he had connexion with her, and, as he believed, totally without her knowledge, as she did not evince the slightest consciousness of the act at the time, or recollection of its occurrence afterwards: the parties were married with mutual consent.

We once attended a patient who even in her dying hour protested in the most solemn manner that she was not conscious of sexual intercourse; and when we recollect that delivery has occurred during sleep, we cannot doubt but that coition, which is so much less likely to disturb, may be consummated during sleep with a female accustomed to sexual indulgence without her being afterwards aware of it. That such an event must be of very rare occurrence is certain, but we cannot deny its possibility, and therefore we are furnished with an additional reason for refusing implicit assent to the statements of females, who, as they will in ordinary cases of illegitimate pregnancy, deny the possibility of their condition with the most unparalleled effrontery and the most solemn and imposing protestations, whilst we should, on the other hand, recollect that impregnation may possibly have been effected without their knowledge; so that, however highly we may esteem their general credibility in other matters, in this they may either try to deceive us or be themselves deceived; we must therefore form our opinion not by what we hear, but by what we can see and feel.

The following case is quoted by Bruhier, Foderé,* and others,† from the Causes Célèbres, to shew the possibility of conception during a state of complete asphyxia or apparent death. "A young friar being on a journey, arrived at a house where they were about to bury a young girl, whom they believed to be dead. He proposed to pass the night in the chamber with the coffin and watch the body. In the course of the night, while examining the body, his passions were so excited by the beauty still remaining, that he determined on satisfying them even under such circumstances. He departed early next morning, and in the course of the day the apparently dead revived, proved to be pregnant, and at the end of nine months brought forth a child, to the great amazement of her friends as well as her own. The friar returned to the place about this time, confessed himself the father of the child, and married the mother, having procured absolution from his vows, which he had taken against his will."

4. *Presence or absence of the hymen.*—It seems almost unnecessary to remark that the presence of the hymen, however perfect its condition, cannot be assumed or depended on as a conclusive proof against the previous occurrence of impregnation, for although it certainly ought to be considered as strong presumptive evidence in favour of virginity, so many cases have been witnessed and put on record by authors worthy of credit, in which that membrane has been found co-existing, not alone with pregnancy, but even with labour, that the fact no longer remains a matter of doubt. Meckel‡ remarks that "the hymen cannot be considered a certain physical sign of virginity, because, on the one hand, it has been often found entire not only in women who had frequently indulged in sexual intercourse,§ but even in some who had brought forth fœtuses advanced even so far

* Dict. de Méd. tom. x. p. 465-6. See, also, Smith, Forens. Med. p. 401.

† Compendium of Midwifery, p. 81-2.

‡ Elem. Med. Jurisp. p. 92.

§ Mierius in Brendel, p. 99.

* Médecine Légale, tom. i. p. 500-1.

† *Louis*, Lettre sur la certitude des Signes de la Mort.

‡ Anatomie Descriptive, &c. vol. iii. p. 735.

§ *Osiander*. Abhandlung uber die Scheidenklappe, p. 24. "Milles causes étrangères au coit peuvent le detruire, et que la copulation n'en determine pas toujours la rupture." *Velpeau*, tom. i. p. 63. See also Metzger, by Ballard, pp. 251-2.

is the seventh month."* The writer was once consulted by a young person whom he found to be pregnant, and whose hymen was as perfect as it had probably ever been; but the opening through it was such as to admit the finger to pass without difficulty, and the girl acknowledged that she had on more than one or two occasions enjoyed the embraces of a very young gentleman, on whose youth it appeared she had relied for immunity from the usual consequences.† The existence of the hymen at the time of labour has been detailed by Ambrose Paré, Willis, Ruysch, Nœgele, Baudelocque,‡ Mauriceau,§ and many others: the cases related by the last two are particularly remarkable. Dr. Davis‖ also refers to more than one case of this kind. Velpeau¶ mentions having met with the hymen entire in the body of a woman of forty, "who had long cohabited with her husband, but without having children." The writer once witnessed a similar case in an old lady of 80, who had been married and lived thirty years with her husband without having children: when visited by the writer, she had been some years a widow, and examination of the parts became necessary in consequence of an affection of the urethra; the hymen would not permit the passage of the point of the little finger without difficulty.

On the other hand we believe it is a matter of universal agreement, that there are many causes besides sexual intercourse capable of destroying this membrane, which there is also good reason for believing may in some cases have been originally defective from imperfect conformation of the part.** In another part of this article the imperforate hymen has been noticed, and its effect in inducing suspicion of pregnancy by preventing the discharge of the catamenia. And it is scarcely necessary to observe here, that in such a case the mere discovery of the obstacle would be proof positive against the condition suspected. Among the Jews a discharge of blood, as the consequence of the laceration of the hymen in primis nuptiis, was considered so unequivocally the test of virginity, that it was made a subject of legislature, and the woman to whom this did not happen was liable to be stoned to death.†† Gardien mentions that the Jewish custom prevails to a certain extent at the present day amongst the Bedouin Arabs; and Mahon, on the authority of Chappe, speaks of a similar custom as at present existing in Siberia and in certain parts of Russia.* It has been remarked by Foderé, Mahon, and others, that the state of the hymen may vary much in the same individual at different times and under different circumstances; and the latter mentions a case where a man not finding it existing in his bride took great offence, but afterwards finding a totally different condition of the part, recognized his error and was satisfied.† Marc has recorded a very remarkable case illustrative of this, and, as he says, "showing that, when the hymen is of the semilunar form, it may disappear for a time, and return again."‡ "A young girl, not 13 years of age, formed an illicit intercourse with a man, in consequence of which she was severely affected with syphilis, for the cure of which she was brought to the hospital of La Pitié: on examination by Dr. Serres and others, there was found extreme dilatation of the vagina, injury of the external genitals, and total absence of the hymen: she was cured, and then they were greatly astonished to find all the physical marks of virginity existing, especially a well-marked semilunar hymen. MM. le Docteur Fournier, Pescay, and Marc were appointed by the Medical Society of Emulation to examine the fact."§

As a suitable conclusion to this section we shall notice a very remarkable case recorded by Nysten, forcibly illustrating the necessity of attending to these unusual conditions, as not being incompatible with pregnancy, which in the case alluded to occurred in combination with several such. In this instance, 1. the pregnancy was ovarian; 2. the girl was only thirteen years old; 3. she had never menstruated; 4. the hymen was perfect; 5. the vagina so contracted that it would scarcely admit the tip of the finger; 6. the organs of generation and the breasts like those of childhood."‖

Examination of the uterus and its appendages after death.—It is unnecessary to repeat here what has been already particularly set forth with regard to the state of enlargement in which the uterus must be when containing the product of conception. In relation to our present subject, the first and most obvious fact to be noticed is, that when an examination is made after death, and the uterus found of its naturally diminutive size, it is proof positive against the present existence of pregnancy. If, on the other hand, we find the organ enlarged, and its condition apparently corresponding to the period of pregnancy supposed to exist, nothing but a careful examination of its contents, or other cause of enlargement, can determine the question at issue. We will here only observe that nothing less than the distinct and unequivocal detection of the ovum or some of its component structures ought to satisfy our

* *Tolberg*, de Varietate Hymenum, p. 14. Meckel says he has the part in his museum.

† See Wm. Hunter's case in *Observations on the areola* in the present article.

‡ Art des Accouchemens, vol. i. ch. 3.

§ Maladies des Femmes Grosses, tom. ii. obs. 489, p. 405, and obs. 583.

‖ Principles of Obstetric Medicine, p. 104. See also Gooch's Compendium of Midwifery, p. 81, and Paris and Fonblanque, vol. i. p. 203. Several similar cases are mentioned in Merriman's Synopsis of difficult parturition, see pp. 58 and 228, 4th ed. See also Smellie, Collect. xxxi. case 26, p. 62.

¶ Traité d'Accouch. tom. i. pp. 63-4.

** *Meckel*, loc. cit.

†† Deuteronomy, chap. xxii.

* Médecine Légale, tom. i. p. 123.

† Loc. citat. p. 121.

‡ See the statement of Buffon, as quoted by Mahon, tom. i. p. 127, 9.

‖ Dict. de Méd. Art. *Violation*, by Marc, vol. xxi. pp. 353-4.

§ Journal de Médecine par MM. Corvisart et Leroux, brumaire, an 11. p. 144 et seq.

minds, or justify us in giving an opinion in the affirmative.*

Another condition of the uterus which may present itself, is that in which it is found enlarged but empty, exhibiting, however, several of the changes which accompany gestation: these, however, upon examination will only afford evidence sufficient to convince us that the organ has recently been distended by something contained within it, and which had been attached to its internal surface by a vascular connection: the substance expelled may or may not have been the product of conception; and the most careful examination of the appearances remaining, or of the structural changes effected, will not enable us to pronounce safely on the precise nature of the cause which had produced them. Thus, for instance, in a case where hydatids have been expelled, we could not determine by examination of the uterus alone, whether the conditions there observable were the result of true pregnancy and the expulsion of a fœtus or ovum, or whether they might not have been produced by some other cause unconnected with conception: we may not, in fact, be able to tell without further investigation whether the woman have recently conceived or not, a question which it may be occasionally of paramount importance to be able to answer: we must therefore turn our attention in another direction, and seek for proof of impregnation in the appendages, particularly in that part of them which is more especially the seat of conception. This leads us at once to investigate the value of that peculiar change in the ovary, by which, after the vivification of the germ, there is produced a new structure, to which has been applied the name of *corpus glandulosum*, or more generally, *corpus luteum*,—a production the presence of which is by some considered incontrovertible evidence of impregnation. Others, however, with equal confidence discredit the value of its presence, and assert that its existence may be owing to causes altogether accidental and independent of sexual intercourse, and that consequently it cannot be taken as certain evidence of conception. It becomes, therefore, a matter of vital moment to examine the truth of such assertions, and to determine, if we can, how far they coincide with or depart from absolute matter of fact, which alone can be the measure of their correctness, and consequently of their value. In order to do this, the first thing which appears to us essentially necessary is, that we should have a clear idea of what a true corpus luteum is, and of what is not a corpus luteum.

If this inquiry should appear to any one superfluous, it is only necessary to turn to the generality of books in which it is mentioned, and then compare the descriptions to be found there with the object as it exists in nature, and we must be convinced how faint is the resemblance between the portrait and the original. We are inclined to think that the naming of this substance has given rise to much of the error which exists and is propagated on the subject, the colour being assumed as the only characteristic necessary to constitute the corpus luteum. Whenever small spots, or even points, of a yellow hue are met with in the ovaries, they are supposed to be true corpora lutea. We recollect distinctly the first time our attention was drawn to the subject was at a demonstration of the structure of the ovaries, when two spots, each not larger than a grain of mustard-seed, and of a yellow colour, were exhibited as specimens of corpora lutea, and as proving that the woman had, during her life, borne two children.

A trial took place some years ago in Edinburgh, which, while it evinced the necessity for a correct knowledge of this subject, which might occasionally arise even under circumstances not apparently connected with its existence, proved but too plainly how little was known about it. A prosecution was instituted against four medical students for exhuming the body of a lady in Glasgow. The body was so disfigured that it could not be identified: the ovaries were, however, examined, and it was reported that there was in one of them a perfect corpus luteum, which would be sufficient to prove that the remains were not those of the lady in question, who was a virgin, and advanced in life. On the trial there was a complete contradiction between the medical witnesses, one half of whom affirmed the appearance in the ovary to be a true corpus luteum, while the others maintained that it was not; so that no satisfactory inference could be drawn from the fact. The body was afterwards identified by a dentist producing a cast which he had taken of the gums.

If we examine the ovaries of a woman who has recently conceived, we observe that the one which has supplied the germ differs in several remarkable particulars from its fellow of the opposite side: it strikes the eye at once as being larger and more vascular; to the touch it feels fuller and softer: we perceive further, that this increase of size of the one is not so much the result of an increased development of the whole substance or body of the organ, as of the addition to it at one part, of a tumour projecting more or less from its natural outline, as we find in the eye, where the circumference of the cornea projects from the outline of the globe, the segment of a smaller circle being superimposed on that of a greater.

When we examine this protuberance, we find that the increased vascularity of the organ is nearly confined to its limits, and very frequently we perceive that the colour of this part is completely different from that of the rest of the substance, giving the notion of deep or dull yellow seen through a slightly reddish medium; and lastly, we observe on some part of the external covering of this prominent part a distinct cicatrix, or appearance as of a rent imperfectly united.*

* See section on *Substances expelled from the uterus.*

* In the case examined by Sir E. Home and Mr. Clift, where the woman died eight days after impreg-

We should observe here that these external changes by which we recognise the existence of the corpus luteum within, are to be seen most remarkably in some of the lower animals. In cows it is not unusual to see the corpus luteum projecting almost like a parasitic tumour from the side or end of the ovary; the same may be said of the sheep, and of animals which naturally have the Graafian vesicles very prominent, as the hedgehog or common sow, in which they absolutely project from the surface: in this animal the ovaries after conception appear literally like bunches of round berries, from the great prominence of the numerous corpora lutea.

Having satisfied ourselves of the presence of the external characters, we proceed to examine the internal structure; in order to do which we should make a section of the ovary, carrying the knife through the centre of the prominent part so as to divide the ovary into two longitudinal sections, by which we expose the corpus luteum presenting the following characteristic appearances.

In *form* and *size* it is almost always an oval, with its longer axis varying from four to five eighths of an inch, and the shorter from three to four eighths; its thickness is generally less than its breadth.*

Its texture is obviously and strikingly glandular, resembling a section of the human kidney;† or, as some one has said, it is like a miniature of the particular sections of the brain called by anatomists *centrum ovale*. William Hunter describes it as "tender and friable, like glandular flesh."‡

It is very vascular, small vessels being very frequently visible without any preparation; but if fine-coloured injections have been previously thrown into one of the branches of the spermatic arteries going to the ovary, the vessels of the corpus luteum will be filled with the colouring matter, and are to be seen very distinctly running from its circumference towards its centre.

Its colour is, as its name implies, a dull yellow, very similar to that of the buffy coat of the blood; exhibiting generally, when recently exposed, a slightly reddish tinge, "*ex flavo rubens*," Haller.

Its centre exhibits either a cavity or a radiated white cicatrix according to the period at which the examination is made: if within the first three or four months after conception, we shall frequently find the cavity still existing, and of such a size as to be capable of containing a grain of wheat;§ this cavity is surrounded by a strong white cyst, and as gestation proceeds, the opposite parts of this cyst approximate and at length close together, by which the cavity is completely obliterated, and in its place there remains a white cicatrix, whose form is best expressed by calling it radiated. Of this latter appearance it ought to be observed here that it is visible as long as any distinct trace of the corpus luteum remains, and forms an essential character, distinguishing this body from every other that might be confounded with it.

After the period of gestation has been completed, or the contents of the uterus prematurely expelled, so that gestation ceases, the corpus luteum soon begins to exhibit a very decided alteration in all its characters, until at length it is no longer to be found in the ovary. The exact period of its total disappearance we are unable to state; but we have found it distinctly visible so late as at the end of five months after delivery at the full time, but not beyond this period; and the corpus luteum of a preceding conception is never to be found along with that of a more recent, when gestation has arrived at its full term; but in cases of miscarriage repeated at short intervals, it may. At the time of delivery the corpus luteum is neither so large nor so vascular as at the earlier periods of pregnancy, except the woman should happen at the time of her death to be labouring under inflammation of the uterine system, in which case the corpus luteum partakes of the turgescence of the other parts, and very remarkably of their increased vascularity.

In the ovary of a woman who died of inflammation of the womb a few days after delivery, and which is preserved in the writer's museum, the white central cicatrix is very distinct, and externally the ovary continues to exhibit the superficial cicatrix and the alteration of form produced by the projection of the part containing the corpus luteum. In another preparation, which shews the appearance of the corpus luteum in a woman who died of pneumonia exactly five weeks after delivery at the full time, it is diminished in size to about one-half of its original dimensions, is closer in its texture, and its colour was becoming indistinct in numerous points, so that it appeared paler, but the radiated central cicatrix is quite distinct; its vascularity also was diminished, as fine injection could not be got to pass into it: the external surface of the ovary exhibits the greater size and prominence of one part, and the fissure on it is still well marked; and it is particularly deserving of remark here that there is *only one cicatrix* observable on each ovary, although the woman from whom they were taken had borne six children.

In another specimen in our collection, taken from the body of a woman who died in the twelfth week after delivery, the external prominence was greatly diminished, but was still

nation was supposed to have taken place, "the right ovarium had a small torn orifice upon the most prominent part of its external surface. We slit it open in a longitudinal direction, in a line close to the edge of this orifice; the orifice was found to lead to a cavity filled up with coagulated blood, and surrounded by a yellowish organized substance." Philos. Trans. 1817. p. 254.

* "Pene hemisphericum, avellanæ mole." *Haller.*—"Longum quatuor lineas, latum tertias lineas, crassum duas lineas." *Roderer.*

† See De Graaf, p. 177.

‡ Anatomy of the Gravid Uterus, p. 14.

§ "Cavea dimidiam lineam lata, non profunda," *Haller.* We once met with this central cavity in the ovary of a cow recently impregnated, large enough to receive the end of the little finger.

sufficiently obvious to indicate the exact situation of the corpus luteum, as was also the superficial cicatrix: the corpus luteum itself had lost much of its colour, and what remained became, on immersion into spirits, of a light grey shade; the texture of its substance was more condensed, and resembled that of a cut apple; and its dimensions, especially in breadth, are reduced to about one-third or rather less, but the central radiated cicatrix is still distinctly observable.

Lastly, in the case of a young woman who died *five months* after giving birth to her first child, the ovary retained very little of its increased size or altered form; the prominence was hardly to be recognized; but the external cicatrix was perfectly obvious. When opened, the corpus luteum exhibited its peculiar colour only in one very small spot, rather larger than a mustard-seed, within which is still observable the central radiated cicatrix; the yellow colour completely disappeared when immersed in perfectly pure rectified spirit diluted with water.* Beyond this period we have never detected the existence of the corpus luteum: the vulgar notion, however, is that it is a permanent structure, and that consequently we have only to examine the ovaries after death to enable us to tell not only whether a woman has borne children, but the exact number of her offspring, from the number of corpora lutea existing in the ovary. This is quite an error, and probably arose from a misconception of the meaning of such an expression as that of Haller, when he says—"Numerum credo eundem esse, qui est fœtuum;"† or, as in another place, "Numerus corporum luteorum est in ratione fœtuum."‡ By this expression, however, he only meant that their number was the same as that of the fœtuses lodged in utero in one gestation, which indeed we find expressly stated by De Graaf, whose words are—"Deteguntur, unus aut plures, prout animal ex illo congressu unum aut plures fœtus in lucem edet."§ Hence, when there is only one fœtus, there is only one corpus luteum. In cases of twins or three children, there will be a corresponding number of these bodies in the ovary or ovaries, for they may be all formed in one ovary only, or some in each. This suggests a circumstance of great importance connected with the number of these bodies which may be found; which is, that occasionally a corpus luteum may be discovered without a fœtus, or a greater number of them than there are fœtuses produced at the time. Thus, in one instance we found two corpora lutea in the ovary of a woman who killed herself by medicine taken to produce abortion. She was reported to have expelled but one ovum. Haller notices this occasional occurrence, and explains it thus: "Si unquam absque fœtu corpus luteum in ovario repertum est, quod est rarissimum, credibile est eum fœtum abortu perditum aut alio modo destructum disparuisse."* We have had several opportunities of verifying this observation, and, amongst other instances, we once found ten corpora lutea in the ovaries of a sow, but only nine fœtuses in the uterus; but at length, after a very diligent search, we discovered in one of the cornea the remains of another fœtus which had been blighted and was in a state of partial decomposition. Haighton also observed this occurrence, but adds that "the uterus in these cases has borne the marks of an early and recent abortion;"† and Cruikshank, as mentioned in another place, speaks of the corpus luteum as a certain mark of conception, "whether the embryo is visible or not."‡ We may remark that from such facts follows of necessity this circumscription of the conclusion to be drawn from what we may observe in the ovaries,—viz. that the presence of a corpus luteum does not prove that a woman has *borne a child*, although it would be a decided proof that she had been impregnated and had conceived; because it is quite obvious that the ovum, after its vivification, may be, from a great variety of causes, blighted and destroyed long before the fœtus has acquired any distinct form. But the converse will not hold good. We believe no one ever found a fœtus in utero without a corpus luteum in the ovary, and that the truth of Haller's corollary, "nullus unquam conceptus est absque corpore luteo,"§ remains undisputed.

Considering the results constantly presented to us by examination, we feel utterly at a loss to imagine what could have induced the following assertion of Sir E. Home: "The remains of the corpus luteum at nine months *after impregnation of the ovum*, are so indistinct as hardly to be recognized; but in the opposite ovarium there is commonly a corpus luteum far advanced, forming another ovum; and it will be found that all the preparations of corpora lutea taken from the ovaria of women who die in childbed, actually belong to this new ovum not yet completely formed."‖ Now, our experience convinces us of the contrary of every statement here made, and we think that one question will be sufficient of itself to shew their inaccuracy: premising that we deny altogether the statement that there is "commonly" found a second corpus luteum, we ask, if this corpus luteum always found in the ovaria of women who die in childbed belongs to the ovum not yet completely formed, how does it happen that we always find on its surface the cicatrix through which the ovum has already escaped?

A similar and equally erroneous idea obtains very generally with regard to the cicatrices on the surface of the ovaries, which have been already noticed as marking the situation of the corpus luteum. These are supposed by many to be permanent and ineffaceable, and of course

* This does not happen when the corpus luteum, taken during gestation, or just at the time of delivery, is placed in contact with the same fluid.

† Elem. Physiologiæ, vol. viii. p. 36.

‡ Op. Min. vol. ii. p. 457.

§ De Organis Mulierum Generat. &c. p. 178.

* Elem. Physiologiæ, vol. viii. p. 36.

† Philosophical Transactions for 1797, p. 166.

‡ Philosophical Transactions, 1797, p. 200.

§ Opera Minora, vol. ii. p. 458.

‖ Philosophical Transactions, 1819, p. 63.

certain indications of the number of children borne by the woman during her life, or of the number of times she had conceived. But such is not the case; the ovaries of women who have borne several children will sometimes be found exhibiting only one or two of these rents or marks on the surface, a very distinct instance of which has been already noticed; the woman in this case having given birth to six children, and yet the ovaries exhibited only one cicatrix on each. On the other hand the effects of inflammation, or the bursting of small abscesses in the ovary, may produce cicatrices which cannot be distinguished from those which are caused by the escape of the impregnated ovum. There is a passage in Beck's Jurisprudence which evinces extremely little practical acquaintance with this subject, implying one error, and distinctly asserting another. His words are, "Upon examining the ovaria, if it be done a short time after the ovum has escaped from them, a corpus luteum is *generally* found, which vanishes soon after, but *leaves a scar for life*."* Dr. Smith appears to confound the cicatrix with the corpus luteum itself, in the following passage: "In the place from which one of these bodies (ova) had been conveyed, a cicatrix was formed which received the name of corpus luteum."†

Having thus far described the characters of the true corpus luteum as accurately as repeated observations and dissections of a great number of women, and a much larger number of brute animals, have enabled us, we wish to declare, first, that we never in any one instance saw the corpus luteum, having the characters we have described as belonging to it, except in females who had previously been impregnated and had conceived; and our firm conviction is, that such a corpus luteum was never found in a virgin animal.

As, however, different opinions have been entertained on this subject, it becomes necessary to examine them and ascertain their value. The views entertained by those who deny the necessary connexion between the formation of the corpus luteum and sexual intercourse followed by conception, are principally two. According to the one, the corpus luteum is a provision for conception, by which the ovum lodged within it is prepared and fitted for impregnation. According to the other view the corpus luteum is properly the effect of impregnation, but may also be produced by other adventitious circumstances causing high excitement of the generative apparatus independently of sexual intercourse. The first of these opinions is generally supposed to have originated with the late Sir E. Home, but it is only justice to say that he merely revived a theory which had been exploded and lain dormant for a long series of years, as appears very clearly from a passage in Wrisberg. This writer, after stating that multiplied observations both in the human race and in quadrupeds proved that the corpus luteum was not to be found in the ovaries "ante congressum fœcundum et inde pendentem conceptionem," adds, "ruit itaque ingeniosum potius quam naturæ congruum, de usu et functione corporis lutei, latum judicium conceptionis materiem ex parte sexus sequioris comprehendere et secernere."* The opinion here alluded to was that of Malpighi, Santorini, Valisneri, and Bertrandi; and it is remarkable that Sir E. Home should have promulgated it anew without even noticing its former existence, and that he should have done so on the data furnished to him by a single case,† in which he examined the body of a young woman who died a few days after conception, when he found an ovum in the uterus, and a corpus luteum in one of the ovaries. From this he concludes at once that this was the commencing provision for a future conception, not the result of the former; but the reasons are not stated.

It has been already shewn that a similar notion was entertained many years ago, and its accuracy disproved by observation; but it is not altogether satisfactory, nor consistent with the spirit of philosophic inquiry, to reject an opinion merely because it has been already exploded, however high may have been the authority for its rejection. We must, therefore, examine this doctrine upon its own merits, before we can refuse it our assent. In the first place, then, if such a statement were correct, corpora lutea ought to be found in the ovaries of almost all women examined just before or during the period of life in which they are apt for conception. No one has ever asserted that this is so; and in point of fact we know it is not the case. In the second place, if such were the relation of the corpus luteum to conception, it ought to be found in a state of greater development, as the distance of time from the former conception increases: now we have demonstrative proof that exactly the contrary happens. In the third place we find that their number corresponds to the number of fœtuses which have been produced, as already explained. Such objections might easily be multiplied, but those already stated appear more than sufficient for our purpose. The other assertion, that corpora lutea may be produced independently of sexual intercourse or conception, during periods of lasciviousness, or from the stimulus of strong passions, or unnatural enjoyments, requires a very careful examination, inasmuch as, if it be really borne out by facts, the presence of the corpus luteum in the ovary would cease to be of any value whatever as a proof of impregnation; and believing, as we think we have full grounds for doing from a very long-continued examination of the subject, that the real corpus luteum is the result of conception, and of nothing but conception, we think we shall be able to shew that some of the assertors of this doctrine which we impeach, have in some instances merely repeated the statements of others without exami-

* Medical Jurisprudence, p. 140.

† Principles of Forensic Medicine, p. 489. ed. 1821.

* Vide paper by Wrisberg, in Trans. Soc. Reg. Gœttingæ for 1781.

† This he himself declares; vide Philos. Trans. 1817, p. 255.

nation; while others have misrepresented the opinions which they quote in their support; and others, again, have mistaken for true corpora lutea accidental formations in the ovaries, having no one character, except the colour, of the bodies which really deserve the name.

Most of the writers who advocate the production of corpora lutea without impregnation, premise as a powerful support in their favour the opinion of Blumenbach, which is thus spoken of:—"In the year 1788 Blumenbach *shewed* that corpora lutea may exist in the ovaries of virgins."* Now, before proceeding to review any of the opinions or assertions built on the authority of this great physiologist, we must first examine what he has really said on this subject. His observations are to be found in a *Specimen Physiologiæ Comparatæ*,† published in 1788, and in our opinion are very far from warranting the conclusion so generally taken for granted to result from them; first, because his own definition of the corpus luteum renders it extremely doubtful whether his observations apply to the body really deserving that name, or merely to the cicatrix on the ovary connected with it. His words are: "Notum est post fœcundum coitum in muliere aliisque mammalibus femineis, in alterutro ovario *fissuram* reperiri cruentam, ex ruptû sub œstrum venereum unâ alterâve earum vesicularum quas Graafius pro veris ovulis venditaverat; idemque vulnusculum temporis progressu in *cicatricem abire cortice eleganter vascaloso cinctam*, atque Malpighii inde temporibus lutei corporis nomine insignitam."‡ And, secondly, even if we are satisfied that he there speaks of the true corpus luteum, which we very much doubt, it is very remarkable that in no one part of his paper does he speak as from personal observation or examination of the subject by himself, but confines himself to physiological reasonings grounded on the facts observed by others,§ from the consideration of which he declares his *belief*‖ in one place, and his *suspicion*¶ in another, that the fact may be so, but he nowhere asserts that he saw an instance of it; and he adds that all the cases his reading furnished him with happened in Italian girls, whose climate he appears to suspect might have something to do with the matter. The passage in which this is expressed appears to us, even from its singularity, worth quotation here; it is as follows:—"Num climati quoque aliquod tribuendum, decidere non audio, annotans tantumnodo quotquot mihi hactenus *apud auctores* occurrerunt ejusmodi haud inficiendi casus eos non nisi in Italicis virginibus observatos fuisse."** Meckel, also, is by some asserted to have maintained this doctrine; but it appears to us that so far as his observations go, they afford it very little if any support at all. He commences with these words:—"The internal organs of generation are modified not by the act of intercourse merely, but by *conception alone*. There is developed in the ovary a peculiar body called corpus luteum,"* which he then describes as resulting from a change produced in one or more of the vesicles of De Graaf; and adds, "the influence of the male semen is the ordinary and regular cause of this change, which, however, *it appears*, may be effected under the influence of other stimuli, *perhaps* by the imagination or unnatural enjoyments." Now it is, we think, quite plain, from the language of the above passage, that he is alluding to the opinions of others, and not stating a fact of which he had assured himself; and accordingly he immediately subjoins, "in truth, many of these rare cases, in which corpora lutea have been found in unmarried women, and in girls having the physical marks of virginity, allow the belief that the formation of these bodies *had been preceded by sexual intercourse and fecundation*." He afterwards makes an observation which, if properly understood and appreciated, would have prevented many of the absurdities which have been promulgated on this subject. "They speak," says he, "of corpora lutea which have been found in newborn or very young animals; but the obvious answer to this is, that *every yellow substance* met with in the ovary *is not a corpus luteum*."† What but the most complete mistake on this point could have induced an annotator on Beck's Medical Jurisprudence to hazard the following observation:—"A recent case has in my opinion completely overthrown the theory, that even strong passions are necessary to the formation of the corpora lutea: the subject was *not above five years old*, and the hymen of course entire; she died of tubercular disease in the lungs, yet in her ovaries were *numerous corpora lutea* as distinct as I ever saw them in the adult impregnated female."‡ The only comment necessary to make on this statement is, simply to remark that *one* real corpus luteum, as it is found "in the adult impregnated female," is fully as large, or even larger than the ovary of a child five years old, therefore it is *impossible* that there could in such a case be several of them.

Dr. Bostock, in his very able and instructive work on physiology,§ gives a summary of the opinions on this subject, but avoids hazarding more than a mere hypothesis himself. It is plain, however, that he inclines to the belief "that corpora lutea are not the necessary result of impregnation."‖ But we must observe that he overstates the opinion of Blumenbach when he asserts that he "decidedly maintained" such a doctrine, which we have already shewn he did not; and he is equally

* See a paper by Mr. Stanley, in the Trans. Coll. Phys. Lond. vol. vi. p. 421-2.

† Trans. Soc. Reg. Gœttingæ, vol. ix.

‡ Op. cit. pp. 109-10.

§ "Corpora lutea in innuptis observarunt *auctores*." Op. cit. p. 113.

‖ "Et ita corpora lutea in virgineo corpore oriri *confido*."

¶ "Non absimilem originem *suspicor*." Op. cit. p. 113.

** Loco citato.

* Anatomic Descriptive, &c. p. 735.

† Ibid. p. 736.

‡ Beck, p. 103. Note, signed *Dunlop*.

§ Elementary System of Physiology, vol. iii. p. 36 et seq.

‖ Note, loc. cit.

inaccurate in quoting Cuvier as a supporter of this physiological heresy: it is only necessary to refer to the passage quoted,* to see that Cuvier is there not speaking of the corpus luteum at all, but of the cicatrices observed on the ovaries; *and throws out a question*, whether these may not sometimes be caused by the passage of germs, under the influence of unnatural stimuli. Dr. Seymour, in his very interesting work on the ovaria,† has given a well arranged summary of the conflicting opinions and theories on this subject, to which he has added some very judicious and pertinent remarks; but upon the particular question before us, he expresses himself at least vaguely. He however appears to believe in the *possibility* of the production of corpora lutea without impregnation, but nowhere asserts that he saw an instance of the kind; on the contrary, the result of his own investigations, as stated by himself, is so strongly against such a belief, that we mean to quote it in his own words as a very strong fact in our favour. "It has occurred to me," he says, "to have examined the ovaria in the human being, and in animals at the period of puberty in very many instances; many had ova ready for impregnation, large, projecting, vascular, *yet no corpora lutea were visible*."‡ Such, also, has been the result of our examinations of a very large number of bodies both of women and of animals, and in no one instance did we ever find a true corpus luteum except as the product of conception; and reasoning merely on the subject, we would ask, if mere imagination or highly excited desires without intercourse are capable of causing such a change in the condition of the ovary, should we not expect to find corpora lutea almost invariably in women who have been living with their husbands, or otherwise enjoying constantly the natural and perfect excitement of the generative system without conception? Of the non-occurrence of which consequence we can speak in very decided terms, from numerous opportunities of making examinations under such circumstances.

We shall now proceed to state, as briefly as possible, the opinions of those whose careful and repeated examinations of the subject fairly entitle them to the highest degree of credit. De Graaf, who is justly celebrated as an accurate anatomist and physiologist, devoted much of his attention to the generative system of the female, and in his work on this subject published in 1672,§ we find him thus speaking. "Quæ vero secundum naturam, aliquando tantum, in mulierum testibus inveniuntur; sunt globuli, qui glandularum conglomeratarum adinstar ex multis partibus à centro ad circumferentiam recto quasi ductu tendentibus conflantur, et propriâ membranâ obvolvuntur. Hos globulos non omni tempore in fœmellarum testibus existere diximus; quia *post coitum tantum* in illis deteguntur, unus aut plures, prout animal ex illo congressu unum aut plures fœtus in lucem edet." De Graaf applied to this formation the name of corpus glandulosum, which name it retained until Malpighi changed it to that of corpus luteum on account of its colour. The great Haller paid particular attention to this point, in the investigation of which he sacrificed many sheep, goats, and cows, besides great numbers of other animals; and by opening the bodies of several at gradually prolonged intervals of time from intercourse with the male, he traced the corpus luteum from its first commencement through all its successive stages of increase and decline.* He tells us, also, that he had opened the bodies of upwards of a hundred women, and met with the corpus luteum about ten times, but never except in those who were at the time pregnant, or had brought forth children.† "Quotquot feminæ nullam fecundationem ante mortem passæ sunt, tot etiam ineisæ nulla corpora lutea ostendunt." Now it is to be observed that Haller continued this investigation through many years, and was perfectly well aware of the theories of Bertrandi, Valisneri, and Buffon, with the latter of whom he corresponded on the subject, and the result of his observations he embodies in two brief but most important propositions:—"Nullus unquam conceptus est absque corpore luteo:"‡ "Corpus luteum in virgineis animalibus nullum est, ex conceptione oritur, neque prius paratum adest." The first of these propositions has never been questioned, and the truth of the second appears to us equally incontrovertible. The observations of Blumenbach were published in 1788, and nine years afterwards, or in 1797, Dr. Haighton read before the Royal Society the details of many experiments on the subject of animal impregnation,§ and thus expresses himself on this point: "I may then say that no corpora lutea exist in virgin animals, and that, whenever they are found, they furnish incontestible proof that impregnation either does exist or has preceded."‖ And again he says, "I decline trespassing on your patience, and therefore lay before you only the conclusion; which is, that in the great variety of experiments on brute animals which my physiological inquiries have led me to conduct, as well as in the extensive opportunities I have had of observing the ovaries in the human subject, I have never seen a recently formed corpus luteum unattended with some circumstance or other connecting it very evidently with impregnation."¶ In the same year Mr. Cruikshank published his account of a series of experiments also on this subject, and we find him remarking as follows:—"These calyces, on the expulsion of the ova, enlarge and become yellow, projecting above the external surface of the ovaria, and form *corpora lutea, a certain mark of conception* in all quadrupeds, and in women themselves, whether

* Leçons d'Anat. Comp. t. v. p. 57.
† Illustrations of some of the Diseases of the Ovaria.
‡ Op. cit. p. 32.
§ De mulierum organis generationi inservientibus tractatus novus. Lug. Bat. 1672.

* Vide Elem. Physiologiæ, vol. viii. sect. xv.
† Vide op. min. vol. iii. p. 185, 186.
‡ Op. min. vol. ii. p. 458.
§ See Philos. Trans. for 1797, p. 159.
‖ Ibid. p. 163-4.
¶ Ibid. p. 166.

the embryo is visible or not."* William Hunter, and his editor Dr. Baillie, speak of the corpus luteum as the product of conception, but do not even mention the supposition of its possible occurrence in any other way.†

When Mr. Angus was tried in Liverpool, in 1808, for the supposed murder of Miss Burris, great doubt arose as to whether the condition of the uterus or its appendages was such as to prove a pregnancy recently existing. "It was not until after the trial that the ovaria were examined. They were then divided in the presence of a number of physicians, and a corpus luteum distinctly perceived in one of them. Mr. Hay took the uterus and its appendages to London, and shewed it to the most eminent practitioners there. He received certificates from Drs. Denman and Haighton, Messrs. Henry Cline, Charles M. Clarke, Astley Cooper, and Abernethy, all stating that it exhibited appearances that could alone be explained on the idea of an advanced state of pregnancy. *And it appears to have been universally allowed that the discovery of the corpus luteum proved the fact beyond a doubt.*"‡ In addition to the authorities here cited, we may be allowed to add the result of our own observations, which have been now continued through a period of more than six years, during which time we never omitted a single opportunity within our reach for examining the bodies of women of all ages, and under all the varying circumstances of virginity, after intercourse, during gestation, and subsequent to delivery at different periods from conception; these opportunities having been afforded by more than one large hospital, as well as in private practice. We have also dissected hundreds of the inferior animals with reference to this point, and have in our museum preparations of ovaries exhibiting the corpus luteum in different conditions in the human female, and also in cows, mares, sheep, sows, goats, bitches, cats, hares, rabbits; and our firm conviction is of the truth of both Haller's propositions, viz. that "*conception never happens without the production of a corpus luteum*," and that "*the corpus luteum is never found in virgin animals, but is the effect of impregnation.*" And we think that those who have supposed or asserted that they may exist without impregnation, and of course be found in the virgin ovary, have been led into the error by confounding appearances and structures essentially different, and in fact having only one character in common, which is their colour, altogether forgetting that "every yellow substance in the ovary is not a corpus luteum."§ It is allowed by those writers that "the corpora lutea of virgins may in general be distinguished by their smaller size, and by the less extensive vascularity of the contiguous parts of the ovarium." ‖ Now we have seen several of these virgin corpora lutea, as they are unhappily called, and have preserved several specimens of them, and according to our experience they differ from those of impregnation in all the following particulars:—1. there is no prominence or enlargement of the ovary over them; 2. the external cicatrix is wanting; 3. there are often several of them in both ovaries, especially in patients who have died of tubercular diseases; 4. they are not vascular, and cannot be injected; 5. their texture is sometimes so infirm that they seem to consist merely of the remains of a coagulum, and at others appears fibro-cellular and resembling that of the internal structure of the ovary, but in no instance did we ever see them presenting the soft, rich, and regularly glandular appearance which Hunter meant to express when he described them as "tender and friable like glandular flesh;"* 6. they have neither the central cavity, nor the radiated cicatrix which results from its closure.

Signs of delivery.

An investigation into the proofs of delivery, whether undertaken with reference to circumstances of a social, professional, or legal nature, although not so frequently required, will be found no less important in its relations to society, nor less difficult in its details, than the examination of the proofs of pregnancy, a very clear and accurate knowledge of which latter is indispensably necessary to enable us to arrive at a satisfactory conclusion, when engaged in such an enquiry as that before us. It may, and indeed frequently does happen, that a woman with an enlarged belly arising from some purely accidental or morbid cause becomes an object of suspicion, and afterwards the sudden reduction of her size may, however unjustly, affix upon her the imputation of clandestine delivery at least; and although such charge may never be made the subject of a legal or criminal investigation, its influences would be alike unjustly prejudicial to the character of the individual, and injurious to the moral interests of society. The writer very lately saw such an instance in the case of a woman separated from her husband, who became affected with what was considered ovarian dropsy, and which enlarged the abdomen to the size of six months' pregnancy, some of the other symptoms of which state were also present. After an attack of inflammation, during which it is to be presumed the parietes of the tumour formed an adhesion with the upper part of the vagina, there took place suddenly a discharge of gelatinous fluid from that cavity, and the abdomen completely subsided in the course of a day, and the previously entertained suspicion appeared to be confirmed beyond a doubt; but on examination the woman had not about her one of the signs of delivery; yet had not the case been at once investigated, loss of reputation at the least would have inevitably, though most undeservedly, followed. In a very interesting case related by Foderé, the life of an innocent woman was very near falling a sacrifice to the

* Phil. Trans. for 1797, p. 200.

† Description of Gravid Uterus, 1794, pp. 14—74.

‡ See Report of the trial; and Edinb. Med. and Surg. Journ. vol. v. p. 220.

§ *Meckel*, supra citat.

‖ Mr. Stanley and Dr. Blundell.

* Description of Gravid Uterus, p. 14.

aw under circumstances somewhat similar. 'A young woman had her menses suddenly suppressed in consequence of a fright, and sought every aid to restore them without effect: he was at length married with a view to induce their return, which succeeded after a time, nd she discharged a great quantity of fetid natters. This fact was proved by the husband nd the medical attendants. It so happened ust at this period that two children were found xposed and destroyed by cold; suspicion fell n this young woman, because she was known o have had an enlarged abdomen, which had ery suddenly subsided. The judges of the istrict ordered her to be arrested and examined y a physician, a surgeon, and two midwives, ho reported that they had discovered marks f delivery. In consequence of this, the unortunate woman was condemned to death for oncealing her pregnancy, and making away ith her children. An appeal, however, was ade to parliament against this sentence; and consequence of two consultations, held by everal physicians and surgeons of the greatest minence, she was acquitted."*

Delivery may be *concealed* with the hope of ving shame, or still more criminally with the ntention of destroying the offspring; and where nfanticide is charged, the law requires proof f delivery, and the finding of the child. Or gain, delivery may be *feigned* for the purose of obtaining marriage with a paramour, gratify the wishes of a husband, or to rrest property from the lawful heir. Perps the most singular case of the kind on cord is that related by Capuron,† in which young woman, with a view to obtaining arriage with her lover, feigned pregnancy and en delivery, and so far succeeded completely her attempt; but after some time, being lled on to produce the child, and refusing to so, she was accused of infanticide, and rought before the criminal tribunal, where she onfessed the fraud which she had practised, nd the motives by which she had been actuad; but she was then called on to prove at she had never been delivered, and an inestigation by medical examiners was ordered, e result of which was a report that they could nd no sign of delivery of either recent or cient date, whereupon she was acquitted and scharged. A similar instance of pretended elivery appeared not long since in a Berlin ournal, as having occurred at Sirakovo in the rcle of Posen, where a young woman, anxious fulfil the ardent desire of her husband to ve an heir, pretended to have been suddenly d unexpectedly delivered, and stole an int to support the falsehood: the case was ndered more atrocious from the real mother ving in consequence of the theft been subcted to the accusation of infanticide; the ct was, however, happily discovered, and the lprit consigned to the punishment due to er crime.‡ Dr. Male tells us that a surgeon as called to a pretended labour, and a dead child presented to him, but there was no placenta; he therefore proceeded immediately to examine the woman, when he found the os tincæ in its natural state, nearly closed, and the vagina quite contracted: the fact was that the woman had never been pregnant, and the dead child was the borrowed offspring of another: it appeared that she was induced to practise the artifice to appease the wrath of her husband, who frequently reproached her for her sterility.

With reference to whatever object this inquiry may be entered on, it is very important to consider, in limine, what are the limits of time within which the signs of ordinary delivery can be detected, and also whether a woman who has given birth to a child necessarily retains any mark or symptom by which her delivery can be ascertained after an interval of many months or years. With reference to the first of these questions, it must be recollected that there is a remarkable difference in the effects produced by parturition on the system of different individuals, as well as in the merely physical changes made in the condition of the parts more immediately concerned in that process, arising partly from the greater strength or tonicity in the constitution of particular persons, and the consequent rapidity with which the parts restore themselves to their original state, and partly depending on the period of pregnancy, and the size of the ovum or fœtus which has been expelled. As a general rule, however, it is agreed on by all who have directed their attention carefully to the subject, that the time within which we may expect satisfactory information has certainly expired when ten days have elapsed from the time of delivery; but we are not to assume this extension of the time suited for the inquiry as implying that we may safely postpone our examination so long, or that up to the end of that period we can obtain all the evidence we require: such is by no means the fact, and experience will soon convince us that in general within a week the condition of a healthy woman who has not sustained any accident in delivery is so restored as to render the result of any such investigation a matter of much uncertainty; many of the most marked alterations in the parts of generation disappearing, "so as to leave no trace remaining eight days after delivery."* Such also was the opinion of Bohn and Albert, in conjunction with Antoine Petit and Louis, when they met in conference on the case of a woman of Mantes who was accused of infanticide, and whom they pronounced innocent on the grounds of her not having been examined as to the fact of her delivery until after the expiration of a month. We were not long since called on to examine a woman five days after delivery at the full time, and were particularly struck with the degree in which the parts had restored themselves to their natural condition, especially

* Méd. Légale, tom. i. p. 476.
† Méd. Légale relat. aux accouchemens, p. 110.
‡ See Paris and Fonblanque, vol. i. p. 250.

* *Baudelocque*, vol. i. p. 115. See also *Foderé*, tom. ii. p. 17. Marc, Dict. de Méd. tom. i. p. 228.

the os and cervix uteri, which hardly differed from their natural unimpregnated form and size. If the contents of the uterus have been prematurely expelled, the signs of delivery, at whatever time investigated, will be found indistinct in proportion to the immaturity of the ovum; so that, after abortion at an early period, so little change is made in the condition of the uterus and other parts, and the woman may exhibit otherwise so few of the signs of pregnancy even when examined within a day or two after the occurrence, that it may be found impossible to form any thing approaching to a decided opinion,* excepting a very careful examination of whatever substance may have been expelled, should that be within our reach; when, if the structures of the ovum be satisfactorily detected, and we have sufficient proof that such body was expelled by the woman, there can no longer be any doubt. While writing these observations we are in attendance on a lady who miscarried a few days since, with little or no pain, but with considerable hemorrhage, at the close of the second month; and in twenty-four hours afterwards we found the os and cervix uteri almost completely restored to their natural state; the vagina and external parts hardly if at all dilated and very little relaxed; the breasts exhibited very imperfectly the appearances which accompany pregnancy, the ordinary sympathetic symptoms of which had been almost entirely absent. Now in such a case as this it would be utterly impossible to arrive at more than a very ill-established probability except by finding the ovum, which in this case was expelled entire and perfect, in which state we have preserved it.

As to the second point, or our being able to ascertain by personal examination whether a woman has ever at any former period been delivered or not: it is plain that we may be able to establish the negative of the question from the existence of some physical condition, such as a perfect hymen, which would be incompatible with the birth of a mature child; this would not, however, prove that abortion had not taken place; but such a state of imperfect development or of imperforation might be discovered, as would preclude altogether the notion of either pregnancy or delivery. But the question of most practical importance is this,—supposing a woman to have been a mother, does there remain any mark or sign by which the fact of delivery can at any future period be established? The reply to this question which experience warrants appears to be, that in a very great majority of cases we should be totally unable to discover any such certain indication of a former delivery; for although in some instances there are to be found appearances which point strongly to a probability of such an occurrence having taken place, they are very seldom indeed such as ought to be considered decisive of the question; while in other cases where parturition has occurred repeatedly, not one of the signs usually insisted on is found to have continued permanent. We very lately examined a patient who had borne five children and nursed three of them, the youngest being now five years old; the breasts were small, but neither flaccid nor pendulous; the nipples short, with not the least shade of brown colour in the areolæ, which exhibited only the delicate rose colour so often observed on that part of the virgin breast; there were neither lines nor spots of any kind on the abdomen; the os uteri was small and natural; the vagina contracted, and the fourchette perfectly entire. It should be mentioned that this lady never carried her children beyond the end of the eighth month. But the remarkable case of Aimée Perdriat, related by Fodéré,* shews very forcibly that the lapse of a few weeks may be sufficient to render impossible the detection of the signs of delivery: the facts were briefly these:—On the 11th of June, early in the morning, Aimée Perdriat left her master's house and went to that of a friend named Rosina, living in the fifth story of the house, begging permission to lie down, as she was unwell with colic: in about an hour afterwards a person living in the third story heard an extraordinary noise in the water-pipe, as if a heavy body was falling forcibly through it. Aimée was not visited by any one except Rosina and another young girl, who came to ask if she wanted any thing. About five hours afterwards Rosina observed blood on the stairs and on the floor of the room, and Aimée remarked that her menses were flowing very profusely. Suspicion was excited, and on the 17th the privy was opened, when a child, placenta, and two bloody cloths were found. Two surgeons examined the body, and reported that there were no marks of violence present, except that the umbilical cord was *torn* off; that it was a full-grown child, and in their opinion had breathed after birth, and had fallen alive into the place from whence it was taken. Aimée was arrested on suspicion of being the mother of this child, and the suspicion was increased by her refusing to submit to the examination of a midwife, and having absconded from Paris: she was brought back, and on the 15th, 17th, and 27th of July, being more than a month after the supposed delivery, she was examined by Baudelocque, Dubois, Ané, Dupuytren, and Lafarge, who declared that they could not discover any sign indicative of delivery having taken place at the time in question. In consequence of this she was acquitted, the judges leaning to the side of mercy; but the circumstances of the case must impress us with a moral conviction of the woman's guilt.

The presence of shining broken streaks, like the remains of cracks, in the skin of the belly, caused by the previous distension of that part during gestation, and which when once

* "Avant les deux premiers mois revolus de la grossesse surtout lorsqu'il ne s'agit pas d'une primipare, l'art ne presente aucun moyen concluant de determiner par l'examen de la femme si un avortement a eu lieu."—*Marc*, Dict. de Méd. vol. iii. p. 193.

* Tom. ii. p. 18.

produced are permanent, is a sign very generally acknowledged as of value; but then we have just seen that a woman may have been repeatedly delivered without the formation of any such marks; and on the other hand we know that any cause capable of stretching the abdominal integuments to the same degree may equally give rise to their production; a remarkable instance of which we lately saw in a man labouring under general dropsy, whose abdomen was literally covered with such streaks, and there were also several on the thighs, prepuce, and other parts of the body. It sometimes happens also, especially in young women of a full habit, that when the breasts have been greatly and rapidly enlarged during pregnancy or after delivery, the skin covering them is in like manner injured, and silvery lines are formed which never afterwards disappear. We have already related the particulars of a case in which we discovered, by the presence of these marks, a delivery which had taken place two years before; and this day, in consultation with Surgeon Conolly on a case of doubtful pregnancy, where previous childbearing was at first resolutely denied, the recognition of these silvery streaks induced us to press the party strongly on the subject, when she confessed that she had given birth to a child nineteen months before. It may be satisfactory to enquire here, whether there is any other affection of the mammæ which might give rise to such a condition of their surface. The mere accumulation of fat we certainly think would not, and the existence of diseased enlargement would not be likely to give rise to mistake; but there is one fact on this subject which deserves to be borne in recollection,—namely, that the application of leeches to the breasts as a means of restoring the menstrual discharge, lately recommended by Dr. Loudon,* has been followed, as he tells us, by these organs becoming "swelled to an enormous degree;" and as this swelling takes place very rapidly, it seems reasonable to suppose that it might produce a similar disorganization of the integument; but we have no evidence from experience on the subject. We have, on several occasions, when examining the state of the os uteri in women who had borne children, observed that its labia felt jagged, and sometimes as if a portion had been torn and remained separated from the rest: we should attach some consideration to this state of the part, because it is not likely to be produced by the expulsion of any accidental formation from the cavity of the uterus, and we have never met with it except after childbirth. The value of the evidence to be obtained from a lacerated state of the perineum will be fully considered presently. Before proceeding to investigate in detail the present circumstances of any case submitted to us for examination, we should endeavour to possess ourselves as fully as possible of the previous history of the woman, if that be not already known to us, which may have been on the one hand such as would greatly tend to render probable the occurrence of delivery, or on the other hand to diminish, or perhaps altogether forbid, our belief in its possibility. We may, for instance, learn that she had been for several months observed to be increasing in size, and exhibiting other symptoms of pregnancy previous to the time at which delivery was suspected to have taken place; or we may have reason to know that she had been long labouring under some form of disease, which, while it rendered the occurrence of pregnancy extremely improbable, was at the same time such as would be likely to induce many of its symptoms. The age also of the individual may be such as would tend greatly to confirm us in a negative opinion; and even supposing that we are satisfied that conception had occurred, this may in no measure facilitate our investigation, but may, on the contrary, involve us in further difficulty. It has been already shewn that a woman may be pregnant, and that the fruit of her womb may be blighted at any period, but may be retained in utero until the full time is accomplished, while the size of the abdomen happening from some other accidental cause to continue increasing until the expulsion of the degenerated ovum occurs, the woman may be suspected of having brought forth a child; nay, it may even happen, however paradoxical such an assertion may at first sight appear, that pregnancy and utero-gestation, even when their full term has been nearly accomplished, and the life of the fœtus distinctly recognized, are not necessarily followed by the birth of a child, as is proved by the facts of the following very remarkable case which the writer saw about three years ago with Surgeon Whitestone and Mr. Mulock. Mrs. C. of Charlemont street became pregnant for the fourth time, and up to the seventh month matters went on favourably; but after that time she ceased to feel the motions of the child, which had been previously very active; she, however, continued to increase in size up to the end of the ninth month, when the membranes having protruded into the vagina and ruptured, a great quantity of horribly offensive fluid and gas made their escape, but no child could be discovered: in a few days afterwards the placenta and cord came away completely macerated, and all the interstitial matter so completely removed as to present a most perfect ready-made preparation of the umbilical or placental vessels, even to their most minute capillary terminations;* but nothing remained of the child except the bones, many of which were subsequently discharged from time to time during the two years which the patient survived. The facts of this case appear to us sufficient in themselves to demonstrate the imperfection of the rule of law concerning concealment of birth, in order to prove which it is held sufficient to ascertain that there has been a pregnancy or a delivery; for in this case pregnancy was clearly ascertained, the mo-

* Edinburgh Med. and Surg. Journ. vol. xxxviii. p. 61.

* It is preserved in the writer's museum.

tions of the child were strongly felt, and the full term of gestation was accomplished, yet no child was born. It may also be observed here, that should such a case as this give rise to the suspicion of infanticide, the accusation could not be sustained, because, in order to do so, the existence of the child must be proved and its body found; and in suspected cases, whether of *concealed* or *feigned* delivery, we should very carefully examine the child if possible, for the purpose of ascertaining whether its state corresponds to the supposed or pretended time of delivery, and to the other circumstances of the case, as by so doing the attempted fraud may sometimes be at once detected. If, for instance, a woman feign to have been delivered two or three days before, and produce as her own a child with the cord separated and the umbilicus quite healed; or, on the contrary, if delivery be asserted to have taken place a month before, and the cord be found still attached to the navel, such incongruities would be so far decisive against the truth of the woman's account. Other discrepancies, such as want of correspondence between the development of the child and the period of pregnancy accomplished, or the interval after delivery, will readily suggest themselves, and ought to be very carefully attended to. Having made these general observations, we have next to consider in detail the individual signs by an examination of which we may be enabled to form an opinion as to the recent occurrence of delivery, when such inquiry is instituted within a proper time after parturition is supposed to have taken place.

1. The face is generally a little paler than usual, the eyes are somewhat depressed, and not unfrequently surrounded by a slightly brownish circle, and the whole expression of the countenance resembles that of a person recovering from a slight indisposition; the pulse is more or less accelerated, the skin softer and warmer than usual, and relaxed with a moisture which has in many a peculiar and sometimes very unpleasant odour.

2. The state of the breasts ought to be a subject of particular attention, especially if examined about the third or fourth day after delivery, at which time they are generally full, tense, and hard, or even knotty under the hand, and if pressed or drawn they yield a lactiform fluid; the nipples appear turgid, and the areolæ are dark and otherwise altered, as already fully described.

3. The abdomen is found full, and its integuments greatly relaxed or even thrown into folds, especially in those who have borne several children; and we recognize those light-coloured broken streaks or cracks already mentioned, which are generally most numerous from the groins and pubes towards the umbilicus; and if the hand be pressed pretty firmly over the lower or pubic region, we feel,—4. the uterine tumour produced by the volume of the imperfectly contracted uterus, which is felt about as large as the head of a new-born child, and rising three or four inches above the brim of the pelvis, into the cavity of which it can be traced by the hand, and lying towards one or other side.

5. The state of the os uteri, vagina, and external parts, next claims our attention. By an examination per vaginam we detect the enlarged state of the uterus and its identity with the abdominal tumour, and at the same time we ascertain the condition of the os uteri, which in a recently delivered woman is found gaping open, so that two or three fingers might be introduced into it with ease; its margins are flabby and very much relaxed, and not unfrequently feel as if divided by several small fissures. If the examination happens to be made within a few hours after delivery, the patulous state of this orifice is such that its margins cannot be distinctly recognized, so that we feel at a loss to distinguish between it and the cavity of the vagina, of which it seems as if it were a continuation. This latter part also is greatly relaxed and dilated, in consequence of which its internal surface is rendered smooth, its natural rugæ being obliterated by the recent distension of its tissues. From the same cause, also, the external parts are swollen, not unfrequently contused or even torn, especially after a first or a difficult labour, and partake of the relaxed state of the internal parts; there is also found issuing a peculiar discharge, to which we apply the name of lochia.

6. Laceration of the perineum. When a woman for the first time gives birth to a full-grown child, it frequently happens that the thin fold of integument constituting the anterior edge of the perineum, and called the fourchette, is torn, and sometimes the rent extending further backwards divides the proper substance of the perineum to a greater or less extent; this, however, is merely a contingency, which may or may not take place, and is, in fact, of rather rare occurrence, except in the simpler form first mentioned, but if recognized in the greater degree, is a very strong proof of delivery having preceded.

7. The lochia. From the time of delivery, a sanguineous discharge is eliminated from the genitals, and continues to flow for a period varying between four or five days to as many weeks, according to the peculiar habit or constitution. In general the discharge continues red for the first three or four days, and then becomes nearly colourless, or acquires a slightly brownish or dirty greenish hue, from which it is sometimes vulgarly called *green waters*, and after a week or eight days it ceases altogether. This discharge has a peculiar odour,* not easily named. Loder compared it to the smell of 'fish-oil;' others speak of it as a sour smell, but any one who has been much about lying-in women, especially in the wards of a lying-in hospital, must be aware of the peculiarity of this odour, which Dr. Beck informs us it has been found impossible by any artifice to destroy.†

* *Marc*, Dict. de Méd. tom. i. p. 227; *Foderé*, t. ii. p. 13.

† Elem. Med. Jurisp. p. 94.

Should such an assemblage of symptoms as here enumerated be recognized as at once sting in the case submitted for examination, doubt could be entertained of the fact of ivery, there being, to use the words of aussier, "no disease or affection besides turition which can possibly produce the ole series of signs above described;" but we y not enjoy the advantage of having before such a satisfactory combination of proofs, l may be under the necessity of forming our nion when only some of these signs can be ected, and others are entirely absent; and en we come to examine them separately, we ll find that they must be received in evi- ice with very great caution, and with various difications of their value, by which the ofs which they afford will be found little re than merely presumptive. Thus it is vious that the expression of the countenance, well as the state of the pulse and skin above iced, may be induced by any indisposition exertion which may have depressed the dily strength of the woman, and otherwise ordered the functions of her system. The te of the breasts has been already very fully sidered in the former division of this article, that it appears only necessary to observe here t, as on the one hand such a circumstance as expulsion of hydatids is capable of inducing at functional activity in the mammæ and an undant secretion of milk, so on the other nd it occasionally happens in weak, delicate men, that little or no alteration is perceived the breasts after delivery; and it was elsewhere remarked that in such persons a similar nt of sympathy is sometimes observable ring pregnancy, so that the changes in the olæ are but imperfectly established. Still we fully warranted in considering a full breast, th abundance of milk about the third or fourth y after delivery is supposed to have taken ace, as a very strong indication of such an currence. "It is possible," says Mr. Burns, or this secretion to take place independently pregnancy, but not with the appearances just scribed."*

The fulness of the abdomen and relaxed te of the integuments, as well as the appear- ce of streaks or cracks, may all arise from y cause capable of producing the same de- ee of distension as occurs in consequence of egnancy, such, for instance, as dropsy or larged ovary, or they may be the result of former pregnancy; while, on the other hand, ey may not be found when delivery has really d recently occurred. As to the uterine tu- our, we must expect to find it distinct or herwise in proportion to the recency of the livery and the period of pregnancy at which took place, the fatness or tenuity of the abdominal parietes, and the degree of activity with which the contractile action of the uterine fibres may have proceeded, from which results in a great measure the difference in the degree of development which this tumour presents in different persons at the same interval of time after mature parturition, being smaller, and in consequence less easily felt, in some at the end of four or five days than in others after double the time. Besides this, a tumour may be felt so situated, and yet may not be the uterus. To satisfy ourselves on this point, we must conjoin the examination per vaginam with that already made externally; and even when we have ascertained the exact nature of the tumour, we must recollect that it may equally arise from the organ having recently expelled a mole, a large mass of hydatids, or even a considerable accumulation of retained menstrual discharge;* which accidental circumstances might also produce the dilated and relaxed state of the os uteri, in which the vagina and external parts would participate. But from such causes as these there would be found neither swelling, contusion, nor laceration of the internal organs; nor could the os uteri be rendered patulous merely by increased secretion, such as long-continued leucorrhœal discharge, which sometimes induces extraordinary relaxation of the other parts. Laceration of the fourchette, although a very common occurrence in childbirth, does not always take place. We have already spoken of a lady who bore five children without sustaining any injury to that part; and within the last few days we examined a young girl of sixteen, and of very diminutive stature, who had borne a full-grown child some months before, and the fourchette escaped uninjured. Many such instances as these have come under our observation;† but should a laceration of the perineum be discovered, it is a proof of immense importance. We must, however, recollect that it may present itself under conditions indicating a more or less remote date as that of the delivery which caused it: thus it may be found a fresh unhealed wound, or the margins of the laceration may be perfectly healed or even callous, but quite disunited and separate from each other; or, lastly, complete union may have taken place, so that the presence of a rigid cicatrix is the only evidence remaining of the occurrence of the accident. Now should we happen, in an examination of this kind, to discover a fresh laceration of the perineum, in connexion with others of the signs we have been considering, especially the relaxed and dilated state of the os uteri, vagina, and external organs, and the presence of the abdominal tumour, it ought to be considered as decisive of the fact of recent delivery; but neither of the other states of the parts would be equally conclusive as proof of a *former* delivery, because they might have been produced by causes totally unconnected with childbirth, as happened in the case of a girl who was romping with a young man, and, losing

* Principles of Midwifery, seventh edit. p. 547. appears proper to notice here a remarkable dis- epancy between the opinion of Mr. Burns, as ove stated, in his own words, and as quoted by . Beck in his Elements of Medical Jurisprudence, ird edit. p. 94, where he is made to assert the act contrary, the word *impossible* being substituted r *possible*, as it stands in the text.

* See section *Suppression of the menses.*

† See also *Marc*, loc. cit. and *Fodcré*, tom. ii.

her balance, fell backwards on the point of the leg of a stool, which tore through the perineum and entered the vagina, causing a frightful laceration. Or it may have been caused by some surgical operation on the part, as in the case related by M. Berard, where it was found necessary to divide the perineum in order to accomplish the removal of a pessary which had lain several years in the vagina.* About two years ago a patient applied to the writer for relief, as she was labouring under prolapse of the uterus and incontinence of urine: on examination there was also found extensive laceration of the perineum, but none of these accidents were the result of delivery. The unfortunate woman had led an abandoned life, and was the victim of a horrid outrage committed by three or four drunken ruffians, who, having first violated her, forced a broken stone into the vagina, which tore the perineum and the neck of the bladder. The stone had been removed in the hospital, but the lacerated parts never recovered the injury. As to the lochia, we cannot expect to obtain much information of a satisfactory kind from that source, especially if the examination is not made very soon after delivery. We have known the discharge cease after the second day; and even when this is not the case, we must take care that we do not confound with it some discharge of a different nature, such as the menstrual, or perhaps one of a morbid origin, from either of which, however, a careful examination of the uterus and external organs would almost certainly enable us to distinguish it.

It appears to us that we cannot more appropriately conclude this review of the ordinary signs of delivery than by quoting the words of two very distinguished writers on such subjects. "The relative value," says Dr. Paris,† "which each of the signs possesses will be better appreciated after we have considered the diseases whose effects may resemble them; but as a general principle we are anxious to enforce the necessity of always considering the consecutive signs of parturition collectively, and not individually; under such circumstances the practitioner can never be betrayed into an erroneous conclusion." "Other circumstances," observes Mr. Burns,‡ "may also concur in confirming the opinion of the practitioner; as, for instance, if the patient give an absurd account of the way in which her bulk suddenly left her, ascribing it to a perspiration, which never in a single night can carry off the great size of the abdomen in the end of a supposed pregnancy."

Delivery without consciousness.—Having in a former part of this article discussed the possibility of impregnation being effected without the woman's knowledge, as during sleep, and having alluded to the fact of delivery sometimes taking place under similar circumstances as an argument *a fortiori* in favour of the credibility of such an occurrence, it seems necessary now to consider briefly that question. That a woman may be delivered without being sensible of if she be at the time labouring under cerebr oppression or derangement, as in coma, in del rium, in puerperal convulsions, stupified b narcotics,* or by ardent spirits,† is a fact of r peated observation; but it is not pretended th in such instances the woman could be *afte wards* ignorant that she had been delivered The occurrence of delivery after the life of th mother has become extinct, and consequent effected by the independent contractile pow of the uterus, has been attested by so man authors of established credit, that we cannot re fuse it our belief; having received the testimon of Foderé,‡ Buffon,§ Leroux,‖ Levret,¶ Bu delocque,** Bichat,†† and others‡‡ of equall high authority, who have recorded instances the fact, to which for the present we sha merely refer, as below, and proceed to notic two or three facts more directly in proof of de livery during sleep or insensibility. For the firs of these the writer is indebted to Dr. Douglas one of the most experienced practitioners in thi city, and whose correct and ingenious exposi tion of the evolution (improperly called spon taneous) of the fœtus is so well known to the profession. In a letter to the writer, Dr. Doug las states that he was called about six o'clock A. M. on the 26th September, 1828, to attend Mrs. D. of the county of W——, but then re siding in Eccles-street. On his arrival he found the house in the utmost confusion, an was told that the child had been born before the messenger was dispatched for the doctor; and from the lady herself he learned that about half an hour previously she had been awakened from a natural sleep by the alarm of a daughter about five years old, who had slept with her for some nights before; and this alarm had been occasioned by the little girl feeling the move ments and hearing the crying of an infant in the bed: to the mother's great surprise she found she had brought forth her child without any consciousness of the fact. Mrs. D. had had several children with favourable labours. In the London Practice of Midwifery,§§ a work generally ascribed to a late very distinguished practitioner, we find the following account. "A lady of great respectability, the wife of a peer of the realm, was actually delivered once in her sleep: she immediately awaked her hus-

* Journal Hebdomadaire, tom. i. p. 263.

† Medical Jurisprudence, vol. i. p. 253.

‡ Principles of Midwifery, seventh edit. p. 547.

* As in the celebrated case of the Countess St. Seran. *Causes Célèbres*, Cause 259.

† See case by M. Deneux in the Dict. des Sciences Méd. tom. xxxi. p. 212.

‡ Méd. Lég. tom. ii. p. 11.

§ See *Gardien*, vol. ii. p. 212.

‖ Obs. des pertes de Sang. Obs. xiii. p. 25.

¶ Art des Accouchemens.

** Art des Accouchemens, tom. i. p. 123 note, Ed. 1822.

†† Anatomie Descriptive, tom. iv. p. 392. Ed. 1829.

‡‡ See *Hartemann*, Act. Nat. Curios. Dec. II. an. 3. Dict. des Sc. Méd. vol. xxxi. p. 212. Journ. Univ. des Sc. Méd. Août 1817. Lond. Med. and Phys. Journ. vol. xlvii. p. 26. Dr. *Planque*, Bibliothèque de Méd. Choisie, vol. iii. p. 222.

§§ Fifth edition, p. 87. See also Barlow's Essays on Surgery and Midwifery, p. 182.

id, being a little alarmed at finding one more bed than was before." To these accounts wish to subjoin the details of a very remarkable case, from a source which leaves no doubt the accuracy of the relation. "A fright duced by the dangerous situation of her y son, when eighteen months old, brought in Mrs. Durant an alarming illness attended h some singular phenomena, the most singular of which respected her memory. The ill- s happened in July; she was then advanced months in a state of pregnancy, and was, en perfectly insensible, delivered of a child. awaking from the insensibility, which had tinued for three days, she imagined it was month of *January*. Her mental powers erally were but slightly impaired, and soon ained their former perfection; nor was her mory affected except as regarded the preling six months: of that time she had forten *all* the events. Some accidental circumnce might afterwards occasionally produce a n of thought, which would bring an event of t six months to her recollection. Several of most important, however, were never reed, *nor could she, I believe, to the hour of death remember that she had then been pregnt.*"*

Examination after death.—Having elsewhere scribed the signs of pregnancy which may be covered after death, it will not be necessary y to say much in addition to the observations eady made. In such an examination our ention should be directed to the same objects ich we have been just considering as the oofs of delivery which may be recognized ring life, almost all of which may be also astained after death, provided, as before in- ed on, the investigation be undertaken within proper time: in addition to these means, by ening the body we are enabled to satisfy rselves more precisely of the exact condition the uterus and its appendages. Should death e place during or immediately after the act parturition, especially from hemorrhage, the erus may be found lying in the abdomen, a tened flabby bag, from eight to ten inches g, its mouth gaping wide open, so that the nd would pass through it without resistance; parietes are soft and relaxed, its cavity often ntaining large coagula of blood, and its inter- l surface covered with the soft and pulpy reins of the decidua, which, if the part be imrsed in fluid, appear as flocculent processes hering to and springing from it in great numrs,† while the portion to which the placenta had been adhering is distinguished by ving less of these deciduous flakes, the subnce of the organ in that situation appearing if laid bare, and exhibiting several semilunar d apparently valvular openings in its structre. But these conditions will be greatly ered should the woman have survived delivery a few days, so as to afford time for the erus to contract; and the change produced will be in proportion to the time since delivery and the energy with which the organ may have exerted its contractile powers, so that in some instances it may be found as large at the end of a week, as in others where the examination is made within two or three days. It would therefore be very difficult, if not impossible, to assign the exact dimensions which the uterus will present at given periods after mature delivery; and should it have occurred prematurely, these dimensions will of course be thereby still further affected. When delivery has taken place at the full time, and the uterus has contracted perfectly, if an examination be made within a day or two, it will be found about seven inches long and four broad; its external surface having a vascular appearance, and not unfrequently presenting patches of a purplish colour; its substance, divided by the knife, is found from an inch to an inch and a half thick, of the consistence, and nearly of the colour, of firm muscular fibre, of which it appears to consist; and the cut surface displays the orifices of a great number of very large vessels. Its internal surface differs little from the description already given; the Fallopian tubes and ovaria, or at least one of the latter, are found turgid and vascular, and lying more confined to the sides of the uterus. At the end of a week the organ has diminished to a length of between five and six inches, and after a fortnight does not exceed five inches in length; its vascularity is diminished, and the thickness of its parietes reduced about one-third; but the density of their structure is found increased in a like proportion, so that the orifices of the vessels are much less distinct, and the colour of the muscular substance has become much paler. After this period little information is likely to be obtained from an examination of the uterus merely; for although it probably is not reduced to its original unimpregnated condition before the end of the fourth week, the alterations which can be appreciated towards the conclusion of that period are too liable to have been induced by contingent causes to allow of our attaching value to them as proof of delivery. Under such circumstances, our attention would be more profitably directed to an examination of the ovaries and the existence of the corpus luteum, the value of which has been already so fully considered that it appears now only necessary to remark, that although its existence is proof positive of previous conception, it can be received as evidence of recent delivery only when it is found in connexion with other circumstances indicative of the occurrence of that event,* in which case it ought to be considered as a very powerfully corroborative proof.

We may sum up the substance of these observations in the following general corollaries:—

1. The signs of delivery are most distinct after the birth of a full-grown child; and least so when the uterine contents have been expelled at an early period of pregnancy.

2. The proofs are more distinct in proportion

* Durant's Memoirs of an only Son, vol. i. p.147.

† See preparation No. 141 in the writer's museum.

* See Report of the trial of Charles Angus for the murder of Miss Burns.

to the recency of the delivery, and any examination made after the lapse of ten days from the time of the delivery is not likely to afford satisfactory information, the most decisive signs in general disappearing within a week.

3. The third or fourth day generally presents the results of delivery very distinctly, the condition of the breasts being then most remarkable from the active secretion of milk.

4. A first delivery is more easily detected than subsequent ones.

5. We cannot safely rely on any of the signs of delivery viewed separately, but must consider them collectively, and their mutual relation and correspondence with each other, and with the other collateral circumstances of the woman's case and history.

6. The chief points of attention ought to be the state of the external parts and of the breasts.

7. There are certain physical signs which, when present, are sufficient to establish a negative decision; such are, for instance, a perfect hymen, or an imperforate state of the parts.

8. But, on the other hand, a woman may have borne children, and no one mark remain by which the fact of delivery could be proved after the lapse of even a few weeks.

9. A woman may be delivered while in a state of insensibility, or even during deep natural sleep; so that her child may perish merely from want of attention, and without any moral delinquency on her part.

(W. F. Montgomery.)

PROGNOSIS, προγνώσις, foreknowledge. The important place which in medical science is justly assigned to the faculty of foreseeing and predicting the future may be inferred from a consideration of the objects which it embraces. The principal of these are—the question whether a disease is remediable—the degree of danger which attends it—its probable duration—the circumstances which may be expected to arise during its course—its tendency to recur—and the probability of other diseases supervening.

The necessity of ministering to that instinctive anxiety with which mankind contemplate the prospect of life or death, of renovated health or protracted suffering, would of itself be sufficient to rank the faculty of prediction among the most essential qualifications of the physician. It, however, derives a stronger claim to this distinction from its important influence in the treatment of disease. Nor is there, perhaps, any one qualification more adapted to produce confidence in the patient and his attendants, and thus to insure compliance with the injunctions of the physician, than the power of predicting with accuracy what will happen in the course of a disease. Again, in a multitude of cases, how powerful an ally does he obtain if he can inspire the patient with hope by his cheering predictions! On the other hand, it often happens that, in diseases attended with little danger, there is a temporary increase of disorder and suffering. If this be foreseen and cautiously announced, disappointment and despondency, such as might retard or even prevent recovery, will be avoided. There are, besides, various circumstances incident to the progress of malady such as the appearance of fresh symptoms, the supervention of some new disease, which if foreseen, may be modified, or perhaps wholly prevented; while, in many acute affections, the anticipation of those periods and conjunctures which experience has shown to be often critical, may suggest means calculated to insure a favourable and decisive effort of nature.

It is not, however, merely in its relation to the treatment of disease that the art of prognosis is important to the physician. He will find it an influential and honourable means of promoting his own reputation; and, what he should still more value, one that may often be made subservient to the dearest and most momentous interests of his patient. That he whose days are numbered by the progress of a mortal disease, should, while his powers are adequate to the task, set his worldly concerns in order is a position which few or none will call in question; but the necessity of preparation for another and an eternal state of being can be duly appreciated by those only who have a just perception of the awful nature of the interests at stake. Such, however, may be the physical or moral condition of the patient, or such the nature of his malady, that the announcement of danger might in many cases seem calculated to accelerate the fatal event, and to counteract the measures devised for his relief. Since then, the issue must often be foreseen by the physician alone, the question of disclosing or concealing his anticipations will frequently place him in circumstances of the most serious responsibility. It would be foreign to the proper object of this article to attempt the delicate task of establishing general rules for the solution of such questions. It will suffice to say that the judgment of physicians would be more generally sound, and their conduct more wise, in this as well as in other parts of their professional duties, if their own minds were more deeply imbued with the importance of the truths and obligations of religion.

The qualifications and attainments which are essential to the art of prognosis may, in general terms, be said to comprehend all those which give superiority in the other departments of medical science. Some, however, are more peculiarly requisite. As a foundation, the accurate discrimination of disease is obviously indispensable; and hence the necessity of those habits of close observation, and of that extensive knowledge of pathology and of the signs of disease, upon which success in diagnosis depends. But in a multitude of cases the mere recognition of a disease is a very inadequate guide to the prediction of its future course and ultimate event. Something beyond this is wanted; and here we see remarkably exemplified that practical superiority which is acquired by men of clear understanding and natural good sense, who have had the advantage of long experience and an extensive field for observation.

The difficulties which are inseparable from ıe subject, and the sources of error and dis-)pointment with which it abounds, are early rced, and often painfully so, upon the atten-on of the physician. Before, however, expe-ence shall have taught him the lesson, he ill do well to exercise great caution in his edictions. Let him bear in mind, on the ıe hand, that the most formidable symptoms ometimes occur when there is no real danger; ıd on the other, that a moment of delusive dm is often the prelude to the sudden ap-earance of indications of approaching death. et him remember, that however accurate may e his diagnosis, his estimate of what is ex-essively called the vis vitæ may and often ust be most imperfect. If such considera-ons as these have their due influence on his ind, he will shrink from a rashness of pre-ction no less injurious to his own reputation an to the welfare of those whose life and alth are intrusted to his eare.

Of the grounds of prognosis.—The first and ost obvious means for predieting the event disease is derived from an attention to the crease or diminution of its more prominent mptoms. But although common sense and perience suffieiently attest the general value this guide, a very limited extent of observa-on will shew that the cases in which it is an nperfect or fallacious one are numerous and nportant. So far, indeed, is it from uniformly dicating the ultimate event of death or reco-ry, that it often fails to resolve the immediate estion, whether the patient is getting better worse. Experience has taught us that the ost conspieuous and distressing symptoms of any diseases are, at least in part, the result what is termed an effort of nature to obtain lief, and that their disappearance merely an-ounces the approaching fatal termination of e struggle. Thus the anasarca which sooner later attends most organic diseases; the uta, colliquative sweating, and diarrhœa of thisis; and the saccharine urine of diabetes, ten cease in the extreme stage of those ma-dies, but cease only to give place to death. e may perhaps refer to the same elass of cts that delusive calm, sometimes accompa-ied by an appearance of revival, which so ten precedes the fatal issue of acute diseases, , for example, of eneephalic inflammation, llow fever, and puerperal peritonitis. Expe-ence further shews that the disappearance of ıe set of symptoms is often a mere precursor f others of equal or greater severity. Thus ıe cold stage of ague is presently replaeed by ıe hot; and the eessation of spasmodic asthma d of serofulous disease of the cervieal glands frequently but the forerunner of pulmonary nsumption. On the other hand, in acute iscases, a marked increase in the severity of ıe symptoms is a common prelude to a salu-ry crisis; while the erisis itself eonsists in the ppearance or aggravation of some circum-ance which, either in kind or degree, is ssentially morbid.

As we thus find that the apparent increase or eerease of a malady eannot be by any means uniformly relied upon as indicating its event, we must have recourse to those materials which *experience* has collected for our guidance. In its application to the prognosis as well as to the treatment of diseases, experience presents itself in a twofold character; first, as entitling us to infer that a certain event will result from certain existing circumstances, merely because it has been ordinarily found to follow them; and, secondly, as the foundation of those generalizations and deductions which constitute the science of pathology. From the age of Hippocrates to that of Morgagni, the art of prognosis, or at least what was valuable in it, was almost exclusively founded upon the former kind of experience; for whatever was derived from pathology was always hypothetical and mostly erroneous. The writings of our own illustrious Sydenham strikingly exemplify the contrast between the value of accurate observation and the fallacy of mere speculation, however ingenious.

The cultivation of pathology in modern times has unquestionably produced an important influence upon prognosis, as well as upon every other branch of practical medicine. It would be foreign to the immediate object of this article to inquire how far that influence has been beneficial, or to what extent its benefits have been associated with mischief. It may, however, be asserted in general terms, that while, on the one hand, pathology has given an increased precision to our views of the nature, and consequently of the event of many diseases, especially of those which we call organic, yet, on the other, a propensity to generalize from inadequate data, and to attribute to the science a perfection which it has by no means attained, has unquestionably led to much error. And there can be no doubt that in the present state of medical seience he who combines a simple and accurate observation of individual circumstances with an enlightened but cautious application of pathology, will be found the most sagacious in prognosis as well as the most successful in practice.

The application of experience to prognosis is greatly facilitated by the aid which nosology affords in creating abstract notions of disease apart from the peculiarities of individual cases. Hence arises a natural division of the subject into two parts. The first embraces prognosis as considered in its relation to *diagnosis*, and comprehends those general conclusions as to the future which are drawn from the known history and tendency of any given disease. The second comprehends those particular circumstances which belong to the individual case, not being included in the abstraet notion of the disease itself.

The value of an aecurate diagnosis as an index of the future is often indisputably great. In many affections it at once informs us whether we must regard the disease as curable or incurable, and whether death or recovery may be expected. Thus, when the existence of hydrophobia on the one hand, or of hysteria on the other, is clearly aseertained, we are able to predict the ultimate event with a confidence

little short of certainty. If a case be identified with tuberculous phthisis or schirro-carcinoma, we at once perceive that the probability of recovery is extremely small. The great majority of diseases, including fevers generally, and indeed most acute affections, are, however, in their own nature, neither essentially curable nor incurable, fatal nor free from danger; and hence, in order to predict the result, we must take into account the circumstances of each individual case: and even when the ultimate event may be learnt from the diagnosis alone, we must still have recourse to them to determine many questions of great interest both to the patient and the physician, as the duration of the disease, the event of particular symptoms, the expectation of new ones, &c. Numerous cases also occur in practice, to which diagnosis is wholly or in a great measure inapplicable; and although in judging of the future some light may be derived from their apparent analogy to known diseases, much will necessarily depend on a consideration of individual circumstances. But not only is diagnosis in many cases unattainable, it is also often unnecessary. How much of that tact which experience gives is independent of any pretensions to accuracy in referring a case to its nosological position! This is remarkably exemplified in the anomalous affections of young females; and frequently also in those which attend the final disappearance of the menses.

It is to be observed that the limits between the two divisions under which it is proposed to arrange the several materials of prognosis are by no means always precise. It may often be doubtful whether a particular symptom is an essential character of the disease in the abstract, forming part of its diagnosis, or merely an accidental circumstance, influencing our judgment of the event. And it not unfrequently happens as a consequence of this uncertainty, that a symptom which was formerly referred to one of these two heads, is in the progress of pathology found to belong to the other.

1. *Of the prognosis of disease as deduced from its diagnosis.*

The prognosis of particular diseases will of course be included in the articles allotted to them in the present work. It will be our more appropriate object here to generalize the subject as far as is practicable, by considering diseases as grouped together in natural families. In adopting a classification for this purpose, the point to be chiefly aimed at is its facility of application, and as no pretension is made to a perfect nosological arrangement, it is unnecessary to enter into a defence of that which will be employed in the following pages. It will be sufficient if the reader be advertised of the sense in which words employed to designate the several families of disease are used, and if the same words be always used in the same sense.

In the progress of this attempt to apply pathology to the subject of prognosis, the imperfect state of that science, or at least its limited applicability to questions of a practical nature, will often be apparent. In many diseases, and perhaps even in the majority, it may adequately account for their tendency and ultimate event; but in many others our knowledge of these points is matter of simple experience, admitting as yet neither of useful generalization nor of explication by any known laws of pathological science.

We propose to consider the different families of disease in relation to the following objects of prognosis: 1. their curability; 2. their danger; 3. the particular circumstances which may be expected to arise in their progress; 4. the supervention of new diseases; 5. their duration; 6. their liability to recur.

1. *Curability.*—The question whether a disease is remediable or not is in its nature quite distinct from that of the degree of danger which attends it. It is true that in many affections, as, for example, hydrophobia, the former appears almost solely determined by the latter, so that we have little or no reason for judging a cure to be hopeless further than our experience of the incompatibility of the disease with the preservation of life. Such cases, however, more properly belong to the next head.

Some diseases appear to be absolutely irremediable either by nature or art; in others, on the contrary, a cure may be almost certainly predicted, and between these extremes we meet with every shade of difference.

Many cases of disease which, to speak with pathological accuracy, must be called irremediable, inasmuch as the structure of the affected part cannot be perfectly restored, are yet, in a practical sense, sufficiently curable, because the alteration of structure, though permanent, is productive of no inconvenience. This is well illustrated in inflammations of serous membranes leading to adhesions of moderate extent.

Of the various forms of *idiopathic fever* (using the words in their ordinary acceptation) no one variety can be considered as in its nature incurable, since it is their general character to have a more or less determinate course and duration, and thus to cease spontaneously when they are not destructive of life. Some varieties, as the plague and yellow fever, (and perhaps the present epidemic cholera ought to be classed with them,) must, however, be deemed in a high degree incurable, because in a large proportion of cases they prove fatal, and as such they will be considered under the next head. In others, as the ordinary continued fevers of this climate and intermittents, (when they are not inveterate, and their local cause can be avoided,) general experience justifies a pretty confident expectation of recovery. The prognosis in remittent fevers is generally good in proportion as the remissions are distinct, or as the affection approaches to the character of an intermittent. As to symptomatic fevers (among which almost all of those which are called hectic, and probably also infantile remittent fever, must be included,) their very designation implies that the question of their curability is contingent upon that of the

primary disease to which they owe their origin.

It may be said of *acute inflammations* as of idiopathic fever, that none of them is, *per se*, incurable. In some, however, as for example acute hydrocephalus and laryngitis, the hope of cure is greatly diminished by the danger which attends them. In many others there is a tendency, more or less strong, to results which constitute organic disease, and which are often wholly irremediable. One of the principal of these results of inflammation is the deposition of coagulable lymph or fibrine, constituting what are called false membranes. These are most frequent in the serous membranes, where they generally cause adhesions between the opposing surfaces, and become eventually organized, and often even secreting tissues. In such an advanced state their removal is certainly beyond the reach of art or nature; and even in their earlier stages there is no evidence of absorption ever taking place, while expulsion is of course out of the question. Although adhesions of serous membranes are thus irremediable in a pathological sense, yet in a practical point of view they are ordinarily scarcely to be recognized as constituting disease. In the pleura and pericardium they are not unfrequently found to have been almost universal without having produced any appreciable inconvenience. The same may be said of the adhesions which are artificially produced by stimulant injections for the cure of hydrocele. Owing to the mechanism of the abdominal viscera, adhesions between different portions of the peritoneum appear more often to interfere with their functions, but by no means uniformly so. Inflammation of mucous surfaces exhibits much less tendency to the production of false membranes, and when they do take place, the prognosis is widely different; for by the conjoined operation of muscular contractions and mucous secretion, the membrane when formed is commonly detached and expelled, unless, as is often the case in croup, its presence has speedily caused death. Hence permanent and incurable adhesions are of rare occurrence. According to the views of Laennec, the hepatized state of the lungs consists in effusion of coagulable lymph into the air-cells, and he seems to regard it as removable by the powers of nature in every stage of its progress. It is, however, probable that the consolidation thus produced is often permanent and irremediable. In iritis there is a great tendency to the formation of organized adhesions, for which a surgical operation is the only resource. Those effusions which take place in the cellular and white fibrous tissues in inveterate gout and rheumatism, appear to be almost wholly incurable. The submucous cellular tissue is probably the seat of the thickening which constitutes permanent or organic stricture. When this is recent, mechanical pressure has some power in producing absorption; but more commonly its destruction by caustics, &c. is the only effectual remedy.

Ulceration, when it is the result of acute inflammation and does not destroy life, may be regarded as curable, though probably the integrity of the organization of the part is never perfectly restored. The deficiency is, however, very rarely discoverable, the eye being the principal exception, and that by no means a constant one. Suppuration, another result of acute inflammation, occurs in two forms. In the one it is merely an altered secretion from the surface inflamed, and unless it take place to such an extent as to be destructive of life, admits of cure. In the other it assumes the form of abscess, and, when not fatal, is remediable in various ways, as by absorption, by ulceration and the evacuation of its contents, or by the aid of surgery. Among the occasional effects of acute inflammation, softening and gangrene may be included. The former, which is principally met with in the cerebral tissue and mucous membrane of the alimentary canal, appears to consist in a disorganization wholly or in great measure irremediable. In gangrene reparation is utterly hopeless; although, when life is preserved, nature sometimes effects what may be called a cure by the separation of the diseased part. It is possible that some other alterations in the condition of parts occasionally result from acute inflammation. They will, however, be more conveniently considered under the general head of organic changes and lesions of structure.

Inflammation seems in general to be more intractable when it attacks parts of low organization, as bone, cartilage, white fibrous tissue, and consequently joints. Chronic inflammation is also commonly less under the control of remedies than acute, and more peculiarly so when, as is often the case, it is connected with a cachectic habit of body, as in scrofula, syphilis, mercurial erethism, &c. It is probably owing in part at least to the scrofulous habit with which acute hydrocephalus is so commonly connected, that every mode of treatment is found ineffectual in a considerable number of cases.

Under the term *profluvia* may be comprehended all those cases of mucous or mucopurulent discharge which cannot properly be referred to inflammation. It will thus include many forms of bronchial catarrh, diarrhœa, and perhaps dysentery, catarrhus vesicæ, and leucorrhœa. None of these is in itself incurable, but every one of them may be and often is so, from being symptomatic of some organic disease, and even when idiopathic they are often very unmanageable.

Hemorrhages, if not so profuse as to be fatal, may be considered as remediable, except when they are symptomatic of organic disease, as hemoptysis attending tuberculous phthisis, and hematemesis and melæna when referable to disease of the liver or other abdominal viscera. In those forms of hemorrhage in which the effused blood finds a ready exit, the integrity of the part is left untouched; but when the effusion occurs in the substance of an organ, the case is widely different. Not only does a coagulum remain, but its presence

is necessarily accompanied with a dilaceration or compression of the substance of the organ; and though the coagulum is often ultimately removed by absorption, the structure of the organ may be irreparably injured. Here, however, as in regard to the organic results of inflammation already adverted to, we must bear in mind that what is pathologically incurable may be unattended with any appreciable morbid effects. Thus, in the case of cerebral hemorrhage occurring in hemiplegiac attacks, every symptom of inconvenience sometimes disappears, not only before cicatrization of the breach has been effected, but even before the coagulum is absorbed. On the other hand, cases are not wanting in which the palsy has been permanent, though absorption and cicatrization had taken place. Pulmonary apoplexy, which Laennec refers to effusion into the air-cells, is considered by that pathologist to admit of perfect restoration of the healthy condition of the organ. The hematemesis of young females, and other hemorrhages which appear to be vicarious of the menstrual discharge, are striking examples of a favourable prognosis being justified under circumstances apparently the most alarming. The hemorrhagic disposition in scurvy being peculiar in its cause, is no less so in its prognosis, which wholly depends upon the power of changing the diet and other circumstances to which the disease owes its origin.

The peculiarly intractable character of most of the forms of *dropsy* is well known. Though this is chiefly, it is by no means wholly to be explained by the dropsy being merely symptomatic of some organic disease; for chronic hydrocephalus and ascites are often, and hydrocele is almost always, idiopathic, yet they are commonly but little influenced by medical treatment. Anasarca and hydrothorax are much more manageable, and even when symptomatic of organic disease, may often be removed for a time by the use of diuretic and other remedies. The powers of medicine in hydropericardium and œdema pulmonum are not much known, principally because the diagnosis of those affections is very obscure. Many forms of dropsy admit of temporary relief by surgical means; hydrocele alone (or almost so) of a permanent cure, namely, by the artificial excitement of inflammation in the serous membrane, which leads to universal adhesion of its opposing surfaces. Ovarian disease can hardly in strictness be recognized as a form of dropsy, and if it be, it is very far from affording an exception to the general intractable character of the family.

Under the designation of *cachexiæ* it will be convenient for our present purpose to include several diseases which have little in common except the impossibility of assigning them a local seat. Some of them are very little amenable to treatment. This is almost proverbially the case with scrofula in its various forms, among which may be included tuberculous diseases generally. Lues and mercurial disease, when inveterate, are very difficult of cure; and diabetes, which may properly be noticed here, is well known to offer an almost hopeless prognosis. In chlorosis, on the contrary, and in scurvy, (when the circumstances which engender and maintain the disease can be reversed,) the prospect of recovery is generally good.

Under the head of *organic disease, lesions, and other changes of structure*, may be comprehended all those deviations from the natural organization of parts which are not distinctly referable to inflammation, or at least not commonly so. As a whole, they are very little remediable, though in the following enumeration many exceptions will be noticed. In hypertrophy and atrophy the prognosis varies greatly with the tissue affected; thus, by the judicious employment of remedial means, great changes may be effected in the bulk of the adipose tissue, and possibly of the muscles of locomotion; whereas in the hollow muscles, as the heart and urinary bladder, which present the two most common and well-marked instances of hypertrophy, such means seem to avail little or nothing. The contrast of the two cases perhaps countenances the opinion of some pathologists, that hypertrophy of the heart is essentially different from that increased bulk of voluntary muscles which results from their increased use.

The development of the natural tissues of the body in parts into the healthy structure of which they do not enter, is an occurrence which rarely if ever admits of remedy. Such are ossifications (with which may be conjoined exostosis and anchylosis) and cartilaginous degeneration. The fatty degeneration of the heart and liver may perhaps be included with them.

New formations are either organic or inorganic. According to most pathologists, tubercles are to be enumerated among the latter. Though the absorption of these bodies is generally admitted to be impossible, there is a mode in which nature has provided for their removal, namely, by the process of softening, or, as it is often called, ulceration; and from recent investigations it appears that the cavities which are thus produced in the lungs are occasionally obliterated by a kind of cicatrization. Of course this, in a pathological sense, is a very imperfect mode of cure, since there is no restoration of the pulmonary substance; and not only is it both rare and imperfect, but owing to the continued deposition of tuberculous matter in other parts of the lungs, it is commonly in the end unavailing.

The occasional expectoration of tubercles is far too rare and partial to modify the general prognosis of the affection. Other varieties of inorganic formations are melanosis, the contents of encysted tumours, gouty concretions, and urinary and bilious calculi. The first is in no way remediable; the others are occasionally got rid of by expulsion or ulceration, but more often not without the aid of surgery. In the opinion of Andral, medullary sarcoma is an inorganic deposition, not a degeneration: it appears to be wholly beyond the reach of remedies.

The organized new formations, as sarcomatous

tumours, polypi, and hydatids, though occasionally removed by spontaneous ulceration, are in general wholly inaccessible to remedies, if we except those which surgery provides. Perhaps ovarian disease may properly be placed here. As has been already observed, it is unaffected by medicine; tapping affords but a very temporary relief; and excision is scarcely practicable except in that early stage of the disease in which it occasions far too little inconvenience to dispose the patient to submit to a formidable operation.

The organic diseases which seem to consist rather in a change or degeneration of the natural structure of the part than in any new formation, such as scirrho-carcinoma and some visceral indurations, softening of the brain and spinal cord, mollities ossium, cataract, &c. do not admit of cure unless by surgical operations; and even then the prognosis is often bad, as in scirrho-carcinoma, and still more in medullary sarcoma, (regarded by some pathologists as a degeneration,) because the disease, though extirpated from one part, may already exist, or is liable to make its appearance in another, implying not a merely local malady, but a morbid state or tendency of the system. Indurations of the liver and spleen, occurring in inveterate ague, appear to be very little under the influence of remedies. If bronchocele and sarcocele properly belong to this division, they afford well-known exceptions to the ordinary incurability of this class of organic diseases.

Dilatations of hollow muscles and canals, when produced by mere distention, are generally curable (supposing the cause removed) in an inverse proportion to their duration, as is seen in the urinary bladder and passages, and in the colon. Even where the dilatation is rather the effect of want of tone or contractile energy the case does not seem to be hopeless; at least Piorry alleges that he has watched the gradual diminution of dilatation of the cavities of the heart; and we know that varicose veins are sometimes reduced in size by the effects of pressure. There is reason to believe that a tympanitic state of the stomach and intestines is sometimes caused by mere want of tone, and admits of cure by proper treatment. The pathology of ileus is imperfectly known; but if, as Dr. Abercrombie inclines to infer from his researches, the only essential circumstance is a dilatation of some portion of the intestinal canal, it may properly be noticed here. The danger that attends this severe affection is well known to be great, but it cannot be regarded as incurable. Dilatation of the bronchi and enlargement of the air-cells (the pulmonary emphysema of Laennec,) are, as far as is known, incurable. Aneurism rarely consists in mere arterial dilatation: such, however, appears to be occasionally the case, especially in the aorta; and it is more particularly in this form of the disease that, in the estimation of some writers, the mode of treatment proposed by Valsalva produces a beneficial effect.

Permanent strictures of canals, from effusion of lymph, have been already noticed among the effects of inflammation: those which depend on muscular contraction only are in a considerable degree remediable by mechanical means. Of permanent contractions of the hollow viscera we know little.

Breaches in the solids.—The reunion of fractured bone is generally practicable, unless in some particular states of the constitution, as pregnancy, lues, and scurvy. The only alleged ordinary exception is the neck of the thigh bone. Lacerated white fibrous tissue, as ligaments and tendons, also readily reunites. The reunion of torn muscles appears to be effected by cellular tissue, not by the reproduction of muscular fibre. It is probable that the hollow muscles and muscular canals would be generally repaired in the same manner were not their rupture mostly attended by fatal consequences; and the same may be said of the solid viscera, as the liver, &c. In the case of bloodvessels being torn or cut through, a peculiar provision is made for the repair of the injury. The separated ends are not reunited, but the circulation is carried on through collateral branches. Divided nerves are said to be reunited by nervous tissue. Excretory ducts, the pulmonary cells, and the cutaneous and cellular tissues are all susceptible of reunion.

Ulcerations generally admit of repair by the processes of granulation and cicatrization; but least so when the system is under the influence of any of the affections already mentioned as cachectic, especially scrofula and syphilis. Of the peculiarly intractable character of ulcers in the former of these we have instances in the articular cartilages, and in laryngeal and tracheal phthisis. With regard to excavations formed by the removal of morbid depositions, we know that healthy abscesses, when emptied, readily heal, and that even the less manageable ones are to a considerable extent curable. It has been already stated, that when life is preserved for a sufficient time, the powers of nature are occasionally adequate to the reparation of tuberculous excavations of the lungs, and hemorrhagic cells in the brain. In some of the congenital breaches, as the hare-lip and imperfect palate, a cure may be effected by operation. In spina bifida, all attempts to cure or even palliate the affection have commonly failed; and in the case of unnatural communication between the cavities of the heart, no means can possibly be of avail.

Displacements.—The prognosis in dislocations of the joints is mostly good, provided the attempt at reduction be not too long delayed. Though the lateral curvature of the spine is often, at least in its origin, merely a displacement of certain portions of the column, it is far from being uniformly a curable affection. The angular curvature rather belongs to the head of diseased structure than to that of displacements. When invagination of the bowels is from above downwards, and no adhesions have been formed, there is good reason to believe that replacement is often spontaneously effected: when, however, adhesions have taken place, the cure must be all but hopeless. The prognosis appears to be also very bad in every circumstance of that rare form of intus-susception which is from

below upwards. External herniæ, when not strangulated, are mostly replaceable either spontaneously or by taxis; and when strangulated, often admit of cure by the division of the stricture. Even in cases which from adhesions or other causes cannot be relieved in this way, a sort of cure is occasionally effected, either spontaneously or designedly, by the formation of what is called an artificial anus. Diaphragmatic and other internal herniæ are wholly inaccessible to the resources of art. Prolapsus of the uterus and anus, when not inveterate or of great extent, generally admits of cure or relief, either by means directed to increase the tone of the parts, or by mechanical support. In the latter affection, when both these means fail, excision of the protruded portion is often resorted to with success. Retroversion of the uterus is almost peculiar to the impregnated state of the organ, its immediate cause being generally distention of the urinary bladder; and when this is removed, the womb readily recovers its proper position, either spontaneously or by manual assistance. Inversion is perhaps never relieved except by the latter means.

When fluids escape from their natural seats by ulceration or disruption, the prognosis is very various, depending on particular circumstances. That of air into the cellular tissue, constituting external emphysema, generally ends favourably, either by spontaneous absorption or by the aid of punctures. Pneumothorax and abdominal tympanitis are much less curable, being almost always the result of organic lesions. The same may be said of effusions of urine, in which, however, remarkable instances of the curative resources of nature, when aided by the prompt and judicious interference of surgical art, are occasionally met with.

Under the general designation of *functional disorders* may be included all those which are not constantly and necessarily associated with visible changes in the condition or organization of parts. Hence, while in most of the preceding classes of disease, pathology throws more or less light upon the question of curability, in the present it almost wholly fails us. Indeed in many of the most intractable and fatal cases of these affections no morbid appearance whatever can be found after death, or at least nothing beyond slight changes in the vascularity of the part whose functions had been disturbed, and which are considered by the best pathologists rather as effects than causes of the disorder. It is true that the functional disturbance is sometimes associated with, and apparently dependent upon, inflammatory or organic disease; and where the existence of this can be known, it must of course materially influence the prognosis.

In reviewing these disorders, it will be most convenient to arrange them according to the organs or functions most prominently disturbed; and so widely do they differ in regard to their prognosis, and so insusceptible are they of any satisfactory generalization, that it will be necessary to speak of most of them individually.

Functional affections of the nervous system, including disorders of sensation and of the muscles of voluntary motion. Two of these, viz. tetanus and hydrophobia, the pathology of which is extremely obscure, are so fatal, that in the former a cure is comparatively rare, and in the latter almost unknown. The convulsions of infants, though much less commonly fatal than the preceding, are a source of great mortality in the first years of life. In those of puerperal women there is generally a tolerably good prognosis, except where they have been produced by very profuse hemorrhage. Apoplexy is another affection often incurable by reason of its immediate fatality; and even when it does not destroy life, but disappears either spontaneously or by the use of remedies, the ultimate prognosis is greatly influenced by its known tendency to recur. Palsy and insanity, though not of themselves very frequently mortal, are often wholly incurable, and commonly but little under the influence of remedies. Palsy, at least in two of its forms, viz. hemiplegia and paraplegia, is more often connected with visible or organic changes than any other affection of this class. Yet even were the existence of such changes more certainly ascertainable than it can be, it would be necessary to use great caution in drawing inferences as to the prognosis. Thus we have the testimony of Dr. Abercrombie, that in cases of hemiplegia the effused blood may be absorbed and even cicatrization effected, and yet the paralysis occasionally remain; while in other cases the paralysis may disappear before absorption has taken place. While so much obscurity hangs over the pathology of these affections, it need not surprise us that remarkable and unlooked-for instances of recovery, even from inveterate palsy, sometimes occur; and hence we properly draw the distinction between a bad and a hopeless prognosis. If aphonia be considered as a form of paralysis, it affords a striking instance of the uncertainty of prognosis in such affections; since, on the one hand, our anticipations of success from the use of remedies should be anything but sanguine, while, on the other, we know that sudden and complete recovery not unfrequently takes place even when the affection has existed for years.

The prognosis in epilepsy is on the whole bad, the malady often resisting every mode of treatment, even in cases in which after death no pathological cause can be detected. On the other hand, hysteria, which sometimes very nearly resembles it, is generally curable; as in fact are most diseases which depend upon a disordered state of the menstrual function. Catalepsy is probably but a modification of hysteria, and like it generally admits of recovery; as also does chorea. Delirium tremens too often ends fatally to allow in general of a very sanguine prognosis. Hypochondriasis, which seems to be intermediate between dyspepsia and insanity, partaking in some measure of the characters of both, is probably on the whole less curable than the former, and more so than the latter.

With regard to morbid sensations, pain,

ough commonly but a symptom of other fections, constitutes of itself the whole cha- cter of one family of diseases, the neuralgiæ. ike the functional disorders just spoken of, ey are sometimes connected with organic or her appreciable disease of some part of the ervous system, but more often not, even when ey are found utterly incurable. The neural- æ, though often irremediable by any mode of eatment, do not on the whole justify a very favourable prognosis. It must, however, be uch influenced by the particular seat of the in. Thus the tic douloureux, many forms of ad and back-ach, gastrodynia, and angina ctoris, are in general far less remediable af- tions than pleurodynia, sciatica, and lumbago. ith regard to the pains of the chest, chiefly curring in females, and referred to the inter- stal nerves, the pathology is obscure, but the ognosis generally good.

With regard to functional affections of e thoracic organs, the cases ordinarily de- gnated spasmodic croup most commonly end vourably. Some authors, however, deny the istence of the disease. Spasmodic asthma, en when apparently independent of organic sease, is confessedly a very intractable affec- n, the prospect of a perfect cure being on the hole but faint. The same may be said of lpitation and angina pectoris, even in the sence of organic disease; and when, as is en the case, they are associated with it, there n be little or no hope of recovery.

Of the various modifications of functional sorder of some one or more of the digestive gans, there is none which can be regarded as its nature incurable, though many, perhaps st of them, are often very obstinate.

The ischuria renalis, though but a functional sorder, is so often fatal that the prognosis is from good. An exception must, however, made as to those cases in which it is a mptom of hysteric affection. Two other rbid conditions of the renal function, namely, secretion of albuminous urine, and the osphatic diathesis, are perhaps mostly con- cted with organic disease; at any rate they commonly very incurable maladies. Dia- tes has been already noticed as being rather constitutional disease than a mere local affec- n of the urinary organs.

In amenorrhœa, when it is not symptomatic some other disease, the ultimate prognosis generally good, though the affection is often ry tedious and unmanageable. Dysmenor- ea is perhaps even more so.

Congestions.—Although either a general or rtial derangement of the balance of circula- n between the arterial and venous systems y mostly form one link in the chain of cir- nstances which constitute diseases, it is very ubtful whether any one which is recognized nosology can be said essentially to consist in ch a state. If, however, it be otherwise, we y safely assume with respect to prognosis, t though the derangement may be sometimes structive of life, or may eventually lead to emediable changes of organization, it cannot nstitute a disease in its nature incurable.

Parasitic animals are chiefly intestinal worms and hydatids: the former are mostly accessible to the powers of medicine; but the latter, being rarely in open canals, cannot be expelled by such means; so that the question of curability very much resolves itself into that of the practicability of a surgical operation.

2. *Danger to life.*—A large number of diseases are in themselves neither so entirely destitute of danger as to cause no alarm, nor so generally fatal as to excite it in a very high degree. The estimate of danger in these affections must therefore depend on the particular circumstances of each individual case, a subject which forms the second part of the present article. There are, however, other diseases which occupy the two extremes of the scale, some being very commonly fatal, and others as commonly devoid of danger. It properly belongs to a general view of the subject of prognosis to attempt an analysis of the circumstances which determine the location of a disease in either of these two extreme classes. As we have already seen that the light which pathology throws upon the question of curability is frequently very imperfect, so will that science be often found an inadequate guide to the discovery of the extent of danger. It may be premised as a general position, that the ultimate issue of disease, whether in death or recovery, can be less certainly foreseen in acute than in chronic affections.

A. Diseases, invariably or very commonly fatal, may be thus classified in relation to the circumstances which seem to determine the danger.

a. Those in which the whole system receives a sudden and overwhelming shock, most apparent in the disturbed balance of the circulation, and commonly attended with a morbid state of the circulating fluids. In this way certain forms of epidemic fever, especially the plague and yellow fever, (and the spasmodic cholera ought probably to be included,) are very often fatal in their first, or, in the language of Dr. Armstrong, their congestive stage; and sometimes even before the manifestation of any local or characteristic symptoms. It is apparently in an analogous way (though the nervous system is then often more prominently affected than the vascular) that life is sometimes suddenly extinguished by violent accidents or the agency of certain poisons.

b. Those in which organs of great importance to life, or having very extensive sympathies, are affected with inflammation or other considerable disease. Thus encephalic inflammation generally, and especially acute hydrocephalus, apoplexy, carditis, pericarditis, and organic disease of the heart, extensive phlebitis, croup, laryngitis, asphyxia, peripneumonia, peripneumonia notha, and severe or extensive disease of the gastro-intestinal mucous membrane, may all be regarded as dangerous affections. In many of them, and perhaps more particularly in those which are seated in the encephalon, even if we were always able during life to ascertain the extent and degree of the local disease or disorganization, we should

have a very uncertain guide for the prognosis of danger, since the researches of pathology shew that these bear no definite relation to the fatal tendency. The amount of functional disturbance probably affords a better criterion. The cases of cerebral abscess related by O'Halloran strikingly exemplify the occasional retention of life when disorganization of an important organ has proceeded to a very great extent.

c. The tendency to a fatal event seems in some diseases to be rather owing to the kind of morbid change or to its extent, than to the importance of the organ affected. Of the first kind of cause we have examples in strangulated hernia, in gangrene generally, in cynanche maligna, and perhaps in ileus; of the second, in fevers when fatal after re-action, in confluent small-pox, diffuse inflammation of the cellular tissue, and extensive peritonitis.

d. Diseases which are fatal by gradual exhaustion, including the greater part of mortal chronic diseases, as phthisis pulmonalis, laryngeal and tracheal phthisis, chronic bronchitis, empyema, tabes mesenterica, psoas abscess, some organic diseases of the liver, scirrho-carcinoma, medullary sarcoma, peritoneal accretions, ovarian disease, diabetes, &c. It is to be observed, however, that few chronic diseases terminate fatally without the supervention of disease in the bronchial or gastro-intestinal mucous membrane, especially the latter; and such a complication must undoubtedly have an important influence in determining the fatal event, and also affords a ground for predicting its approach. Profuse hemorrhages may be classed among diseases which are fatal by exhaustion. The most common examples are, the rupture of aneurisms, wounds of arteries, and puerperal hemorrhage. In some forms of apoplexy internal hemorrhage seems to be, in part at least, the immediate cause of death.

e. Intense pain, though not often of itself fatal, seems to be occasionally so. Gastrodynia perhaps affords the most frequent and decisive examples.

f. In some affections the prediction of death is rather founded upon the high probability that another and fatal disease will supervene than upon the danger which immediately arises from the existing one. The termination of ischuria renalis in apoplexy or coma is perhaps the most considerable instance.

g. The fatal tendency of puerperal peritonitis seems to be much more explicable by the peculiar condition of the system at large immediately after parturition, than by the seat or intensity of the local affection.

h. There are two diseases, namely, hydrophobia and tetanus, in a very high degree dangerous to life, yet so obscure in their pathology that it seems impracticable to unite them with any other class of mortal diseases.

B. Diseases which in themselves are rarely fatal may be thus classified:—

a. Those in which, although there be general disturbance of the nervous and circulating systems, it is moderate, and unattended by any considerable local affection, such as the ordinary intermittent and continued fevers of this country.

b. Inflammations of parts not essential to life, or not having extensive sympathies with other parts of the body; such as those of the eye, tonsils, parotids, mammæ, testicles, prostate, urethra, vagina, joints (including articular rheumatism and gout), lymphatic glands, and cellular tissue.

c. Organic affections of similar parts, as cataract and many other affections of the eye, bronchocele, hydrocele, sarcomatous and encysted tumours, and hydatids. The principal exceptions are when these affections are such as are considered specific, as scirrho-carcinoma and medullary sarcoma.

d. Certain functional disorders, as epilepsy, catalepsy, chorea, hysteria, insanity, hypochondriasis, the neuralgiæ in general, spasmodic asthma, nervous palpitation, dyspepsia, amenorrhœa, and most of those disorders which are connected with it, as chlorosis and vicarious hemorrhages. Nowhere is the imperfection of pathology, as a guide to prognosis, more apparent than in relation to this class of affections: for example, it is by experience only, and an experience which does not admit of generalization, that we judge of the wide difference in respect of danger between epilepsy, hysteria, and syncope on the one hand, and hydrophobia and tetanus on the other.

3. *Circumstances which may be expected to arise in the course of a disease.*—Although a distinction may properly be made between the appearance of new symptoms during the progress of a disease, and the supervention of new diseases, it must necessarily often be arbitrary, and sometimes obscure; since it wholly depends upon the fact of such symptoms or circumstances being or not being recognized by nosologists as separate diseases. Those which are not generally admitted as such may be arranged under three heads, *critical*, *non-critical*, and *intermediate*, that is, such as are critical in a lower degree, denoting merely a temporary alleviation of the malady.

Critical.—It is to be premised that, though a particular circumstance may in one disease be critical, it may in another, or even in a different stage of the same, be non-critical. Thus profluvia, hemorrhages, and tumours, which towards the termination of fevers are often critical, are mostly not at all so in the earlier periods of their progress. Whether critical circumstances be the cause, sign, or effect of the termination of the malady, is a question of little moment in relation to prognosis, though it may be one of much interest with regard to practice.

In treating of critical circumstances, we find a distinction of much practical importance, namely, as they indicate the permanent removal, or merely the temporary disappearance of a disease. The former are chiefly seen in continued fever and acute inflammations. Why, in such affections, one symptom or circumstance is critical rather than another, is a question involved in much obscurity. What has been called the constitution of the season appears to

ve considerable influence. Thus in some idemics, fevers most commonly terminate by eating; in others, by purging; though perps the most frequent mode is by copious inary deposits. In other cases the crisis is arked by hemorrhages, abscesses, buboes, or rbuncles, There seems in fact little beyond ere experience of the prevailing tendency, to ide us in the anticipation of the particular cumstance which is likely to mark the solun. The constitutional predisposition of the dividual has, however, probably some share; d also the characters of the disease, in regard the organs or functions which are most ominently disturbed. It might indeed be njectured that when the function of an organ s been interrupted by disease, it would, at e cessation of that disease, be renewed with gmented energy. And perhaps, as a general sition, this has some foundation in truth. seems to be in degree illustrated in the asmodic cholera, in which affection, while the rce of the disease falls very much upon the gans concerned in digestion, healthy bilious cretion often marks its favourable termination. ne position must, however, be received with nsiderable limitation. Thus, as Laennec ates, peripneumonia much more often termiates with urinary deposits than with copious uta.

In those affections which are characterized accessions or paroxysms returning at interals, the termination of the paroxysm is very mmonly marked by some critical circumance. Such is the sweating of ague, the exectoration in some forms of asthma, vomiting pyrosis, perhaps the swelling of the foot in gular gout, sleep in epilepsy, and the secreon of lithic acid in some of those painful affecons of the loins which are too indiscriminately lled fits of stone or gravel, there being often o evidence whatever of the passage of such oncretions.

Intermediate.—In many diseases we can redict, with more or less certainty, the occurence of circumstances which, though they by o means denote the cessation of the malady, ommonly imply a certain measure of relief. uch are dropsical effusions and hemorrhages n organic diseases and chronic inflammations f important organs, as the brain, heart, lungs, nd liver. It is true that such an occurrence ay itself constitute a more troublesome or imediately dangerous disease than the primary ne which it tends to alleviate; and perhaps his is more particularly the case in regard to he brain, owing to the mechanism of the ranium. But even there we have strong reasons or supposing that hemorrhage occasionally, nd serous effusion more often, serves to mitiate existing diseases. Effusion into the joints nd neighbouring tissues, in gout and articular heumatism, is also generally attended with ome alleviation of suffering. In hectic and in emittent fevers, sweating, urinary deposits, and ther secretions, make an imperfect solution; nd this is observable, though in a less degree, n the daily history of even continued fevers.

Non-critical.—Under this designation may be comprehended all those circumstances, whether they be pathological changes or functional derangements, which make up the history of a disease, and which consequently may be predicted when that history is known. It is evident that prognosis of this kind is chiefly available in those affections which have a more or less determinate course and regular succession of events, the occurrence of which may be foreseen from the commencement. Such is the series of events which constitute a fit of ague, and the succession of symptoms in acute exanthemata, gout, syphilis, yellow fever, and epidemic diseases in general. The following may be instanced as some of the more considerable examples of non-critical circumstances whose occurrence may be predicted in certain kinds of disease.

a. In fevers and febrile affections generally, daily exacerbations and remissions in the symptoms may be looked for, commonly more or less nearly corresponding with the hours of sunset and sunrise. These are most conspicuous in the fevers called remittent, (as indeed their designation implies,) including infantile remittent fever, and in hectic fever; in which latter some authors distinguish two daily exacerbations, namely, about noon and sunset. Among acute inflammations, rheumatism and gout present these daily variations most conspicuously. In many cases of neuralgic affections and chronic rheumatism, the daily accessions occur at very different hours from those above named, governed by circumstances which are wholly unknown, and as to which it is impossible to generalize.

b. In inflammations, certain pathological results, varying with the tissue or organ affected, may be more or less confidently predicted. Thus inflammation of the mucous membranes, the skin, and cornea, is most liable to pass into ulceration; that of the former also often leads to softening, and occasionally, as in croup and diphtheritis, to effusion of coagulable lymph, or false membrane. Serous effusion, and the formation of false membrane resulting in adhesions, are the most common effects of inflammation of serous membranes. Erysipelatous inflammation frequently tends to gangrene; so also, in the opinion of Dr. Abercrombie, does inflammation of the muscular tissue, as in the enteritis of Cullen, and in ileus. Inflammation of the cellular tissue, kidneys, tonsils, mammæ, and, in India, that of the liver, ends chiefly in suppuration and abscess. In gout and rheumatism there is a tendency to those effusions into the white fibrous tissue which cause stiff joints; and in gonorrhœa, to the thickening which produces stricture. The pathology of phlegmasia dolens is yet involved in much obscurity; but as a point of prognosis, it deserves notice that its appearance may be often foreseen when much pain is felt in the groin soon after parturition.

c. Certain organic affections have a pathological course peculiar to themselves. Thus tubercles pass through the process of softening; scirrhus goes on to carcinoma; medullary sarcoma to hemorrhage; and ulceration of the

articular cartilages to abscess and sinuses in the surrounding parts.

d. In diseases which cause long confinement to bed, and are attended with much emaciation and general loss of vital power, the occurrence of bed sores is to be apprehended. Hence they often appear in protracted fevers, phthisis pulmonalis, inveterate lues, the worst cases of insanity, &c. Somewhat analogous to this is the tendency of punctures in anasarcous limbs to cause gangrene.

e. Perhaps in most fatal chronic diseases, and certainly in phthisis pulmonalis, the appearance of slight delirium may be expected to precede death.

f. Lastly, some individual diseases are liable to circumstances peculiar to themselves, and not admitting of being generalized. Thus the disappearance of cynanche parotidæa is very commonly attended by swelling of the testes or mamma; and inveterate ague produces indurations of the liver and spleen.

4. *Supervention of new diseases.*—There are many varieties as to the mode in which this occurs. Thus the disappearance of the primary affection, and the development of a secondary one may be simultaneous; and if the nature of both diseases be the same, the substitution of one for the other is called metastasis or translation. Again, there may be an interval between the cessation of the first affection and the appearance of the second, as is sometimes observed when phthisis pulmonalis follows measles. Or, lastly, the two may co-exist. It is to be observed, that although some diseases always supervene in the same way, this is by no means the case with all: thus disease of the heart and pericardium may either replace articular rheumatism or co-exist with it. It may perhaps be assumed as a general position, subject, however, to exceptions, that when the primary disease is acute, the supervening one commonly supplants it; but when it is chronic, they go on together.

The circumstances under which new diseases supervene upon previously existing ones may be thus generalized:

a. A great degree of vascular disturbance of the system at large is very prone to end in local inflammation, its particular seat being apparently in great measure determined by the predisposition of the part. Thus local inflammations very often occur in the course of fevers and acute exanthemata; and hysteritis or peritonitis follows profuse puerperal hemorrhage. Perhaps the frequent appearance of encephalic inflammation after violent concussion may be referred to the same head.

b. It has been already observed that chronic diseases of important organs, as the lungs, heart, brain and its membranes, liver, and mesentery, very commonly lead to disease of the gastro-intestinal and bronchial mucous membranes.

c. Diseases attended with great exhaustion, as protracted fevers, phthisis pulmonalis, diabetes, diarrhœa, and hemorrhages, generally induce anasarca. In organic diseases of important viscera, not only does dropsy take place in the cellular tissue, but also often in the cavities; and as a general though not universal rule, more especially in those with which the diseased viscera are more particularly connected. Thus hydrothorax and hydropericardium are found to supervene upon disease of the heart and lungs; ascites upon those of the liver and abdominal viscera generally; while most organic affections of the encephalon sooner or later cause serous effusion into the ventricles, or between the membranes.

d. Many cases of supervening disease seem referable to the relation or sympathy which subsists between different tissues of the same organ, and between the external and internal parts of the same region of the body. Some of these cases are strictly metastatic; in others, the primary and secondary diseases co-exist. We have examples in inflammation of the brain and its membranes ensuing upon erysipelas of the face and scalp, upon injuries of the latter, and upon otorrhœa and ophthalmia; in pleurisy occurring in peripneumony and phthisis; in the alternation of abdominal dropsy with diarrhœa or dysentery; perhaps also in anasarca following scarlatina, though in other exanthematous affections little or no tendency of this kind is observed.

e. Continuity of tissue, together with close alliance in function, is a cause of secondary diseases, most conspicuously seen in the mucous membranes. Thus, stricture of the urethra and disease of the prostate are apt to lead to disease of the bladder; and the latter, including vesical calculi, to disease of the kidneys. Common catarrh is often followed by an analogous affection of the rectum and urinary bladder, and by an herpetic affection of the upper lip; the diphtheritis of Bretonneau is very prone to pass into croup; and cynanche maligna, and occasionally pertussis, into bronchitis. An American anatomist states that he has traced the continuity of the white fibrous tissue of the limbs with that which enters into the structure of the pericardium, and thence deduces an explanation of pericarditis supervening upon rheumatism. A more simple and natural explanation appears to be that rheumatism is a disease which attacks muscles and fasciæ generally, and therefore, among the rest, occasionally affects the heart and pericardium.

f. The supervention of a new disease seems sometimes to arise from a peculiar sympathy or relation between parts which are neither contiguous, nor immediately connected in function. We have examples in the chylopoietic viscera and encephalon: thus encephalic inflammation not unfrequently ensues upon hepatitis; while the latter is sometimes produced by injuries of the head. So in fevers, meningeal inflammation is found to follow that of the gastro-intestinal mucous membrane, or the reverse. Again, infantile remittent fever is often the precursor of acute hydrocephalus.

g. When a constitutional predisposition or diathesis, such as the scrofulous or tuberculous, subsists, various diseases will either call it into activity for the first time, or, if it had previously been developed in an organ in a latent and

nsuspected state, make its presence manifest. This latter is perhaps often the case in regard to the apparently exciting causes of phthisis pulmonalis. Thus all diseases which occasion great prostration of strength, as protracted fevers, exanthemata, diarrhœa, diabetes, and chlorosis, are apt, in the predisposed, to lead to tuberculous disease or external scrofula. So also inflammations or other diseases of the organs most liable to these affections will often call them forth: thus pneumonic inflammation, bronchial catarrh, and sometimes pleurisy, will pass on to phthisis pulmonalis; and inflammation of the mucous membrane of the small intestines into tabes mesenterica. Perhaps the frequent termination of spasmodic asthma in phthisis may be properly classed with the preceding facts. If the constitutional diathesis be already manifested in one organ or tissue, there will be much reason to suspect its present latent existence, and future development in others. Thus external scrofula is often the precursor of phthisis pulmonalis and tabes mesenterica; acute hydrocephalus has been observed to supersede threatened consumption; and Dr. Baron states that accretions may be expected to take place in the pleura, when they already occupy the peritoneum. So, also, the extirpation of medullary sarcoma in one organ is commonly unavailing, owing to its existence or development in others.

h. The disappearance of a morbid action or secretion of a part, or the absence of its accustomed return, is very often followed by disease in some other parts; more especially if the constitution had been long habituated to the preceding affection, or if that affection had suddenly disappeared. Cases of this kind constitute a numerous family, apparently very capricious in their individual characters, and little susceptible of useful generalization. Thus the disappearance of cutaneous diseases, profluvia, hemorrhages, purulent discharges, &c. may give rise to internal diseases of all kinds and localities, the particular nature and seat being of course very much influenced by the patient's age, habits, &c. as is illustrated by the well-known liability of aged persons, under such circumstances, to apoplexy and palsy. The following cases may be enumerated as of most frequent occurrence, and consequently of most practical importance in regard to prognosis:—the various forms of irregular gout, which (whatever be our view of the pathology of the disease) may be fairly considered to be caused by the absence or premature recession of the disorder from the extremities; hysteria and vicarious hemorrhages, resulting from amenorrhœa; the various diseases to which women are subject when they cease to menstruate, of which scirrho-carcinoma is the most important, if not the most frequent; apoplexy and palsy, following the suppression of hemorrhoids in the aged; the alternation of gout and gravel; the occurrence of hernia humoralis, when gonorrhœa is hastily stopped by astringents; the termination of ischuria renalis in fatal coma; and the occurrence of some general and fatal disease after extirpation of a merely local one, as scirrho-carcinoma of the breast.

i. The obstruction of excretory ducts by the impaction of concrete matter frequently gives rise to disease. Thus jaundice is often caused by biliary calculi lodging in the ductus communis; and it occasionally happens that both the ureters are obstructed by calculi so as to induce ischuria renalis.

k. It is more particularly in regard to the brain and nervous system that we meet with instances of one functional disorder passing into another; though, as is often the case, both may be independent of any vascular or organic change. Thus epilepsy and chorea occasionally lead to fatuity, and mania to complete amentia.

l. There is a question of much practical interest in regard to prognosis which is entitled to some notice in this place; namely, whether there is a general tendency in functional disorders to pass into inflammation or organic disease. Notwithstanding the statements of Dr. Wilson Philip, the general experience of physicians seems to furnish a negative answer to this question, as it respects the most common of all functional disorders,—those of the digestive organs: and the same may be said of palpitations of the heart. In some of the functional disorders of the brain and nervous system, especially mania and epilepsy, pathologists have however, in a large proportion of cases, noted appearances of vascular derangement, and in many, even of disorganization; as especially the Wenzels, in regard to epilepsy. Unnatural vascularity of the spinal chord is also said to be commonly found in fatal cases of tetanus and hydrophobia, and even in those of spasmodic cholera; but it is very doubtful whether it constitutes any important part of the pathology of these affections. Perhaps the same may be said of the morbid vascularity generally found in the kidneys in fatal cases of diabetes.

5. *Duration of disease.*—The distinction between acute and chronic diseases of itself implies some sort of prognosis of their duration, yet necessarily a very imperfect one, not only because the limits of the two classes admit of no precise definition, since the same kinds of disease sometimes belong to one, sometimes to the other; but also because there is a wide range of duration among diseases referred to the same class, as for example between a twenty-one days' fever, and the worst forms of plague and spasmodic cholera. Fevers in general are considered acute affections; the only considerable exception being those which are symptomatic of organic diseases, and which mostly assume the form of hectic. Inflammations, with very few exceptions, may be either acute or chronic; and so difficult is it often found to determine to which class a given case ought to be referred, that many modern pathologists have resorted to the expedient of distinguishing a third and intermediate class, which they call subacute.

Profluvia, hemorrhages, and dropsies, diseases which have much natural affinity with inflammations, are, like them, both acute and

chronic; mostly assuming the latter form when they are symptomatic of organic affections. The cachexiæ are in their nature chronic; and it is well known that when inflammation occurs in persons whose constitutions are infected with scrofulous or tuberculous disease, it commonly assumes a chronic, and at most a subacute form. Organic changes and structural lesions are necessarily chronic. Of functional disorders, some are essentially acute, as apoplexy, hydrophobia, and tetanus; others almost always chronic, as dyspepsia and hypochondriasis; many, sometimes one, sometimes the other, as paralysis and the neuralgiæ; and, lastly, some are of an intermediate or anomalous character, being chronic as a whole, but acute as to the successive paroxysms, as epilepsy and spasmodic asthma.

However uncertain the prognosis of the duration of diseases may commonly be, it is, as a general rule, much less so in acute than in chronic affections; and in some of the former it is in a considerable degree determinate. Of these we find examples in certain endemic or epidemic fevers, as well continued as intermittent and remittent; in some of the exanthemata, especially small-pox and measles, and some varieties of herpes; in acute inflammations in general, including hydrocephalus acutus; in acute profluvia, especially when epidemic, as catarrh and dysentery; in hydrophobia, tetanus, and perhaps ischuria renalis. The acute diseases, whose duration can least be calculated upon, are such as are associated with the scrofulous or tuberculous diathesis, or with secondary syphilis; those inflammations in which the inflammatory action is but slight, as pertussis; and such as are prone to shift their seat, as especially rheumatism.

Of course in proportion as the nature of the disease itself throws little light on the question of its duration, we are obliged to have recourse to the particular circumstances of each individual case, and in chronic diseases these constitute almost our sole guide.

A subsidiary means of predicting the duration of some acute diseases is derived from the knowledge of what are termed *critical days*. They have been chiefly observed in fevers, and in this work are properly treated of under that head. A general notice of the subject is all that can be attempted here.

Critical days are those on which experience has shewn that fevers most commonly terminate. Authors have more particularly noted as such the third, fifth, seventh, ninth, eleventh, fourteenth, seventeenth, and twentieth, being separated in the earlier stages by periods of two days, in the later of three, and perhaps even more. Supposing the distinction to be founded in truth, we are thus able to predict with more or less confidence, at any period of a fever, that it *may* terminate on the next critical day or on any subsequent one, but that its cessation is not likely to occur at any intervening time.

The term critical days properly denotes nothing more than the fact of termination, without any reference to its being favourable or the reverse. As to this point some authors have, however, made a distinction of days in regard to fevers generally, and with more appearance of truth as to some particular diseases. Thus Sydenham, in his admirable description of small-pox, has noted the eighth day in the distinct form, and the eleventh in the confluent, as those on which the disease is most apt to terminate fatally.

It is obvious that the mere knowledge of the existence of critical days can be of little avail for prognosis if there be no means of predicting on which of them a disease is likely to terminate. This has been supposed to be in some degree furnished by certain intervening days called *indicative*, because the occurrence of particular symptoms on them is considered to denote the termination of the affection on the next critical day.

The law which determines the series of critical days in fevers of a continued type seems to be a modification of that which regulates the periodical recurrence and termination of the paroxysms of intermittents, and the less definite course of remittents. It seems indeed as though the existence of critical days was most discernible, and consequently most available for prognosis, in proportion as fevers tend to the remittent character; and it is probably owing to the slight tendency to this character in the common continued fevers of our own country that the subject so little either occupies our attention or influences our practice.*

6. *Liability to recurrence or relapse.*—By the former of these words is properly meant the re-appearance of a disease after an interval of exemption from it; by the latter, its renovation during the period of convalescence. There are very few diseases that may not, and that occasionally do not, recur when circumstances favour their production. With some, however, it very rarely happens: such are, 1. diseases which are almost uniformly fatal; 2. those epidemic fevers which appear to be partly propagated by infection or contagion, as plague, yellow fever, and typhus, and also rubeola, scarlatina, variola, pertussis, influenza, and perhaps spasmodic cholera. It is to be observed that diseases which are manifestly contagious, without being epidemic, such as syphilis, are by no means indisposed to recur. 3. Diseases which are almost peculiar to infancy and childhood, or the adult age, are of course not likely to recur in after life: such are infantile remittent fever, convulsions, porrigo, chorea, chlorosis, and perhaps epistaxis. 4. The organic results of some diseases seem to oppose an obstacle to their recurrence. Laennec asserts that this is the case with extensive adhesions from pleurisy, and it is certainly so with hydrocele when cured by exciting adhesive inflammation.

The diseases which most frequently recur may be distinguished into two classes, accord-

* One of the most exact and satisfactory reports which has appeared of late years on the subject of critical days in the fevers of our own climate is to be found in Dr. Welsh's account of the epidemic fever of Edinburgh in 1818.

g as the recurrence is regular and periodical, irregular and as it were accidental. Those hich ordinarily belong to the first class are w in number, the principal being intermittent vers. In these, the type being once known, e are able to foretel the appearance of the ext fit. The prognosis must, however, be rmed with some limitation, since not only ay art interfere, but there appears to be very ften a natural tendency in these fevers to cease pontaneously after a certain though variable umber of paroxysms. Some neuralgic affec- ions, especially headach, frequently assume a eriodical character, observing the ordinary eriods of intermittent fevers, and that even hen they cannot be referred to malaria. The nly other diseases which are often observed to eturn periodically are gout and spasmodic sthma, and in these the periods of recurrence orm no part of the general character of the lisease, but vary in each particular case. There are besides numerous other affections which occasionally observe very exact periods of return. The principal are hemorrhages, especially hemorrhoids; profluvia, as diarrhœa; and some functional disorders, as mania, epi- lepsy, and jaundice. But as these peculiari- ties belong to the individual, and not to the disease, they are of no general interest in prognosis.

The liability of diseases to return irregularly and accidentally may in general terms be as- cribed to the continued influence of some cir- cumstance which stands in the relation of a cause, either predisposing or exciting, but more commonly the former. Such causes may be thus classed:

a. Organic disease frequently gives rise to the repeated recurrence of other diseases, and these may affect either the part in which the organic disease is seated, or others more or less remote. Of the former we have examples in the liability to repeated attacks of pleurisy, peripneumony, bronchial catarrh, and hemo- ptysis, which attends the presence of tubercles in the lungs; in the tendency to spasmodic stricture, where permanent stricture exists; in the frequent occurrence of partial peritonitis and ascites, when the liver is organically dis- eased; of menorrhagia, in cases of scirrhous uterus; and of affections of the intestinal mu- cous membrane, in disease of the mesenteric glands. We have examples of organic disease in one part causing repeated morbid affections of other parts, in the anasarca and various hemorrhages which attend diseases of the heart, and in hematemesis and melæna ac- companying that of the liver.

b. Nearly allied to the preceding description of cases is the well-known tendency of chronic affections to assume more or less frequently during their progress an acute character. Perhaps this is most conspicuously seen in the serous membranes, as in the pleura, peritoneum, and arachnoid membrane.

c. In many cases the liability to a particular disease on the application of slight exciting causes seems referable to some defects, not amounting to notable disease, in the vascular or nervous apparatus of a part, the result of previous attacks. It is most conspicuously seen in affections of the skin and mucous membranes, as for example in ophthalmia, cynanche tonsillaris, catarrh and bronchitis, diarrhœa and dysentery, gleet and leucorrhœa, diseases which, if they have once occurred, often leave a manifest tendency to their repro- duction. In numerous other cases, however, the tendency in a disease to re-appear seems to admit of no such pathological explanation, nor indeed of any other satisfactory one, how- ever we may attempt to conceal our ignorance by the use of such terms as mobility, excita- bility, and the like. In many of these affec- tions the vascular system is prominently dis- turbed. Such are erysipelas, biliary calculi and jaundice, gout, rheumatism, hemorrhoids, puerperal hemorrhage, amenorrhœa, dysmenor- rhœa, phlegmasia dolens, and calculous affec- tions of the urinary organs. In others, as palsy, epilepsy, insanity, neuralgia, palpita- tion, angina pectoris, spasmodic asthma, hic- cup, dyspepsia, colic, and hysteria, the ner- vous system seems to be most affected.

d. Repeated attacks of the same disease often originate in the presence of some con- stitutional diathesis or depraved state of the general health. Hence the frequent recurrence of constitutional syphilis and of scrofulous affection of the glands and joints, the forma- tion of successive crops of tubercles in the same or different organs, and the liability to scirrho-carcinoma, medullary sarcoma, car- buncles, &c.

e. Affections peculiar to certain periods of life are liable to recur during those periods, as epistaxis in childhood, and cerebral hemorrhage in old age.

f. Affections which may be traced to the in- terruption of some function, as hysteria and vicarious hemorrhages to suppression of the menses, may of course be expected to recur as long as the interruption continues.

The practical application of our knowledge of the liability to the recurrence of disease under the several circumstances now enume- rated, consists chiefly in the avoidance of the occasional and exciting causes, since the per- manent and predisposing ones are for the most part beyond our reach.

By the term *relapse* is properly signified the renewal of a disease during the period of con- valescence, or before the effects of the pre- ceding attack have entirely disappeared. Hence it is almost exclusively applied to acute dis- eases, especially fevers and febrile affections generally, including acute inflammations. The liability to relapse may be said in general terms to be in an inverse proportion to the complete- ness of the recovery. In epidemics it appears to depend in part upon their prevailing character and tendency, being much greater in some than in others; and it seems to be a general rule that when an affection, which ordinarily terminates by some marked crisis, has receded without such an occurrence, or when it has

disappeared early and suddenly, without running its usual course, there is a more than common danger of relapse. It is also laid down as a maxim by Hippocrates and other writers who treat of critical days, that when fevers end on non-critical days the patients are peculiarly liable to a relapse.

II. *Of the prognosis of disease as deduced from the particular circumstances of individual cases.*

Our judgment of the future in many cases of disease is greatly influenced by the consideration of their being *primary* or *secondary*, *idiopathic* or *symptomatic*. The question of the curability and probable duration of a secondary or symptomatic affection is commonly very much involved in the prognosis of the primary one. This general rule, however, requires some limitation. Thus dropsical affections, which are symptomatic of organic disease of the heart, are not unfrequently removed, at least for a time, though the primary affection be wholly incurable. There is, however, in such cases, as has been formerly observed, great liability to a recurrence of the secondary malady.

The principal cases in which prognosis is influenced by the secondary or symptomatic character of the disease may be classed under the following heads.

a. Fever which is symptomatic of local inflammation of an acute character cannot be removed while the inflammation subsists. With regard, however, to the febrile state which attends local diseases of a more chronic and passive nature, and which often assumes the form of hectic, the same position cannot be assumed, except with considerable modification. Here we not only often meet with great spontaneous variations, the causes of which are mostly but little known, but we even find the hectic fever, to a certain extent, under the control of remedies. Thus the power of sulphuric acid to diminish the sweating is generally admitted, and the influence of bark is attested by high medical authority.

b. When local inflammation or other disease arises during the progress of continued fever, it is by no means necessary that the primary affection should cease before the secondary one can admit of removal. Indeed, when the local affection does not proceed to disorganization, it more commonly disappears before the cessation of the primary fever. It may perhaps be assumed as a general rule that the symptoms of a local affection arising in fever are more prominent and severe than those of an idiopathic affection of the same character and tendency. The treatment of fever appears to be generally influenced by this rule, and its bearing upon the question of prognosis is obvious.

c. What has been above stated in regard to hectic fever is also applicable to other affections which are symptomatic of organic diseases; that is to say, the secondary affections are not only subject to great spontaneous variations, but may often be mitigated or removed by medical art, though the primary disease be permanent and incurable. As illustrations of this we may cite those symptomatic affections which are common to organic diseases in general, namely, hemorrhages, dropsies, and affections of the bronchial and gastro-intestinal mucous membranes, and many others which are more proper to particular ones, as pleurisy and peripneumony to tuberculous phthisis; dyspepsia, pyrosis, gastrodynia, and obstipatio, to organic diseases of the stomach; dysentery, to those of the liver; and dysuria, tenesmus, &c. to diseases of the urinary and genital organs.

d. Affections which are symptomatic of a deranged or interrupted function are mostly very unmanageable till the latter is restored. The most remarkable examples are furnished by the various diseases which attend amenorrhœa, such as hysteria in all its forms, regular and irregular, hematemesis, obstinate vomiting, suppression of urine, &c. While the menses are absent or defective, these affections are very little under the control of remedies; but though they often assume a threatening aspect, experience teaches us that there is very little danger to life. For our knowledge of the great and extensive influence of derangements of the digestive organs in producing or maintaining various morbid affections, we are very much indebted to the sagacity of Abernethy. These affections sometimes present a formidable aspect, such as violent palpitation of the heart or interruption of its action, angina pectoris, palsy, and even a state like apoplexy; others, though less alarming, are very distressing, as neuralgia and asthma; and all of them, however generally exempt from actual danger, can only be treated with success by means which act upon the primary disorder.

e. Besides the above principal varieties of symptomatic affections, there are some more anomalous ones which deserve notice; especially worms and teething, which give rise to convulsions and various other diseases of children; and pregnancy, the origin of a long list of disorders, as vomiting, indigestion, costiveness, &c. These are all more or less subject to the general rule, that the removal of the symptomatic affection is in a great measure dependent upon that of the primary one.

f. When one disorder succeeds to or takes the place of another, the prognosis does not appear to be in general different from what it would have been if the secondary affection had occurred primarily. Dr. Cheyne, however, states that hydrocephalus supervening upon and displacing enteric disease, is more dangerous than when it occurs primarily. On the other hand, insanity is found much more often to admit of recovery when it is induced by some preceding affection, as fever or pregnancy, than when it arises spontaneously.

g. When primary and secondary diseases subsist together, the complication generally makes the prognosis additionally unfavourable; as, for example, when ulceration of the intestinal mucous membrane is superadded to

hthisis pulmonalis. Sometimes, however, the tal termination of a disease appears to be tarded by such complications, as in the well-nown case of mania suspending the progress f phthisis.

In many kinds of disease the prognosis is uch influenced by the nature of the *exciting auses*. The following may be noted as some f the more prominent examples of this ind.

It seems to be a general rule that epidemic isorders are more tedious, unmanageable, and angerous, than affections of the like nature nd intensity which appear sporadically, and rise from some known causes peculiar to the ndividual, such as exposure to cold, intem-erance, &c. This is very observable in regard o affections of the bronchial and gastro-intes-inal mucous membranes. There seems to be n exception to this rule in some diseases which are traceable to the influence of marsh niasmata; as, for example, neuralgic affections, which are then more curable, supposing the uture action of the cause be avoided, than when they arise from cold, &c.

Local inflammations, abscesses, and ulcers, when originating from an external injury or other cause which affects the part only, gene-rally afford a much better prognosis than when they appear spontaneously; because in the latter case they have generally a constitutional origin, often of the nature of a cachectic dia-thesis. Tetanus, however, is more fatal when the affection is produced by a local injury than when it is referable to a cause acting on the system at large, as cold. We may here advert to the well-known fact, that in fractures or other severe local injuries, the prognosis is more unfavourable when the violence done to the part is accompanied with a general shock to the system.

In some affections of the nervous system, the prognosis appears to be partly influenced by the nature of the exciting cause, though in a way which cannot easily be explained. Thus epilepsy and insanity are said to be peculiarly intractable when they have been first brought on by fear or terror.

The mode of invasion is a point of much importance in the prognosis of many acute diseases, as fevers and febrile disorders gene-rally, including the exanthemata. The first shock is sometimes so violent, or the progress of the disorder so rapid, that before remedial means can operate, life is extinguished, or ir-reparable disorganization produced. This is often seen in severe epidemic diseases, as plague, spasmodic cholera, &c.; and, among local inflammations, in meningitis and oph-thalmia. If we except cases of the above de-scription, it may be laid down as a general rule, that in proportion as the first invasion of an acute disease is well-marked and decisive, it will be found not only more controulable by remedies and shorter in duration, but also less likely to terminate fatally, or to cause per-manent disorganization. On the other hand, where a disease is insidious and imperfectly developed in its commencement, remedies are generally less efficacious; and even were it otherwise, the early diagnosis is often so ob-scured as to prevent their being resorted to with sufficient promptitude and energy. Chro-nic affections are generally more or less indis-tinct at their commencement, and are very often so much so as to baffle all attempts at precise diagnosis. In proportion as this is the case, the prognosis is commonly unfavourable, the efficacy of remedies being mostly less decisive, and the event often revealing an ex-tent of disease little suspected in its earlier stages.

Regularity or irregularity of progress, as a guide to prognosis, is applicable only to dis-orders which have a pretty marked and deter-minate course, as especially to the exanthemata. In these affections, any considerable deviation from the accustomed course, as a premature disappearance of the eruption, furnishes an unfavourable augury; such cases not unfre-quently ending fatally, even when there has been no peculiar severity of symptoms, or other circumstances, to excite alarm. Gout is an-other disease in which irregularities are often the precursors of dangerous and sometimes of fatal consequences. There is one disorder which affords an apparent rather than a real exception to the preceding rule. It is well known that, in intermittent fevers, changes in the accustomed hours of access of the paro-xysms, whether they occur spontaneously or are caused by the use of remedies, often predict the approaching cessation of the malady.

In many diseases, especially those of a chro-nic character, the prospect of recovery is much influenced, and in general unfavourably so, by the length of their *past duration*. This in-fluence seems to result from various causes, of which what may be called the force of habit is perhaps the most considerable. Its operation is conspicuously seen in many of those affec-tions which are chiefly referable to the nervous system, as well as in others in which the oc-currence of some secretion or other form of evacuation indicates disorder of the vascular apparatus of the part affected. Of the former we have examples in epilepsy and the neu-ralgiæ; of the latter in hemorrhoids and leu-corrhœa; while spasmodic asthma and gout are cases of a somewhat mixed character. In all these affections, and in many others of the same kind, the hope of recovery is in general small in proportion to their duration, and to the influence of habit which that duration implies. Another cause which renders the duration of a disease unfavourable to the hope of recovery, is its tendency to produce changes in the orga-nization of parts. Perhaps all the affections commonly called nervous have more or less of this tendency, as, for example, epilepsy and asthma. It is, however, more conspicuously seen in some other diseases, as ague, gout, and rheumatism; in all of which the inveteracy of the affection is found to be increased by the production of organic changes. A third mode in which diseases become more intractable by continuance, is by diminishing the vigour of the system, and consequently its powers of re-

sistance. This is illustrated in many kinds of chronic discharges.

The cases in which the prospect of recovery is improved by the duration of the disease are chiefly those in which it is observed to have a natural tendency to exhaust itself after long continuance. Examples are furnished by some of the chronic cutaneous diseases, as porrigo, and perhaps lepra. A tendency of the same kind is in some instances connected with age. Thus external scrofula and dyspepsia, however intractable during the earlier periods of life, are often found to diminish or disappear in mature and middle age.

With regard to the influence of the duration of disease upon its danger, it is obvious that all those affections which have a tendency to destroy life, either by inducing fatal disorganization, or by exhausting the vital powers, become increasingly dangerous in proportion as their continuance is prolonged.

Of particular symptoms.—In the infancy of pathology a great number of symptoms which, either singly or in conjunction, are now known to indicate certain kinds of disease, merely served as guides to predict the event of individual cases. Thus, much of what Hippocrates has said on the subject of prognosis more properly belongs to that of diagnosis; and it is probably in a great measure owing to the change above noted in the relative position of these two branches of medical science, that while the latter increasingly occupies the attention of physicians, and has given birth to many valuable systematic works in our own times, the former has, for the last half century, almost ceased to be the subject of distinct treatises.* That part of prognosis which is independent of diagnosis being thus restricted in its materials, will not require a large proportional space in this article. It will be found that in local affections generally the most prominent symptoms are essentially diagnostic, and therefore foreign to our present object. In affections of a more general nature, such especially as fever, the case is different; and numerous symptoms present themselves which do not appear to be diagnostic of any particular state of disease, but which greatly influence our judgment of the event. These will necessarily occupy a prominent place in the following enumeration. It must, however, be borne in mind that in many cases our knowledge is too imperfect to enable us to determine with certainty what symptoms are properly diagnostic, and what are merely prognostic.

It is a general rule that the disappearance of the several morbid circumstances in the condition and functions of the body which constitute disease marks the approaching return of health; and, in fact, great part of the prognosis of particular diseases, as stated in systematic works, is of this kind. It seems, however, useless to extend an article like the present by an enumeration of points so self-evident. The chief exceptions to the above rule are to be found in the disappearance of one or more morbid circumstances while others remain. Indeed, in a large proportion of cases of disease, the prognosis is rather deduced from a general consideration of all the symptoms than from changes in particular ones; and hence arises an imperfection inseparable from this branch of the subject.

As the consideration of every individual morbid symptom would be at once tedious and unprofitable, it will be sufficient to particularize those which are most important and of most general application to the subject of prognosis.

Symptoms chiefly referable to the nervous system.—Delirium being one of the most common symptoms of fevers and febrile disorders generally, cannot in itself be considered unfavourable. In two of its forms, however, it indicates a threatening state of disease; namely, the delirium ferox, which perhaps mostly implies meningeal inflammation; and the muttering delirium which is one of the characters of typhus and adynamic fevers. An access or increase of delirium sometimes precedes a crisis in fevers; and, on the other hand, its cessation, though a favourable occurrence when conjoined with other marks of lessening disorder, is not unfrequently but the commencement of stupor and coma, or a part of that delusive calm which has been already adverted to as sometimes taking place before the fatal termination of many acute affections. In encephalic inflammations generally, including acute hydrocephalus, the violence and duration of the delirium is one measure of the severity and consequent danger of the disease. In acute pulmonary affections and also in jaundice, the occurrence of delirium has always been regarded as more or less alarming. That which frequently follows some local injuries does not appear to denote peculiar danger. In chronic diseases generally, particularly in phthisis pulmonalis, its occurrence is one of the most unequivocal indications of the approach of death.

Besides delirium, there are other modifications of mental disorder very common in fever and encephalic inflammations, which, when they are prominent, generally denote a severe and formidable disease. Such are, an expression of great confusion in the countenance, corresponding confusion of thought, and want of any recollection of things said or done immediately before.

The expression of great anxiety in the countenance and manner is a very unfavourable symptom in acute affections; while hope and cheerfulness, when not arising from delirium, are of good omen, being at once a cause and an indication of amendment. In many chronic affections, however, these indications are reversed. Thus in dyspepsia, jaundice, hypochondriasis, &c., anxiety and depression of

* In a list of fifty works appended to the article *Pronostic*, in the 45th vol. of the Dict. des Sciences Médicales, which was published in 1820, thirty-five are of dates prior to 1700, (a majority of them being rather comments on Hippocrates than original treatises,) fifteen between 1700 and 1777, and none later.

rits by no means imply any well-founded rm; while, on the other hand, in phthisis lmonalis there is often confidence of recovery en to the last period of existence.

A strong presentiment or anticipation of ath is at all times ominous, since, apart from ery consideration of its foundation, it often pears to be the cause of its own fulfilment. ie same may be said of a confident anticipa- on of recovery, whatever be its source; for hether connected with religious impressions, excited by the prognostics of pretenders to e healing art, it often produces the most traordinary effects.

The opposite states of preternatural suscep- bility and complete insensibility of the organs the external senses are alike unfavourable mptoms in fevers and febrile diseases. fence, a very contracted or dilated and im- oveable condition of the pupil, as well as rabismus, and that state of the eye in which remains constantly half closed with only the hite part visible, have always been considered f bad omen in such affections. It is, how- ver, to be observed that deafness is a frequent ccurrence during convalescence from fevers; nd that extreme sensibility of the eyes and f the whole surface are not uncommon in ysterical affections, and of course of little noment.

In febrile disorders, sensibility to suffering, vith complaint of pain, are generally favour- ble, while the total absence of both is always bad symptom. Severe attacks of local pain re not unfrequently the precursors of a crisis; nd a peevish sensibility to uneasiness of any kind is proverbial as an indication of approach- ng convalescence.

In acute inflammations severe pain in the ffected part cannot in general be considered s alarming. The principal apparent exception s found in enteritis; in this case, however, the severity of the pain seems chiefly owing to spasmodic affection of the muscular coat of the intestine. Throbbing pain is a well-known precursor of suppuration.

With regard to local pains, severe headach is an unfavourable symptom in peripneumonia notha, and perhaps in pulmonary affections generally. A sudden and violent attack of pain in the head, preceding apoplexy, denotes a very dangerous form of that disease. Very severe pain in the loins has been observed to precede the confluent form of small-pox, and at the invasion of febrile disorders in general, mostly portends an attack of considerable violence.

Pains which are prone to shift their seat, as in acute rhematism, are generally less manage- able than such as are fixed.

The sudden disappearance of pain, without any known or satisfactory cause, is always alarming, as is seen in ileus, enteritis, and hernia, although in these cases it has been too exclusively regarded as an indication of com- mencing gangrene.

The sensation of pricking in palsied limbs often precedes the recovery of their power.

In fever, constant lying on the back, with the legs drawn up, a continual tendency to sink down in the bed, or general rigidity of the trunk and limbs, are all unfavourable symptoms; while recumbency on the side, with occasional changes of position, and a flexible state of the muscles, are of good omen. In peritoneal inflammation great retraction of the lower extremities upon the trunk indicates a severe affection; while their occasional extension, together with the capability of sitting upright, are sure signs of the subsidence of the inflammation.

Convulsions and spasmodic affections are much worse symptoms in the advanced than in the early stages of fevers, and are generally less alarming in women and children than in adult males. Indeed, in young children (as Sydenham remarked in small-pox) their occurrence at the invasion of febrile disorders is often rather favourable than otherwise. In general it is not so much their severity as their continuance and frequent recurrence which imply danger. Among the different forms of convulsive movements, subsultus tendinum, picking at the bed-clothes, &c.; tremors of the hands and lips, and grinding of the teeth, are more peculiarly alarming, as being common indications of approaching dissolution.

A propensity to keep the hands and feet out of bed, and the trunk uncovered, commonly denotes a state of severe disease. Any form of paralysis occurring in fevers and acute inflammations is generally more or less alarming. Severe rigors are not ordinarily unfavourable in acute affections, as they tend to produce speedy reaction. In chronic diseases they are much more often so, mostly implying internal suppuration.

Extreme debility, or loss of muscular power, almost always justifies alarm.

Somnolence, occurring at an advanced stage of febrile affections, if it be associated with other indications of their decline, and especially if it follow some form of crisis, is highly favourable. In other circumstances, however, it is often but the beginning of a state of torpor, eventually passing into fatal coma. Sleep which is hurried or disturbed by convulsive startings, or in which the eyes are half open, shewing the white part only, or in which the lower jaw drops, is of bad omen. Constant wakefulness is always an unfavourable symptom.

Of all the indications of approaching death, and of all the forms in which it takes place, perhaps none is more general than coma. Yet coma does not invariably portend death. In fevers attended with much cerebral disorder, and in idiopathic affections of the encephalon, more particularly in children, it is not unfrequently recovered from. In pulmonary affections it is almost always a fatal symptom.

Circulating system.—The prognosis deduced from the action of the heart and arteries varies greatly in different diseases and under different circumstances. Extreme weakness, with great frequency, and perhaps irregularity of the

pulse, is one of the most constant precursors of death. The principal exception is found in cases of profuse hemorrhage, when the pulse often remains full and vibrating, almost to the last moments of life. A very great degree of frequency, such as any excess above 150, is of itself almost invariably indicative of danger; and under some circumstances, especially after parturition, a pulse even above 100 justifies the apprehension of impending mischief. In cerebral affections more particularly the pulse is liable to great variations of character, and these are sometimes valuable for the purposes of prognosis. Thus in apoplexy, the transition from a small, weak, and rapid pulse, to a full, strong, and labouring one, is always alarming. Mere irregularity or intermissions, especially when met with in advanced life, are by no means so alarming as is popularly supposed; and the most vehement palpitations of the heart, alternating with protracted intermissions, are met with in those sympathetic affections of the organ which experience shews to be attended with little real danger.

Syncope is chiefly an alarming symptom when it is connected with disease of the heart and larger arteries, or is the result of extreme exhaustion, as from profuse hemorrhage.

With regard to morbid conditions of the blood, the separation of a thick and tenacious coat of fibrine, with great contraction of the coagulum and concavity of its surface, though mostly indicative of active local inflammation, or of a general inflammatory diathesis, cannot in itself be regarded as an indication of danger. The dark, grumous, or pitch-like blood, which is commonly met with in the first or congestive stage of severe febrile disorders, and in some other affections, though a much more formidable appearance, does not by any means necessarily imply great danger, since it often disappears after one or more bleedings, as in diabetes and fevers. That dissolved and watery state of the blood in which it resembles claret, and is scarcely or not at all coagulable, such as is often seen in purpura, is much more alarming than either of the two preceding.

The prognosis of hemorrhage, when considered as a separate disease, has already been adverted to. As a symptom of other diseases, it is often an important guide to their prognosis. In febrile disorders it is presented under two very different aspects; in the one appearing as a critical symptom, and denoting the favourable termination of the malady, in the other constituting an occurrence of much danger. The distinction between the two must of course be drawn from the circumstances under which the hemorrhage takes place. The modifications of hemorrhage in which the characters of the effused fluid are widely different from those of natural blood, such as the black vomit of yellow fever, and the alvine discharges in melæna, are always alarming. Hemorrhages, when occurring in chronic affections, as in tuberculous disease of the lungs, scirrho-cancer, organic disease of the heart, &c. though often producing some temporary relief, must always be considered as very unfavourable in relation to the ultimate event.

Respiratory system.—There is scarcely any more certain indication of severe and dangerous disease than great disturbance of the respiratory function, if we except those cases in which it is referable to some spasmodic affection of the organs, of which asthma is the most considerable example. Slow, labouring, and irregular, or hurried and feeble respiration, is one of the most common precursors of death; and where an audible rattle in the throat is also heard, that event may almost invariably be pronounced near at hand. Spasmodic asthma is almost the only case in which orthopnœa does not imply a formidable state of disease. Stertorous breathing, which is in a great measure peculiar to severe cerebral disorders, is always more or less alarming. Extremely fetid breath in fever is unfavourable.

Deep sighing is sometimes one of the most prominent indications of such a degree of exhaustion after hemorrhage as leaves little hope of rallying. Moaning is chiefly observed in children, especially in acute hydrocephalus, and is an unfavourable symptom.

In chronic diseases which are attended with cough and expectoration, these symptoms are commonly observed to cease before death. In aged persons, the disappearance of an habitual bronchial affection is always an alarming circumstance, being generally a prelude to some fatal attack, as of apoplexy. The prognosis to be drawn from the character of the sputa varies with the nature of the existing disease. Thus purulent expectoration, when associated with tuberculous disease, is always alarming; in chronic bronchitis it is less decidedly so, and in acute bronchial affections supervening upon fevers, &c. the prognosis is often good, even though the excretion be of an alarming extent and duration. This is perhaps still more strikingly observed in abscess of the liver communicating with the bronchial tubes.

Notwithstanding many occasional exceptions, it cannot be doubted that the frequent appearance of blood mingled with the sputa must be ordinarily regarded as a very unfavourable circumstance. Fetid and black sputa are always alarming.

Hiccup occasionally precedes a favourable reaction in some cases of acute disease, as for example in the epidemic cholera; but much more commonly it appears in the advanced stages of both acute and chronic diseases as one of the indications of approaching death. In fevers, hurried or inarticulate and scarcely intelligible speech is generally an unfavourable symptom.

Organs of digestion.—Perhaps there is no one single circumstance indicative of approaching convalescence of such general value as the return of the tongue to its natural state; and, on the other hand, its various deviations from that state are among our best guides for judging of the severity and probable danger of disease. A perfectly dry tongue, whether its surface be polished, of a livid red or mahogany colour,

covered with a rough coating of brown or blackish fur, is at all times indicative of severe and commonly of more or less dangerous disease; while a natural degree of moisture almost always justifies a favourable augury, except in affections which are attended by hectic fever. Redness of the tip and edges, with unnaturally prominent papillæ, is too commonly met with in acute diseases of most kinds, especially those in which there is much irritation of the gastro-intestinal mucous membrane, to be regarded as unfavourable, unless when it is peculiarly vivid; but in chronic affections, continued redness of the tongue commonly justifies apprehensions. Paleness is not a threatening symptom, except when it is one of the results of alarming hemorrhage. The temperature of the tongue may be said in general terms to furnish the same indications as that of the surface of the body. An extreme degree of coldness has lately excited much attention, as being one of the characteristic symptoms of the present epidemic cholera in its worst form. The opposite states of tremor and of rigidity with retraction of the tongue, have been noted as unfavourable symptoms in fevers and other acute diseases.

Brown or black sordes on the lips, gums, and teeth, always denote more or less of danger. Bleeding of the gums, when it occurs late in fever, as part of a general hemorrhagic disposition, is an unfavourable symptom. The lips, more than any other part of the body, indicate, by their livid or purple colour in severe affections of the organs of respiration and circulation, that want of arterialization of the blood which is almost always an alarming symptom. Coldness of the lips and dropping of the under lip and jaw are among the features of the well-known facies Hippocratica. Salivation has been occasionally noted as critical in fevers, but its value in prognosis is chiefly seen in those cases in which mercury is given with a view to produce its specific effect. In these its appearance often warrants the anticipation of a favourable change. An aphthous state of the mouth and fauces is generally alarming, but more decidedly so in chronic than in acute affections, and in adults than in children.

An unnatural degree of appetite is sometimes observed to precede the development of severe inflammation of the gastro-intestinal mucous membrane; but it is chiefly in relation to convalescence that the appetite is a guide to prognosis, for its return, after a period of more or less complete anorexia, is one of the surest marks of returning health. Its sudden manifestation by a craving for some particular kind of food, after severe and protracted cases of fever, has been often noted as the first indication of a recovery which had previously been despaired of.

In febrile disorders, intense thirst always implies a severe affection; but its apparent absence, under circumstances in which it is ordinarily present, is a far more dangerous symptom, as being one of the indications of a general loss of physical sensibility.

Difficulty of swallowing, when it results from loss of muscular power in the œsophagus, as in the advanced stages of fever, hydrocephalus, apoplexy, and palsy, is always an alarming symptom. When it arises from some mechanical obstruction, the prognosis of course varies with the nature of the particular cause.

Vomiting at the commencement of febrile disorders cannot be considered as unfavourable, unless it be very severe and protracted. In acute affections of the gastric mucous membrane, as well as in chronic diseases of the stomach, it may furnish some kind of index, though certainly no constant or sure one, of their severity and danger. Though vomiting is popularly associated with the very notion of cholera, it is of itself no guide to our prognosis in that affection, being sometimes very inconsiderable in its most severe form. In cerebral affections, unless it recur very frequently, it is often rather a favourable symptom, indicating the continuance of physical sensibility. Thus after concussion, it is one of the marks which distinguish a temporary suspension of the cerebral functions from a state of perfect coma. Vomiting of black matter, as in yellow fever, and sometimes in melæna,—of putrid, as in some very bad forms of fever,—and of fæces, as in ileus, are all alarming symptoms. There is one case in which the most protracted and uncontroulable vomiting can hardly be considered dangerous, —namely, when it is merely a symptom of hysteria. In pregnant women, especially in the earlier months of gestation, it is often peculiarly obstinate, without giving just occasion for alarm.

Diarrhœa, like other evacuations in febrile affections, occurs under two circumstances widely differing in their relation to prognosis; being in the one case critical, in the other a cause of exhaustion, often connected with severe disease, or even disorganization of the intestinal mucous membrane. Diarrhœa is also critical in some other affections, especially those in which there is much congestion in the abdominal viscera; it also often marks the solution of colic and ileus. Black and pitchy stools are sometimes met with in critical diarrhœa; but when evacuations of this kind, instead of marking the solution of an acute disease, assume a more chronic character, as in melæna, the prognosis is mostly unfavourable. Hemorrhage from the bowels is sometimes critical in fevers, but is more often one of the results of a general hemorrhagic tendency which rapidly exhausts the patient's remaining strength. Involuntary passage of the fæces is under all circumstances alarming. Diarrhœa, when it occurs in the course of chronic affections, commonly renders the prognosis increasingly unfavourable, because it mostly implies the extension of disease to the intestinal mucous membrane. In such cases it very often ceases for some hours before death, being one indication of the approach of that event. Great insensibility to the action of emetics and purgatives is an alarming symptom in many cerebral diseases, especially the acute hydrocephalus.

A tympanitic state of the intestines generally denotes danger, though, as Dr. Abercrombie has shewn, it is sometimes recovered from, even after enteric inflammation. A hard and tumefied state of the hypochondria and neighbouring parts has been long noted as an unfavourable symptom, except when, as is sometimes the case, it precedes a critical diarrhœa. Great depression of the abdomen, so as to make the hips and false ribs prominent, is indicative of a threatening state of things.

If we except some severe affections of the biliary system, met with in tropical climates, a copious secretion of healthy bile is generally a favourable occurrence. It was found very commonly to indicate recovery in the epidemic cholera of India. Jaundice supervening upon cerebral affections is a dangerous symptom, and in all circumstances that form of it in which the skin is of a green hue justifies a much worse prognosis than the yellow variety.

Urinary organs.—A complete, or nearly complete cessation of the renal function is always dangerous (unless when it is part of an hysteric affection), being very commonly followed by fatal coma, both in children and adults. Retention of urine from insensibility of the bladder is an unfavourable symptom in fever; its involuntary discharge is still more so. Bloody urine is occasionally critical; but more often, like other hemorrhages in the advanced stages of fever, it implies danger. Of all the occurrences which mark a crisis or favourable turns in fevers and inflammations generally, none is more common in our own climate than a copious deposition in the urine, sometimes of bilious matter, but more often of sediments chiefly composed of lithic acid and its compounds. In fact, when these are found in the urine, the prognosis is almost always good, except in cases attended with hectic fever; whereas the presence of the earthy phosphates as commonly denotes a dangerous state of disease. Albuminous urine is decidedly unfavourable, unless perhaps in cases of acute dropsy.

Sexual organs.—Amenorrhœa is a common attendant of many chronic diseases, generally occurring when they have made some progress, and, consequently, giving a more unfavourable aspect to their prognosis.

The skin and subcutaneous tissue.—As to colour: a livid, purple, or leaden hue of the lips, cheeks, and surface generally, is a symptom indicative of danger. Sudden and frequent variations of colour, a circumscribed flush of the cheeks, extreme pallor, or its opposite, a very high degree of redness (when not from an exanthematous affection), are all unfavourable symptoms. In eruptive disorders, the imperfect development of the eruption, an unnatural colour of it, or its premature recession, are circumstances generally more or less alarming.

As to temperature: the opposite extremes of intense heat and death-like coldness are both alarming. Partial and unequal distribution of heat, especially that sense of burning which is often felt in the palms and soles in chronic diseases attended with hectic fever, and also frequent variations of temperature, are unfavourable. Coldness of the extremities is one of the most familiarly known precursors of death.

Moderate perspiration, if diffused over the body, attended with warmth, and not of long duration, is almost never unfavourable, and often critical. The extremes of dryness and moisture, like those of heat and cold, are dangerous; but especially moisture when combined with cold, as in the cold clammy sweats which often denote approaching death. Partial sweating, as of the head, chest, or extremities (as in phthisis pulmonalis), is always unfavourable. Perspiration of a fetid, cadaverous, or urinous odour, is an alarming symptom, unless it belong to hysteria. Sydenham observes that sweating in the eruptive fever of small-pox denotes that the disease will assume the distinct form.

Petechiæ, vibices, ecchymosis, and oozing of blood from the skin, are always unfavourable symptoms, though in various degrees, depending on the particular circumstances in which they occur.

When œdema or anasarca appears towards the termination or after the cessation of acute diseases, it is rarely alarming, and is sometimes even critical. On the contrary, in chronic and organic diseases it always confirms a prognosis already unfavourable; and in these cases its disappearance, especially when sudden, is often among the indications of approaching death.

Abscesses and buboes are analogous to excretions, inasmuch as they are sometimes critical, and at others complications, which increase the patient's sufferings and accelerate his death.

Emaciation, even to a great degree, is rarely alarming when it is the result of acute disease. In chronic diseases it almost invariably renders a prognosis otherwise doubtful decidedly bad. To this head may be referred most of those well-known features which together make up the facies Hippocratica; namely, the pointed nose, sunk eyes, shrivelled ears, hollow temples, and pale, black, livid, or lead-coloured complexion.

Besides those circumstances which form part of the disease itself, there are others pertaining to the individual affected, the climate which he inhabits, the season of the year, &c., which often materially influence our prognosis of the future. An attempt to estimate the value of all these with any degree of exactness would involve an extension of this article much beyond the limits assigned to it; a brief review of some of the leading facts is, therefore, all that can be attempted.

Sex.—The influence which sex has on prognosis is chiefly referable to affections of the sexual organs, especially of the female. It has been already observed that the various morbid affections which are apt to occur about puberty, or for a few years after, when the menses are absent, such as hemorrhages, disorders of the digestive organs, different modi-

ations of hysteria, &c., though often very vere and apparently threatening, scarcely ever stify alarm, unless they are complicated with ed local disease, as tubercles, &c. The sudn suppression of the menses, as from cold terror, is very apt to be followed by severe d often tedious disorders of various kinds. orbid affections occurring about the time of e natural cessation of the menses often assume very formidable character, resulting in scirus of the womb or breast, or organic disease other kinds. The various local affections nich immediately depend on pregnancy, as miting, hemorrhoids, œdema, &c., may of urse be expected to cease with their cause. flections which partially or wholly disappear nen conception takes place, such as phthisis d mania, may be expected to return with ual or increased energy after parturition. The ognosis is considered more unfavourable in egnant females than in others, after severe juries and surgical operations. It may perps be assumed as a general rule, that in the egnant state local affections are attended with mptoms more severe than those which would company them under other circumstances. If is be the case, a better prognosis will comonly be justified than would otherwise be missible.

Age.—The difficulties and sources of error hich are inseparable from the art of prognosis nder all circumstances, are found to be pecurly great in relation to the diseases of infants d young children. In them the powers of e are easily overwhelmed or soon exhausted, that affections comparatively slight are often pidly and unexpectedly fatal. On the other and, if those powers are adequate to sustain e shock of disease till its violence is past, covery commonly takes place with peculiar pidity, and often under circumstances appantly the most desperate. If there be one ass of affections more peculiarly dangerous an others in the earliest periods of life, it is evere injuries of the skin. Hence burns, even very inconsiderable extent, and small blisters, e often speedily fatal. As children are much ore constitutionally disposed to convulsive flections than adults, their appearance is in neral proportionately less alarming; yet viont, or rather protracted convulsions, are very equently the cause of death in infants. In ildhood, the prognosis of surgical operations commonly better than at other periods of life, ot only from the activity with which nature rries on the work of reparation, but from the bsence of those depressing moral causes which t a more mature age so often paralyse the hysical powers of the system.

In many affections the prognosis is greatly odified by the advance from childhood to uberty, and from puberty to manhood and old ge. Of the former we have illustrations in ickets, external scrofula, epilepsy, chorea, and inary calculus, disorders which, when most ractable in childhood, often spontaneously prove and disappear about puberty, or in the pproach to manhood. On the other hand, some of these very affections, especially epilepsy and chorea, not unfrequently make their first appearance about puberty. Indigestion arising from irritability of the gastric mucous membrane, a very common and troublesome affection in youth and early manhood, often gradually diminishes with the approach of middle age. The influence which age has upon prognosis in regard to many disorders of females has been already considered in connexion with the subject of sex.

The circumstances of very advanced age are in some respects analogous to those of infancy, in others conspicuously different. The vital powers being feeble, as in infants, are easily overwhelmed; and thus comparatively slight attacks of bronchial inflammation, vomiting, purging, hemorrhage, &c., often rapidly carry off old people. But unlike the early stages of life, the power of reparation being no less feeble than that of resistance, many diseases, not in their nature directly fatal, admit of very imperfect recovery, and often lead to gradual exhaustion. Fractures and ulcers of the surface are examples familiar to every one.

Constitution, &c.—In persons of vigorous constitution, whether of the sanguine or melancholic temperament, acute disease, though often vehement and proportionately dangerous, is commonly more under the control of active remedial measures than in those of an opposite habit. Weakness and exhaustion not only predispose to inflammatory affections, but also render their occurrence more dangerous, even though they may not assume a very intense or vehement aspect. Persons of delicate form, lax fibre, and great physical and moral susceptibility, whether their temperament be sanguine or melancholic, are so liable, under various and even opposite circumstances, to become the subjects of tuberculous or other incurable chronic affections, that in them the prognosis of the ultimate event of even slight disease is generally more or less doubtful.

In almost all circumstances of disease, a calm, equable, and cheerful constitution of mind tends to render the prognosis more favourable. In cases of severe local injury, and after surgical operations, it is found to be of the greatest importance.

With regard to habits of life, the peculiar danger of almost every severe malady, and often of trivial ones, to gluttons, drunkards, debauchees, and those whose constitutions are broken down by alternations of excess and privation, is familiarly known. This partly explains the frequent extreme fatality of epidemic diseases in armies, especially when moral causes of a depressing nature are superadded.

In connexion with facts of this kind may be mentioned the far greater mortality of infants in foundling than in lying-in hospitals; no advantages of cleanliness, ventilation, and care, compensating for the deprivation of that mode of sustenance which nature has provided for the first months of existence.

A marked constitutional tendency to any

form of disease, whether it be hereditary, or common to the members of a family of the same generation without the suspicion of inheritance, or peculiar to the individual himself, generally makes the prognosis decidedly more unfavourable.

Climate often influences the prognosis of disease. In tropical countries acute diseases are commonly more vehement in their attack, more rapid in their progress, and more apt speedily to cause irremediable disorganization, than in temperate regions. Hence the prognosis is generally more unfavorable. On the other hand, temperate climates, being most commonly variable, are more apt, by the repeated irritation which frequent and sudden changes in the atmosphere produce, to render chronic affections, and especially those of the respiratory organs, incurable and ultimately fatal. It is perhaps from a similar cause that syphilis is generally found to be a more tractable and less dangerous disease in warm than in cold and variable climates. Convulsive affections, particularly tetanus, are observed to be not only more common, but also more fatal in hot countries. It is hardly necessary to state, that in all diseases which arise from local causes, such as marsh miasmata, the prognosis must be proportionately bad while exposure to the influence of those causes continues.

Season.—The season of the year is a circumstance of some importance in the prognosis of many diseases. This is in general better in spring and summer than in autumn and winter; and more particularly so with regard to scrofulous and tuberculous affections, and diseases of the pulmonary organs, among which measles may be enumerated. It has been noted from the time of Hippocrates downwards, that autumnal intermittents are both more severe and more intractable than vernal ones; and perhaps the observation is generally applicable to continued fevers, though subject to much exception.

The varieties of form and character assumed by diseases in different years, or at different periods of the same year, and which mark what Sydenham calls the constitution of the season, of course involve corresponding varieties in the prognosis. The experienced tendency of particular epidemics is indeed often found to be a more certain guide to our judgment of the future than could be derived from a mere consideration of the symptoms; a point which has been justly insisted on by Dr. Gooch in relation to puerperal or peritoneal fever.

The effect of remedies previously tried, whether in the same person under a preceding similar attack, or (as in the case of epidemics) in other persons similarly affected, is often an important aid to our prognosis of their operation, and consequently of the event of the malady.

(Edward Ash.)

PROLAPSUS UTERI.—See Uterus, Diseases of.

PRURIGO.—See Tinea.

PSEUDO-MORBID APPEARANCES. There are three conditions in which any tissue or organ of the body may be found, between which it is necessary to discriminate with accuracy, in order to form correct inferences in morbid anatomy. The first of these is the natural or healthy, which we find to present certain varieties either of colour or density, according to the age of the subject. The second is the abnormal or morbid, and is to be regarded as the result either of some perversion of the development of a part, or of the influence of disease upon it. The evidence of this condition is derived in the one case from some congenital malformation, and in the other from certain appearances which the texture of the part exhibits, and which vary in aspect and extent, according to the duration and violence of the disease: these are the morbid appearances. The third condition differs from both of those above-mentioned, yet in some points resembles the morbid. This condition is in general produced by causes which come into operation after death; sometimes, however, they may partially take effect a short time before death; and sometimes it may owe its rise to other causes, hereafter to be noticed, and only in action during life. The appearances which characterize this condition of the tissues of the human body may be denominated *pseudo-morbid appearances*, as being liable to be confounded with and as it were simulating those which are morbid.

Although the attention of pathologists has been a good deal directed to this subject of late years, we find but little written upon it, and the term pseudo-morbid in limited use. Dr. Yelloly, in a paper published in the fourth volume of the Medico-Chirurgical Transactions, was the first to point out that the mucous membrane of the stomach may exhibit an increased degree of vascularity under certain circumstances, independently of inflammatory action. In France, the extravagant assertions of Broussais, who, in order to establish a favourite hypothesis, pronounced every increase of redness to be indicative of inflammation, had the good effect of inducing anatomists to inquire whether other causes than disease could similarly alter the aspect of the tissues. By the researches of Trousseau and Rigot,* and also of M. Billard,† much light has been thrown upon the post-mortem changes which occur in the body, and which give rise to appearances often very similar to those of inflammation. We are likewise indebted to John Hunter, Allan Burns, and more recently to Dr. Carswell and Orfila for much interesting and valuable matter, which we shall presently have occasion to notice.‡

It may be well to state our reasons for the

* Archives Gén. de Méd. October and November 1826, and July 1827.

† De la Memb. Muqueuse Gastro-intestinale.

‡ Although distinct treatises on this subject are rare, we must not omit to state that it has received due attention in several modern works, either on morbid anatomy in general, or on particular parts

doption of a hybrid term, *pseudo-morbid*, in preference to others more generally in use. Let it be observed that we employ the term in question to denote those appearances in any given tissue which might be mistaken for the effects of morbid action in that tissue. To apply the terms *cadaveric* or *post-mortem* to such phenomena would be to limit their number and causes; whereas it will appear in the sequel that some tissues of the body may present appearances which must be regarded as *pseudo-morbid*, and which result from the action of causes operating *before* death. We are not aware that the term is employed by any writer except the author of an analysis of MM. Trousseau and Rigot's papers above-mentioned, which is to be found in the 28th volume of the Edinburgh Medical and Surgical Journal, and Dr. Christison, in his very valuable and elaborate work on Poisons. Under this denomination, then, we would be understood to include all appearances in the dead body which might be mistaken for morbid appearances, whether they arise from the action of causes antecedent to death, or whether they be strictly such as are now generally spoken of as *cadaveric* or *post-mortem* appearances.

In the great majority of cases, a more or less gradual diminution of the vital powers precedes dissolution. The influence of life in preserving the integrity of the membranes of the body, whether it act through the nervous system or in any other way, gradually diminishes, and a corresponding change is manifested. This is most conspicuous in the capillary circulation, which becomes impeded to a variable extent in several places, the vessels being less capable of resisting the force of gravitation. This disturbance of the capillary circulation may be noticed in almost every tissue in the body. In the agony of death, the same cause, it is natural to expect, will operate to a greater degree, and at the same time the occasional muscular contractions, which often mark the final struggle, must mechanically cause irregular distributions of the blood in the sanguiferous system. The extent to which these irregularities take place is in general proportionate to the strength of the patient (inversely), to the duration of the struggle, and in some cases, we conceive, to the degree of fluidity of the blood itself (directly). Any one who has ever watched a patient in the last stage of typhus fever will not want further testimony in favour of the accuracy of the preceding statements. The general cutaneous *hyperæmia* of the back and dependent parts indicates that the laws of gravitation have begun to operate to a much greater extent than during the state of health.* We may also adduce the *pneumonie des agonisans* of M. Laennec, the *engouement de position* of Andral, or the *pneumonie hypostatique* of Piorry, as additional corroborative evidence.

But even when life is in full vigour, local sanguineous determinations may occur independently of the immediate operation of disease on the part in which they appear. Thus the performance of particular functions may cause an afflux of blood to the particular organs; as for example, while the function of digestion is going on, we find that a marked change is produced in the colour of the mucous membrane of the stomach. Again, if any obstacle occur to the free return of the venous blood, there is in general formed a congestion of the capillary system to a greater or less extent; this is more conspicuous where the veins are destitute of valves, as in the mesenteric veins, the pulmonary veins. Hepatic disease, by compressing one or more ramifications of the vena portæ, and some forms of disease of the heart, are very frequent causes of the local determinations to which we allude.

With the cessation of life is removed all opposition to the full scope and play of gravitation and chemical affinities, the former of which was partially in operation during life. The manner in which the fluids seek the dependent parts is clearly to be attributed to the action of gravitation. In fact it has been proved to be so caused, over and over again, by the simple experiment of turning the body occasionally, so as to change the dependent parts; in this case the blood is invariably found to leave the vessels that were before lowest to seek those that now are so. Bodies being usually placed supine after death, the integuments on their posterior surfaces are uniformly found congested, but if the body be placed immediately after death on the face and abdomen, a similar congestion will present itself in the integuments covering those parts.

The effects produced by the operation of chemical affinities are apparent in the alterations in the texture, the density, and the specific gravities of the tissues: gases are evolved, new fluids are formed, and the membranes are often considerably discoloured; in short, in the action of these affinities consists the putrefactive process, whereby new compounds are formed, and the former constituents of the body almost wholly vanish. We find considerable variation in the period of commencement and rapidity of course of this process, not only as regards different bodies compared with each other, but also with respect to particular parts of the same body. The age and habit of the individual, the quantity of the fluids, the kind of death, as well as the circumstances which preceded it, the season of the year, climate, state of the atmosphere, are so many circumstances which exert a powerful influence on the rapidity of the phenomena of this process, as must be familiar to every one who has studied anatomy even in the most superficial manner.

To the action of these same chemical affinities.

of it. We need hardly refer to Andral's invaluable Treatise on Pathological Anatomy. In Laennec's work, also, and in those of Bertin and Hodgson, constant allusion is made to appearances supposed to be cadaveric or produced in the agony of death.

* See an interesting essay by Bourdon, entitled "De l'Influence du Pesanteur sur quelques Phenomênes de la Vie." Paris, 1823.

we think, may be fairly attributed, at least in part, a very evident cadaveric phenomenon; namely, that increased porosity of the membranes by which the contained fluids are allowed to transude through the coats of the canals or sacs which hold them. We say *increased* porosity, for it must be admitted as the result of recent experiments, that transudation may take place to a slight degree even during life.* Life, then, must be supposed to operate in limiting this porosity, by preventing the action of the chemical affinities; when life ceases, these affinities come into play, and there takes place a separation of the molecules of the tissues to a degree proportionate to the extent of action of the same affinities. There is no part of the body in which we do not observe this phenomenon; it is not confined to sacs with simple parietes, but extends also to those of which the walls are compound; we observe it to take place through the coats of vessels, through the walls of any or all of the membranous viscera, and even through serous membranes.

The alterations which are produced, then, on the several organs or membranes of the body by the action of the agencies above detailed, may be stated in general to be—1. such as affect the colour of parts; 2. such as alter their density or consistence; 3. such as alter the contents of a natural cavity, as for example a serous sac, by increasing or diminishing the quantity, or altering the nature of fluid in it.

We proceed to consider these effects as they manifest themselves in the different parts of the body, and we shall adopt the order usually followed in making a post-mortem examination, commencing with the external integument and the cellular tissue, then proceeding to the contents of each of the three great cavities, head, thorax, abdomen; and, finally, to the arterial and venous tissues.

1. *The external integument.*—The alterations in colour which the skin presents after death, are almost the only phenomena which it exhibits liable to be mistaken for those of disease; and even they are so distinct in the mode of their formation, that any mistake must arise from a very superficial examination. Spots of various degrees of redness, and also varying in extent, are almost uniformly observable on the dead body. In general they are of a dark red, which increases in depth of colour with the length of time that has elapsed from the death of the subject. As this cutaneous discoloration is principally owing to the influence of gravitation, we find it uniformly on the most dependent parts, the occipital portion of the scalp, the posterior surface of the neck, the back, nates, posterior parts of the thighs and legs. That it is confined to the skin may be seen by cutting into the corion where the redness exists. It is moreover to be observed that this redness is vascular, and that the surface of the skin presents the appearance of a râniform distribution of vessels. This is important, as characterizing the kind of discoloration arising from gravitation, and distinguishing it from that which may be the result of the pressure of ligatures or vestments, &c. on the surface before death; for in this latter the redness will be found to be diffused and uniform, without any appearance of vessels.

But cutaneous discolorations or lividities may occur in situations not dependent, and at a more advanced period after death, being phenomena purely cadaveric. When decomposition has fully set in, and gases are being disengaged in the stomach and intestines, the surface of the skin of the face and neck becomes of a livid colour; the superficial veins are full, and streaks of a dark colour indicate the course of most of them. This congestion Chaussier attempted to explain by attributing it to the compression of the right auricle of the heart by the diaphragm, which was pushed up by the stomach distended with gas; and he states that by producing a similar distention of the stomach artificially, viz. by the introduction of a fermenting mixture into it, he was enabled to exhibit similar effects on the cutaneous capillary system. The compressed right auricle causes in the blood a retrograde motion from venous trunks to branches, from the branches to the capillaries, which is the more easily done, as at this period the blood has to a considerable degree resumed its fluidity. To this fermentation and gaseous development may be attributable, as Chaussier further observes, the passage of pieces of food from the stomach into the pharynx, larynx, and bronchi, the passage of worms into the bronchi, nasal fossæ or mouth.*

2. *The cellular tissue.*—The subcutaneous cellular tissue is generally more or less discoloured in the neighbourhood of or immediately beneath the cutaneous discoloration. Here, however, the change of colour takes place from a two-fold cause,—the gravitation of the fluids in the vessels, as well as the transudation of the serous portion of the blood through the vascular parietes. These two causes generally reduce the subcutaneous tissue to an anasarcous condition, which of course increases with the progress of decomposition; the serous portion of the blood, too, becomes more and more tinged by the colouring matter. We need hardly refer to the common appearance of the cellular membrane under the integuments of the back, with which every student of anatomy is familiar, in proof that this is the ordinary condition of that membrane, and that too within a very short period after death, as the effect of gravitation and transudation. But as putrefaction advances, and the blood resumes its fluidity, we observe ecchymoses to form in the subcutaneous tissue, the distinction of which from the effects of contusions before death is sometimes an important task for the medical jurist, and is rendered

* See the experiments of Foderé on absorption; of Dutrochet; and the Observations of Bouillaud on Dropsies.

* *Chaussier*, Médecine Légale, & Table des Phénomènes Cadavériques.

ore difficult by the fact that these ecchymoses
) not seem to be formed under the influence
' gravitation, being found even in elevated
rts. Although it does not strictly come
ithin the range of this article, it may be pro-
r to mention that the following circum-
ances, noticed by Orfila, will assist in distin-
ishing these cadaveric ecchymoses from such
: may have been formed by violence or other-
ise before death:—1. Their situation, which
ill generally be found in those localities where
ie cellular tissue is very lax and distensible,
; in the occiput, loins, eyelids, and scrotum;
. the general evidence of an advanced stage
f putrefaction presented by the dissolving
ondition of all parts of the body; 3. the uni-
ormity of colour presented by these ecchy-
ioses, which is not usually observed in those
ade during life.*

Subcutaneous ecchymoses, however, may be
roduced by direct violence applied to the body
hortly *after* death, as has been proved by
xperiment by Dr. Christison, and as may
ften be seen in the dissecting rooms. Effu-
ions of blood into the intermuscular cellular
issue, it is important to bear in mind, may
kewise be produced by violence to the body
fter death. During the winter 1830-31, we
ad occasion to notice this fact upon bodies
vhich, from the then imperfect state of the laws
egarding dissection, were conveyed to London
ightly packed in boxes from distant parts of
he country. In such bodies extensive extra-
asations of blood into the cellular membrane
etween the muscles of the back were uni-
ormly present. This fact had been likewise
reviously well ascertained by the happily de-
vised experiments of Dr. Christison on the
ccasion of the murders committed at Edin-
urgh.†

We do not find any induration of the cellular
issue of a pseudo-morbid character; but it
nay be remarked, although the fact cannot
have escaped the most superficial observer, as
a post-mortem result, that this tissue is fre-
quently emphysematous, and, indeed, always
so after a certain period in the work of decom-
position, but sometimes very soon after death,
as in some low and putrid fevers, &c.

3. *The head.*—On opening the cranium, the attention is first directed to the quantity of blood contained in the small venous trunks which are seen ramifying on the surface of the dura mater and in the sinuses. It was long ago noticed by Vicq d'Azyr, and subsequently by Marc, that the straight sinus and torcular Herophili uniformly contain coagulated blood, in consequence of the blood when fluid flowing to that dependent position. On the same principle we may expect to find the superficial veins of the dura mater more distended towards the posterior portion of that membrane. With respect to the general appearance of the dura mater, the anatomist has only to take care that he attributes a condition of hyperæmia of it, whether local or general, to its proper cause: in consequence of the fibrous character of this membrane it is not liable to a diffuse discoloration, such as some of the other tissues are, nor do we find any alterations of its consistence which are at all likely to be mistaken for morbid ones. In fact it resists the putrefactive process for a considerable time, as do all membranes of the same nature. It is proper, however, to remember that a *hyperæmia* of this membrane may be developed in the progress to decomposition, by the disengagement of gas in the stomach, and the compression of the right auricle, in the same manner as Professor Chaussier supposed some cutaneous lividities to be produced, as already alluded to.

When the dura mater, with its adherent layer of arachnoid, has been slit up, so as to expose the visceral layer of the latter membrane, and in fact to open into the arachnoid sac, the anatomist generally looks first for some effusion between this membrane and the subjacent pia mater. We fear that in general too much stress is laid upon the occurrence of effusions between the arachnoid and pia mater. Here what is really a natural condition is very apt to be mistaken for a morbid one; and, on the other hand, the total absence of effusion is too often regarded as indicating a state of health, when such a conclusion can be by no means constantly deduced. The interesting discoveries of M. Majendie relative to what he has termed the cephalo-spinal fluid, deserve more attention than seems to have been bestowed upon them by most practical pathologists. The principal conclusions at which he has arrived are the following:—1. That in the state of health there exists a fluid between the visceral layer of the arachnoid and the pia mater, both of the head and spine; the quantity of which is never below two ounces in the adult, and often amounts to five in subjects of large stature, and whose cranium is not of small dimensions;—that the fluid contained in the spine communicates with that in the head, and vice versâ, so as to pass freely from one cavity to the other;—and that a portion of the same fluid is found in the lateral, the third and fourth ventricles of the brain, which communicate with the space between the arachnoid and pia mater by an opening situated at the inferior extremity of the fourth ventricle, between the upper part of the spinal marrow and the valve of Vieussens. 2. That this fluid may be demonstrated in full quantity either during life, or at a short time after death; but after a period of little more than twenty-four hours it becomes absorbed, and therefore diminished in quantity, or altogether removed: if after that period sub-arachnoid effusion of this kind exist, it is to be considered either as entirely a post-mortem appearance, or the remains of the natural effusion, to which had been added a quantity of fluid, the result of morbid action. 3. That a diminution as well as an increase in the quantity of this fluid is capable of producing serious disturbance in the functions of these important portions of the nervous system. It is plain, therefore, from the above abstract of Majendie's discoveries respecting this cephalo-spinal fluid, that it would be always

* *Orfila*, Leçons de Médecine Légale.
† Ed. Med. and Surg. Journal, vol. xxxi. p. 243.

difficult, and often impossible, to decide whether a sub-arachnoid effusion be a natural, a morbid, or pseudo-morbid phenomenon. Unless the effusion be very considerable, and have been found very shortly after death, we cannot with certainty pronounce it to be the effect of disease. But those which are found forty-eight or seventy-two hours after death are for the most part pseudo-morbid, being caused by the transudation of the serous part of the blood through the vascular parietes, so much so that, in opening a body two or three days after death, we may invariably expect to find sub-arachnoid effusion to a greater or less extent. We conceive that a due attention to these facts connected with the cephalo-spinal fluids will sufficiently account for the surprise or disappointment which some have expressed respecting the want of coincidence between the severity of symptoms and the extent of effusion.

The degree of colour of the pia mater is often increased by the same causes which we have already enumerated as influencing post-mortem sanguineous determinations: in this case it will always be found that the other tissues within the cranium which admit red blood are similarly congested. In some cases this congestion may go so far as to produce extravasation; and if the body has lain long after death, the serum effused between the pia mater and arachnoid will be more or less tinged with the red particles of the blood. We may here remark further, that sanguineous extravasations from apoplexy, if extending into the cavity of the ventricles, will communicate their colour to the cephalo-spinal fluid, provided the natural communication of the internal cavity of the brain with the sub-arachnoid cavity be not interrupted.

With respect to the encephalon itself, it may be stated that in general (such obvious cases as apoplectic clots, abscesses or tumours being excepted) it is extremely difficult, nay, often impossible, to decide between the morbid and pseudo-morbid states of this organ. This latter state is such as manifests itself by a change in the colour and consistence of the cerebral tissue. As to colour, we find it, here as elsewhere, influenced by the quantity of fluid blood in the viscus: in the cortical substance, from its much greater vascularity, that discoloration is most likely to appear; and it is of the first moment to distinguish it from the redness of inflammation, because we find that the same colour may be the result of an active determination of blood to the brain, as well as arise from a mechanical congestion of its membranes and substance. To determine this question it will be necessary to note accurately certain collateral circumstances—the condition of the arterial and venous system of the head generally—the degree of plenitude or vacuity of the heart, whether it afford any obstacle to the free return of the blood, or by an increase in its propelling power magnify the momentum of the columns of blood to the head—the position in which the head of the individual has been laid since death—and also whether putrefaction has begun, or the degree to which it has advanced.

The alteration in consistence, by a diminution of it, *(softening,)* is the most constant and obvious change which the brain and spinal marrow present. This softening is equally the result of disease and of the tendency to decomposition. Before proceeding to indicate the distinctions between these two kinds of softening, it may be well to notice that in the state of health different parts of the cerebro-spinal axis present a marked difference as to consistence. Thus, in the adult, the spinal marrow is softer than either the cerebellum or cerebrum; the cerebellum than the brain; both these parts softer than the pons Varolii. In the child the spinal marrow is firmer than the brain, and more resisting than in the adult.*

The morbid and pseudo-morbid softenings present many characters in common, as to situation, colour, smell: indeed, we have no sign sufficiently free from ambiguity to indicate either of these conditions with certainty: both attack the grey substance most frequently, and before the white; both exhibit the same varieties and shades of colour—with this exception, that in the morbid softening we often see the affected part of a bloody tinge, arising from a slight sanguineous effusion: sometimes a purulent infiltration is found, which is obviously decisive. In the extent of these two forms of ramollissement, we have a more certain indication of their cause; the pseudo-morbid will generally be found to pervade the whole cerebral mass, varying perhaps in degree according to the above-mentioned scale of natural variations of consistence, but the morbid ramollissement is almost invariably circumscribed. We say *almost*, because a morbid ramollissement has been met with of unusual extent, occasionally in the adult, but more frequently in the new-born infant. A state of general ramollissement of the brain is met with in cases of general anasarca, and differing very much from morbid softening. It arises from the infiltration of the brain by the fluid effused in the cranium and beneath the arachnoid. It can be produced in the dead body by injecting water through a small opening made in the head; the whole fluid injected will not be found in the serous membrane.†

M. Orfila suggests the propriety of pronouncing with caution on a morbid ramollissement merely from its locality being defined, because the cadaveric softening does not begin at the same time in all parts; the fornix, septum lucidum, and walls of the lateral ventricles, being the situations in which it first shews itself.

The spinal marrow is remarkable for the rapidity with which it softens. Every anato-

* *Orfila*, Exhumations Juridiques, tom. ii. p. 225. Such is undoubtedly the case at the usual period after death when post-mortem examinations are made. But we are disposed to think with Calmeil, that immediately after dissolution the spinal marrow is of firmer consistence than the brain. The Essays of this author on the Anatomy and Physiology of the Spinal Marrow are well worthy the reader's attention. Vid. Journal de Progrès des Sciences Méd. tom. xxxi.

† *Gendrin*, Hist. Anat. des Inflammations, vol. i. p. 188.

t knows that in order to dissect that organ sfactorily he must obtain it from a body te recently dead, and that even then a short osure to the air causes a rapid diminution ts consistence. The internal grey substance ms more prone to this diminution of conence than even the white, and hence the at diversity of opinion among anatomists ecting its exact form and characters in tate of health. However, in this organ re does not appear, so far as we at present w of its morbid states, any difficulty in tinguishing the pseudo-morbid softening n that which is caused by disease; for the umscribed locality of the latter, with the mented vascularity of the surrounding por-, and slight sanguine tint of the softened t, will in general be sufficiently character-c. We are not aware that such a decidedly hological general ramollissement of the cord been found as we have noticed in the in.

4. *The thorax.*—On opening the chest in usual way, the membrane of the pleura first racts notice. After the lapse of some time m death, an effusion is invariably found in s serous sac, which is liable to be mistaken a morbid one. The subserous cellular sue and the pulmonary substance being undantly pervaded by fluids, it follows that ransudation of them must necessarily occur er a certain period, and of course they will collected into the sac of the pleura. The ody colour of this fluid, its serous cha-ter, the absence of any organizable matter ch as serous membranes are prone to secrete, sufficient to prove that this is not a morbid cnomenon; moreover, it will seldom be und except in a body examined at least ty-eight hours after death, and its quantity ll be in proportion to the condition of the dy as to decomposition. Sometimes, but rely, gaseous effusions take place in the eural sac; they are in general complicated th old pleuritic effusions, and result from eir decomposition, thus constituting one of e species of pneumothorax described by ennec. Whether this disengagement of gas kes place before or after death is not easily termined; probability is in favour of the ter, but the experiments of Gendrin seem to dicate the presence of a variable quantity of s in the chest in very acute pleurisies, ap-aring just when the inflammation seems to ve arrived at a certain degree of violence.

In the mucous membrane which lines the r-passages, from the larynx and trachea to the inutest bronchial ramification, discolorations cur from various causes, which are extremely kely to deceive even a practised eye. In the rynx, trachea, and larger bronchi, this disco-ration is not so variable. We here find a ssive hyperæmia from the gravitation of the ood, in which case the mucous membrane is ly partially congested. We also find here a ngestion from obstruction to the circulation nerally, dependent on disease of the heart; t in the minute bronchial ramifications we nd not only the influence of gravitation or transudation after death producing alterations in the aspect of the membrane, but likewise these causes are apt to take effect in the struggle of death, or even some time before death in very debilitated persons. The progress of putrefaction in general produces a very marked and diffuse brown colour of the mucous membrane, much more intense in the smaller tubes. To be able to decide upon any one of the above species of hyperæmia of the bronchial membrane will require a careful consideration of coexisting circumstances. In the latter instance the general condition of the pulmonary and the other tissues as to their state of preservation, will materially assist; in the other cases the injection is ramiform, and the membrane does not appear so uniformly dyed, the redness being chiefly limited to dependent parts; and the state of the heart or great vessels will assist further in deciding upon the true nature of the redness. These circumstances will direct us in discriminating any of these different forms of redness not only from the others, but also from that which is produced by inflammation. Inflammatory redness, it should be remembered, is often accompanied with some secretion, either a viscid and adherent mucus, or a pseudo-membranous exudation, or even purulent fluid, all which are unequivocal proofs of the morbid nature of the colour of the membrane.

In examining the pulmonary tissue itself, we experience considerable difficulty in distinguishing between its pseudo-morbid and morbid conditions. We can say with confidence, from tolerably extensive opportunities for studying the subject, that there is no one point in morbid anatomy more difficult to pronounce upon with certainty, than whether a hyperæmia of the lung be inflammatory or not. Every one must have experienced how unsatisfactory are the signs of the second stage of pneumonia—the *engouement* of authors. It is obvious that this difficulty is greater the longer the period which may have elapsed since the death of the subject. It however rarely happens that a patient dies in the first stage of pneumonia; most frequently we find that the disease has in one portion of the lung advanced to its second stage *(red hepatization)*, and very frequently the third stage *(grey hepatization)* is exhibited in the same lung along with the two preceding. Where either of the forms of hepatization exists, there can be little doubt as to the nature of the congestion in any other part of the lung. Moreover, we may remark that the inflammatory congestion affects the upper as well as the dependent parts. The following observations from Andral will show how he estimated the difficulty of laying down any distinction between inflammatory and the pseudo-morbid hyperæmia. "It is," he says, "in the lungs as in the intestines, where a local accumulation of blood may be found in the dead body, which has had no share in producing any of the morbid phenomena observed during life, but was formed during the last moments of existence, or after life ceased altogether. Hence it follows that the existence of a simple congestion, especially when it occupies the most dependent portions

of the lung, is not sufficient to prove that a process of irritation or inflammation had been going on there during life. Does an alteration in the consistence of the part afford a more certain criterion to judge by in such cases? For a long time I was of opinion that when the lung was red and gorged with blood at its posterior portion, and at the same time was softer and more easily broken down than natural, it was a proof that the hyperæmia was caused by inflammation; but I have since altered my opinion, and am now convinced that whenever the sanguineous congestion is so great that the lung contains a larger proportion of blood than of air, the pulmonary parenchyma is invariably soft and friable. The reason of this fact will readily be understood if we reflect that, when the lung contains a much larger proportion of air than of blood, the parietes of the bronchi, when pressed by the finger, press in their turn on the compressible fluid they contain, and in this way, by compressing or expelling the air, retire before the pressure of the finger, and so escape being ruptured. But when the lung contains a larger proportion of blood than of air, the former fluid being almost wholly incompressible, the pulmonary tissue cannot recede from under the finger, and is therefore easily ruptured."* And in another section he remarks, "as the anatomical characters of the hyperæmia are precisely the same in both these cases, it follows that, in this instance at least, the true nature of the lesions found on dissection can only be known by the nature of the symptoms observed during life."†

We can hardly suppose it possible that gangrene of the lung and any post-mortem congestion of it could be confounded together. The peculiar smell from a gangrenous spot is a certain indication of its true nature. However, if any condition do appear closely to resemble gangrene, by carefully washing the suspected portion of lung in clean water we shall in general succeed in exhibiting the sound pulmonary texture.

In the pericardium the signs of disease are so very obvious that we know of no phenomenon which that membrane can present which could be considered pseudo-morbid. There is found, however, in its cavity, after a certain time, a sero-sanguinolent effusion in small quantity, which, like a similar one above noticed in the pleura, is to be regarded as a cadaveric result. (See Hydro-pericardium.)

Except after the lapse of a considerable time from death, we have never seen any post-mortem condition of the substance of the heart which could be mistaken for a morbid one. We not uncommonly meet with softening of the muscular texture of the heart; and this may arise from so many different causes, that Andral has enumerated six varieties of it; with any of these may be confounded a true cadaveric softening, which, however, generally does not appear for a long time after death. The best criterion of the true nature of a softening of the heart's parietes may be formed from the state of the internal membrane; if that membrane be healthy, or do not partake in the diminished consistency of the heart's parietes, then the great probability is in favor of this condition being the result of disease. But when the internal membrane is of a deep red colour, and is more or less softened, while at the same time there is no appearance of any lymph or other product usually resulting from inflammatory action, then we consider it impossible to determine with certainty to what cause the softening is to be attributed. In some instances the blood has been known to transude through the walls of the heart, and form ecchymoses either between the fibres or on the external surface. Such ecchymoses will want the regularity of form which those formed during life would possess, and rarely, if ever, take place except in an advanced stage of decomposition. We have twice seen numerous ecchymosed spots on the hearts of patients who died of purpura hemorrhagica; but these should be considered as morbid, and attributable to the same cause as the cutaneous ecchymoses.

The internal membrane of the heart often presents an obviously pseudo-morbid alteration in its colour. When the examination of a body does not take place for forty-eight hours after death, or in very warm weather for a longer period, we may invariably expect to find this membrane of a red colour to a greater or less extent. That portion which lines the dependent parts of the cavities will always be found so, and to a greater degree than the rest, because the colouring matter sinks through the coagulum so as to come immediately in contact with the internal surface of the heart; and this will account for the fact, that except at a very advanced period in the cadaveric decay, this redness generally appears in patches, and those most intense which are most dependent. A precisely similar redness will occur under circumstances which can leave no doubt that it took place during life; but as this subject is closely connected with the appearances of the internal coats of arteries, we shall defer any farther remarks upon it till we come to that section of our article.

The fibrinous masses which are almost uniformly found in the cavities of the heart are not to be considered in every instance as morbid productions, as the older pathologists thought; in general they are formed after death, or immediately before it, and merely form the natural disposition of the fibrine to assume the solid form. However, some of these coagula have been found organized, some containing pus, others with pieces of bone on them or in them; whence we must conclude that these fibrinous masses may be formed before death, and produce considerable disturbance of the circulation.*

5. *The abdomen.*—Of all the serous membranes, the peritoneum is most liable to *morbid* effusions. But in this cavity, as well as in that

* Andral's Pathol. Anatomy, by Townsend, vol. ii. p. 508.

† Op. cit. vol. ii. p. 509.

* Dr. Harty has given a very elaborate narration of the symptoms of two cases, which in his opinion were produced by these so-called polypi of the heart. Dub. Med. Transactions, vol. i.

the pleura, we generally find a post-mortem asion after thirty or forty hours; which, like t of the pleura, is in general coloured by re or less admixture with blood. This fluid l always, except it be in very great quantity, found in the pelvic portion of the perito- m. In the serous membrane itself, we ow of no pseudo-morbid appearance likely occur, except we name that softening pro- ced by contact with the acid contents of a rforated stomach, which we shall presently no- e more fully. The discoloration arising from ntact with the gall-bladder is too evident to mistaken for disease.

In examining the exterior of the intestinal tube the intestines lie in the abdominal cavity, we serve appearing through the serous coat vas- lar ramifications more or less numerous and ore or less filled with blood. Here we observe ll illustrated the effects of gravitation on the ood within the vessels of the intestines; ose coils which are lowest, namely those ich hang into the cavity of the pelvis, always esenting the deepest colour, and also the ost depending portions of all the parts of e canal.

There is no membrane of the body which esents pseudo-morbid colouration arising from many different causes, as the gastro-intesti- l mucous membrane: we speak now of the lour which results from particular distribu- ons of the blood in its vessels. In the first ace, we may notice that the *act of digestion* oduces an increased degree of redness of the ucous membrane of the stomach as well as the small intestine. The effect produced digestion on this membrane has been well oticed by Gendrin; he says that the mem- ane becomes of a rosy hue, deeper in young an in old subjects; and that it is owing to e action of this function may be very well ferred from the fact that only that portion of e membrane is coloured which is in contact ith the chymous mass. It is also remarked ound the portions of digested matter which e found in the lower part of the small in- stine. It appears, too, that the degree of lour depends very much upon the quality of e food, being less intense when the food is f a bland nature. This has been proved upon wo dogs, to one of which milk only had been iven, to the other an equal quantity of rich roth highly seasoned; the mucous membrane f the latter was of a deep red colour, while hat of the former was very slightly altered. asting also has the effect of altering the colour f this membrane, giving it a rosy hue in its whole extent; in this way differing from the ffects of digestion, which produces only a partial colouring.

A third cause of alteration of colour results rom "the passive hyperæmia," to adopt the anguage of Andral, "which has always a ten- dency to take place in the last moments of life n the parts abounding with capillaries." In his case the colour is generally of a darker hue, and the greatest quantity of blood is found in the vessels of the depending portions of the intestines.

Any obstacle to the free return of the venous blood, whether it reside in the liver, or from compression of the vena portæ itself, or whether it is to be found in the heart, will produce increased vascular injection of the mucous membrane; the blood in such cases will be of the venous kind, and the injection extensive, and even universal; varying, however, according to the period before death at which the obstruction commenced.

Such are the circumstances which operate before death in producing pseudo-morbid colouring of the mucous membrane. In the true inflammatory redness, there is generally some degree of thickening of the membrane, as well as a viscid mucous secretion in variable quantity. The redness, too, is not affected by position, being equally great on the upper as in the depending portions; and in a more advanced stage of the inflammation there may be lymph or purulent matter.

After death, we find the blood accumulating with greater rapidity, and in a more marked manner in the depending parts. This phenomenon may be observed as to the mode of its occurrence, by removing a coil of intestine, tying it at each extremity, and hanging it up; after some time the blood will be seen to leave the upper part, and accumulate in the lower portion of the intestine. If there be much blood in the capillary system of the mucous membrane, we observe another cadaveric phenomenon, after the body has lain for some time: the mucous membrane, and of course the villi, are gorged with blood, which presently begins to ooze out upon the surface, and to pass into the cavity of the intestine. This we lately saw well exemplified in the case of a young gentleman who died of fever, and whose body we could not obtain permission to examine till five days after death. All the upper portion of the small intestine was free from sanguine congestion, but that part of it which lay in the pelvis was found to be of a dark red hue externally; the mucous membrane being gorged, especially at its inferior part, and the cavity of the intestine full of fluid blood. This phenomenon is easily explained if we consider how freely the blood passes from the larger mesenteric veins to the villi, which moreover, from the researches of Ribes, appear to contain more veins than arteries; it is also further accounted for by the great facility with which an intestine may be inflated by blowing air into its principal venous trunk. Contact with the spleen produces a redness of a different kind, being more of a uniform stain or tinge of the membranes in its vicinity. This obviously arises from transudation of the blood from this vascular body through its coats. After a certain period we find the blood to transude through the coats of the larger vessels of the stomach and intestines so as to produce a more or less continuous stain, or extravasation of blood in the cellular membrane on each side of the trajet of the vessel. This appearance must be familiar to every one who has examined a stomach in an early stage of decomposition; the stain is distinctly visible on the mucous

surface, and may also be noticed on the peritoneal surface. The period at which this transudation may take place will very much depend on the season, the temperature of the room, and perhaps the state of the blood.

There are two other causes of discoloration which it is well to remember, although the appearances they produce may not be very apt to be mistaken for morbid ones. One of these is the presence of gases in the cavity, which may alter in various ways the colour of the blood collected in the coats of the intestine. The action of the bile too, by soaking into and combining with the mucous membrane, produces a very obvious change in its colour, and this may even extend into the stomach. There is a third cause of discoloration resulting from the action of the gastric acid on the blood, which we shall notice more fully after considering the other effects of that acid.

In inspecting the alimentary canal, we should not neglect to observe accurately the nature of its contents, for sometimes some coloured fluid may be found among them which may impart its colour to the membrane. Dr. Christison quotes a case in which a suspicion of poisoning had arisen from the inspector hastily referring the altered colour of the inner membrane of the stomach to inflammatory action. It was ascertained that the deceased was in the habit of taking a strong infusion of corn poppy, *(papaver rhœados,)* which, when administered to dogs, produced appearances identically the same. The inference was obvious.*

It will thus appear, that in attempting to form a judgment as to the precise nature of any coloration of the alimentary mucous membrane, there are numerous sources of fallacy which it is important to avoid. It is in the stomach that most of these pseudo-morbid appearances occur, but many of them likewise are to be met with in the intestines. They may be classed as follows: 1st, those which are produced antecedent to death, and 2nd, those which are strictly post-mortem or cadaveric. Under the former are comprehended, 1, those produced by the stimulus of digestion; 2, those resulting from long abstinence; 3, the result of passive hyperæmia toward the close of life; 4, such as arise from a disturbed state of the circulation owing to a retardation in, or obstacle to, the free return of the venous blood. Under the cadaveric may be enumerated, 1, that arising from post-mortem hypostasis, which is sometimes accompanied with cadavaric hemorrhage; 2, that produced by contact with a vascular body like the spleen; 3, those stains or streaks resulting from transudations of the blood through the coats of the larger vessels, more especially of veins; 4, that produced by the action of gases evolved into the cavity of the intestine, upon the blood contained in its vessels; 5, that from imbibition of the bile; 6, that from contact with some coloured fluid in the intestine forming part of the ingesta; and, lastly, that produced by the action of the gastric acid, of which we have yet to speak.

* Vide Christison on Poisons, p. 121.

Attenuation or thinning of the mucous membrane is occasionally met with as a morbid phenomenon. We sometimes, however, find it caused mechanically by a continued distention of the tube. Thus Billard relates a case in which he found a mass of lumbrici in a portion of small intestine, which was so distended by them that it almost equalled the cœcum in volume, and its wall was so thin as to permit the worms to be seen coiled up in its interior. We lately examined the body of a young girl, in which the cœcum was distended with fæces to such a degree that it extended across the upper outlet of the pelvis to the left iliac region. From the excessive attenuation of the wall of the intestine, the fæces were distinctly visible through it.

Softening of the mucous membrane is an alteration of texture which equally takes place under the influence of morbid causes as of others of a different nature. Nobody denies the existence of softening of the gastro-intestinal mucous membrane consequent upon inflammation; but it may reasonably be doubted whether it arises from that cause so frequently as has been supposed. Neither can this alteration of consistence be considered as a frequent result of the putrefactive process, for unless the membrane be exposed to air, we find that it softens slowly. Andral has found its consistence unimpaired eight or ten days after death, and in bodies which exhibited abundant signs of advanced putrefaction. Even when exposed to the air it softens slowly, as Billard did not perceive any change till the sixth day of the exposure of a portion of mucous membrane, and in a situation where the sun's rays could exert their full influence upon it. Hence we may with reason reject putrefaction or decomposition from the list of causes of this alteration, seeing that the majority of post-mortem examinations take place within forty-eight hours after death.

To John Hunter we are indebted for the first notice of what must be considered a very important fact, viz. that in the body of an individual dead soon after digestion has commenced, the mucous membrane of the stomach, the great end especially, may be found dissolved, and even the wall of that viscus perforated, and this through the solvent power of the gastric juice, "that menstruum which the stomach itself has formed for the digestion of food."* Without inquiring into the grounds on which so many subsequent writers or experimenters attempted to refute or deny Hunter's hypothesis, we shall content ourselves with referring the reader to Dr. Carswell's very able paper on this subject,† in which he will find the opinions of Jæger, Laisné, Gairdner and others, fully discussed, and pass on to state the facts which appear fully to establish the original opinion of the great British physiologist. The first circumstances in favour of this opinion are those related by Hunter himself, viz. the fact of having found a solution of the

* Hunter's Animal Economy, p. 231.

† See Edinb. Med. and Surg. Journ. v. 34, p. 282.

omach in two persons killed suddenly and ortly after having taken food; the frequency the solution in fishes, who generally died of blence and with the stomach full, and in other imals killed violently and during digestion. Spallanzani, Adams, Cooker, and Carlisle terwards confirmed these experiments. Some ilures, however, occurred in the attempts to oduce this phenomenon at pleasure in ani- als, and hence the confidence of subsequent perimentalists was somewhat shaken. Some bservations strongly corroborative of the Hun- rian doctrine were published by Allan Burns; e found the stomach dissolved and perforated, nd not only this, but every viscus with which ne fluid that escaped from the stomach came contact was also softened in its walls; and a still further confirmation, he observed, n examining the body two days after his first spection, that the solution had extended con- derably. Recently Dr. Carswell, in the aper above referred to, has fully succeeded in roving that this softening takes place in ealthy animals killed during digestion, and hat, in whatever part of the stomach "this nction was going on most actively, or an ac- umulation had taken place of the products of ecretion, there the organic alterations had also ccurred." Finally, a case has occurred to Dr. Sharpey, as related by Dr. Christison, precisely analogous to that of Mr. Burns. "On proceeding to open the body of a child or the purpose of dissecting the nerves, he marked that the stomach was perforated and elatinized, but the adjoining parts uninjured. He then sewed up the body in order to shew ne appearances to some of his friends next ay. By that time the peritoneal surfaces of ne spleen and left kidney were found much oftened and pulpy where they lay in contact with the hole in the stomach."*

Such, then, is the evidence upon which we would attribute a form of softening (and per- aps the most frequent) of the mucous mem- rane of the stomach to the action of the astric juice, and it may be added that this ction may go on to produce a perforation of he wall of the stomach. The softening is enerally observed at the most depending part, most commonly the great sac: here the mem- rane appears like jelly, yet hardly so firm. "When raised between the fingers the coats crumbled to pieces like a recent pseudo-mem- rane," and often the serous coat is similarly oftened. The only alteration of colour in he mucous membrane is that of being ren- lered rather whiter than the natural hue. The perforations resulting from this cause of course vary in extent according to that of the softened issues; we find them, therefore, of all sizes, sometimes so great as to involve a considerable portion of the stomach. The margins appear half dissolved, fringed, and generally formed of the serous membrane, and for a considerable distance round the mucous membrane is gelati- nized. Moreover, as has been first noticed by Dr. Carswell, the bloodvessels distributed on the softened parts and also on every part which had come into contact with the fluid, were altered in colour, so as to form brownish, brownish black, or pure black arborescences. When the fluid could not come in contact with the membrane, the vessels exhibited their natural colour. It may be stated further that the fluid found in these stomachs at once reddened litmus. In the instances of this form of perforation which have occurred in the human subject, no symptoms whatever of gas- tric disease were present before death, the patients having died of disease of some other organs or by violence. Thus, according to an abstract which we take from Dr. Christison's work, it has been found in women who died of convulsions after delivery, in children who died convulsed or of hydrocephalus, after death from suppuration of the brain both idiopathic and traumatic, from diseased mesen- teric glands, from nervous fever, and after sudden death from fracture of the skull and hanging.

The softening of the mucous membrane thus formed is to be distinguished from that which is the result of morbid irritation during life, as well as of that produced by the intro- duction of irritant poisons. Cruveilhier has described a condition of this membrane in the stomach of children, which he calls "*ra- mollissement gélatiniforme*." This softening, like that above described, extends to the other coats of the stomach and even causes perfora- tion. In short, this affection described by Cruveilhier has the strongest possible resem- blance to the pseudo-morbid softening of Hun- ter; but the evidence adduced in favour of its morbid character is derived from certain sym- ptoms supervening a short time before death. We know of no means whereby we can dis- tinguish between these two alterations, except, perhaps, the dark colour of the blood con- tained in the vessels of the softened part, which, if the alteration described by M. Cru- veilhier were the effect of morbid irritation, would not be likely to occur. On the whole, however, we are strongly disposed to the opinion that the *ramollissement gélatiniforme* of Cruveilhier is a pseudo-morbid phenomenon, and identical with that caused by the action of the gastric juice.

In a true pathological softening there are uniformly present some additional signs of in- flammation; thus, we sometimes have redness of the membrane, and generally an increased opacity and a thickening of the submucous tissue; and it may be indifferently found on all parts of the stomach, even where the gastric juice could not come in contact with it; more- over, here likewise we have not the black dis- coloration of the blood which is a remarkable character of the softening by the gastric juice.

The perforation which results from this softening must be distinguished from that caused by inflammation or by rupture. The existence of signs of inflammation in the serous membrane would be unequivocal evi- dence; but sometimes the perforation or rup- ture occurs at too short a time prior to death

* Christison on Poisons, p. 127.

to allow of the production of peritoneal inflammation, in which case the appearance of the margin of the opening, the state of the surrounding membrane, and of the submucous tissue, will assist in forming a conclusion.

We have alluded to the effect which the gastric fluid produces when brought into contact with the blood in the vessels of the stomach. The effect is nearly similar to that produced in the case of poisoning by acetic acid, related by Orfila in the Annales d'Hygiène for July, 1831, namely, a black or brownish black discoloration of the blood, without affecting the coats of the vessels. In the instance under consideration, however, the discoloration is not so extensive as in that of poisoning by the acid, the quantity of acid in the gastric juice being so small. But we sometimes meet with a brownish black discoloration from morbid action, which may be distinguished chiefly by the fact of its occupying the villi of the membrane, and by the gradation through which the colour passes from red to brown, and from brown to black; to which we may add that the discoloration by the gastric juice is most conspicuous in the large trunks. The absence of all appearance of transudation, as well as the state of the other tissues, will sufficiently indicate that the black colour is not caused by putrefaction.

In the parenchymatous viscera of the abdomen there are no pseudo-morbid appearances worthy of notice; they are chiefly such as are produced by mechanical obstacles to the free course of the blood, or such as are caused by the operation of the principle of gravitation. In some bad states of the blood the liver and spleen have been found softened in their texture to such a degree that they almost appeared to be thus altered by putrefaction; however, in general, the effect of putrefaction is to diminish the size of those organs, while the reverse often takes place in the case to which we allude.

6. *The bloodvessels.*—It is not uncommon to find considerable vascularity of the cellular membrane forming the external investment of arteries. The minute vessels ramifying in this tissue, called vasa vasorum, are minutely injected, and form beautiful arborescences freely anastomosing over the surface of the arterial tube. These often are produced as a mere mechanical effect, or as the result of gravitation. The alterations of colour which the internal coat of arteries exhibits deserve particular attention. Every one must have observed that if an artery be slit open, its coagulum or blood removed, and its inner coat exposed to the air, it quickly acquires a bright-red colour. Again, if the blood remain fluid for some time after death, if its fibrine be less contractile than in the healthy state, the inner coat of the arteries will be generally found to be deeply coloured. In examinations made when putrefaction has fully set in, a similar colouring of the same tissue will uniformly be seen. Again, if a coagulum exist in an artery, and the colouring matter have sunk to its most depending part, that portion of the inner coat will be coloured which is in contact with the colouring matter of the clot. Finally, by inclosing some blood in an artery, and keeping it there by ligatures, we are able to produce a red colour in its internal membrane. Such are the different ways in which a red colour or stain of the inner coat of arteries may be produced, very similar to that which is the first indication of inflammatory action in it. In veins similar discolorations, and from the same causes, are observed, and in them those arising *post mortem* take place much more quickly than they do in arteries. The red colour of the inner membrane of either arteries or veins can be but little depended on as a sign of inflammation; nor, indeed, can we derive any conclusion from it at all unless it be accompanied with an albuminous exudation or other unequivocal product of inflammatory action.

In the preceding detail of the various pseudo-morbid alterations which are to be met with in the principal tissues of the body, our design was, not to exhibit to the reader the difficulties in the way of forming a correct estimate of the condition of any structure, but to convince him, and in the most practical way, of the necessity for and utility of observing great caution in deciding upon the presence or absence of disease. We shall bring this article to a close by stating a few conclusions suggested by the consideration of the subject, which may serve as useful directions in making or recording post-mortem examinations.

1. Before proceeding to examine a body, the inspector should invariably ascertain, with as much accuracy as possible, the length of time which may have elapsed since the death, and it should be noted in the record of the inspection. The neglect of this has rendered many apparently valuable cases, noted in some of our standard works, utterly inconclusive. We allude more especially to cases in which serous effusion has been found round the brain or spinal marrow. 2. The reporter of post-mortem inspections should in no case content himself with merely stating what he conceived to be the state of a tissue, as, for instance, "*that such a membrane was inflamed*," but he should be careful to note, as clearly and as concisely as may be, the appearances which presented themselves, and any concomitant circumstances calculated to unfold the true nature of those appearances, whether morbid or pseudo-morbid. This precaution need not, however, preclude any remarks as to the impression conveyed at the time of examination, but it is obvious that it will have the advantage of recording a plain statement of facts, from which each reader may have equal means of deriving a conclusion. 3. There are some points respecting the examination of certain parts worthy of attention. In every case of suspected disease of the spinal marrow, the spinal canal should be opened before the head, in order to form an estimate of the precise quantity of fluid that may happen to be effused. The advantage of this is apparent from what we state respecting the free communication between the two portions of the cephalo-spinal fluid. The brain should not be removed from the cranium until the ventricles

e been examined, that as little as possible of fluid may escape. Of course this is only licable where the head is opened before the ne. As to the manner of opening the head, have generally preferred to do so by sharp strong blows of a hammer, so as to crack skull round, the head being supported by other hand, and not placed upon so unding a fulcrum as a table or block. We e found this method preferable to that of ing, which, we conceive, disturbs the parts e, and, unless the saw be very sharp, is ays extremely tedious; not to mention the iculty of preventing the saw from injuring dura mater, or even the substance of the in itself.

(R. B. Todd.)

PSORIASIS.—The term *psoriasis*, (scaly er; dartre squameuse,) from ψώρα, a scab itch, was first employed by Dr. Willan denote a cutaneous disease, which consists entially in a greater or less degree of inmmation of the rete mucosum and contiguous face of the cutis; and in the secretion of unhealthy epidermis, forming itself into les which exfoliate, and are renewed with ater or less rapidity. The natural transpion through the affected parts is almost apletely interrupted, and its place supplied the exuberant growth of a morbid cuticle. oriasis is so closely allied to lepra that some ters* have proposed to conjoin them under head, which in a practical point of view uld be attended with no inconvenience. th are well marked scaly diseases, and the erence between them consists in the more fect circular regularity of lepra, its inflamed rgin, raised scaly circumference, and usually pressed centre; while the outline of the ches of psoriasis is irregular, and their ntre rather elevated than depressed. Yet connexion between the two diseases is so imate, that we sometimes observe both ms of eruption in the same individual; pts of lepra being intermixed with the more gular and extended patches of psoriasis.

The elementary character of psoriasis is a ly surface with inflammation of the subent vascular tissue; but to these are geally superadded the formation of fissures l excoriations, discharging a thin fluid, ich concretes into crusts, intermingled with formed upon true scales; and in severe l protracted cases there also occurs overowth of the cutis, which acquires unnatural ckness and solidity. This affection is atded with heat and itching, which, although dom altogether absent, become at times re intense and distressing: during these ecerbations the inflamed skin flushes with t, and swells up into ridges like an erectile sue.

Psoriasis varies much in the rapidity of its ogress: it generally appears first in the form of small, red, shining spots which become covered with scales; and under these other scales are formed, while the first loosen and fall off. Thus the scales thicken, the spots multiply, enlarge, coalesce one with another, and form large patches. In other instances of this disease, considerable portions of the integument are affected at once, becoming rough, harsh, and chopped. Psoriasis is usually preceded by languor, lassitude, and loss of appetite: and is accompanied in its early stage by more or less of febrile disturbance, which is always most strongly marked in those cases where the disease is suddenly developed. It is very often periodical in its attacks, disappearing and recurring with marked regularity at certain seasons of the year. In the case of a lady, whose leg has for many years been affected with a large patch of *psoriasis inveterata*, the disease uniformly disappears during pregnancy, leaving a pale, wrinkled surface similar to the scar of a burn.

Causes.—Psoriasis is not generally believed to be contagious; but Dr. Willan,* it appears, had observed *psoriasis guttata* to occur among the children of the same school or family at the same time: and we remember to have been consulted by two ladies having this disease on their necks, who were impressed with the belief that they had received it from their female attendant. Its hereditary nature is generally admitted; and several instances in proof of this opinion are known to us. Psoriasis is more frequently seen among the lower than the upper classes of society, and oftener among females than males, occurring especially during disorder of the uterine functions, as in chlorosis and after parturition. Persons of a full habit and dark complexion are most subject to this disease; and a distinct tendency to it is indicated by a dry and husky state of the skin, with languor of the circulation. It is more especially a disease of cold climates, and its occurrence is much promoted by the keen, dry winds of spring, and the sudden alternations of temperature which take place both at that season and in autumn. Hence it has been observed to recur particularly at these periods for successive years, and to be then most aggravated; but we have known psoriasis to be most severe during the heats of summer.

Various occasional causes appear to give rise to this disease; such as chilling the stomach by large draughts of cold water while heated,† the sudden exposure of the body to cold after violent exercise, acid and indigestible substances taken into the stomach. In children psoriasis appears sometimes to originate from the irritation of dentition; and in adults it has been observed to arise during great mental anxiety, grief, and apprehension‡—most probably from the influence which these states of the mind exert over the digestive organs. There is reason to believe that both gout and

* *Plumbe*, On Diseases of the Skin. *Duffin*, in in. Med. and Surg. Journ. 1826, on Squamous seases.

* *Bateman*, Synopsis, p. 38.

† *Falconer*, Memoirs Medic. Soc. London, vol. iii.

‡ *Bateman*, Synopsis, p. 38.

urinary calculus are connected with psoriasis, not as causes, but concurring consequences of the same disordered condition of the stomach and bowels. Numerous local irritations are productive of psoriasis affecting the hands and arms, as in washerwomen, bakers, and others.

Dr. Willan* has mentioned that both *psoriasis guttata* and *psoriasis diffusa* are sometimes the sequel of *lichen* and *prurigo;* and we recollect an instance where *psoriasis inveterata* appeared to have been the consequence of *eczema rubrum*. We have observed also the disease last named degenerate under our eyes into *psoriasis guttata*.

Psoriasis has been divided by Dr. Willan into numerous species, of which only four deserve particular consideration; the rest being regarded as mere varieties, for which a brief notice will suffice.

1. *Psoriasis guttata*, (drop-like scaly tetter.) This appears in the form of irregularly shaped spots, some no bigger than a pin's head, others nearly as large as a sixpence; which multiply, extend, and coalesce into patches, all of them covered by white glistening scales, excepting those in the face, where they appear merely as red spots, rough and slightly elevated. It is seldom attended with much inflammation of the skin. Its type is sometimes acute, at others chronic; the former is most frequent in children, in whom it occasionally overspreads nearly the whole body in a few days; the latter is usual in adults. When the progress of *psoriasis guttata* is rapid, it is always accompanied by general feverish disturbance, and in many cases preceded by muscular pains. It appears most frequently in spring, and sometimes recurs annually at that season for several successive years. This is the most common form of psoriasis, constituting, according to Rayer,† three-fifths of all the cases which are met with.

2. *Psoriasis diffusa*, (diffuse scaly tetter). The character of this species is considerably more inflammatory than any of the others, and it is more nearly allied to impetigo and eczema; indeed Alibert has described one form of it under the name of dartre squameuse humide.‡ The skin affected by this eruption is much more hot, red, and tender, more frequently presents fissures and excoriations, and is much less closely covered with scales, which differ from those of the foregoing species in being occasionally of a brownish tint, more irregular in their form, and placed more edgewise on the surface. Diffuse psoriasis sometimes appears at once over a large extent, the skin becoming harsh, cracked, red, and scaly: at other times its progress can be traced from the formation of minute, elevated spots, covered with distinct scales, which after a time are connected by the inflammation of the intervening spaces; these in their turn become scaly, and the whole is at length changed into one continuous eruption. Again, in other cases, the disease appears in small separate patches, which may remain distinct, but are also apt to extend and coalesce, acquiring ultimately the characters just described. The cuticle becomes rent into fissures, which discharge a thin, serous, and sometimes bloody fluid, while the cutis, which is always more or less turgid from inflammation, at length suffers a real overgrowth. The development of this disease is usually attended with constitutional disturbance, which is afterwards maintained by the continued irritation of the inflamed skin. The heat and itching are often very troublesome, and any additional excitement from increased temperature, or the friction of the clothes, produces a distressing aggravation of the symptoms. In children this is particularly remarkable, for in them diffuse psoriasis appears in a severe form, generally from the age of two months to two years. Dr. Willan* was led to erect this into a distinct species *(psoriasis infantilis)* in consequence of the affection of the mucous membrane of the nostrils which usually accompanies it, and the intermixture of scaly patches with smooth shining elevations, which in the cleft of the nates often assume the appearance of moist flattened condylemata. But we have seen this occur in other squamous diseases, apparently from the mere action of heat and moisture preventing the scales from forming, and increasing the morbid turgescence of the affected spots. The disease in this altered form is more amenable to treatment, the flattened elevations yielding in general readily to the application of sulphate of copper.

When diffuse psoriasis continues its progress unabated, it either destroys the patient by the effects of cutaneous irritation, and of the accompanying morbid condition of the alimentary mucous membrane; or more frequently it degenerates into the inveterate form *(psoriasis inveterata)*. But the severity of the disease is usually limited to a few months, after which it becomes greatly ameliorated or disappears altogether, again to recur during the variable weather of spring or autumn, most frequently the former, but sometimes at both seasons.

The causes of this species of psoriasis are the same as those already enumerated; but it appears oftener to originate from the application of irritating substances to the skin, and exposure to sudden alternations of temperature: hence arise the local varieties which occur in washerwomen, bakers, shoemakers, workers in metals, and cooks. The first of these is often very severe, affecting the hands, wrists, and fore-arms, particularly about the part up to which they are usually immersed in the washing-tub. It arises from the irritation of the soap, and the alternate exposure of the skin to hot water and

* On Cutaneous Diseases, vol. i. p. 156. To the works of Dr. Willan, and of his pupil and follower Dr. Bateman, the writer of this article gladly acknowledges the heavy debt which he owes. Not to have drawn from the rich treasures left us by those distinguished physicians, would have been at once discreditable to himself and unjust to his readers.

† Maladies de la Peau.

‡ Maladies de la Peau. Pl. 13. Another form of the same species has been named by him *dartre squameuse orbiculaire*. Pl. 14.

* Vol. i. p. 170.

d air, and is most frequent in spring and nter.

The bakers' itch *(psoriasis pistoria)* is con- ed chiefly to the back of the hand, where skin is more tender than in the palm, and ere it is exposed both to the irritation of the ur and to the strong heat of the oven. We e also observed a cutaneous affection some- at similar on the hands of cooks, arising from posure to the scorching heat of the fire.

3. *Psoriasis inveterata* (inveterate scaly tet- ; dartre squameuse lichénoide). This, as name imports, is the most obstinate of all the ms of the disease, sometimes originating in diffuse species, at other times being the con- quence of *prurigo senilis* or of *eczema ru- m*. It is characterized by an exceedingly ckened state of the cuticle, which appears in n layers of a glistening white colour, re- nbling the shining bark of a tree, or the skin a dried fish; divided not into the mosaic of thyosis, but by transverse lines and fissures: often encases a part or the whole of a limb, d sometimes extends over the greater part the body, leaving unaffected a portion of face, or perhaps the palms and soles. The ges of the divided cuticle are usually curled vards, and these chinks open and close with motions of the body, which in such cases are t unfrequently attended with a rustling or ght crackling noise. A quantity of thin id, sometimes tinged with blood, oozes from fissures, and occasionally large portions of thickened cuticle are detached, leaving a ght red and exceedingly tender surface, at st discharging copiously a watery liquid, and n becoming covered with a hard dry epi- rmis, which separates from time to time in ge plates. The formation of scales and flat- ied crusts is so rapid in this disease, that great antities are found every morning in the pa- nt's bed,* resembling in this respect the de- ne of mercurial eczema, in which, however, appearance is produced by the drying of the ous discharge rather than the formation of e scales. When the cuticle is thus exten- ely and deeply diseased, the nails participate the change, becoming thickened and brittle, quently separating and being renewed.

4. *Psoriasis gyrata*, (serpentine scaly tetter). is very rare species of psoriasis is chiefly re- rkable for the red waving ringlet-like stripes ich it presents on the back or breast of the tient; the figures on one side of the spine, or one breast, often bearing a near resemblance those on the other. It is unnecessary to de- ibe minutely the fantastic shapes which it metimes exhibits; suffice it to say that the l colour of these tortuous stripes is partly aded by a thin covering of light branny les, which are constantly being thrown off d renewed. It is distinguished from herpetic d impetiginous eruptions, to which it bears a mote general resemblance, by the absence of sicles and pustules. Like other species of oriasis, it is much influenced by the weather and the seasons of the year—subsiding in sum- mer, and becoming more intense in spring and autumn.

Such are the great divisions of psoriasis founded on its peculiar forms and the degree of its severity, and under them, especially the diffuse species, may be ranked all the local va- rieties which have been described by Dr. Wil- lan and others. The most important, and per- haps the most common of these varieties, is that which affects the palms of the hands, *(psoriasis palmaria:* dartre squameuse cen- trifuge:) it is characterized by inflammation and thickening of the skin of the palm, with scales dispersed over the surface; and very often fis- sures, from which thin fluid oozes, attended with heat, itching, and sometimes considerable pain on extending the fingers. Patches of the same description appear also on the inside of the wrist and on the sides of the fingers; the nails likewise are affected in protracted cases, becoming thickened and opake, and mouldering away or being cast off. This is often observed to be an hereditary disease, and in those dis- posed to it the nails usually possess an unna- tural brittleness which makes them snap under the scissors. In such individuals the exposure of the hands to a cold dry wind, or frequently moistening them, is almost sure to induce some degree of psoriasis. The same affection is seen also on the soles of the feet, but in a less severe form, and rarely accompanied with fissures, as the feet are much better protected from cold, and very seldom exposed to the air while moist.

Diffuse psoriasis is sometimes seen on the scalp, producing an inflamed state of the skin, and a copious formation of white scales: in some instances the bulbs of the hairs become affected, and baldness is the consequence. The skin around the different natural apertures of the body is also subject to psoriasis, which, from the movements of the parts, is almost always productive of painful fissures. Thus it is met with on the edges of the eyelids *(psoriasis oph- thalmica)*, the lips *(psoriasis labialis)*, the nos- trils, and on the verge of the anus and prepuce *(psoriasis preputialis)*. When the lip is affected with psoriasis, it is most commonly the prola- bium of the under lip: its causes are obscure, but Rayer* states that he has twice observed it in persons who were great talkers, and addicted to the practice of biting their lips. The scro- tum is likewise subject to this disease, and that generally in the inveterate form *(psoriasis scro- talis.)*

Treatment.—The treatment of psoriasis is rendered of much greater importance than that of many other cutaneous diseases by the severe suffering which in many of its forms it pro- duces; by its long continuance, sometimes for a lifetime; and by the obstinacy with which, after an apparent cure, it returns on a change of season, or the application of some slight occa- sional cause. It very seldom exists to any con- siderable extent along with a general healthy

* *Willan*, on Cutaneous Diseases.

* Maladies de la Peau, t. ii. p. i. p. 35.

state of the frame: the system is usually either oppressed by the effects of a luxurious and indolent mode of life, or enfeebled by bad health, or by scanty nourishment and clothing, neglect of cleanliness, and the other concomitants of poverty. In both of these cases a change in the mode of living and in the state of health must be accomplished before we can hope to derive permanent benefit from the employment of remedies. A strict regimen, extending to every particular of diet, clothing, and exercise, suited to the peculiarities of the individual, must be the first step in our treatment. Should much irritation exist, and the strength of the patient permit, blood should be taken by venesection or cupping; and in the local varieties, such as the palmar and ophthalmic, leeches in the vicinity will be found useful. A general antiphlogistic regimen should be pursued, the use of spirituous liquors abandoned, and even wine and ale very sparingly, if at all, allowed; pickles, sour fruits, vinegar, shell-fish, baked meats, pastry, highly seasoned dishes, and other indigestible food, should be carefully avoided. The bowels ought in every instance to be freely opened and kept in regular order: in many cases a sustained purgative treatment by calomel and saline medicines has succeeded in effecting a cure. In the hands of M. Biett* this mode of treating psoriasis has proved highly advantageous; but it has been strongly opposed by Willan and Bateman, whose opinion on this subject has tended in no small degree to prevent British practitioners from making a fair trial of its efficacy. Of this practice our own experience does not enable us to speak with confidence; but we believe that it will be found to be suited only to those cases where there exists a tendency to plethora. Psoriasis, we have already stated, is sometimes combined with an opposite condition of the system, as it is met with in delicate chlorotic females. In these a course of tonic medicines, consisting of the preparations of cinchona and steel, will be necessary, if not as the immediate means of cure, at least for the purpose of preparing the body for the successful employment of other remedies.

Mercurials as well as purgatives have been denounced in general terms by Willan and Bateman,† as unsuited to the treatment of psoriasis; and it must be admitted that the full action of mercury in this disease is positively injurious, as Willis‡ long ago discovered. But it will not be denied that this remedy, when judiciously managed, in small and alterative doses, possesses a great power of correcting many of the disordered states of the digestive organs, and of restoring to the skin a soft and perspiring condition. The mercurial pill, mercury with chalk, Plummer's pill, and corrosive sublimate, have in our hands proved very serviceable, both in psoriasis and other scaly affections. One of the numerous remedies which have been employed internally for the cure of this disease is sulphur: it may be considered to act both as a revulsive, and by its immediate effect on the skin, through the pores of which, even under scaly disease, it is exhaled in the form of hydro-sulphurous gas. Among the different modes of exhibiting this popular remedy, may be enumerated the sulphureous mineral waters, sulphur conjoined with soda, with magnesia, or with cream of tartar; and lastly, the diluted sulphuric acid, which was given by Dr. C. Smyth in very large doses, and according to his report, with excellent effects.* It is proper here to remark, that the sulphuric acid, when taken diluted, undergoes decomposition in the alimentary cavities; and that by its continued use the body becomes impregnated with sulphur, just as when that substance itself has been administered.

We are furnished with still more powerful remedies of a revulsive character in the tincture of cantharides and the different preparations of arsenic. The former of these was first recommended by Dr. Mead† in cutaneous diseases, and since his time its reputation has undergone many vicissitudes. Dr. C. Smyth, Dr. Falconer, and Dr. Willan, speak of the tincture of cantharides as altogether inefficient in the treatment of scaly disease; but M. Biett,‡ at the Hospital St. Louis, has revived the use of this medicine in psoriasis, and found it to possess great efficacy. Our own experience has convinced us of its utility, but we have been repeatedly obliged to relinquish its employment in consequence of its effects on the urinary and generative organs. Arsenic, which was first introduced by Dr. Fowler in the treatment of squamous affections, has maintained its character among British practitioners with little or no interruption, and has even gained a place in the estimation of the physicians of France, notwithstanding the denunciations of the school of Broussais. M. Biett uses the solutions of Fowler and Pearson, and has also introduced into practice the arseniate of ammonia, of which he speaks very favourably. He employs, likewise, with advantage, the arsenical pill formed of the protoxide and black pepper: each pill contains one-thirteenth of a grain of arsenic, and two daily are considered by him as the maximum dose. Iodine is another medicine of the revulsive class, from which we anticipate very beneficial results in the treatment of psoriasis, but as yet our limited trials do not enable us to speak of its effects with confidence. Before taking leave of these powerfully acrid substances, it is necessary to caution the younger portion of our readers against employing them

* *Schedel et Cazenave*, Abrégé pratique des Malad. de la Peau.

† *Willan*, vol. i. pp. 183, 184; *Bateman*, Synopsis, p. 43.

‡ De Medicin. operat. Opera, p. 292.

* *Smyth*, in Medical Communicat. vol. i. p. 191.

† Medicina Sacra, cap. ii. Although Dr. Mead's remarks refer professedly to the leprosy of the Jews, he appears to have had in view scaly diseases; for he describes, as an instance of leprosy, the case of a countryman, whose skin was glistening like snow with white scales, which, when rubbed off, left a raw surface exposed. This individual seems to have laboured under psoriasis inveterata.

‡ *Schedel et Cazenave*, Abrégé pratique.

ng the existence of constitutional disturb- or irritation of the digestive organs, and oint out the necessity of attentively watching effects, that any inflammatory movement eleterious influence on the stomach or brain be immediately counteracted. In some s, when the appearance of such symptoms obliged us to suspend these medicines, t benefit has been obtained from blood- ng, both in allaying the irritation which had caused, and subduing the cutaneous tion.

here remain to be noticed some other reme- of the revulsive tribe which possess a eer- degree of efficacy in scaly diseases. The ure of white hellebore (veratrum album), pitch given in large doses in pill, are both ly recommended by Dr. Bateman: from atter we have seen beneficial results. The or potassæ has occasionally proved useful soriasis, as we have repeatedly experienced; when this disease exists along with the diathesis, as in gout and calculus, (no un- l combination,) its property of correcting ty affords a prospect of decided benefit.* bitter sweet (solanum dulcamara) has vise obtained considerable reputation for cure of psoriasis; its effects are rather nar- than revulsive; but its sensible action, e doses usually prescribed, is seldom very ous. The belief in its efficacy as a remedy scaly eruptions rests on unexceptionable ority;† and the remarks of Dr. Gardner‡ ne defective mode in which the decoction sually prepared may serve to explain much at disappointment which has of late been rienced in its exhibition.

soriasis being remarkable for the severity of ocal effects, we are naturally led to attempt cure by means of topical remedies; and ough these alone will rarely prove effectual, ust be acknowledged that, without their iously directed aid, we shall rarely if ever eed in obtaining a satisfactory result. We often enabled to relieve the patient's suffer- by such applications, as infusion of almond or of bran, decoction of poppy-heads, weak t lotion, emulsion of bitter almonds, lotions aining hydrocyanic acid, cream or fresh er, neats' foot or almond oil. A still more ing effect on the whole frame will be pro- d by the use of a tepid or moderately warm , to which a quantity of bran or a little car- te of soda or potass has been added. A fa- ite remedy among the French for the same ose is a bath of greasy dish-water (eau de elle grasse)—rather an unseemly applica-

After due attention has been paid to the of the general health, and when the rity of the local irritation has somewhat ided, we may proceed to employ the warm , from 96° to 104°, with such friction as he easily borne, in order to stimulate and soften the skin, and detach the scales. The simple vapour bath, or this combined with sulphur or iodine, affords still more powerful means of softening the surface and exciting the skin to a healthy performance of its functions, and the secretion of a sounder cuticle. Such baths certainly form a valuable addition to our means of curing every variety of scaly disease, and often enable us to subdue affections which would formerly have resisted all our remedies.* But the vapour-bath, in its different modifications, is a remedy which always demands the watchful care of the physician: its excitement not unfrequently proves too great, requiring its suspension, or even the abstraction of blood. Baths of mineral waters, especially those impregnated with sulphur, have long been resorted to with benefit for the cure of psoriasis; and similar baths, formed artificially by means of the sulphurets, will often be found of great service, provided the disease is not in too active and irritated a state. In the slighter forms of psoriasis, as when it is confined to the face and forehead, a sulphurated lotion, prepared by infusing sulphur in boiling water, has often proved highly advantageous. The internal use of the sulphureous mineral waters, or of corresponding medicines, may be beneficially conjoined. Saline mineral waters and sea-water have likewise been employed in this disease, and from the latter we have seen excellent effects; but chiefly we believe from the influence of sea-bathing in improving the general health. In one very aggravated case of diffuse psoriasis, where the disease was in an active and increasing state under the use of the arsenical liquor, the patient commenced sea-bathing, and anointed the eruption merely with fresh butter: a speedy amendment followed, and the affection almost wholly disappeared in about a month, but it was not eradicated.

Although the transpiration from the affected surface is much obstructed in psoriasis, it is not wholly suppressed; and there are still left many interstices from which an insensible perspiration is exhaled. By covering the part with oiled silk, we retain this and preserve the skin in a continual vapour bath, which softens it, and tends to restore it to a healthy state. The benefits of such a practice have been long known in the treatment of several local forms of psoriasis, as that of the palms; and the plan may be usefully extended even to cases where a large part of the body is affected. Great benefit is also derived from merely protecting the patches of psoriasis from the action of the atmosphere, which is remarkably evinced in that of the lips, nostrils, and eyelids. Any mild adhesive cerate will answer the purpose; but it is usual to employ one containing a very small proportion of the nitrate, or the white precipitate of mercury. Dr. Willan states that in psoriasis of the lips, nothing but the mildest cerate or plaster can be borne; and that its constant use is indispensable to a cure.

But ointments are employed in psoriasis, not

See the case of Horace Walpole, Phil. Trans. 30. p. 206.

Crichton, in Willan on Cutaneous Diseases, 5.

In Med. and Phys. Journ. May, 1830.

* *Rapou*, Traité de la Méthode fumigatoire.

merely to protect and soften the surface, but as strong topical stimulants, to excite the healthy actions and remove the thickening of the skin. Those in most common use are, the ointment of nitrate of mercury, the pitch ointment, and one composed of equal parts of these two. We are indebted to M. Biett for the introduction of remedies of vastly greater power, formed from the preparations of iodine. Of these the most efficient are the ointments of the iodides of mercury and sulphur,* which we have found fully to merit the praises he has bestowed on them. It is necessary for the success of these stimulating ointments that they should be well rubbed into the spots and patches at bedtime, washed off with soap and water in the morning, and if the situation of the eruption permit, again rubbed in, and the same process carefully gone through twice daily. In cases of solid thickening, both of the cuticle and cutis, sometimes seen, particularly in the knee and elbow, where even these powerfully stimulating ointments prove unavailing, we have derived great benefit from the application of strong acetic acid. The agency of this liquid in removing the most obstinate horny warts, and thinning the cuticle, when vinegar and sponging has been long employed, first directed our attention to it as a remedy in psoriasis; and the result of our trials has been highly satisfactory—the diseased cuticle separating in flakes, and a new surface being exposed of a much more healthy character. The application of the acid, which requires to be repeated, is hot and painful, especially when there are excoriations or fissures, but these ought to be protected by some mild cerate. Blisters have likewise been had recourse to in obstinate states of psoriasis, and with marked benefit; but their effects appear to be less permanent than those of the acetic acid. When there is oozing of fluid from the patches of psoriasis, advantage will be derived from the use of astringent lotions, as the liquor alum. compos. and solutions of corrosive sublimate, or of sulphate of copper; and when the effusion of moisture has thus been dried up, and the parts are a little hardened, which readily takes place, some mild adhesive cerate may be applied at bedtime and washed off in the morning. By steadily persevering in this plan, very troublesome cases of the local forms of psoriasis have been completely cured. In some of these obstinate varieties, particularly that of the scrotum, fumigations with sulphur and with cinnabar have effected a cure.

The long list of remedies which has now been reviewed, furnishes in itself abundant evidence of the intractable and rebellious nature of psoriasis; but it is not without reason that they have been enumerated, for it is well known to those familiar with chronic diseases of the skin, that a change of remedies is frequently required; and that one will at length succeed when all others have failed.

Should our efforts to effect the cure of psoriasis have proved unavailing, it will be proper, if the patient's circumstances and general health permit, to recommend his removal to a more genial or even a warm climate, where the habitually increased activity of the cutaneous functions, and the change which his constitution is likely to undergo, may render successful the modes of treatment which were previously without effect.

When the cure of psoriasis is about to be accomplished, the scales rapidly drop, and soon cease to be reproduced; the thickening and inflammation of the skin gradually yield, at length the affected spots appear as if slightly depressed, having a somewhat darker tint than the healthy skin, and occasionally we observe around these cicatrices a pale or white border. The completion of these changes of the diseased surface affords satisfactory evidence of the cure of psoriasis; and without this cicatrization, the mere absence of scales amounts only to a temporary amendment.

(W. Cumin.)

PUERPERAL DISEASES.—The object of this article is to present a general view of the parturient and puerperal states, and of the various diseases which may occur, singly or combined, in their varied circumstances. Such views of an important class of morbid affections are frequently of more practical value than the most laboured treatises on individual diseases. But the present class is one of peculiar moment; no other is so complicated in itself, and none excites such deep interest in the minds both of friends and of the physician.

The class of puerperal diseases must be viewed as embracing all those morbid affections which arise out of the state of pregnancy,—the act of parturition, the complicated condition of the system and organs which immediately follows parturition, and the function of lactation.

In the early period of pregnancy, several organs, but especially the stomach, sympathize with the new condition of the uterus, and suffer severely.

In the later periods of pregnancy several causes combine their influence especially to endanger the state of the brain. It is upon the conjoined and separate operation of these causes that our attention should be particularly fixed in regard to the diseases of this period; for it is frequently by their co-operation alone that the morbid influence upon the brain is brought into activity, whilst it may occur, afterwards, that one or even several of these causes may be removed, and yet a remaining one may renew or continue the morbid effect upon the brain which they had conjointly begun. The causes which co-operate in the last period of uterine gestation, in inducing a morbid state of the brain, are chiefly uterine and intestinal irritation, concurring with the actual pressure of the gravid uterus upon the various viscera and

* ℞.—P. tenuiss. proto iodid. hydrarg. gr. xii.—℥ii. Axung. purific. ʒi. *m.* ut fiat ung.

℞.—P. tenuiss. deuto iodid. hydr. gr. xii.—℥iß. Axung. purif. ʒi. *m.* ut fiat ung.

℞.—P. tenuiss. iodid. sulphuris, ℥i.—℥iß. Axung. purif. ʒi. *m.* ut fiat ung.

sels situated behind it, and the state of thora of the vascular system especially, asioned by this pressure.

During parturition, the contractile efforts of uterus and of the abdominal muscles add other source of danger to those already men- ned; and it is at this period that the brain is st subjected to fulness and pressure, and t convulsions or even apoplexy are apt to cur.

Several sources of danger are removed when ivery has taken place; and yet this is not ays sufficient to protect the patient from attack of convulsion, for this terrible ction has first occurred even after delivery l been effected. In this case, especially, suspect that a state of intestinal load and tation has been the exciting cause of the con- sion. This observation confirms the remark eady made, that when several causes have operated to induce a state of danger, some y be removed, and yet, if one remain, it y lead to the most disastrous events. This culiarity in the study of puerperal diseases not be pointed out too often or too ongly.

Convulsions do occasionally occur after de- ery, even although the system be in a state exhaustion from hemorrhage. The state of neral exhaustion is not, we believe, incom- ible with a state of fulness of the brain; but s kind of convulsions will be found, we nk, frequently to involve also a state of in- tinal load and irritation.

The danger may arise, however, immediately er delivery, more directly and simply, from tate of inanition and exhaustion, the effects an emptied condition of the uterus and domen, of abstracted pressure upon the cera and vessels along the spine, and per- ps of loss of blood.

To these sources of danger after delivery ist also be added the effects, perhaps, of otracted suffering, of violent pain, of mental rm, and of what may be termed the 'shock' parturition.

There is another series of puerperal affections ich do not occur for the most part until me hours at least after delivery. These ections consist principally of uterine, peri- neal, or venous inflammation, of the effects of estinal irritation, of the effects of loss of ood, or of two or more of these combined. ere are two other sources of irritation in the ndition of the mammæ, and occasionally of e uterus; and there is that terrible disease, e epidemic puerperal fever.

Considering the important and sudden change ich takes place in the condition of the uterus parturition, we cannot be surprised that this gan should frequently be the subject of in- mmation in the puerperal state. Neither can be matter of surprise that its appendages, the ljacent viscera, and the peritoneum at large, ould not unfrequently participate in this orbid condition. And when we further con- er the degree of violence to which the brain s been subjected during parturition, we must : led to expect that this important organ should be left by that process in a state of proneness to inflammation; and this is pre- cisely the case: for next to the viscera of the abdominal cavity, the brain is perhaps the organ which is most apt to become affected by puerperal inflammation, though in fact puer- peral phrenitis is a far more rare disease than has been supposed.

We have further to consider the peculiar condition of the internal surface of the uterus after parturition. M. Cruveilhier has compared it to that of a wound. However this may be, phrenitis and inflammation of the absorbents are among the most formidable of puerperal diseases, diseases arising from this peculiar state of the internal surface of the uterus.

There is another not less fertile source of puerperal disease in the state of the alimentary canal after delivery. This state consists, in general, of a loaded or disordered condition of the large intestines, but is sometimes also induced by improper things taken into the stomach. It is most important to observe that the effects of stomachal or intestinal irritation are very similar to those of inflammation, as it affects the head or abdomen; for on the just diagnosis of these cases depends the proper application of the remedies.

Similar observations apply to the effects of loss of blood when these are of the remote cha- racter, and attended by the phenomena of re- action.

In this case the head is apt to be so affected as to lead to the idea of inflammation of the brain; and the heart, so as to present the sym- ptoms of disease of this vital organ.

But it is rare that these sources of disease act thus distinctly; it is far more usual to observe them co-operating to produce mixed cases. One of the most frequent of these is puerperal mania. It is in such complicated cases that all the attention and energies of the mind are required to appreciate the influence of each, and to adapt the remedies to this complicated form of disease.

There is not unfrequently, also, a source of irri- tation in the state of the uterus itself. A certain degree of after-pain is usual in almost every case; but a state of irritation and pain is frequently kept up by the presence of clots of blood, and the efforts for their expulsion. This state of the uterus is full of dangers; not in itself, but by masking and concealing the beginning of dan- gerous diseases: pain of an inflammatory kind is too apt to be neglected, under the impression that it is but the usual after-pain.

A similar remark may be made in regard to the irritation excited during the establishment of the secretion of milk. This process is apt to be attended by pain, fever, and affection of the head, which frequently mask the beginnings of puerperal disease.

Both these sources of irritation concur to add complexity to the character, and difficulty to the diagnosis of puerperal diseases, and to con- stitute that peculiarity of this study to which we have already alluded.

The first of these classes of disease might perhaps be denominated *parturient*, whilst the

second might be distinguished by the epithet *puerperal*; the former occurring chiefly in or near the act of parturition; the latter usually some hours afterwards. There is a third class of morbid affections which follow still more remotely upon child-bearing, and which consist principally of the more continued effects of intestinal disorder or of loss of blood, and issue, for the most part, in an inability to support the drain occasioned by lactation.

A fourth series of puerperal maladies, using this term in its most extended sense, arises out of undue lactation itself. They consist in the various forms and effects of exhaustion, and constitute a most important and interesting subject for renewed inquiry; for we believe them not to be at present by any means fully understood.

There is still another consideration which is full of interest in regard to puerperal diseases,—namely, the state of health of the patient previously to her confinement. That which most frequently modifies the puerperal state is disorder of the general health, which may possess very various characters. It frequently occurs, from such a state of general disorder, that the recovery after confinement is tardy, the secretion of milk scanty, or even morbid, affecting the health of the infant; and that there are many local affections, especially of the head or of the heart, which are full of pain and suffering.

We have now taken a rapid survey of the principal causes of puerperal diseases. It may be truly said that many of these causes co-operate in every case; but it is also true that each puerperal disease is to be referred to one or two of these causes more especially. Every case of puerperal affection may, therefore, be considered as a case of modified disease, requiring that the mind of the physician be active and comprehensive, so as to embrace the numerous circumstances of the disease. This is true in a degree which scarcely obtains in any other class of diseases; and it is on this account that we have represented the study of puerperal diseases as requiring peculiar habits of inquiry and investigation.

Of the morbid affections which occur in the parturient state.—The term parturient is adopted to express the condition of a person just before, just after, and during the act of parturition. A brief notice of the morbid tendencies of this state is a necessary introduction to the more detailed account of some of the morbid affections which occur in that which may perhaps be more properly termed puerperal. The distinction between the parturient and the puerperal states will be found to be at least of great practical utility.

We have already cursorily alluded to the principal causes of apoplexy and convulsions, as they occur in the last stage of utero-gestation, and in the act of parturition. It is our present object to enter into this important question with somewhat more detail.

The first cause enumerated as conducing to these affections of the brain was uterine irritation. That this species of irritation does indeed dispose to disease of the brain, is sufficiently obvious from the occasional occurrence of convulsions in cases even of dysmenorrhœa or painful menstruation.

A second exciting cause of affection of the brain, probably not very different in its nature from the former, is found in the parturient effort of the uterus when labour has begun. The effect of labour-pain upon the vascular system of the head is sufficiently seen in the flushed state of the countenance; and the attack, or the recurrence of convulsion, not unfrequently takes place with each uterine effort.

With the uterine efforts must, however, be conjoined those of the abdominal and other muscles, in our estimation of the influence of labour-pains upon the state of the brain.

The third cause of affection of the head in the parturient state is stomachal or intestinal load or irritation. It appears almost unnecessary to adduce any example of the influence of these causes upon the vascular system and nervous origins within the head. The presence of indigestible substances in the stomach, and of indurated or otherwise morbid fæcal matters in the large intestines, are amongst the most usual causes of apoplexy and convulsions in those who are predisposed to these affections, and especially in the puerperal state. The late Dr. John Clarke published an interesting and important paper, to which we shall have occasion to revert hereafter, upon the morbid influence of oysters, taken at this period, upon the brain; and it cannot be doubted that other indigestible substances have frequently, perhaps unsuspectedly, produced the same deleterious effect. One of these effects was convulsion. And it is to be particularly remarked that the cases published by Dr. Clarke all occurred after delivery, and of course even after some of the predisposing causes of puerperal convulsion had ceased to operate.

But a still more frequent concurrent cause of convulsion or of apoplexy in the parturient state is a loaded condition of the large intestines. The operation of this cause is frequently made obvious by the effects of purgative medicines and enemata in these cases, both in the relief they effect in the symptoms of affection of the brain, and in the character of the alvine evacuations: the quantity of scybalous fæces which have thus been evacuated in some instances would appear incredible, were not the torpid and dilated condition of the intestine taken into the account.

Nor can there be any doubt that the gravid uterus itself acts by its size and by its pressure upon the descending aorta, in inducing fulness of the vessels of the brain in the latter period of utero-gestation. It is on this principle that delivery frequently secures the patient against the recurrence of the fit of convulsion. When the pressure of the gravid uterus falls more particularly upon the vena cava, the effect of interrupted circulation is of course observed in the lower extremities, chiefly under the form of œdema, but perhaps of phlegmasia dolens.

It usually happens, as we have observed already, that apoplexy or convulsion occurs

parturient state from the conjoined operation of several of these causes; and it is only by an attentive consideration of all of these sources of danger, that the attack is to be prevented in the first place, and its recurrence in the second.

It is important also, with the view of prevention, to consider the probable condition of the encephalon itself immediately leading to an attack of convulsion or apoplexy. It is doubtless one either of irritation or of fulness. Every cause of these morbid states of the brain must therefore be carefully removed and avoided, whilst their effects are combated by the most vigorous remedial measures.

This is the more important, because each recurrence of convulsion is not only attended by immediate danger, but aggravates the morbid condition of the brain, and augments the tendency to the repetition of the paroxysms of convulsion. The same observation may be made of each contractile effort of the uterus and abdominal muscles during parturition, which, like the fits of hooping-cough in other circumstances, has in some instances led to convulsion.

The state of the system which obtains immediately after delivery is in many important circumstances different from that which exists during pregnancy and in the act of parturition. The emptied state of the uterus and abdomen constitutes in itself a source of inanition; and there is usually more or less of loss of blood, and sometimes even an extreme degree of hemorrhage, so that the system in general must be considered to be in a state of exhaustion. There can be no doubt that this very exhaustion alone has in some instances induced convulsion; but it is probable that in many, some of the causes of this terrible affection which have been mentioned, and especially a state of uterine, stomachal, or intestinal irritation, have concurred to produce this effect.

The more usual immediate consequences of delivery and of uterine hemorrhage is a state of syncope; this is more or less severe and alarming according to the degree of loss of blood and of the susceptibility to its effects, and varies from the slightest degree of faintishness to such a state of syncope as may endanger life.

Similar effects are sometimes to be attributed to the protracted sufferings of a lingering labour, in other cases to the violence of pain, and in others to alarm and dreary apprehensions and anticipations on the part of the patient. These circumstances sometimes lead to sudden death, an event which may occur immediately upon delivery. In such cases, cordials given during the last stage of labour, the recumbent position guardedly preserved, and the immediate and careful application of the abdominal bandage, may save the patient.

Perhaps the condition of the system under the influence of some of the circumstances of parturition cannot be better expressed than by the term 'shock;' and it may be aptly compared to a similar state under very different circumstances, and especially those of a painful operation. This state of shock seems to consist of a partially suspended power and action in the system. It may be suddenly fatal, or it may yield to reaction, which may or may not pass the boundary of health; or, lastly, after some feeble efforts, it may lead to a gradual but irretrievable sinking of the vital powers. This subject has not been sufficiently noticed in medical writings, especially in connexion with the parturient state.

One of the influences of shock still requires to be mentioned. Many causes of disorder may long remain dormant, or may be affecting the system in the most gradual manner only, until they are called into a more active operation by some kind of shock. This is particularly true in regard to intestinal irritation. This cause of disorder may long subsist in an inactive state, until, by the occurrence of some shock to the system, it is brought into but too effective operation. It is for this reason that the effects of intestinal irritation are so frequently observed in the puerperal state and after various accidents, without which this cause of constitutional derangement might have long remained inoperative, or at least insufficient for the production of acute disease.

In the treatment of apoplexy or convulsions before delivery, and even after delivery, except in cases of profuse uterine hemorrhage, the principal remedy is bloodletting; the second object is the removal of all those exciting causes of the disease which have been mentioned; and the third is cupping of the occiput and neck.

In the case of hemorrhage, the remedies are still the removal of the exciting causes and cupping.

A state of exhaustion from loss of blood generally from the system, does not protect the brain from a state of vascular fulness. This is abundantly proved in the excellent paper of Dr. Kellie, in the Medico-Chirurgical Transactions of Edinburgh, and by the fact of the occurrence of convulsions, and even of apoplexy, in this state of exhaustion. It is in this very case that cupping of the occiput is so strongly to be recommended. The brain, in some cases of exhaustion, is relieved by the topical abstraction of a very small quantity of blood; and this relief is not only obtained by a less expenditure of blood, but is more permanent than similar relief by general bloodletting.

The next point in the treatment is the removal, not of one or two, but of all sources of irritation—of all the possible exciting causes.

A point not less important than the treatment of these affections is their prevention. No means would conduce so much to this purpose as the invariable administration of copious warm-water injections at some period before or during labour. The large intestines would thus be relieved of their load, and a great and fertile source of future disease would be removed. And this remark applies not to affections of the head only, but to many other puerperal diseases.

Of the morbid affections which occur in the puerperal state.—The morbid affections which occur in the puerperal as distinguished from the parturient state usually commence at such a

period after delivery as may have given space for reaction to take place, after the state of inanition and exhaustion which usually obtains immediately upon parturition.

It should be observed, however, that there is scarcely a disease of the puerperal state which does not occasionally show itself before delivery. In these cases the disease usually remains stationary, or nearly so, until parturition has taken place, and then assumes its exasperated form.

In some instances, and those of the most serious kind, puerperal disease supervenes insidiously, and makes a slow and probably an unheeded and fatal progress.

Even of those puerperal diseases which commence by marked symptoms, the more serious are not always the most unequivocal in their mode of attack. Pure inflammation is, for example, less marked by rigor, heat, and other obvious symptoms, than are the effects of intestinal irritation. This is a point which requires to be enforced upon the attention of practitioners; for, in inflammation especially, it is of the utmost importance to detect the disease in its very origin.

The effects of intestinal irritation and of loss of blood are apt to produce symptoms of increased action resembling those of inflammatory disease, and prompting the use of evacuant remedies. This proceeding is attended by two sources of error: in the first place the symptoms are frequently relieved in the first instance,—a state of faintishness taking place of that of reaction,—and the physician is apt to judge that the remedy had relieved, but was used in too mild a degree to subdue the disease, and is thence led to a repetition of the measure: in the second place, after the first and second moderate use of the lancet, for instance, the reaction returns in a still more violent degree than before; and it is then imagined that the disease, though relieved, was not only not subdued, but had been suffered to make a fearful progress; the lancet is therefore again used, until it may be that the powers of the system yield, and sinking takes place of reaction; or, if the last bloodletting be considerable, the scene may be closed by a sudden and unexpected dissolution.

We now proceed to treat of each particular form of puerperal disease.

Of puerperal inflammation within the abdomen.—Inflammation within the abdomen, as it occurs in the puerperal state, may be divided into three kinds; that which chiefly affects the uterus and its appendages; that which appears to be general over the peritoneum; and that which is confined to a portion of this membrane.

A distinction of still greater practical importance is that between the acute and the insidious forms of puerperal inflammation of the abdomen. Sometimes the attack is distinctly characterized from the beginning; at other times it is of the most insidious character, perhaps to be referred back to a date anterior to parturition, or even apparently issuing out of mere labour-pain. These are points which require to be deeply impressed upon the mind of the young physician, in order that they may induce in him that degree of watchfulness in regard to these diseases which they so imperatively demand.

Inflammation within the abdomen, of whatever kind it may be, is only to be ascertained by the presence of pain, induced or aggravated upon pressure. This is the pathognomonic symptom of the disease. All the other symptoms are only accessory; and they are all, without exception, inconstant. In some insidious cases of abdominal inflammation, the tenderness even is only discovered by a careful examination; and there is sometimes pain under pressure when there is no inflammation.

These remarks will, we trust, lead to the most careful examination of the abdomen, and of the symptoms in general, in every case of puerperal disease.

The acute attack of puerperal inflammation within the abdomen is frequently marked by rigor. This is frequently in the worst cases only slight. We cannot sufficiently enforce this fact upon the attention of our readers. Some have imagined that there could be no puerperal inflammation of the abdomen without severe rigor; and they have generally supposed that severe rigor necessarily supposes an attack of inflammation. We can most unequivocally attest that both these opinions are erroneous, and contradicted by facts.

We would make precisely the same observations in regard to great heat of surface or fever. We have known many instances of acute puerperal inflammation within the abdomen unattended by heat of skin, and many cases resembling inflammation, but not in reality inflammatory, in which the heat of surface was extreme.

Frequency of the pulse is not a less uncertain indication of inflammation. We are enabled to say, from careful observation, that the pulse is but little accelerated in many cases of puerperal inflammation within the abdomen, whilst it is excessively and even alarmingly frequent in some cases in which inflammation does not exist.

In regard to pain and affection of the head, they are by no means essential attendants upon puerperal inflammation of the abdomen in its first stages, but, on the contrary, appear to denote another and different kind of morbid affection, which may exist alone or as a complication of inflammation.

Pure puerperal inflammation of the peritoneum is to be ascertained by an attentive examination of the abdomen. There is either pain increased upon pressure, or tenderness discovered upon pressure; and this is either general over the abdomen, or confined to the hypogastric region; or, lastly, in cases of partial peritonitis, to some other part of the abdomen. With the pain or tenderness there is frequently either general tumidity of the abdomen, or a local hardness; in the latter case it is frequently such as to denote an enlarged and inflamed condition of the uterus, but it occasionally arises from an affection of the ovarium

from partial inflammation and suppuration the peritoneum.

There are sometimes, and only sometimes, ckness and vomiting; there are also, in some stances, a suppression of the lochial discharge, d a flaccid state of the mammæ. But we not think the precise cases in which these fects do or do not occur, have been distinctly certained by the observation of a sufficient mber of facts.

In pure puerperal inflammation of the abomen there is not necessarily much rigor, at of skin, load of the tongue, affection of e head, or great frequency of the pulse; there on the contrary, in many instances, only a ght degree or even an entire absence of ri-r, little or no heat of surface, or whiteness of e tongue, little frequency of the pulse, and affection of the head. But the countenance, anner, and respiration, usually become highly aracteristic.

Puerperal inflammation within the abdomen marked by an expression of extreme pain d anxiety in the countenance; the brow is ntracted, and the upper lip is drawn upards in a peculiar and characteristic manner, d bound round the teeth or rather gums. ese appearances are increased on pressing on the abdomen, or they are observed at at moment if they had not been manifest fore. The countenance is generally pale and ther sunk, but with partial heats.

The manner of the patient is much changed, d has become expressive of suffering and xiety. The movements of the body are atded by pain, and are therefore suppressed; if performed at all, it is with an expression suffering in the countenance, and of caution the manner; and there is an appearance as the body had become heavy and helpless.

The respiration becomes rather hurried and xious, and it is performed principally by ovements of the thorax, those of the diaragm and abdomen being more or less, metimes completely, suppressed,—a circumnce which gives great peculiarity to the apearance of the breathing. Sometimes there is nsiderable heaving of the chest, with some rry, some noise from the ingress and egress the air, and sometimes with a sort of blowg: this state of the respiration is attended the utmost danger, being frequently one of e first symptoms of the sinking state, of hich we shall have to speak immediately, and which we wish earnestly to call the attention our readers.

The general surface is usually a little inreased in its temperature, and there is frenently perspiration.

The pulse is at first only moderately frequent, it gradually becomes more so, and it is often mall and apparently feeble.

We have already alluded to the occasional currence of sickness and vomiting. The abomen is frequently tense and tumid, as well tender under pressure: this is an affection be anxiously watched; it sometimes inases to a state of complete tympanitis. The te of the bowels is very various; there is by no means always constipation; sometimes there is diarrhœa, with or without the discharge of mucous stools.

Instead of general tumidity of the abdomen, there is frequently a distinct tumour with tenderness in the region of the uterus, in the iliac region, or in some other region of the abdomen, leading to the suspicion of an especial affection of the uterus or ovarium, or of a partial inflammation and suppuration of the peritoneum.

We have thus described the most usual form of puerperal inflammation of the abdomen in its commencement. It does not seem either possible or profitable to divide the disease into distinct stages. But it is quite incumbent upon the practitioner to trace the usual changes which are observed in this disease: these are, first, a gradual amendment; secondly, a gradual exasperation of the disease; and thirdly, the supervention of the state of 'sinking.'

Little can or need be said upon the two first of these changes. Every appearance of a return to a healthy state of the functions and general appearances of the patient will raise our hopes; but there are no points of so much importance to be watched as the expression and condition of the countenance, the manner, and the state of the abdomen.

No apparent amendment is to be at all depended upon unless it has continued and been progressive for four-and-twenty hours; this is a caution of great importance to the young physician, in guiding him in his expressions in regard to the prognosis. And even in the most favourable cases the further progress towards recovery is to be watched with the utmost care and precaution.

In the less favourable cases the countenance becomes more and more altered, the pulse more and more frequent, the abdomen more tender and tumid; the muscular powers of the patient appear overwhelmed; the respiration becomes more heaving, and, as we have usually termed it, "blowing," being somewhat audible,—a condition of the breathing always attended by the utmost danger. At this period, too, there is often some degree of delirium, alternating perhaps with slight dosing, and there are generally restlessness and jactitation, and the patient cannot bear the arms to be covered.

At this period, too, the tongue is frequently loaded and more foul, and sometimes dry; the bowels are variable, frequently flatulent and loose. The mammæ are flaccid, the lochia suppressed; the skin is clammy and wet, if not cold; the hands and wrists are often livid, and the feet cold.

This description of symptoms applies to the case of general inflammation of the peritoneum. The more partial cases of peritonitis continue longer, and affect the constitution less and less rapidly. In some instances the integuments over the seat of the inflammation have become tumid and inflamed, and an issue has at length been effected for the subjacent pus: the abscess has afterwards collapsed and healed, and the patient has slowly but finally recovered. This opening frequently takes place

about half-way between the umbilicus and spinous process of the ilium. In other instances the matter has been evacuated by the rectum, and in some rare examples by the bladder. In other cases the abscess has not been evacuated during life; but the patient has become gradually emaciated, and the health and strength have failed; there have been great frequency of the pulse and hectic, and the disease has at length, though perhaps very slowly, proved fatal. It has, however, occasionally happened that the effused fluid has been reabsorbed, and the fatal event averted.

But the acute form of puerperal peritonitis sometimes issues in a state of sudden sinking of the vital powers. The change and symptoms are such as have frequently led to the suspicion of gangrene having taken place; but no such appearance is observed after death.

This state of sinking is usually rather abrupt in its manifestation. The patient may be left not without hope the preceding night, but on being visited on the ensuing morning is found to have passed into a state of hopeless sinking. The pain has ceased, but the tumidity of the abdomen is augmented; the breathing is attended by heaving and blowing; the skin of the arms and hands is cold, clammy, and livid, the livid colour only partially disappearing on pressure; the pulse is thready and excessively frequent; the countenance is altered and sunk; the patient may be roused, but is then, perhaps, unconscious of pain, and expresses herself as being relieved; the hands are kept out of bed; sometimes there is cough, and the feet are livid and cold.

The morbid appearances usually induced in cases of inflammation of the uterus and of the peritoneum are well known.

In inflammation of the uterus there are, in different instances, exudations of serum, of coagulable lymph, and of pus, or it is the seat of distinct abscesses; and its internal surface is frequently morbidly red, and the source of various discharges. The appendages of the uterus are frequently the seat of similar morbid appearances.

The peritoneum when inflamed pours out serum, coagulable lymph, or pus; and its different surfaces are apt to be variously glued together. Frequently the intestinal canal is found distended to the utmost, as before death, by fetid gases.

In some instances pus is effused and deposited in various parts of the peritoneum, being confined by the adhesion of contiguous portions of this membrane.

There is no part of the peritoneum, and no viscus in the abdomen, which may not become the seat of puerperal inflammation and of the consequent changes of structure. The parts most frequently affected by puerperal inflammation, however, are the organs contained within the pelvis,—the uterus, its appendages, the rectum, the bladder, and the peritoneal lining of the pelvis; and then the peritoneum in general. In an interesting case, published by Dr. Ley, the spleen was found to be a principal seat of disease.

We now proceed to state the treatment of puerperal inflammation, and we must observe, in the first place, that nothing can be trusted to to save the patient but the most ample bloodletting, and, in the second place, that nothing should preclude the use of this remedy but the actual existence of the state of sinking.

In regard to the measure and the repetition of the bloodletting, many points must be taken into consideration. The earlier and the more fully this remedy is employed, the more efficacious and the safer it is, and the safer is its full repetition.

There is one point which we would particularly impress upon our readers. It is, that the bloodletting should in this disease always be performed when the patient is in the erect position; and it may then in general be safely carried to deliquium. We do not recommend this mode of proceeding with the view of producing deliquium merely, but also that this deliquium may serve us as a guide in judging of the extent to which we may carry the depletion. If the patient be sitting upright, and faint by the loss of blood, we have a security and remedy against any danger from this event in laying the patient low; but if deliquium be induced by bleeding the patient in the recumbent position, we cannot say that we think it will be always without danger. We think the plan which we have proposed at once far more safe as well as far more efficacious in subduing this disease. If it were requisite, the patient's head might be laid even lower than the rest of her body, should deliquium supervene.

The same rule may apply for the repetition of the bloodletting. If the fullest effect is desired which the patient can safely bear, let her be bled to syncope in the erect posture. She will faint from losing a larger or a smaller quantity of blood precisely in the inverse proportion of the previous exhaustion; the state of syncope will not only warn us to desist from drawing more blood, but will arrest the flow of blood itself just at the point when the patient can bear to lose no more.

This is a most important criterion for the employment of a most powerful remedy. We do not by any means wish it to be understood that it is always safe to bleed to deliquium in the erect posture; but that, when it is determined to bleed, it is important to have the boundary, which it would be unsafe to pass, at least clearly defined.

Sometimes the patient will faint on being merely placed upright: is it then, ever, and in what particular cases, safe to bleed?

The next question is in regard to topical bloodletting; and we think there is one important rule for the adoption of this remedy. It may of course be enjoined to be done immediately after general bloodletting; but it is particularly useful in those cases in which the system is obviously subdued by the general bloodletting, and yet the inflamed part remains tender under pressure. In such cases leeches, or, still better, cupping, if it be properly and tenderly performed, will prove a most useful remedy.

It is quite unnecessary to state the utility, or rather the necessity, for the administration of purgative medicines in this disease. There is good reason to suppose that some cases have been subdued even by this remedy alone; and the efficacy of purging in conjunction with bloodletting is quite undoubted. A constant catharsis should be kept up, indeed, until the disease is completely subdued.

In cases in which there is great tympanitic distension of the abdomen, an injection of warm water sometimes succeeds in inducing evacuations of flatus, which greatly relieve. We have sometimes thought that still more effectual relief of the same kind might be obtained by the introduction of a flexible tube, properly pierced, high into the large intestine.

Much and important relief may also be afforded in some cases in which suppuration has taken place, by giving exit to the pus when it plainly fluctuates and approaches the surface.

Blisters also are of great service in those cases of this disease which are not attended by much heat or irritability; but in other cases they have appeared to us to add to the patient's sufferings, to prevent sleep, and to do harm by leading to a state of exhaustion.

There are still three other powerful remedies of which a cursory mention must be made in this place. The first is vomiting, which is well known to have been so successful in the hands of M. Doulcet of Paris. The second is the spiritus terebinthinæ, recommended by Dr. Brenan of Dublin. The third is the attempt to induce a state of ptyalism by mercurial medicines and inunctions.

Emetics, like purgative medicines, but especially the spiritus terebinthinæ, have doubtless been used successfully in many cases; but we much suspect that many of these cases were not inflammation, but intestinal irritation.

Ptyalism would seem to deserve a trial; it is one of those measures which are most powerful, and yet generally unattended with risk, and it would by no means preclude the adoption of every other more prompt and efficient mode of treatment. If adopted early, it might prevent some of those protracted states of the disease which occasionally occur and wear out the patient.

During the existence of inflammation the patient should be allowed absolutely nothing but tea or gruel in the smallest quantities.

In some cases in which the pain is not severe, but the tension of the abdomen great, continued but extremely light frictions of the abdomen have done great good. They may be followed by the application of a cold lotion and by fomentation of the feet.

In cases of pure inflammation the use of opium is not desirable. The pain must be subdued by bloodletting; and every thing that by masking the pain can divert our minds from the use of this remedy involves danger to the patient. And there are seldom those symptoms of constitutional irritation which require the use of opium until the inflammation has subsided. In mixed cases we think the use of opium, especially after bloodletting, may be both necessary to subdue constitutional irritation, and beneficial in the cure of the disease.

Of the effects of stomachal and intestinal irritation.—Some of the effects of intestinal irritation may be observed before parturition; but it is far more usual to find them developed afterwards. They generally take place rather suddenly, about forty or fifty hours after delivery; but the puerperal state appears so to dispose to this affection that the presence of any cause of stomachal or intestinal irritation cannot always be borne with impunity for many days even after delivery.

This affection may, for the facility of description, be divided into the acute and the insidious; each of these forms manifests itself with general symptoms only, or with some predominant local affection.

The acute form of intestinal irritation is generally ushered in by a violent rigor. This is an important fact; for rigor, as we have already observed, has been considered as denoting puerperal inflammation, and essential to the latter disease. Neither of these suppositions is true; for puerperal inflammation may occur in a severe and fatal form without rigor; and the severest rigor may only portend an attack of the effects of intestinal irritation; and in general the latter disease is attended even with a severer rigor than the former.

In the attack of intestinal irritation there is usually, after the rigor, great heat of the surface. We have already observed that this is by no means an essential part of puerperal inflammation; indeed we do not think that it properly belongs to the latter disease, but that, when it does occur with inflammation, it denotes a mixed case and the co-existence of intestinal irritation.

In the attack of the effects of intestinal irritation there is usually earlier and even greater frequency of the pulse than in cases of puerperal inflammation; the pulse is also usually fuller than in the latter disease.

Intestinal irritation induces symptoms which are similar to those of the most acute phrenitis, or to those of the most acute peritonitis. This is a remark of the utmost practical importance; for the remedies in these different cases are totally different; and we should say that in the former the freest bloodletting must be aided by purgative medicines, whilst in the latter the freest and fullest evacuation of the intestines must be aided by bloodletting.

A mistake in either case would, in our opinion, endanger the life of the patient; and it is a foolish and idle remark to say that it is better to mistake irritation for inflammation than inflammation for irritation. It is of the utmost importance to attend to the distinctions which we have made between inflammation and intestinal irritation in regard to the treatment; for, although both bloodletting and purging are to be used in every case, yet the former is the remedy in inflammation, and the latter in intestinal irritation. If the cure of inflammation be trusted even chiefly to purga-

tive medicines, we think it will frequently proceed to the destruction of the patient; and if bloodletting should be chiefly employed, in like manner, in intestinal irritation, we believe it would leave the disease unsubdued, and eventually plunge the patient into a state of irremediable exhaustion.

The affection of the head and that of the abdomen frequently co-exist or alternate in the same case; but sometimes one of them exists to the exclusion of the other, or supervenes upon the cessation of the other; and in the latter case the affection of the head usually succeeds that of the abdomen. The diagnosis is much confirmed by this conjunction of the two affections.

In the affection of the head from intestinal irritation there is frequently the severest pain and the utmost intolerance of noise, light, and disturbance of every kind. It is in these cases principally that the pavement is covered with straw, the knocker tied, the patient's room kept dark and still, so that these very external circumstances speak a significant language to the physician. To the symptoms which have been enumerated are frequently added wakefulness and even delirium.

When the abdomen is affected from intestinal irritation, there are general pain and tenderness upon pressure, and frequently tumidity, combined with the general symptoms which we have already enumerated.

Much is effected and learnt in this case by the exhibition of large injections of warm water and of active purgative medicines, a careful examination of the evacuations, and a studious observation of the effects produced upon the disease. The fæces will be found to be scybalous, or at least offensive and dark-coloured, and in large quantity; and the relief obtained, or the return of pain, will be found to depend upon the evacuated or neglected state of the bowels.

Another point of great importance is an attentive inquiry into the diet of the patient; this inquiry frequently reveals the mystery of an attack, and of course immediately leads to the adoption of an important remedy.

In regard to the course of cases of intestinal irritation, we imagine that under judicious treatment this would always be one of progressive recovery. When a contrary event occurs, we think it is to be attributed to the misuse of remedies, and especially of bloodletting. In this manner some of the symptoms which are detailed in the succeeding section are superinduced, and sometimes a sudden dissolution has overwhelmed the practitioner with consternation.

One of the characteristics of intestinal irritation is the susceptibility to syncope upon bloodletting. This is of course much more remarkable upon a second or third bloodletting than upon a first use of the lancet. No dependence can be placed upon the appearance of the blood drawn. This may be much buffed and cupped in the puerperal state without the existence of inflammation, and in cases of the most decided inflammation these appearances of the blood may be but little observed.

We have scarcely had an opportunity of examining the state of the internal organs after death; for in general the patients affected by intestinal irritation have recovered. But no doubt that such an examination would illustrate the following important remark of the late Dr. Denman:—"We have been told that in the dissection of some who are said to have died of puerperal fever, no appearances of inflammation have been discovered; but I should suspect that in such cases some important appearances had been overlooked, or that errors had been committed as to the nature of the disease, and probably in its treatment." A due consideration of the effects of intestinal irritation will also serve to elucidate other cases of morbid affection, in which the appearances of inflammation were looked for on dissection, but were not found. This observation applies particularly to affections of the head, heart, and abdomen. In several cases of this morbid affection, which we had the opportunity of examining many years ago, no morbid appearances were found on the most careful inspection. We have already sufficiently alluded to the causes of this affection. They are for the most part obvious sources of gastric or of intestinal irritation; the former chiefly affecting the head, the latter both the head and the abdomen, either together or separately.

In the treatment of the effects of intestinal irritation, we would by no means exclude the use of the lancet. Bloodletting may be useful in such a case, for the same reason that it is useful in simple fever. But we repeat that this remedy is only subsidiary to the full and free evacuation of the bowels, and, if necessary, of the stomach. If it were trusted to alone, or with only a moderate attention to the state of the alimentary canal, or if it were used in the manner which is required to be efficient in puerperal inflammation, we are persuaded that the patient would die of exhaustion, before the symptoms would yield.

The remedies of intestinal irritation and its effects we would enumerate and arrange in the following order:—first, the full evacuation of the intestinal canal; secondly, bloodletting; thirdly, some soothing anodyne; fourthly, leeches, cupping, a lotion, a liniment, or a blister, according to the circumstances of the case, for the topical affection; fifthly, the mildest nutritious food; sixthly, the most absolute quiet, and the most perfect security from light, noise, disturbance, and every other source of excitation; seventhly, great coolness, and free ventilation of the sick room; and, lastly, a constant watching over the patient during sleep, to avoid the injurious effects of turbulent dreams on the one hand, and of too long sleep and fasting on the other. Upon each of these points we proceed to make such observations as we have learnt from practice to be of importance.

In regard to the state of the alimentary canal, it is quite obvious that an emetic is the proper remedy when the symptoms can be attributed to any indigestible substance taken; and we

would recommend this remedy, even although it might appear, from the lapse of time, unlikely that the injurious substance should still remain in the stomach.

When the case originates from intestinal irritation, we would earnestly recommend that the first remedy should be an enema, consisting of three or four pints of warm water, very slowly and gently forced into the bowels. This should be followed by an active purge; and this should, in due time, be followed by a repetition of the injection. The evacuations should be immediately carefully examined, and the effects upon the symptoms of the disease be watched.

To abate the general heat and excitement of the system, to relieve the head or the abdomen, and to ensure perfect safety, the patient should, in cases in which the strength is not particularly impaired, be raised into the erect posture, and be blooded until faintishness be induced. This effect, also, should be carefully watched and observed. If it occur from the loss of a small quantity of blood, it confirms the diagnosis; if it do not occur until much blood have flowed, it should suggest the suspicion of more than mere intestinal irritation,—of one of those mixed cases which so frequently occur, and of which we propose to treat in a subsequent section.

We do not imagine that this decided use of the lancet can ever be attended with danger, if there have been no previous loss of blood or other cause of exhaustion. But it could not be repeated with impunity. It would lead to exhaustion with the symptoms of reaction, to the state of sinking, or even to sudden dissolution; and if the case be really one of intestinal irritation, and the other remedies have been duly applied, such repetition of bloodletting will not be required.

It is an observation of great importance, that in inflammation repeated bloodletting is required, and is borne with safety; in intestinal irritation, on the contrary, the repetition of bloodletting is neither necessary nor safe.

This free evacuation of the bowels and detraction of blood are very apt to be followed by symptoms of hurry and alarm in the system. These effects are frequently prevented by the timely administration of an efficient and kindly anodyne; and we believe no anodyne is possessed of those qualities in a higher degree than Battley's *liquor opii sedativus*. Of this excellent medicine a full dose may be given, and, if necessary, repeated in five or six hours.

If this plan do not perfectly relieve the topical affection, some local remedy must be applied. In cases of cerebral affection, leeches may be applied to the temples, or cupping, or a blister, to the nape of the neck, a cold lotion over the whole head, and fomentation to the feet. Leeches, a fomentation, a liniment, or a blister may be applied, if there be affection of the abdomen.

Before the patient falls asleep, we should recommend some mild food to be taken, as gruel or panada. This plan prevents exhaustion, and frequently relieves the local symptoms by securing a more refreshing kind of sleep. For the same reason the utmost quiet must be preserved in the patient's room. The least disturbance greatly agitates the patient, and prevents the good effects of the remedies which have been employed.

Some other circumstances have been before enumerated which claim our attention in the treatment of this morbid affection; but, in order to prevent repetition, we postpone the remarks which we have to make upon these points to the next section,—upon the effects of loss of blood; in which case an attention to them is, if possible, still more necessary than in that under our immediate consideration.

On the effects of loss of blood in the puerperal state.—The effects of loss of blood usually present themselves to our notice in rather an insidious manner; they are not generally introduced by rigor, or heat, or any other acute symptom; though there may be exceptions to the last part of this rule. It is an important remark that the remoter effects of loss of blood are frequently developed in cases in which there is also intestinal irritation in a dormant form, but that they very rarely occur in conjunction with inflammation; the effects of loss of blood, when they do occur in cases of inflammation, generally denote that the inflammatory action has been subdued.

We have already observed that there is rarely either rigor or heat of surface: there may be transient chills and flushes, and slightly augmented temperature; but the countenance, and especially the prolabium, is generally pallid, and the skin is in a natural state.

The case is usually denoted by a throbbing fulness with moderate frequency of the pulse, throbbing pain of the head, and palpitation of the heart, which is apt to alternate with a state of syncope on slight exertion, or on assuming the erect posture; and there is usually a degree of panting. There is a characteristic susceptibility to fainting on taking a very small quantity of blood.

We have repeatedly known the effects of loss of blood to be mistaken for inflammation of the brain on one hand, and disease of the heart on the other. We consider this an important remark, as suggesting at once two characteristics of this affection, and the necessary caution in the diagnosis in puerperal diseases.

When the head is affected from loss of blood, there are much beating and throbbing of the temples, pain, a sense of pressure, or vertigo, with rushing or cracking noises.

When the heart is affected, there are great fluttering, beating, or palpitation, starting during sleep, hurry and alarm on awaking, sometimes with faintishness, a feeling of sinking or of impending dissolution, &c. and with the palpitation there is frequently beating and throbbing of the carotids, and sometimes of the abdominal aorta, perceptible to the touch or even to the eye. These affections sometimes recur in the form of attacks which are attended by much hurry and alarm.

Besides these more marked affections of the head and heart, which render it so necessary to distinguish this affection from inflammation or disease of those organs respectively, there are many symptoms which occur in a less marked degree or form.

There is frequently an inability to bear noise or disturbance, or even the act of thinking with attention; but there is rarely intolerance of light; the last symptom usually denoting a state of intestinal irritation.

There are frequently vertigo or faintishness on any exertion, or on assuming the erect posture; and when these two are combined, there has sometimes been a sudden and unexpected fatal termination of the patient's sufferings. In many cases there are great faintishness and urgent demand for the smelling-bottle, for the fan, or the fresh air, and for cold applications to the face or temples, and a feeling of impending dissolution. The respiration is affected in different cases with panting, hurry, sighing, heaving, blowing, moaning, gasping, catching, &c. There is in some cases an irritative cough in violent fits, or in the form of perpetual hacking, apparently arising from an affection of the larynx or trachea. The stomach is liable to be affected with retching, vomiting, hiccup, and eructation; and the bowels, even in cases in which they were not previously disordered, become variously deranged, with constipation, diarrhœa, and flatulency. There are frequently, in severe cases, urgent restlessness and jactitation. In some cases there are various spasmodic affections. In other instances there are catching pains, which are apt to be mistaken for inflammation. There are frequent changes, sudden attacks of alarming symptoms, a sense and fear of impending dissolution, urgent messages, &c. which become characteristics of this affection.

Another characteristic consists in the faintishness, gasping, or feeling of dissolution, which sometimes follows even a slight bloodletting; an awfully sudden death has immediately ensued upon a full and mistaken bloodletting at this critical period. Even the operation of purgative medicine has sometimes induced a degree of faintishness.

Every source of disturbance, of anxiety, or of alarm, and every kind of effort either of mind or body, is apt to be followed by a return or exasperation of the symptoms, and cannot be said to be free from danger. We have already remarked that an effort of the muscles and assumption of the erect posture have proved suddenly fatal. This sad event occurred to a lady who raised herself in bed in this exhausted state to make water; she fell down and expired. But when the fatal event from loss of blood is not sudden in this manner, the state of reaction sometimes yields to one of fatal sinking.

The symptoms of exhaustion with excessive reaction may gradually subside and leave the patient feeble, but with returning health; or they may yield to the state of sinking. This term is adopted not to express a state of negative weakness merely, which may continue long and issue in eventual recovery; but to denote a state of positive and progressive failure of the vital powers attended by its peculiar effects, and by a set of phenomena very different from those of exhaustion with reaction.

If in the latter the energies of the system were augmented, in the former the functions of the brain, the lungs, and the heart are singularly impaired. The sensibilities of the brain subside, and the patient is no longer affected by noises as before; there is, on the contrary, a tendency to dozing, and gradually, some of those effects on the muscular system which denote a diminished sensibility of the brain supervene, as snoring, stertor, blowing up of the cheeks in breathing, &c.; instead of the hurry and alarm on waking, as observed in the case of excessive reaction, the patient in the state of sinking requires a moment to recollect herself and recover her consciousness, is perhaps affected with slight delirium, and is apt to forget the circumstances of her situation, and, inattentive to the objects around her, to fall again into a state of dozing.

Not less remarkable is the effect of the state of exhaustion with sinking on the function of the lungs; indeed, the very first sure indication of this state is, we believe, to be found in the supervention of a crepitus in the respiration, only to be heard at first on the most attentive listening; this crepitus gradually becomes more audible, and passes into slight rattling, heard in the situation of the bronchi and trachea; there is also a degree of labour or oppression, sighing, hurry, and blowing, in the breathing, inducing acuteness in the nostrils, which are dilated below and drawn in above the lobes, at each inspiration; in some cases there is besides a peculiar, catching, laryngeal cough, which is especially apt to come on during sleep, and awakes or imperfectly awakes the patient. The heart has at the same time lost its violent beat and palpitation, and the pulse and arteries their bounding or throbbing. The stomach and bowels become disordered, flatulent, and tympanitic, and the command over the sphincters is impaired. The last stage of sinking is denoted by a pale and sunk countenance, inquietude, jactitation, delirium, and coldness of the extremities.

We now propose to detail the principles of the treatment in cases of the effects of loss of blood in the puerperal state.

In the first place the state of exhaustion from loss of blood, with or without reaction, by no means precludes the possibility of congestion within the head; and it is no less certain that the application of leeches to the temples, or of the cupping-glass to the back of the neck, relieves the symptoms of affection of the head, arising from loss of blood, in a remarkable manner. In a case given by Mr. Hey, which we regard as being of this character, and to which we shall have occasion to revert hereafter, urgent symptoms of affection of the head were twice relieved by the abstraction of but three ounces of blood from the temporal artery. This mode of treatment must not, therefore, be neglected except in

he most extreme cases, in which the loss of even so small a quantity of blood, and that from the head even, might prostrate the remaining powers of the patient.

The next point of practice which requires to be mentioned is the state of the stomach and bowels. If these were free from all disorder before the occurrence of the loss of blood, yet the state of exhaustion ever induces a deranged state of the alimentary canal. The state of the bowels must, therefore, claim our attentive consideration in every case of symptoms arising from loss of blood. Their functions and tone must be carefully restored by every means in our power, while we as carefully avoid any fresh source of exhaustion. The bowels must in particular be carefully evacuated daily. This may perhaps be best done by means of the warm-water injection so often recommended by us already, with or without the aid of a draught containing an ounce of the infusion, and two or three drachms of the compound tincture of rhubarb, and of manna.

By these means the state of irritability which is so apt to affect the system, and especially the head and the heart, in cases of exhaustion from loss of blood, is greatly obviated. But for this affection it is frequently also necessary to give some mild but efficient anodyne. The tinctura opii, the tinctura hyoscyami, the spiritus ammoniæ aromaticus, &c. are extremely useful remedies in this affection. But perhaps the best are Battley's liquor opii sedativus, or the extract of poppy, given in efficient doses.

When the head, the heart, and the alimentary canal have been thus relieved, and even during the exhibition of the medicines which have been enumerated, it is of the first importance to attend to all the following points: viz. nourishment, fresh air, quiet, soothing, sleep, &c.

It is difficult to give fixed rules for the administration of nourishment; but the first rule is to ascertain that the bowels have been properly evacuated, otherwise food will only oppress the stomach; the second is to give the nourishment itself in such forms as will prove light and easy of digestion; the third is that it should be taken at first very slowly and in small quantities. Arrow-root in water, beef-tea, panada, sago, &c. may be given frequently.

The best restorative we possess is, we believe, fresh air; but it is especially the best in the cases under consideration. The warmth and closeness of a lying-in room must therefore be forthwith exchanged for free ventilation, only observing the due precautions against giving cold.

Nothing is more essential than quiet both of body and mind. Bodily exertion leads to still further exhaustion, and perhaps even to unexpected dissolution; and every kind of mental effort or hurry not only exhausts the patient's strength, but is extremely apt to lead to those attacks of symptoms of irritability of which we have given so full a description.

The patient should be soothed and lulled in every possible way; and it is of the utmost importance to procure sleep. But it should be observed, in regard to sleep, that too long a sleep is apt to exhaust or overwhelm the patient. This is especially true if it be not preceded by nourishment. The sleep is also apt to be injurious by leading to turbulent dreams, which have the same bad effects as waking hurry of mind; the sleep should, therefore, be watched, and it should be interrupted if the patient is observed to suffer from agitation: this is best done, we think, by offering nourishment, for the patient is immediately collected, on awaking, from knowing what is doing.

There is one point which we have not hitherto mentioned as it deserves; it is the efforts made by the parent to suckle her infant. Nothing is so injurious in all puerperal diseases. These morbid affections have often appeared to be first induced by the attempt to nurse; and they have still more frequently been exasperated by it. This attempt especially involves within itself almost every thing which can be injurious in a state of exhaustion; the drain, the muscular effort, the mental excitement implied in the act of suckling, are all of the most injurious tendency in this affection.

Of mixed cases, and especially of puerperal mania.—Perhaps the cases which most frequently present themselves to our notice in practice are of a character distinct from those which have been described in the preceding sections, differing from them principally by blending two or all three of those cases in an individual patient.

Our systems of nosology have, we are persuaded, greatly erred in attempting to separate diseases from each other, and describe them as distinct, when they far more frequently occur in conjunction; so that the mind of the medical student is not at all prepared for the cases which most frequently occur to him when he first enters upon practice. A little experience teaches him the difficulty, nay the absurdity, of attempting to give each individual case a name, or to put it down in a list of diseases. Each patient, on the contrary, presents to him a new congeries of symptoms, a new complication of diseases or disorders.

To apply these remarks to our present subject, it may be truly said that puerperal cases are more complicated than any. But we have already insisted upon this point; and we now proceed to illustrate the various combinations of inflammation with intestinal irritation, or of either or both, with the effects of loss of blood.

Some cases have conjoined the most decided symptoms of intestinal irritation with those of inflammation, and, having proved fatal, have presented all the traces of inflammatory action on examination. It has already been shown that in many cases of inflammation there are none of the symptoms which denote intestinal irritation; there is an absence of rigor, of heat, of affection of the head, &c.; but the effects of inflammation are found upon dissection.

On the other hand, there have been all the symptoms of intestinal irritation, as rigor, heat, headach, with pain, tenderness, and tension of the abdomen, without a trace of the effects of inflammatory action on examination after death. The conclusion from these separate statements is obvious; inflammation and intestinal irritation may exist separately, but they may also exist together.

The effects of loss of blood are frequently observed in cases of inflammation, when the primary disease has been perfectly subdued. But they are still more apt to concur and to assimilate themselves with those of intestinal irritation, when there has been much loss of blood by hemorrhage or by bloodletting.

This subject, as well as the interesting question of the diagnosis, might be illustrated by a reference to the valuable treatise of Mr. Hey upon puerperal fever. This author, as well indeed as almost every writer upon this subject, appears to us to have combined in one description all the three different cases of which we have treated. It is not, therefore, wonderful that their works should involve many inexplicable discrepancies in the symptoms and in the treatment. Some cases have occurred without rigor, heat, or headach; others have combined all three with or without affection of the abdomen. Some have been cured without the lancet; others have not yielded to the most judicious and most ample bloodletting. It is doubtless a most important question,—how can these discrepancies be explained?

Other difficulties and other discrepancies have arisen from the addition or superinduction of the symptoms of loss of blood, in cases of inflammation or of intestinal irritation. This is a mixed case which frequently occurs, and causes much embarrassment to the young and inexperienced physician; and it has too frequently happened that the lancet has been prescribed under a false impression of inflammation; and that great danger and even immediate dissolution have ensued.

There is a mixed case which shows itself under a still different form from any which have hitherto been described; it is *puerperal mania*. We believe this disease to result, in general, from all the circumstances following parturition combined, but chiefly from the united influences of intestinal irritation and loss of blood. We purpose to pursue this subject hereafter. In the meantime, however, we would observe that we are persuaded that real puerperal phrenitis is comparatively a rare disease; that puerperal mania is seldom of an inflammatory character, and that it is especially to be treated by those measures which are suited to the mixed case of intestinal irritation and exhaustion. This opinion is confirmed by the fact of mania occurring from undue lactation, as well as from the circumstances of the puerperal state. We are inclined to attribute much more to the combined influence of irritation and exhaustion than to the mere "state of the sexual system which occurs after delivery," which has been assigned as the chief cause of this morbid affection by Dr. Gooch, in a most interesting paper upon this subject in the sixth volume of the Transactions of the College of Physicians, p. 280; although we would by no means exclude the influence of this principle altogether. There is ample evidence in Dr. Gooch's cases of the influence of intestinal disorder; and the events of labour and the circumstances of lactation ever add to this a state of exhaustion. This view is the more important, because it directly suggests the proper mode of treatment, which consists in restoring the system to a state of due health by every means in our power, whilst we adopt every measure which can soothe and allay the morbid irritability of the nervous system.

We are confirmed in this view of the nature of puerperal mania not only by a careful investigation of its causes and the good effects of the remedies which we have mentioned, but by having met with the symptoms of intestinal irritation as a prelude to those of mania.

There are frequently also many of the appearances of disorder of the general health, sometimes jaundice even; and the state of the complexion and of the alvine evacuations leaves no doubt as to the influence of the morbid condition of the intestinal canal. Bloodletting plunges the patient into a state of danger, perhaps into one of irretrievable sinking.

Puerperal mania is, in fact, in the most emphatic sense a mixed case: previous derangement of the health; intestinal irritation; loss of blood; the pain and shock, and anxiety attendant on parturition; the subsequent morbid state of the genital organs;—all these may combine with predisposition to induce the maniacal attack.

But our attention must be chiefly directed to the degree of exhaustion which obtains, to direct us what remedies to employ and what measures to avoid.

On being called to a case of puerperal mania, we have long been in the habit of asking whether the patient has or has not been bled; on this greatly depends the event of the case: if blood has been freely taken, the patient will probably die; if otherwise, most puerperal cases of mania issue well.

It must be admitted in this place, however, that puerperal mania may possibly be combined with inflammation, especially of the uterus, its appendages, or the peritoneum. This is to be ascertained by a careful examination. In such a case bloodletting must be used, and in such a case it can be borne.

Puerperal phrenitis is certainly a rare disease. This opinion was early expressed by the writer of this article, and it is confirmed by Dr. Gooch. The same remark may be made in regard to the most influential cause of puerperal mania, and the danger of bloodletting in that disease.

The symptoms in puerperal mania occur in the most insidious manner: there is a little excitement during the day, and sleeplessness at night; then something bordering on delirium; then actual delirium; and then confirmed mania.

The most important parts of the treatment

are extreme quiet of mind and of body; a regulated state of the bowels; a mild, light, but nutritious diet; a cold lotion to the head; fomentations to the feet; every soothing plan; careful watching; and time. It too frequently happens that the friends undo in one day what the physician's care has effected in many: visitors intrude; the infant is brought; conversation, excitement are permitted.

The treatment consists, in fact, much more in avoiding sources of harm than in positive remedies. Bloodletting is replete with danger; every depleting means, by adding to the exhaustion, adds to the malady. The cure depends more upon nursing than upon the materia medica. It is proper, however, to state that the mildests opiates have lulled and soothed, and obtained rest, and allayed the disease. The progress of puerperal mania has also been controlled by administering mercury so as to induce ptyalism, and avoiding its effect on the bowels.

We have thus given a rapid sketch of those puerperal diseases which are of most frequent occurrence and greatest practical interest. But here is another series of puerperal diseases of still more terrible character, of which a sketch must now be added. They consist of softening of the substance of the uterus, inflammation of the lymphatics, and phlebitis.

The first of these may be suspected whenever there are, after rigors and fever, with uterine pain or tenderness, and suppressed lochia, symptoms like those of the sinking state, the countenance becoming collapsed, the pulse extremely frequent and small, the respiration hurried and anxious, the strength prostrate.

The symptoms in inflammation of the lymphatics are very similar, and of a typhoid character; these are usually conjoined with those of peritonitis, and occasionally with pleuritis. But there are not the secondary abscesses observed in the disease to be next mentioned.

The important distinction in regard to uterine, as in the other forms of phlebitis, is between the adhesive and the suppurative. In the former the effects are localized. Uterine phlebitis of the adhesive character is attended with local pain and tenderness. The occurrence of crural phlebitis seems to constitute the disease formerly termed the phlegmasia dolens. This disease is distinguished by pain in the situation of the iliac and inguinal veins, with tension and swelling, afterwards pursuing their course down the thigh. The femoral vein is found hard, tense, elastic, painful, and tender.

The suppurative phlebitis is a far more formidable and fatal disease. It is denoted by the occurrence of terrific typhoid symptoms, and by external suppurative inflammation of the integuments or of the eye; whilst abscesses form internally in the brain, the lobules of the lungs and liver, in the spleen, in the joints, in the muscular substance, &c. It is usually attended by peritonitis.

Of the treatment of softening of the uterus, of inflammation of the lymphatics, and of suppurative and diffused phlebitis, little is known; and it would be foreign to the object of this sketch to enter upon any discussion of the subject.

(Marshall Hall.)

PUERPERAL FEVER.—See Fever.

PULSE.—The stroke or beat of an artery, as recognized, for the most part, by the finger applied to the integuments lying over it, is denominated *the pulse;* by the Greeks it was termed σφυγμὸς; by the Latins *pulsus,* whence our English term is derived.

We propose to divide the following article into three parts, which may be regarded respectively as historical, physiological, and pathological. The first will consist of a brief historical account of what was known on the subject of the pulse by the ancients, as well as the opinions that have been entertained respecting it by the moderns. In the second place, we shall inquire into the cause of the pulse. We shall endeavour to explain its different varieties, and shall point out their connexion with the other parts of the animal economy. Lastly, we shall offer some remarks on the morbid conditions of the pulse, and inquire into the degree in which they may enable us to judge of the seat and nature of disease, so as to assist us in forming our diagnosis and prognosis, and in directing our practice.

I. *History of the opinions that have been entertained respecting the pulse.*—We have a distinct notice of the pulse in the writings of Hippocrates; it is mentioned, however, incidentally, and in a few passages only, and he appears to have attached scarcely any importance to it, either theoretical or practical. It is commonly supposed that he is the first writer who employed the term pulse (σφυγμὸς) to denote the natural and ordinary beating of the artery. It would seem that the ancients usually applied the term to what we should call pulsation, i. e. the beating that is felt by the individual himself, in a part that is inflamed, or otherwise morbidly affected, without applying the finger to it. But although there are certain passages in the writings of Hippocrates where the word is used in the more correct and restricted sense, yet it must be admitted that these are few in number; a circumstance which is the more remarkable, when we consider with what minute accuracy he detailed the other symptoms of the diseases of which he has left us a distinct account. We may farther notice, that from the manner in which he refers to the pulse, he seems to have made little or no use of it, either in regulating his practice, or in forming his diagnosis. Where, for example, he gives a detailed account of the phenomena of fever, he states with great minuteness the temperature of the patient, the state of the respiration, of the secretions and excretions, and indeed all the circumstances to which the most judicious modern physician would direct his attention, except the pulse. The only use which Hippocrates made of the pulse was to assist him in forming his prognosis; but even here we meet

with little of that acuteness of observation which, on most occasions, characterizes the writings of the great father of medical science.*

It is generally agreed that Herophilus was the first physician who was fully aware of the importance of the pulse, and paid particular attention to its various conditions. He was one of the most distinguished ornaments of the Alexandrian school, and is especially celebrated for his knowledge of anatomy, into which science he introduced many great improvements. The fame of Herophilus is principally supported by the authority of Galen, who expressly notices his merits on this point.† We learn, however, from Pliny,‡ that he was supposed by some to have introduced into practice a number of unnecessary and even fallacious distinctions concerning the pulse, and that, for the most part, his opinions were derived more from hypothesis than from actual observation.

The author whom we shall next notice is Celsus. The judicious manner in which he treats his subject, the candour which he displays in referring to the opinions of others, together with the elegance and purity of his diction, have caused him to be regarded as one of our highest classical authorities. This is more especially the case on all questions of literary history, as he appears to have aimed more at giving a correct view of the state of medical science in his age, than a mere transcript of his own observations and experience. In his account of the pulse he has been supposed to revert to the doctrine of Hippocrates. When giving directions for the treatment of fever, he remarks upon the great importance of obtaining a correct criterion of the presence of the disease, and in this connexion he introduces the following observation: "We principally trust to the veins, a thing which is most fallacious, for they are frequently too slow or too quick, depending on the age, the sex, and the peculiar nature of the body." He goes on to inform us that there are various cases in which the pulse is affected by circumstances quite unconnected with any morbid condition of the body, and where we should fall into the greatest mistakes were we to suffer our judgment to be influenced by the state of the pulse.§ The multiplied and varied experience of the modern practitioner has proved that the precautions of Celsus, although not without some foundation, were carried to an unreasonable length; and that, although the pulse is affected by most if not by all the extraneous circumstances mentioned by him, yet that it still leaves us the most valuable indications of the state and nature of disease.

We now arrive at the period of the celebrated Galen, a man whose talents and acquirements were of the first order, and who from other causes obtained an ascendancy over medical opinions more considerable and more durable than had been acquired by any of his predecessors; and we may venture to add, than will be ever again obtained by any individual. There is scarcely any topic, connected either with medicine or with pathology, which Galen has not investigated; and the pulse is one on which he bestowed a peculiar degree of attention. He has devoted to this subject no less than six different treatises, some of considerable length, in which he investigates in the most elaborate manner everything concerning the use of the pulse, its causes, its different varieties, the method of distinguishing these varieties, the prognostics to be deduced from them, and other analogous subjects.*

A characteristic feature of the writings of Galen is the methodical arrangement, and the numerous technical divisions which he introduces into almost all the subjects which fall under his notice. He proceeds on this principle when treating of prognostics, which he classes under the three heads of those which relate to the concoction of the humours, to the absolute removal of the disease, or to particular crises of various kinds. Again, he supposes crises of all kinds to be derived from three kinds of powers or actions, arranging them, according to their origin, under the denominations of natural, vital, or animal; the pulse he regards as principally indicative of the different kinds of vital actions. It would carry us far beyond all reasonable limits, were we to follow our author into his speculations concerning the causes of the pulse, and the mode in which its different actions manifest themselves, so as to give rise to a most complicated system of minute distinctions and varieties, which it is difficult even to comprehend, and of which few only have probably any actual existence.

With respect to the cause of the pulse, Galen, according to his ordinary custom in such cases, attributes it to a specific faculty inherent in the heart and vessels, which he names pulsative, by which their alternate contraction and dilatation is produced. As the pulse is an effect resulting from the action of the vital faculties, it affords us one of the most correct indications by which we may judge of the strength or weakness of the vital powers in general, and of the consequent tendency to life or death, and thus constitutes one of our most valuable means of prognosis. Hence the extreme importance of making ourselves acquainted with all its variations, and connecting them with the state of the other actions and functions of the animal economy.

The use of the pulse was supposed to be to maintain the heat of the body, and to remove the excess of excrementitious matter from the blood: by considering the condition of the vital powers, in relation to these supposed

* Hippocrates enumerates a peculiar state of the pulse among the signs of disease in his treatise 'De Humoribus;' also, in various parts of his 'Coacæ Prænotiones.'

† See his treatise De Diff. Puls. lib. ii. c. 10.

‡ Hist. Nat. xxix. 1.

§ Lib. iii. cap. 6.

* The following are the Latin titles of Galen's Treatises on the Pulse: De Pulsuum Usu; Introductio in Pulsus; De Differentiis Pulsuum, 4 lib.; De Cognoscendis Pulsibus, 4 lib.; De Causis Pulsuum, 4 lib.; De Præcognitione ex Pulsibus, 4 lib.

processes, he lays the foundation for the differences in the pulse which he endeavours to establish. These differences he first arranges under the two heads of simple and compound, which he again subdivides into numerous varieties, depending partly upon the supposed quantity of motion in the vessels, the nature of this motion, the length of time which it occupies, the space which intervenes between the pulsations, the force of the vital action, and the particular disposition of the artery. Proceeding upon these principles, he forms all the supposable combinations of these different circumstances, and from them he deduces a great number of varieties, to which he gives distinct appellations, but which it would be useless to attempt to describe, or even to enumerate.

Those who are curious to obtain farther information on this point may especially consult his dissertation "On the Varieties of the Pulse," a work of considerable length, which is exclusively devoted to this particular object. It may be regarded as one of the most learned of Galen's performances, and as peculiarly characteristic of the methodical and technical manner in which he treats his subjects.

After the age of Galen we have little to detain us until the revival of medical science by the Italians in the sixteenth century. Medicine was, indeed, very assiduously cultivated by the successors of Galen, during what are termed the dark ages; and among the Arabs especially, we meet with various individuals of great eminence for their learning. But their attention was almost entirely confined to the writings of the Greeks, and particularly to those of Galen, which they regarded as standards of excellence; these they translated and re-published in various forms, and illustrated by almost innumerable commentaries and dissertations, adding very few original observations, and making scarcely any advance in the principles of the science. This system prevailed to so great an extent, that it has been asserted, and, as it would appear, without exaggeration, that for more than one thousand years after the death of Galen, scarcely a single improvement in medicine or physiology was made which was been thought worthy of being transmitted to posterity.

In tracing the history of science among the nations of antiquity, we seldom think it necessary to go beyond the limits of Europe, or the period of Grecian literature; yet it is generally admitted that the Greeks were not themselves the inventors or the originators of the arts in which they so much excelled. It is a question of very difficult decision, what was the country in which they took their rise, whether in Egypt or in India, or in some other part of the East. It is, however, certain that the Oriental nations made very early advances in various departments; and that, while Europe has been undergoing numerous revolutions, and been gradually advancing to its present state of improvement, Asia has remained much more stationary; so that, in many cases, we have reason to believe that it exhibits at this day nearly the same condition which existed perhaps two thousand years ago. This is most remarkably the case with the Chinese, both in regard to their early civilization and to the little change it has experienced; and it hence becomes a subject of great interest and curiosity to inquire into the opinions and practices of this remarkable people.

We are furnished by the missionary Jesuits with a minute account of Chinese medicine, and particularly of their opinions respecting the pulse. It appears that they paid great attention to it, and supposed that it afforded them indications of almost every change to which the body is subject, as well salutary as morbid. Thus, among other notions, it was conceived that the different organs produced by their derangement different effects upon the pulse, some of which were to be detected by examining the pulse of the right side of the body, and others that of the left. They farther imagined that from the state of the pulse of a pregnant woman, the sex of the fœtus might be ascertained. They arranged the different parts of the body under three divisions, upper, middle, and lower, in conformity with their respective situations; and they conceived, that according as one or other of these parts was affected, so a corresponding state of the pulse was to be recognized.* We might be the more disposed to inveigh against the futility and absurdity of these opinions, were we not aware that they but too much resemble some of those which were supported by the most enlightened and learned physicians of Europe scarcely a century ago.

At the revival of letters, when the human intellect began to rouse itself from its long repose, the mathematical sect of physicians sprung up. Their reasonings were, for the most part, founded upon erroneous principles, and were almost exclusively derived from physical deductions, which were inapplicable to the phenomena of the living body. Still these labours were not entirely without their use, by stimulating the mind to exertion, and by indirectly leading it to those subjects which are more connected with the principles that ought to guide us in our inquiries. It is on this account chiefly that we notice the name of Bellini, a learned professor of Pisa, who flourished in the beginning of the seventeenth century, and wrote a treatise on the pulse.† Although the fundamental principles of the sect to which Bellini belonged were, in many respects, essentially erroneous, yet they led to a closeness of reasoning which was more favourable to the progress of knowledge than the completely hypothetical method of their rivals the chemists.

It was not, however, until the immortal discovery of Harvey was generally recognised, and its importance duly appreciated, that any considerable progress could be made in our knowledge of the laws of the circulation, or that we could expect to form any just conception

* See especially the "Description de la Chine," by Du Halde.

† De Urinis et Pulsibus, 1683.

either of the theory of the pulse, or of the circumstances that might be supposed to affect it. The general turn for observation which now became prevalent in all the departments of philosophy, of which the discovery of Harvey itself may be regarded as one of the most splendid results, gave rise to various investigations respecting the cause and nature of the pulse, varying much in their respective merits and importance, but all of them professing to be derived from observation or experience, and contributing more or less to the establishment of the principles of a correct theory.

Among the first of these productions which will require our notice, is a work which appeared early in the seventeenth century, in many respects peculiar in its style and in the opinions which the author adopts, but of real value, as possessing the merit of pointing out a precise mode of ascertaining with accuracy the rate of the pulse, by means of an instrument adapted for measuring short intervals of time. This was done by Sir J. Floyer, in "The Physician's Pulse Watch," published in 1707. The instrument which he describes is indeed awkward in its construction, and must have been inconvenient in practice, but it deserves to be recorded, as being the first step of an important improvement.

In the year 1731 a singular work made its appearance, written by Solano, a native of Lucca, but who passed the greatest part of his life in Spain; it was entitled "Lapis Lydius Apollinis." In the course of his practice he had met with some cases of what is termed the rebounding pulse, and being struck with its peculiarity, and with the symptoms which succeeded it, he was led to pay particular attention to the various states of the pulse, and to the morbid changes which appeared to be connected with them. He accordingly directed his attention almost exclusively to this function, and he is said to have arrived at an inconceivable degree of acuteness in predicting the event of disease by the peculiar indications of the pulse. The result of his experience, real or supposed, forms the subject of his volume, which obtained, at the time of its publication, a considerable degree of celebrity.

The investigation was zealously pursued by Nihell, an English physician, who likewise resided in Spain, and who undertook to give to the world the principles of Solano under a more intelligible form, and divested of a degree of obscurity which is attached to the original. Accordingly, in the year 1745 Nihell published his "New and extraordinary Observations concerning the Predictions of Crisis by the Pulse."

A few years after the appearance of Nihell's treatise, a work of a similar kind was published in France by Fouquet; who, proceeding upon the plan of Solano, endeavoured to point out the connexion between certain peculiar states of the pulse and the affection of peculiar organs of the body.

The subject was still farther prosecuted by a learned countryman of Fouquet's, Bordeu, who, in the year 1756, published his "Recherches sur le pouls par rapport aux crises." In this treatise he proceeds upon the method of Solano; but he goes even beyond him in the minuteness of his distinctions, and the apparent accuracy of his discriminations; and from these he professes to draw a system of indications and prognoses, which, although in some of its parts it may not be altogether without foundation, is generally admitted to be derived from subtile and over-refined distinctions, which it is impossible to recognise, and which, for the most part, can have no real existence. It does not appear that in this country the system of Solano ever had any considerable number of adherents, while in France the learning and ability exhibited in the work of Bordeu, aided also by his reputation as an able and successful practitioner, contributed to give a degree of weight and authority to his opinions, greater than was due to their intrinsic merit. Even in the present day, we observe in the French school an attempt at nice discriminations of the pulse, which are conceived by the English to be altogether imaginary, a state of things which may probably be traced, in some degree, to the writings of Bordeu.

For the opinions which have been, of late years, generally embraced in this country respecting the pulse, we are probably indebted in no inconsiderable degree to two short, but very valuable treatises; the first consisting of an essay, which was read by Dr. Heberden before the College of Physicians in the year 1768; the latter, of the "Observations respecting the Pulse," by Dr. Falconer, published in the year 1796.

Dr. Heberden has the merit of having freed the subject from most of the subtile and over-refined distinctions which had been introduced into it, in the first instance by the followers of Galen, and afterwards by those who adopted the opinions of Solano. He informs us that his object was to direct the attention of the practitioner to "such circumstances of the pulse, in which they could neither mistake nor be misunderstood." He continues: "what I mean is, the quickness or frequency of the pulse, which, although distinguished by some writers, I shall use as synonymous terms." Proceeding upon this principle, he gives us the valuable results of his own observation on the respective frequency of the pulse at different ages and in different states of the constitution, and points out various circumstances in which the frequency of the pulse, considered by itself, without reference to other symptoms, was found to be a very inadequate criterion of the nature and degree of disease.

Nearly a similar view of the subject was taken by Dr. Falconer. Referring to the essay of Dr. Heberden, he has the following remark. "It has been reserved for the good sense and clear understanding of a physician, who does honour to our own country, to free the study of the profession from many needless incumbrances of this kind, and to direct the attention of practitioners to the only circumstance respecting the pulse which is capable of commu-

nicating accurate and distinct ideas, or of affording decisive indications." He farther agrees with Dr. Heberden, that the quickness and frequency of the pulse are to be regarded as synonymous terms, and characterizes the frequency "as the only circumstance respecting it (the pulse) of which we can form any clear or determinate idea, and which we can be assured conveys the same information to others that it does to ourselves;" while he speaks of the other distinctions as fanciful or whimsical, and as serving to perplex and embarrass the practitioner.

With the greatest respect, however, for these individuals, who may be justly regarded as among the most enlightened and candid physicians of modern times, we conceive that they have attempted to simplify the subject too far, and that, in discarding a mass of erroneous notions, they have fallen into the opposite extreme. But whatever we may think of their opinions on this point, the facts and observations which they have adduced are of the highest importance, and rest upon authority which can never be called in question.

It will be scarcely necessary to pursue the historical part of this article below the termination of the last century, for although we have many very valuable observations on the pulse of a later date, they are either contained in works principally devoted to other topics, such as general histories of medical science, and accounts of particular diseases and individual cases, or they are written for the express purpose of establishing and elucidating some physiological position, which will be more conveniently discussed in the second part of this article.*

II. *Physiology of the pulse.*—In treating of the physiology of the pulse there are various points that present themselves for our consideration. In the first place we must inquire into the cause of the pulse, and when we have ascertained the cause, we shall be prepared to investigate the exact nature of the effect, and what relation it bears to the other functions of the animal economy.

Since the immortal discovery of Harvey, it is universally admitted that the pulse depends immediately upon the action of the heart, which, by its contraction, expels a portion of blood from its cavities into the great arteries. The contraction, or, as it has been termed, the systole of the heart, must therefore correspond, in point of time, with the stroke of the artery, while, during the diastole of the heart, the artery returns to its quiescent state. But although there can be no difference of opinion on this point, there are various subordinate questions, which have been the subject of warm and protracted discussions, some of which remain still undecided.

Of these, one of the most important is, whether the arteries themselves possess any contractile power, by which they are enabled to co-operate with the heart. The contractile power of the arteries has been supported by direct experiments, and especially by those in which the blood was found to be propelled along the vessels after the heart was removed from the body; while, on the contrary, this property has been denied by other physiologists, because, in experiments made for the express purpose, the artery could not be made to contract by the application of those agents which are known in ordinary cases to stimulate the muscular fibre. There is certainly some difficulty in reconciling the apparently discordant results; but, upon the whole, the weight of evidence is in favour of the contractile power of the arteries; for it appears almost impossible to explain various phenomena without admitting this power, while the negative results that have been adduced against this opinion are explicable upon other principles. We may therefore assume it as an established point, that the blood is propelled along the vessels by the joint power of the heart and arteries.

Proceeding, however, upon this position, that when the heart contracts, a certain impulse is propagated through the artery which causes it to strike the finger, it still remains to be ascertained what is the exact nature of this impulse. We may inquire whether the vessel be actually distended, so as to have its diameter increased, or is it merely extended in length, or displaced? or without having its size actually augmented, or being removed from its situation, is it only rendered more tense or firm, or what other change does it experience? When we estimate the bulk of the blood sent into the aorta at each contraction of the heart, and compare this with the quantity of blood previously contained in the vessels, although we might theoretically suppose that the diameter of any particular artery was actually increased, it must be admitted that the increase of bulk would be much too small to be perceived by the finger, or to produce the sensation which is conveyed to us by the pulse. Hence we may conclude that the terms systole and diastole are scarcely applicable to the different states of the artery; for although we may conceive them to be technically correct, when considered as a question of theory, we cannot admit of their actual existence in any sensible or perceptible degree.

As to the extension or displacement of the artery, it appears certain that when the jet of blood is forcibly projected into a flexible tube, like that of which the artery is composed, there will be an effort produced to straighten it and to diminish its flexures, and at the same time to extend it in a longitudinal direction, as far as the texture of the organ itself and its connexion with the neighbouring parts will permit. There is, however, reason to believe that these changes, although they may actually take place to a certain extent, do not exist in sufficient degree to produce all the effect which is experienced, and we are therefore indneed to search for some other cause of the phenomena.

The solution of the problem was attempted

* For a more minute account of the opinions respecting the pulse, we may refer especially to the histories of Le Clerc and Sprengel, and to Haller, El. Phys. lib. 6, sect. 2; also to the art. *Pouls*, in the Dict. des Scien. Méd.

by Dr. Parry,* who, after proving the insufficiency of all the former modes of explanation, proposed a new view of the subject. We shall quote the words of the author, as they express, in a short compass, the fundamental positions on which the hypothesis rests. "In the larger arteries there is no sensible dilatation or contraction,—therefore the pulse cannot depend on this alternation. The chief cause of the pulse is a strong and predominant impulse of distention from the systole of the left ventricle, given by the blood as it passes through any portion of an artery forcibly contracted within its natural dimensions." The pulse is felt when the motion of the blood is impeded by the compression of the artery, and it is the resistance to this obstruction which produces the pulse. We feel much disposed to acquiesce in Dr. Parry's opinion, at least it may be asserted that there is no other which gives a sufficient explanation of the phenomena, while at the same time there is nothing in the hypothesis either repugnant to the laws of the constitution, or inconsistent with the structure and properties of the organs in question.

It will follow as a consequence of this opinion, that the pulse must be progressive, i. e. the impulse must be made on the different parts of the artery at different times, corresponding to their distance from the heart. But although this may be theoretically true, it has been questioned whether the difference be really perceptible, and many very accurate observers have not hesitated to affirm that they have been unable to recognise it. There are, however, physiologists of the first eminence, who inform us that they can perceive a difference in point of time in the beat of the different parts of the arterial system. Considering, therefore, that a positive fact, where the authorities are equal, is to be preferred to a negative one, we must admit that the progressive beat of the arteries is perceptible.

Another question which, like the last, must be answered partly from theory, and partly from observation, is whether the force of the different parts of the arterial system always maintains the same relation to that of all the other parts, and to the action of the heart. If the action of the heart be increased in a certain ratio, is that of every artery increased in the same ratio, or is the same ratio observed in every increase or diminution of action which may occur in any part of the arterial system? If the heart were the sole impelling power, this equality of ratio must necessarily be preserved; but if the arteries themselves partake of this action, and cooperate with the heart in the propelling power, it will follow that a local cause may produce a local effect; and this we in fact find to be the case.

If we suppose that the arterial system derives its power ultimately from the force of muscular contractility, and that this is exercised conjointly by the heart and the arteries, we may inquire to what change of properties or of constitution are the parts concerned in this operation obnoxious, which may produce an actual or perceptible effect on the pulse; and farther, what is the nature of the changes which would be thus produced.

The mechanical structure of the parts we may conceive to remain unchanged, but the force of contractility is perpetually varying. And although we may suppose that the heart and arteries are not under the direct influence of the nervous power, yet we are disposed to acquiesce in the doctrine of those physiologists who maintain that they are indirectly affected by it, in the same manner with the involuntary muscles generally, so that we have here another source of variation in the pulse.

The function of respiration exercises a most important influence over the circulation. The essential object of this function is to produce such a chemical change in the blood as to enable it to maintain the contractility of the muscular parts, and among others, that of the heart itself. Any interruption to this change in the nature and constitution of the blood will necessarily impede the action of the heart, independently of any direct change in its susceptibility, while a still more material change in the circulation will be produced, if both the nature of the blood and the power of the heart be simultaneously affected. The function of assimilation is still more immediately connected with the process of sanguification, and consequently with the quantity and quality of the blood, so that we have here two direct and immediate causes always in operation, which, either separately or conjointly, may contribute to affect the state of the pulse. From these considerations it will appear that, independent of any external agency, we shall have a sufficient number of changes in the powers or actions connected with the circulation, to account for all the actual varieties that are observable in the state of the pulse, and to serve us as a basis on which to construct a theory of the cause and nature of these variations.

Let us now attempt to apply these observations to explain the phenomena of the pulse. We may arrange all its varieties under the three relations of time, force, and equality, considered either simply or in combination. Thus the strokes of the artery may be in the simple relation of frequent or rare, strong or weak, regular or irregular, or we may have the combined relations of frequent and strong, weak and regular, &c. It will be a question, however, for consideration, whether all the varieties that can be actually detected are reducible to these three simple or combined relations; and in order to elucidate this point, it will be necessary to determine what are the characters of the pulse which can be clearly recognised, and are generally allowed to exist.

The first is that which depends upon the simple relation of time, constituting the frequent or rare pulse, indicating merely the number of strokes in a given period. The next variety is the quick or the slow pulse, including something beyond the mere number of beats in a

* Experimental Inquiry concerning the Arterial Pulse, 1816; with additional experiments by his Son, 1819.

given time, and taking into account the period occupied by each individual pulsation. From what has been stated in the first part of this article, it will appear that it has been questioned by physiologists and physicians, whether it is possible to distinguish between these two states of the pulse, or rather, indeed, whether this difference actually exists; whether, for example, a pulse can be at the same both rare and quick, or frequent and slow. This point formed the subject of a very warm discussion between the celebrated rivals Stahl and Hoffmann, about the beginning of the last century, the former maintaining the affirmative, and the latter the negative opinion. We have seen above, that the high authority of Heberden and Falconer is in favour of the opinion of Hoffmann, yet we have also high authorities on the other side of the question; and proceeding upon the same principle as on a former occasion, we do not hesitate to decide in the affirmative. It may indeed be impossible to discriminate between a quick and a frequent pulse where the frequency is considerable; yet in cases of less frequency, we conceive that a difference may be detected. These are the only simple relations of time.

With respect to the second class of relations, that of force, we have first the most simple character of strong and weak, depending directly upon the degree of force with which the heart propels the blood into the arteries. It may be doubted whether there be any state of the constitution in which the contractility of the heart is increased or diminished, without the action of the arterial system, taken in its whole extent, being likewise increased or diminished; nor, if this condition should exist, are we in possession of any method of detecting it through the medium of the pulse.

We may conceive a state, in which the contractility of the heart may remain unchanged, but in which the nervous energy may be increased or diminished, in which case an indirect effect may be produced on the pulse, giving rise to two possible variations, the one depending on an increase, the other on a diminution of nervous power. Then again, conceiving the muscular and the nervous powers to be derived from different sources, and not necessarily dependent on each other, we have the farther possible modifications of increased contractility, while the sensibility is either increased or diminished, and the reverse. But although some of these may be regarded as possible and even not unfrequent occurrences, it does not appear that we have any means of recognising their effects on the pulse, or of distinguishing them from each other. The only characters of the pulse which belong to the relation of strength, besides that of the simply strong and weak pulse, is the hard or soft, and what is perhaps nearly the same, or differing from it by a minute shade only, the quality which has been termed tension, where, without the actual bulk of the artery, or the force of the heart being increased, a sensation is communicated to the finger of greater firmness or density. It is probable that under one or other of these characters may be comprehended all the essential variations of the pulse which are connected with the simple relation of force.

We must next speak of those variations of the pulse which proceed upon the relation of equality. These naturally arrange themselves under the two heads of equality as to time, and equality as to force. The first constitutes the regular or the irregular pulse, and the irregularity may be of two kinds; when one beat among a certain number of strokes is omitted, as in the intermitting pulse, or when the beats generally bear no uniform relation to each other. With respect also to the irregularity of force, we have, in like manner, two varieties; the first, where there is a general inequality in the strength of the pulsations compared with each other; the second, that state of the pulse where a weaker and a stronger beat succeed each other, with at least a certain degree of uniformity. One variety of this has been termed the rebounding pulse, and there are others, much insisted upon by the older writers, and perhaps not altogether without an actual existence, where this change of force is continued through two or three strokes, constituting a kind of increasing or decreasing series, to which the terms *inciduus* and *miurus* (μείουρος) have been respectively applied.

If we now bear in mind the three general causes which we have supposed to affect the circulation, the vital powers of contractility and sensibility, and the state of the circulating fluid, we shall perceive that the relations of time, force, and equality may be, each of them, supposed capable of being influenced by the third of these causes, which will give rise to an additional set of combinations, of possible, perhaps some of them of frequent occurrence. Thus, what is termed the full or small pulse probably depends upon an excessive or a deficient quantity of blood in the vessels. That peculiar state of the pulse in which the sensation conveyed by the artery to the finger has been likened to that of a thread, a wire, or a cord, may be supposed to depend upon the small quantity of blood in the vessel, combined with an increased or diminished contractility of the heart, while the contrary state of a sluggish or an oppressed pulse, and the like, may be attributed to an unusual fulness of the vessels, the vital powers of contractility and sensibility not being increased, or even one or both of them being diminished.

The varieties in the pulse which have been enumerated above, are supposed to be derived from, or to be dependent on, the general or ordinary actions of the animal economy, and to be explicable by a reference to the principles which influence these actions. There are, however, many other variations which profess to be the result of observation and experience, but which are admitted to be altogether empirical, and of which no explanation is attempted to be given. Some of these were referred to in the first part of this article. Such are, for the most part, the different states of the pulse pointed out by Solano and his followers, and especially by Fouquet and Bor-

den. The greatest part of these we may unhesitatingly pronounce to be altogether without foundation; there are, however, some of them which are supported by such numerous and learned authorities that it would be improper to pass them by without noticing them a little more particularly.

It has been a favourite notion with many physiologists, ancient as well as modern, that diseases of the different regions of the body, for example, of the upper, the middle, and the lower, might be recognised by corresponding differences in the state of the pulse. But we may venture to assert that this doctrine is erroneous. The mere local situation of a disease can have no effect on the pulse, except as far as regards the distance of the organ from the centre of the circulation; while, on the contrary, wherever the morbid part be situated, it is easy to imagine that the function to which it is subservient, or even its texture and composition, may materially affect the condition of the circulation, and that this may possibly be detected by the state of the pulse. Antecedently to all experience on the subject, we might expect that an inflammation of any part connected with the brain or an organ of sense would produce a different effect upon the pulse from an inflammation of the lungs, and this again from a similar affection of the stomach or the intestines. We may farther conceive that an inflammation of a mucous, a serous, a muscular, or a membranous texture, would respectively impress a specific character on the circulation, as manifested by the pulse; but this will be altogether independent of the mere locality of the organ, and must be referred to a totally different principle. The idea which was long prevalent, of there being a connexion between the diseases of each side of the body and the pulse of the same side, would appear, in like manner, to be entirely without foundation.

There is, however, another set of causes which materially affect the pulse; these may be divided into internal and external. The internal are connected with the original powers or constitution of the body, or with its natural and ordinary progressive changes. Such are age, sex, temperament, and peculiar idiosyncrasies, the states of sleep and watching, of repletion and inanition, mental emotions of all kinds, and the revolution of the diurnal period. All the above are within the limits of health, and the catalogue is to be augmented by the long and melancholy train of morbid affections. Among the external causes are climate, temperature, various atmospherical changes, peculiarities of diet, modes of life, certain occupations and acquired habits. All these circumstances more or less affect the pulse, and cause it to deviate from what may be regarded as its medium or standard condition, and they are all of them objects of especial attention to the judicious and intelligent physician. The further consideration of these may, however, be more conveniently referred to the third division of this article.

III. *Pathology of the pulse.*—After having made ourselves acquainted with the physiology of the pulse, we shall be prepared for entering into the consideration of its pathology, and for inquiring into the degree in which it may serve us as an indication of the nature and seat of disease.

We have had ample occasion to remark upon the great difference of opinion that has existed on this latter point among the most eminent men both in ancient and modern times. While Hippocrates and Celsus paid but little attention to the indications of the pulse, Galen, on the contrary, fell into the opposite error, and aimed at what was considered, even by some of his contemporaries, as an excessive and over-refined minuteness. Among the moderns, the prevailing disposition has been to regard the pulse as one of the most important means of ascertaining the nature and progress of disease; and it may be asserted generally, that the pulse is among the first objects to which the practitioner directs his attention. Yet even among the most enlightened and candid of the moderns, we have opinions promulgated which must diminish the confidence we might otherwise be disposed to feel on this subject. We have seen above, that Dr. Heberden limits the characters of the pulse, which are available by the practitioner, almost to its different degrees of frequency; and with respect to its indications generally, the tendency of his observations is to show that the pulse is, in many cases, a very inadequate guide in enabling us to form our indications, and that not unfrequently it would lead us to absolutely erroneous conclusions.

In this state of uncertainty it may be useful to recur to first principles, and to endeavour to unite theory with experience and observation. If there be a state of the system in which the muscular contractility and the nervous energy are one or both of them increased, we might expect that an increased action of the heart would be the consequence, and that this increased action would be communicated to the arteries, and would, according to circumstances, produce a full, a hard, a frequent, or a quick pulse, or any combination of these conditions. If, on the contrary, the force of the heart be diminished, either directly by the diminution of its contractility, or indirectly by that of the nervous influence, the blood will be propelled with less force into the arteries, and will be moved with less facility along them. The pulse will then become languid or oppressed, feeble, small, intermitting, or irregular, according to the quantity of blood in the vessels, and the relation of this to the vital powers.

Proceeding, then, upon the united basis of theory and observation, it may be useful to consider, first, what characters of the pulse are the most distinctly perceived and clearly discriminated; and, secondly, to inquire what conditions of the vital powers or of the functions may be supposed capable of producing a distinct and specific change in the state of the pulse.

But before we proceed to examine into the relation which these various states of the pulse

pear to the different morbid conditions of the body, it will be proper to offer a few brief remarks on the effect of the circumstances alluded to above, which, independently of disease, are supposed, in a greater or less degree, to influence the circulation.

The first in point both of order and of importance is the age of the subject. The pulse of a newly-born infant is 130 or 140 in a minute, nearly twice as frequent as that of an adult; but its frequency soon begins to diminish, its mean rate during the first month being about 120. During the first year it falls to about 110; during the second year to about 100; from the third to the sixth year it may be estimated at about 90; and by the tenth or twelfth year it arrives at the state in which it remains for the greatest part of life. Numerous observations have been made for the purpose of fixing the average rate of the pulse in the healthy adult. This subject was particularly attended to by Dr. Falconer, and we find in his essay a copious collection of observations made by himself and others, in order to ascertain this point; the number which he fixes upon is 75, and there appears sufficient ground for acquiescing in his conclusion. It is further to be remarked that the pulse is more irritable in youth than in more advanced age, being more affected both by external and by internal causes.

With respect to the two sexes, it is generally admitted that the pulse of the female is more frequent than that of the male, perhaps eight or ten beats in the minute; it likewise resembles the pulse of youth in its liability to be affected by all those circumstances which influence the state of the circulation. An analogous observation may be made with respect to temperaments; in the sanguine temperament, where the constitution more resembles the state of youth and of the female, the pulse is more frequent and more irritable than in that of an opposite character. With respect to idiosyncrasies, it is obvious that no general remarks can be made; but it is important for the practitioner to be aware that individuals, who may resemble each other in all that respects age, sex, or temperament, may still have a different rate of the pulse, and this independent of any apparent morbid condition or assignable cause.

The states of sleep and watching, and more generally of rest and motion, very considerably affect the pulse. The observations that have been made on the pulse during sleep are not altogether uniform, but they tend generally to the conclusion, that the pulse becomes slower during this state. With respect to the effect of motion, every one is aware how much the pulse is increased in frequency by exercise of any kind; the degree of this increase being partly in proportion to the degree of exercise employed, and partly to the previous state of the constitution or the ordinary habits of the individual. On this subject, as well as on many other points connected with the mechanism of the pulse, we have a number of valuable observations by Bryan Robinson, a writer whose facts appear to be correct and worthy of our attention, although his physiological hypotheses are, for the most part, discarded.*

The state of the system with respect to repletion or inanition very materially affects the pulse. The taking of food increases both its frequency and its fulness, and that often in a very considerable degree. After a meal which cannot be regarded as excessive or intemperate, the pulse may be increased by one-fifth of its average number of beats, while its strength and fulness are almost equally augmented. When abstinence is carried to a great and unnatural excess, the pulse, although much diminished in strength, appears to be increased in frequency; but this occurrence can seldom be observed without the presence of some other disease, which is the immediate cause of the abstinence, and which would probably of itself affect the pulse.

Every one is aware how much the circulation is affected by mental emotions of all kinds. If we arrange them, according to the ordinary distribution, under the two great classes of exciting and depressing, we shall find that they, each of them, increase the frequency of the pulse; the former, however, for the most part, have the effect of also increasing its force, while the latter, on the contrary, render it more feeble.

It is generally admitted that the pulse undergoes a kind of periodical revolution during the course of the day, and this independent of any of those circumstances, external or internal, which might be supposed to affect it. This subject has been attended to by various physiologists, and among others by Bryan Robinson and Falconer, who have given us tables of the results of their observations. We are, however, scarcely able to draw any conclussions from them, except that the pulse is less frequent in the morning, and that it has a general disposition to become more frequent as the day advances; but it appears very difficult, if not impossible, to determine in what degree this increased quickness is to be attributed to food, exercise, or to other exciting causes.

We are still less able to draw any general conclusions respecting the operation of the external causes, which were enumerated above as liable to affect the pulse; it is less easy to observe their distinct and separate action on the system, and it may be apprehended that the operation itself is in most cases less uniform. If there be any exception, it is with respect to external temperature, which seems very generally to increase the frequency, and in most cases the strength and fulness of the pulse. Temperature, however, like all other stimulating agents, if carried beyond certain limits, either as to quantity or duration, exhausts the vital powers, and produces a state of weakness, which may be recognised by the pulse. Excessive cold exercises a directly debilitating power over the system, and produces a corresponding effect on the pulse.

* Treatise on the Animal Economy, 1732.

There is, however, a considerable diversity in the accounts which we have on this subject, in consequence of the difficulty there is in ascertaining the point at which cold may be considered as exceeding the limits of the salutary action which it exerts when in a moderate degree only. With respect to the other external causes which affect the pulse, we may remark that they are all of them points to which the practitioner should direct his attention, in order that he may learn to distinguish between the effects which proceed from these causes, and those which belong to the diseases under treatment.

To return from this digression to consider the characters of the pulse, the following may be enumerated among those which are the most distinct and unequivocal. In the relations of time, the pulse may be frequent or rare, quick or slow; in the relations of force, it may be strong or weak, hard or soft, full or small, free or compressed: in the third relation, of equality, we have the irregular pulse with respect both to time and force, with the varieties of each, the intermitting, the rebounding, the fluctuating or wavering pulse, &c.

In considering the changes that may be communicated to the pulse by a change in the action of the heart, we may remark that, of the two vital powers which contribute to this action, the nervous power is the one the most liable to variations, and the most under the influence of external agents; we therefore assume that, in most cases of increased or diminished action, the change originates in an affection of the nervous system. It hence becomes necessary to consider what are the laws which regulate the actions of the nervous system—at least, what are the changes in this action which are especially applicable to the case in question. Now there are two states of the nervous system recognised by physiologists, which must influence the action of the heart in such a way as to affect the frequency of the pulse; the first condition, which has been termed the increased mobility or excitability of the nervous system, the other a sedative operation, tending directly to diminish its action. The effect of the increased mobility of the nervous system is to render a part under the influence of the nerves more susceptible of action, while the force of the action is not proportionably increased; the operation of a directly sedative agency is to diminish the action of the parts in all respects, both as to susceptibility and to force. The diseases of hysteria and apoplexy, or rather the tendency to these diseases, may be cited as affording us, respectively, types of these two states of the nervous system; the former giving rise to frequent and irregular contractions of the muscles, the latter tending altogether to destroy their contractility. Hence we observe a foundation for what at first view might appear as contradiction, that a debilitating cause, acting on the heart, may in one case cause an increased, and at another time a diminished frequency of the pulse.

It is generally admitted by physiologists that a principle analogous to what has been described as occurring in the nervous system exists also in the muscular; that absolute force and susceptibility of action bear no necessary relation to each other, but that each of them may be increased or diminished without a corresponding change in the condition of the other. With respect to the pulse, however, it is admitted that we are, for the most part, unable to distinguish between the affections of the muscular and the nervous systems; consequently all that we can aim at is to ascertain in what manner or in what degree the morbid cause acts generally upon the powers which increase or diminish the susceptibility or force of the contractions of the heart.

It will be scarcely necessary to offer any remarks on the mode of feeling the pulse. We have, indeed, in some of the older writers, many minute directions on this subject, and in some French works, even of recent date, the "exploration" of the pulse is treated of in detail, as an elaborate art of difficult attainment. It no doubt requires accurate observation and minute attention to appreciate all the changes to which the pulse is liable, but there appears to be nothing in the subject of peculiar difficulty, or which will not be overcome by a due familiarity with the phenomena of disease. The anatomical structure of the part, and its practical convenience, render the artery at the wrist, in a great majority of cases, the most eligible part for ascertaining the state of the pulse; we may occasionally find it necessary to examine the artery in the neighbourhood of a part which is supposed to be the immediate seat of disease, and in some instances we compare the action of different arteries with each other; but these are points which scarcely require or admit of general directions.

What has been stated above bears immediately upon the second point which we proposed for consideration, viz. to inquire what condition of the vital powers or of the functions may be supposed capable of producing a distinct and specific effect upon the pulse, and what are the diseases which derive their distinctive characters from the changes consequent on these conditions. Now we shall find that the diseases in which the action of the heart is more immediately or directly concerned are those which we referred to the great class of febrile affections. These may be arranged under the two divisions of fevers that originate in, or are essentially connected with, increased action of the vital powers, and those which originate in a diminished action of these powers; the first constituting what is popularly termed inflammatory fever, the synocha or causa of systematic writers; the latter the low or nervous fever, the typhus of the nosologists. If to these we add a third class of diseases, which depend upon a directly sedative operation on the nervous system, nearly corresponding to the anæsthesiæ of the nosologists, we

shall have three great divisions, to which we may refer all the various changes in the state and condition of the pulse which can be easily reduced to any general principles.

We are now arrived at that part of the subject to which all the rest ought to be subservient, and which alone gives it its value—the practical application of our theoretical principles; yet, important as it is, on this occasion it must necessarily be passed over with a very slight notice. All that can be accomplished in an essay like the present, is to establish and illustrate certain general positions, which may be applicable to each particular disease, or even to each individual case,—a detail which would be inconsistent with the nature and the limits of our article, but which will be amply supplied by the other parts of this work.

The object of the practitioner is to ascertain, if possible, in the first instance, what is the ordinary state of the pulse of each individual, as depending upon his peculiar constitution or habits; and, secondly, how it may be supposed to be affected by the circumstances, either external or internal, which were enumerated above, and which are independent of the disease in question. In the third place, he must ascertain the state of the pulse with respect to its three principal relations of time, force, and equality, considered either simply or in combination, and endeavour to trace their connexion with the supposed cause of the disease, and with the derangement which has been induced in the various powers and functions of the system. These he will probably find it convenient to refer to one or other of the three great classes mentioned above, and he must regulate his practice, and form his diagnosis and prognosis by still farther viewing them in connexion with the other symptoms of the disease. The result of this process will be, that by referring to the physiological principles which we have attempted to establish, the practitioner will frequently be enabled to explain what would otherwise be obscure and unintelligible; yet it must be acknowledged, on the other hand, that he will meet with numerous anomalies which he will find it impossible to reduce to his system, and which can only be duly appreciated by a careful and diligent observation of the phenomena of disease, and by steadily preferring the result of experience to the deductions of any theory, however plausibly formed or ingeniously supported.

(John Bostock.)

PURGATIVES.—See Cathartics.

PURPURA.—The terms purpura, purpura hemorrhagica, and hemorrhœa petechialis, are employed to denote that affection which was formerly distinguished in medical writings by the designations of morbus maculosus hemorrhagicus, petechiæ sine febre, phœnigmus petechialis, *(Sauv.)* &c. This disease is characterized by an efflorescence on the skin, occurring independently of primary fever, consisting of red, purple, or livid spots of various sizes, (termed petechiæ, vibices, and ecchymoses,) and in its more severe form accompanied by hemorrhage from various parts of the body, chiefly from the mucous membranes. The spots are seldom elevated above the level of the surrounding cuticle; they are unattended by itching or any uneasy sensation; and on division of the cuticle by a scalpel they are found to consist of minute effusions of blood. They are therefore essentially different from every form of rash or other cutaneous eruption; and are properly considered as the result of a *cutaneous hemorrhage*.

Petechiæ (a name introduced into nosological language from the Italian *petecchia*, and supposed to be originally derived from their resemblance to flea-bites) have been long noted as a symptom in continued fevers and other febrile diseases, in which they have been supposed to indicate peculiar malignancy. (See the article Fever.) From their constant occurrence in certain epidemic fevers, these were considered as constituting a specific exanthematous disease, which was described in nosological systems and practical writings under the names of petechiæ, febris petechialis, febris purpurata, &c. The occurrence of petechiæ in continued fever, no less than in small-pox, measles, &c. is now universally allowed to be a contingent symptom, and most commonly arises from the influence of foul air, a hot regimen, the neglect of purgatives, or similar errors in treatment. It is accordingly much less frequent than formerly. *Petechial fever* is the "purpura" of Sauvages' nosology; a term which had previously been used in the same sense by Riverius, Diemerbroeck, &c. By others of the old writers it had been employed to signify affections totally different, viz. various forms of papulous eruptions and rashes, as red-gum, lichen, miliaria, nettle-rash, measles, and scarlatina.* We must therefore take care not to apply their observations to what is now termed purpura.

We owe the name of purpura in its present acceptation to Dr. Willan. In his nomenclature of cutaneous affections it is used as a generic term, to include every form of petechial eruption, febrile or non-febrile. He therefore includes under it, as a species, purpura *contagiosa*, the petechial eruption in continued fevers; a name every way objectionable, as it would tend to perpetuate the ancient errors of the idiopathic nature and specific contagion of those petechiæ. Under the names of *P. simplex*, *P. hemorrhagica*, and *P. urticans* he describes "three striking varieties" of petechial eruption independent of primary fever,—varieties which confessedly differ chiefly in degree, and which, under the general name of purpura, form the subject of the present article.

Purpura, considered by Willan as an affection of the skin, was ranked by him under the

* Willan on Cutaneous Diseases, p. 452.—Bateman, Synopsis, p. 103, (third edit.)

order "Exanthemata," or rashes, of his arrangement; to which it bears some affinity in external appearance only, but even in this respect does not agree with his definition of the order. Rayer has more correctly classed purpura (under the somewhat quaint name of hémacélinose*) under "Cutaneous and Subcutaneous Hemorrhages." But purpura cannot be correctly considered as merely a cutaneous disease, since, as Dr. Watson has well observed, "the effusion of blood (which, strictly a hemorrhage in all parts, takes the form of red or purple spots where the quantity effused is but a drop) is not confined to the skin nor to the subcutaneous tissues, but is observed occasionally on the internal surfaces also, and in the parenchymatous surface of the viscera. The disease, therefore, is properly a hemorrhage, but it is not properly, or merely, a cutaneous hemorrhage."

Purpura, considered as a hemorrhagic affection, is a most interesting subject of pathological inquiry, and demands peculiar attention from the danger which attends it, and from the obscurity which attaches to its nature and mode of cure. It has, therefore, ever since it was first distinguished from typhoid fever, attracted much notice from medical writers. For its earlier literary history, the reader must be referred to Dr. Willan's work, where he will find it amply detailed. Reference to the old writers can be of little avail for pathological and practical purposes. The first systematic account of the disease, under the name of hemorrhœa petechialis, was given in this country by Dr. Adair, in his thesis published in 1789. Dr. Bateman, in his inaugural dissertation published in 1800, described it under the same appellation. The description of purpura by Willan, in his Reports of the Diseases of London, and subsequently in his great work on Diseases of the Skin, is given with his usual perspicuity, but he was practically unacquainted with the severer cases of the disease, never having met with one which proved fatal. He considered the disease as nearly if not quite identical with scorbutus, and to be combated by similar remedies. These views were disputed by Dr. Parry and Dr. Harty, and were considerably modified by Dr. Bateman in his Synopsis. Since that period a succession of valuable and instructive cases have been published in the Edinburgh Medical and Surgical Journal, and a few in other periodical works.† Yet much remains to be done ere the pathology of purpura or its treatment can be considered as satisfactorily fixed on scientific principles.

Phenomena of the disease.—These may be referred to—1. appearances on the skin; 2. hemorrhages; 3. constitutional symptoms; 4. progress and duration of the disease; 5. circumstances noticed respecting the blood and the urine; 6. morbid appearances on dissection.

1. We have already given a general description of the efflorescence on the skin characteristic of purpura. There are three different forms of it, (well represented in plates xxvii. and xxix. of Bateman's "Delineations,") viz. the P. simplex, P. hemorrhagica, and P. urticans of Willan. The *P. senilis* of Bateman (figured in his 30th plate) is a nearly local form of ecchymosis, unattended with fever, hemorrhage, or other constitutional symptoms; we shall therefore refer to the "Delineations," and to the third and subsequent editions of the "Synopsis," for his account of it.

In the *purpura simplex*, the petechiæ are described by Willan and Bateman as occurring with little constitutional disorder. "They are most numerous on the breast and on the inside of the arms and legs, and are of various sizes, from the most minute point to that of a flea-bite, and commonly circular. They may be distinguished from recent flea-bites partly by their more livid or purple colour, and partly because, in the latter, there is a distinct central puncture, the redness round which disappears on pressure."* Purpura simplex is chiefly noticed in women and delicate children. It is thus described by Heberden:—"Cutis puerorum interdùm ubique distinguitur maculis purpureis, similibus earum quæ in febribus nascuntur. Tamen cum his adversa valetudo nulla est, neque præcessit, neque subsequitur. Aliæ *pustulæ* (scil. maculæ) vix sunt semine milii majores, aliæ sunt tres pollices amplæ. Post paucos dies cunctæ, sine medicamentorum auxilio, suâ sponte plerumque recedunt. In quodam puero sic affecto, si modò digitus leviter cuti imprimeretur, continuò sanguis ex vasis vicinis exiit, et sugillatio, tanquàm in collisis, facta est."† The latter circumstance is more frequently noticed in the next form of the disease.

In *purpura hemorrhagica* "the petechiæ are often of a larger size, and are interspersed with livid stripes and patches, resembling marks left by the stroke of a whip, or by violent bruises. They commonly appear first on the legs, and at uncertain periods afterwards on the thighs, arms, and trunk of the body, the hands being more rarely spotted with them, and the

* From αἷμα, *blood*, κήλις, *spot*, and νόσος, *disease*. *Rayer* Malad. de la Peau, t. ii. p. 158.

† *Duncan* (senior), Medical Cases, Edin. 1781, p. 90.—*Rogert*, Acta Soc. Reg. Med. Hafn. tom. i.—*Adair*, Diss. Inaug. Edin. 1781.—*Ferris*, Med. Facts and Observat. 1781.—*Tattersall*, Med. Comment. vol. xx. (1795.)—*Walker*, Annals of Med. vol. ii. (1797.)—*Bateman*, Diss. Inaug. 1800.—*Willan*, Reports on Diseases of London.—Willan on Cutaneous Diseases.—Bateman's Synopsis.—Bateman's Reports on Diseases of London.—*Parry*, Edin. Med. Journ. v. 7.—*Bateman*, ibid. vi. 224 and 374.—*Jeffreys*, ibid. viii. 435.—*Walsh*, ibid. ix. 161.—*Harty*, ibid. ix. 186.—Ibid. xiii. 402.—*Combe*, ibid. xvii. 83.—*Johnston*, ibid. xviii. 402.—*Duncan*, (junior,) ibid. 405.—*Nicholl*, ibid. xviii. 540.—*Darwall*, ibid. xxiii. 53.—*Magee*, ibid. xxiv. 307.—*Kift*, ibid. xxvii. 71.—Blackall on Dropsies, p. 150.—*Yeats*, Medical Transactions, iv. 429.—*Gairdner*, Edin. Medico-Chirur. Trans. i. 671.—*Wood*, ibid. 680.—*Fairbairn*, ibid. ii. 157.—*Latham*, Med. Gazette, i. 544.—*Watson*, ibid. vol. vii.—Mackintosh's Pract. of Physic, vol. ii.—*Rayer*, Malad. de la Peau, tom. ii. p. 168.

* *Bateman*, Synopsis, p. 104.

† *Heberden*, Comment. cap. lxxviii. de maculis purpureis.

unk generally free. They are usually of a ight red colour when they first appear, but on become purple or livid; and, when about disappear, they change to a brown or yel- wish hue; so that, as new eruptions arise, id the absorption of the old ones slowly pro- eds, this variety of colour is commonly seen the different points about the same time. See Delin. plate xxviii. fig. 2.) The cuticle er them appears smooth and shining, but is ot sensibly elevated; in a few cases, however, e cuticle has been seen raised into a sort of esicles, containing black blood.... The gentlest ressure on the skin, even such as is employed feeling the pulse, will often produce a purple lotch like that which is left after a severe ruise."* The nature and seat of the small fusions of blood which constitute the pete- iæ, from which the vibices and ecchymoses ffer chiefly in magnitude, are well explained y the anatomical researches of Rayer. "On issecting the skin," he observes, "it is found at the petechiæ and ecchymoses do not all ccupy the same situation. Some are very perficial, and seated on the surface of the te mucosum; others occupy the alveoli of e cutis; the largest and darkest-coloured have eir seat under the skin in the cellular tissue. these the blood is found coagulated, but it fluid in the smaller and more superficial fusions. The vascular ramifications conti- uous to these minute ecchymoses are in their atural state. The blood is easily removed by ashing or maceration."†

The variety termed by Willan and Bateman *urpura urticans*, is comparatively rare. It is haracterised by "rounded and reddish eleva- ons of the cuticle, resembling wheals, but hich are not accompanied, like the wheals of rticaria, by any sensation of itching or ting- ng." These little tumours gradually dilate; ut within twenty-four hours or somewhat nger, subside to the level of the neighbour- g cuticle. They are commonly situated on e legs, where they are intermixed with pete- iæ; (see Delineat. plate xxix.;) they also ppear on the thighs, breast, arms, &c. The pots are not permanent, but fade, while others ppear in succession in different places. The uration of the complaint varies from three to ve weeks. Willan never observed it to be ttended with hemorrhage or fever; he states at it generally occurs in summer and autumn, nd attacks those who are exposed to daily tigue, &c., or young women who live luxu- ously and take little exercise. Some œdema f the extremities usually accompanies it, and is occasionally preceded by stiffness and pain the legs.‡

2. The hemorrhages attendant on purpura ke place from the mouth, nostrils, bronchial ubes, stomach, intestines, bladder, uterus,— short, from every part of the mucous mem- ranes. They also in some cases occur from e skin; at least this singular hemorrhage bears in some cases a close analogy to pur- pura. In all these cases the effect produced on the system is from the loss of blood; but where the hemorrhage is strictly internal, as from the serous membranes or the parenchy- matous substance of the viscera, the mischief is done by the mechanical compression or de- struction of the texture of organs essential to life. Both cerebral and pulmonary apoplexy may thus occur and destroy the patient; of which there are several cases on record.

The most frequent hemorrhage, particularly in weak subjects, and where there is an ap- proach to what has been termed the scorbutic diathesis, is that from the mouth. The gums are tender, and easily bleed on being touched. The lining membrane of the inside of the lips and cheeks, the investing membrane of the tongue, and also in some cases that which covers the tonsils and contiguous parts, pre- sent dark-coloured spots, which are usually elevated and distended with blood, which they pour out either spontaneously or on the slightest pressure. In some very unfavourable cases (as that related by the late Dr. Duncan*) these spots degenerate into gangrenous ulcerations.

The tendency to the several kinds of hemor- rhage varies at different periods of life: ac- cording to Rayer, epistaxis is the most common in children, as might be expected; uterine he- morrhage in women; and pulmonary or intes- tinal hemorrhage in male adults. The quantity of blood lost is often very considerable; and, as in other cases of hemorrhage, it is very apt to recur, and to become periodical. A case is mentioned where it returned daily at the same hour for a considerable period.

3. We have already stated that the constitu- tional symptoms are usually but slight in the varieties of the disease termed P. simplex and P. urticans. In both of these forms, occurring without hemorrhage, considerable febrile excite- ment has been observed in some cases. With regard to P. hemorrhagica, the following account of the preceding and accompanying symptoms is given by Bateman: "This singular disease is often preceded for some weeks by great las- situde, faintness, and pains in the limbs, which render the patient incapable of any exertion; but not unfrequently it appears suddenly, in the midst of apparent good health. It is always accompanied by extreme debility and depres- sion of spirits; the pulse is commonly feeble, and sometimes quickened; and heat, flushing, perspiration, and other symptoms of slight febrile irritation, recurring like the paroxysms of hectic, occasionally attend. In some pa- tients, deep-seated pains about the præcordia, and in the chest, loins, and abdomen, have been felt. In others, a cough has accompa- nied the complaint, or tumour and tension of the epigastrium and hypochondria, with ten- derness on pressure, and a constipated or irre- gular state of the bowels. But in many cases no febrile symptoms have been noticed; and the functions of the intestines are often natural. In a few instances frequent syncope has oc-

* *Bateman*, Synopsis, p. 105.
† *Rayer*, Malad. de la Peau, ii. 162.
‡ Willan on Cutaneous Diseases, p. 461.—Bate- man's Synopsis, p. 116.

* Edinburgh Med. Journal, vol. ix. p. 405.

curred. When the disease has continued some time, the patient becomes sallow, or of a dirty complexion, and much emaciated; and some degree of œdema appears in the lower extremities, and afterwards extends to other parts."* This is a very faithful general account; but in several of the cases which have been recorded, the febrile symptoms, and those indicative of internal affections of the congestive or inflammatory kind, have been much more considerable than we should collect from Dr. Bateman's statement. Such affections are considered by Rayer as always constituting an "accidental complication" of purpura; and he says that it is only in such cases of accidental complication that he has seen it present the characters of active hemorrhage.† On the other hand, it is to be observed that the mode of treatment which has been directed to the relief of the internal symptoms, has in several well-marked cases procured the cessation of those proper to purpura; an effect which has also not unfrequently occurred from a profuse eruption of the catamenia,‡ or from a hemorrhage which has appeared to be, in the language of the schools, critical. This subject, however, will more properly come to be considered under the heads of pathology and treatment.

4. "The purpura hemorrhagica," observes Willan, "has not any regular or stated termination. It was protracted, in the cases under my own observation, from fourteen days to twelve months and upwards. The disease did not, in any of these cases, prove fatal."§ In some cases the disease has proved fatal from internal or external hemorrhage, or the violence of the febrile symptoms, or prostration of the vital powers, in a shorter time, considerably, than the former period mentioned by Willan. In others it has assumed a completely chronic form, and either recurred periodically, or as to some of its symptoms been more or less constantly present. Several well-attested cases are recorded where it has appeared to be linked in an inexplicable manner with the mode of existence of the individual, and put on the character of what are properly called "constitutional hemorrhages." (See Hemorrhage.) In such cases, it has existed for years without impairment of the general health. A boy is mentioned by Bateman on the authority of the elder Dr. Duncan, whose skin for several years was constantly covered with petechiæ, and exhibited vibices or purple blotches on the slightest blow; yet he was in other respects in good health, and capable of active exercise. Pulmonary hemorrhage at length supervened, and carried him off.‖ A case is related by Adair, where the symptoms of purpura recurred regularly for six succeeding summers.¶

5. We have not been able to meet with any account of the chemical analysis of the blood in a case of purpura. Its sensible qualities, however, and mode of coagulation have been carefully noted in several cases. Dr. Watson asserts that "in many, perhaps in all instances of the disease, in which it can be examined, the blood is found actually to have undergone a change, and not merely a change which may be ascertained by nice or elaborate chemical research, but such an alteration of its sensible qualities as is evident to the eye, and forces itself upon our notice."* The inquiry into the state of the blood is certainly one of the highest interest, both with regard to the pathology of this disease in particular, and as it bears upon the general doctrines of pathological science. But in pursuing it we must be careful to keep in view the causes which, independently of any primitive alteration in the state of the blood existing as the cause of all the phenomena of purpura, may materially affect the condition of that fluid. The co-existence of fever or inflammation will, of course, give rise to those alterations in the blood which are proper to those morbid states; accordingly we find it stated by Dr. Parry, that in both his cases the blood was highly buffed, the crassamentum firm and cohesive, but bearing a small proportion to the serum.† In other cases where the blood has been examined, there had previously occurred either very profuse or long-continued hemorrhage, which necessarily altered the quality of the blood by diminishing the quantity of the red globules as well as of the fibrine of the blood in proportion to the serum. Our conclusions ought, if possible, to be derived from the examination of blood drawn at the height of the disease, when no excessive hemorrhage has preceded, and in cases where there are no decided marks of inflammation or other disease co-existing with purpura.

Some of the most remarkable results of the examination of the blood in purpura have been the following. In the case of a sea-captain, a plethoric subject with a full pulse, the state of the blood obtained by a *second* venesection, and when purgatives had been prescribed, and two pounds of blood previously lost by epistaxis, is described by Dr. Jeffreys as follows: "The blood drawn yesterday shews an inflammatory buff on its surface, at least an inch and a half in thickness, firm and yellow, far exceeding any thing I ever saw in rheumatism or pneumonia, but not at all cupped; in fact, the whole serum looks like a corrupted coat of coagulable lymph. The crassamentum appears in a very dissolved state, of nearly a black colour, and much less in quantity than usual."‡ This patient was again twice bled, the blood presenting the same appearances; he ultimately recovered. In a case related by Dr.

* *Bateman*, Synopsis, p. 107.
† Op. cit. ii. 167.
‡ *Bateman*, Reports of Diseases of London, p. 130.
§ Op. cit. p. 457.
‖ Synopsis, p. 108.
¶ Diss. Inaug. p. 16.

* Watson's Lumleian Lecture, Med. Gazette, vol. x. p. 499.
† Edin. Med. Journ. v. 8. In a case related by Bateman, (Reports on Diseases of London, p. 131.) of purpura occurring in a stout farmer, with a sharp and frequent pulse, the blood also exhibited a firm buffy coat.
‡ Edin. Med. Journal, viii. 435.

Johnston, of decidedly febrile character, and which rapidly proved fatal, the blood did not separate into serum and crassamentum; it had little consistence or tenacity, but traces of coagulable lymph were diffused through it.* In Dr. Duncan's case, which has been already quoted, the blood, while flowing slowly from the vein, was observed to be florid and semi-transparent, resembling diluted arterial blood. It slowly formed a loose coagulum, from which no serum was separated; the coagulum was like jelly, tremulous, transparent, and colourless, the few red globules having subsided to the bottom. In this case much blood had been previously lost by hemorrhage.† In Dr. Combe's case the blood was pale, coagulated slowly, separated no serum, and was not buffed.‡ In Dr. Gairdner's the blood first drawn by the lancet seemed, four hours after, to coagulate very imperfectly into a homogeneous mass. On the following day it resembled a tremulous jelly, the top of which was of a greenish buff colour with brownish spots like tadpoles. What afterwards oozed from the puncture resembled turbid lymph, or a watery fluid containing colouring matter in suspension; the cloths taken from the arm appeared as if stained with bloody water.§ In Dr. Fairbairn's case the blood first drawn resembled that described by Dr. Duncan and Dr. Combe; on a second bleeding it presented the same appearances; but on the third it shewed the buffy coat, coagulated somewhat more firmly, and separated a portion of serum.‖

The state of the urine has been less attentively noticed, or at least less frequently. We possess, however, the accounts of two cases in which the urine has been analysed. At the conclusion of Dr. Combe's case, which we have just referred to, the results of the analysis of the urine are stated, at the height, during the decline, and after the cessation of the disease. At the height of the disease, and previous to venesection, the urine was found to contain a large proportion of serosity and of the phosphates, no free acid, and but a small proportion of urea. When the force of the disease had been broken, and the hemorrhage had ceased, there was no longer any albuminous matter, but a free acid, and but a small proportion of urea. Finally, when the patient was convalescent, the analysis of the urine detected no ingredients differing from its healthy condition. In Dr. Gairdner's case, also above referred to, the urine, on analysis by Mr. Murray, shewed a deficiency of urea and an excess of albuminous matter. For the chemical details we must refer to the original cases. In Dr. Blackall's work on Dropsy, several cases are related "resembling land-scurvy," two of which, at least, are clearly cases of the hemorrhagic purpura, in which the attack was sudden and attended with febrile symptoms. In both these cases the urine was albuminous, and Dr. B. states his opinion that "venesection would have been their appropriate remedy; in the early stage, probably a successful one."

6. The appearances which are exhibited by the skin on examination after death have already been noticed. Of the morbid alterations discovered in the internal organs we possess a tolerable number of histories, recorded with various degrees of minuteness.*

The chief morbid appearances which have been noticed in the three great cavities, have been the following.

In the *head*. In a case transcribed by Rayer† from Stoll, the meninges of the brain, especially on the left side, were spotted with several large ecchymotic maculæ; some ecchymoses, resembling clots of extravasated blood, from the size of a lentil to that of a bean, were also found in the convolutions of the brain. The surface of the ventricles, and that of the cerebellum, were covered with innumerable small petechiæ; the left ventricle was distended with straw-coloured serum. The girl who was the subject of this case had died comatose, having previously suffered severely from headach (which chiefly affected the left side); she had high fever, petechiæ, and hemorrhage from the mouth. In Dr. Walsh's case‡ of a soldier previously in good health, who died apoplectic on the fourth day from the supervention of purpura hemorrhagica, besides the impression of petechial spots on the pericranium, and an ecchymosis of the right temporal muscle, a considerable coagulum (a table-spoonful) was found pressing on the brain, and the vessels of the pia mater were turgid with black blood. In Mr. Wood's case§ the pericranium and dura mater were covered with petechial spots, and "in the right temporal region a fine coagulum, floating in bloody serum, had forced its way through the broken-down brain into the ventricle." Similar effusions of blood on the brain were observed in two cases by Dr. Watson.‖

In the *chest* the following appearances are noticed by Rayer as characteristic of this disease. "The outer surface of the lungs is commonly speckled with numerous ecchymoses, which are the more distinctly visible, that the surface of the lung in the intervals retains its natural hue. Beneath each of these ecchymotic spots the tissue of the lung is of a uniform brownish-red colour, is firmer in its texture than the surrounding healthy lung, and presents a circumscribed engorgement, from which, on pressure, black blood is squeezed out—a morbid alteration quite analogous to the hemoptysical engorgements described by Laennec." Similar petechial spots are also found

* Edin. Med. Journal, xviii. 402.
† Ibid. xviii. 405.
‡ Ibid. xvii. 83.
§ Edin. Medico-Chir. Transactions, i. 671.
‖ Ibid. ii. 671.

* *Raymann*, Acta Nat. Cur. apud Adair, diss. inaug. p. 14. Edinburgh Med. Journal, vi. 374. Ibid. ix. 164. Ibid. xiii. 402. Ibid. xiii. 405. Ibid. xxvii. 71. Edinburgh Medico-Chir. Trans. i. 681. Ibid. ii. 161. *Rayer*, Malad. de la Peau, tome ii. observ. 171, 172, 173, 174, 175. Cases 173 and 174 are transcribed from Stoll, Rat. Medendi.
† Obs. 174.
‡ Edin. Med. Journ. vol. ix.
§ Edinburgh Medico-Chir. Trans. vol. i.
‖ Med. Gazette, x. 502.

on the surface of the heart, on the pleura, &c. The other morbid changes noticed in the thorax are not so characteristic, being common to other diseases. Such are the effusions of serous or sero-sanguineous fluid very commonly found in the cavities of the pleuræ or pericardium, or in the cellular tissue of the lungs. In one case (Dr. Johnston's) the heart is stated to have been small, pale, and easily lacerable. In some cases it has contained fluid blood, or pink-coloured gelatinous coagula in some of its cavities. The pericardium, in one case, and the inner membrane of the aorta in another, shewed a blush of redness. In a boy who died ten days after the supervention of purpura, Dr. Bateman found a large firm tumour occupying the situation of the thymus gland; this tumour, which must have been of slow growth, had not perceptibly affected the respiration or impaired the general health. Tubercles of the lungs were found in a case mentioned by Rayer;* and pulmonary tubercles, and the marks of chronic inflammation of the substance of the lungs, were met with in another case in a child seven years old. But this case, in which petechial spots and epistaxis supervened only on the day of the child's death, and as a symptom of impending dissolution, ought not to be taken as a fair instance of purpura.

In the *abdomen* petechial and ecchymotic spots are often found throughout a considerable tract of the mucous membrane of the alimentary canal, especially in the stomach, duodenum, and upper part of the small intestines, but sometimes also in the colon. Similar spots are also met with underneath the serous membranes, as betwixt the folds of the mesentery, and under the peritoneal covering of the viscera. Dr. Fairbairn found the cardiac extremity of the stomach emphysematous, (which did not arise from putrefaction,) the liver and spleen somewhat softened, and a bloody fluid could be squeezed from their substance; one kidney was also softened. A case is related by Dr. Bateman, where the spleen had been felt during life nearly as low as the spine of the ileum, and after death was found enormously enlarged.†

Predisposing and exciting causes.—Purpura generally may be stated to be rather a rare disease; it is especially so in its more severe forms. The purpura simplex most commonly affects children; cases resembling purpura urticans, but often presenting anomalous symptoms, occur chiefly in young women. Of seventeen cases of purpura hemorrhagica, which were all that Dr. Willan had met with, two only were men, nine women, three boys, and three infants under a year old; four of the women were above the age of fifty. The proportion of male adults is considerably greater in the cases which have been recorded subsequently to the publication of Willan's work, especially in the severe and fatal cases.

Willan, Bateman, and Rayer agree in stating that purpura chiefly occurs in individuals of delicate habit, or enfeebled by their occupations or mode of life; by confined, low, or damp habitations, scanty food, hard labour, grief, anxiety, fatigue, and watching; or who have suffered from acute or chronic disease. In a case mentioned by Willan, it ensued on excessive drinking of undiluted spirits.* In a fatal case which occurred to Bateman, it came on during a severe salivation, accidentally induced by a few grains of mercury.† A remarkable case is related in the appendix to Adair's Thesis, of a Hampshire farmer, aged 34, who was hereditarily predisposed to insanity, and becoming affected with religious melancholia, refused all food and drink except bread and water. After having some time subsisted on this diet, symptoms of purpura or scorbutus supervened; viz. petechiæ all over the body, accompanied by remarkable roughness of skin, a large ecchymosis above the right ham, gums tender, swollen, and bleeding, legs œdematous, pale dejected countenance, great debility, stiffness of the joints, (which preceded the petechial eruption,) oppressed respiration, bowels costive. This patient recovered under the use of vegetables and ripe fruits, for he could not be persuaded to take animal food.

On the other hand, purpura frequently occurs where no causes of a debilitating or depressing nature can be supposed to have existed; in persons in the prime of life, in the easy and opulent classes of society, breathing a pure air, and enjoying the necessaries and comforts of existence. "This circumstance," observes Bateman, "tends greatly to obscure the pathology of the disease; for it not only renders the operation of the alledged causes extremely questionable, but it seems to establish an essential difference in the origin and nature of this disorder from that of *scurvy*, to which the majority of writers have contented themselves with referring it. In scurvy, the tenderness of the superficial vessels appears to arise from deficiency of nutriment, and the disease is removed by having recourse to wholesome and nutritious food, especially to fresh vegetables and to acids; while in many cases of purpura the same diet and medicine have been taken abundantly without the smallest alleviation of the complaint .... In other cases, where a residence in the country, and the circumstances of the patients necessarily placed them above all privation in these respects, the disease appeared in its severest degree."‡

Pathology of purpura.—If the opinion just adverted to of the identity of purpura with true scurvy were admitted, it would not be necessary to enter into any particular inquiry respecting the pathology of the former disease, as distinct from scorbutus. Dr. Willan seems to have entirely acquiesced in that opinion. "I consider it (purpura), under all the forms described, as pertaining to the scurvy; though it is not always attended with sponginess of the gums and a discharge of blood from them, according to the definition of scorbutus in noso-

* Observ. 171.
† Synops. p. 112.

* Reports on Diseases of London, p. 167.
† Synopsis, p. 110.
‡ Ibid. p. 110.

ogy."* Into the nature and causes of scorbutus we are not to enter in this place; not only because we can say nothing satisfactory of a disease which we have never seen, and which is now happily rarely to be met with even by naval practitioners, but because it will form the subject of a separate article in this work. We are, however, inclined to acquiesce in the opinion of Bateman and of most succeeding writers, that purpura (at least many cases of it) is distinct in its nature, causes, and mode of treatment, from the true scurvy described by Lind, Trotter, &c. and as we conceive there can be no doubt of the truth of Cullen's doctrine, "that there is one disease only entitled to the name of scurvy; that it is the same by land as upon the sea, depending every where upon the same causes,"† it appears to us that the name of *land-scurvy*, as a synonym for purpura,‡ is improper, and calculated to lead to an erroneous notion of the latter disease.

The late Dr. Duncan enumerates the following as the possible modes in which he conceives the phenomena of purpura might be produced:—1. increased tenuity of blood, allowing it to escape from the extremities of the capillary arteries; 2. dilatation of the mouths of these arteries, allowing natural blood to escape; 3. tenderness of the coats of the minute vessels, giving way from the ordinary impetus of the blood; 4. increased impetus of the blood, rupturing healthy vessels; 5. obstruction in the vessels causing rupture; 6. two or more of these causes acting simultaneously or successively. But he acknowledges that he cannot reconcile any of these suppositions with the phenomena of the disease.§ Other recent writers equally confess their ignorance of its true pathology. Of the intimate nature of the process by which the blood is poured out at once from the capillaries of the cutaneous surface, and of the internal organs, we must probably be content to remain ignorant, until the *physiological* action of that important part of the vascular system shall be better understood than it is at present. Many processes, both natural and morbid, are not more explicable than the occurrence of petechiæ, either as a symptom of fever, or from other causes; and especially the process of *hemorrhage by exhalation*, of the close connexion of which with the phenomena of purpura there can be no doubt.

The most striking peculiarity of purpura, considered as a hemorrhagic disease, is the *universality* of the hemorrhagic tendency, whereby the blood is poured out not only from the various mucous membranes, at least from several of these outlets, simultaneously or in succession, but is also effused into the textures of the skin and cellular membrane, forming petechial spots, and occasionally into the serous cavities or the texture of the solid viscera. It is, therefore, a very probable, if not a certain conclusion, that the immediate cause of these phenomena is one affecting the whole system; and none seems so probable, or so well accords with the phenomena, as *an alteration in the composition and vital properties of the blood.* When we take into consideration the analogy which subsists between the phenomena of purpura and those of petechial fever on the one hand, and of cachexy, passive hemorrhage, and scorbutus on the other, it is highly probable that a similar cause is in operation in all these cases. In scorbutus it is generally admitted that the composition of the blood is vitiated. That a change both in its composition and its vital properties is intimately concerned in the production of the phenomena of fever, is a conclusion the proofs of which are rapidly accumulating upon us. (See the articles Fever, and Morbid States of the Blood, in the present work.) We have, therefore, strong analogical grounds for believing that a like cause is productive, at least in some cases, of that assemblage of symptoms to which we give the name of purpura. The proofs of this opinion will be found fully and very ably developed in Dr. Watson's Lecture on Purpura,* to which we refer the reader.

The third hypothesis suggested by Dr. Duncan, viz. weakness or frangibility of the coats of the capillary vessels, has several facts to support its probability, and especially the tender state of the gums, and the readiness with which blotches and ecchymoses are produced in some cases by the slightest pressure on the skin. Such a state may co-exist with a primary diseased condition of the blood, and may be induced by the circulation of such blood through these vessels, which is not improbable; though, as Dr. Watson has suggested, the relation of cause and effect may be different from this: "It is easy to imagine that some derangement (of the nature of which, supposing it to exist at all, we know nothing) in that part of the circulating system which is strictly capillary, and in which those changes take place whereby the blood, from being scarlet or arterial, becomes purple or venous, should modify or interfere with the change itself, and so come to affect the quality of the blood."†

But to whatever conclusion the pathologist may come on these points, it cannot affect the practical fact, that purpura is not unfrequently connected with a state of the system at large, or of particular organs, which not only will bear, but requires depletory measures for its removal, and which renders the use of tonic and stimulant remedies improper and dangerous. Of this the recorded cases of the disease supply abundant evidence. "The rapidity of the attack," observes Dr. Bateman, "the acuteness of the pains in the internal cavities, the actual inflammatory symptoms that sometimes supervene, the occasional removal of the disease by spontaneous hemorrhage, the frequent relief derived from artificial discharges of blood and from purging,—all tend to excite a suspicion

* *Willan*, p. 466.
† First Lines, sec. 1790.
‡ Good's Study of Med. vol. ii. p. 875, and Syst. of Nosology, p. 268.
§ Edin. Med. Journ. ix. 410.

* Medical Gazette, vol. x. p. 498.
† Ibid. p. 499.

that some local congestion or obstruction is the cause of the symptoms in different instances."*

Diagnosis.—The diseases with which purpura is most likely to be confounded are, typhous fever attended with petechiæ, and scorbutus. Where the symptoms denoting purpura are accompanied by febrile symptoms of some intensity, it may become a question whether the purpura or the fever be the primary disease. The origin and course of the complaint, the period at which the petechiæ appear, the extent and the variety of the accompanying hemorrhages, will enable the practitioner to judge of the nature of the case. With regard to scorbutus, that disease is now fortunately seldom if ever to be met with in its genuine form. Cases of petechial efflorescence attended with hemorrhage and signs of great general debility, without any febrile or inflammatory symptoms, may be considered by some practitioners as properly belonging to scurvy; and if they occur in patients who have been much exposed to the influence of debilitating causes, the tonic treatment appropriate to that disease, and especially pure air and an improved diet, will generally be beneficial.

Prognosis.—In the milder cases of purpura, which are unattended by hemorrhage, by any considerable febrile symptoms or organic disease; or where the hemorrhage is slight, or attended with amelioration of the symptoms; a favourable prognosis may be formed. But when much blood is lost by the profuse occurrence or long continuance of hemorrhage, or where there are symptoms of serious internal congestion or inflammation, high fever, or great depression of the vital power, the prognostic is unfavourable. Even in chronic and *constitutional* cases a guarded prognosis should be given, and the danger of the supervention of fatal hemorrhage should not be lost sight of.

Treatment.—While the older doctrines prevailed, which ascribed the symptoms of purpura solely to debility of the solids and attenuation of the blood, a tonic and invigorating treatment was universally recommended. The mineral acids, cinchona, and wine, comprehended the whole medicinal treatment; these, however, were acknowledged to be often merely palliative, and to have little effect in producing a radical cure.† The same remedies are alone mentioned by Willan, who at the same time insists strongly on the importance of pure air, exercise, good diet, and whatever may tend to produce cheerfulness and serenity of mind.‡ Willan's experience of this disease had not been extensive; and in particular its more severe and fatal forms had not occurred to him. The publication of his opinions respecting this disease and its treatment called forth the observations of Dr. Parry on the utility, in some cases, of venesection.§ Dr. Harty and Dr. Bateman subsequently called the attention of the profession to the benefit to be derived from the employment of purgative medicines. Dr. Harty having experienced a complete failure in a case of purpura hemorrhagica which he treated strictly according to the plan of Willan, with every advantage of country air, nourishing diet, and tonics, had his attention turned to the functions of the alimentary canal in this disease. In a seemingly very unfavourable case of purpura hemorrhagica, in a tedious and obstinate case of purpura simplex attended with fever and headach, and in nine others, he employed brisk purgation with decided success.*

Dr. Bateman, after admitting that in slighter degrees of purpura, occurring in women and children who have been under the influence of close air, want of exercise, and other debilitating causes, the tonic plan, as recommended by Willan, may be adequate to the cure of the disease, adds:—"But in adults, especially those already enjoying the benefits of exercise in the air of the country, and who have suffered no privation in respect to diet; or when it appears in persons previously stout, or even plethoric; when it is accompanied with a white loaded tongue, a quick and somewhat sharp, though small, pulse, occasional chills and heats, and other symptoms of feverishness, however moderate; and if at the same time there are fixed internal pains, a dry cough, and an irregular state of the bowels,—symptoms which may be presumed to indicate the existence of some local congestion,—then the administration of tonic medicines, particularly of cinchona, wine, and other warmer tonics, will be found inefficacious, if not decidedly injurious. In such cases, free and repeated evacuation of the bowels, by medicines containing some portion of calomel, will be found most beneficial. The continuance or repetition of these evacuants must, of course, be regulated by their effects on the symptoms of the complaint, or on the general constitution, and by the appearance of the excretion from the intestines. If the pains are severe and fixed, and if the marks of febrile irritation are considerable, and the spontaneous hemorrhage not profuse, local or general bloodletting may, doubtless, be employed with great benefit, especially in robust adults."† We have given Dr. Bateman's practical directions at length, because little has been added to them by subsequent writers, except in the way of illustration. We apprehend that in very few cases will tonics be requisite or admissible, at least at the commencement of the disease. We have seen them do evident mischief, even in children of delicate frame, in whom the cautious but effectual employment of laxatives and a mild antiphlogistic regimen have afterwards effected a cure. From the manifest success of purgatives, and especially calomel, in the congestive form of typhous fever attended with petechiæ, practitioners have learned not to be deterred by the symptoms of apparent debility from employing this most useful class of remedies in such fevers; and in purpura, notwithstanding similar signs of prostration of strength, they are no less efficacious.

* Synops. p. 111.
† *Adair*, Diss. Inaug. p. 18.
‡ *Willan*, Reports, p. 93; Cutan. Dis. p. 461.
§ Edinb. Med. Journ. v. 7.

* Edinb. Med. Journ. v. ix. p. 186.
† *Bateman*, Synops. p. 114.

Venesection is a more hazardous remedy, and requires greater discrimination as to the cases and period of the disease in which it may be employed with safety and advantage. In the circumstances pointed out by Bateman, and especially where there is hardness of pulse and fixed local pain, there can be no doubt of the propriety of having recourse to it, especially at an early period of the disease. But we must be very cautious not to push it too far, or employ it too late to be of benefit. Dr. Mackintosh informs us that he lost a patient some hours after she had been bled; and the subject of Dr. Fairbairn's case, though a strong man in the prime of life, never rallied after the third bleeding. Dr. Fairbairn candidly confesses that he doubts whether the bleeding was not carried too far. In other cases which have been treated by venesection, but where, from the symptoms of debility or supposed putrescent tendency, wine and other stimulants have been administered, it is much to be suspected that these have proved injurious, and that if a mild antiphlogistic regimen had been trusted to, the result might have been more satisfactory.

In conclusion, we may sum up by observing that, in the treatment of cases of purpura, we are not to be guided by the name or the external appearances of the disease, but by diligent attention to the symptoms, and especially to the state of the functions, and the habit and constitution of the patient. Where high excitement prevails, with strength of pulse and vigor of constitution, and we have reason to suspect inflammation, or an approach to it, venesection and free purging, with a suitable antiphlogistic diet, are the appropriate remedies. Where a quite opposite state exists, extreme languor and debility, pale cachectic complexion, small and weak pulse, and much hemorrhage has occurred, all active depletion must be abstained from, and the strength supported by beef-tea and other mild nutriment, while sulphuric acid, and perhaps divided doses of quinine, may be resorted to. In intermediate cases, a mixed treatment must be adapted to the exigencies of the particular case by the discrimination of the practitioner. It will be often much safer in such cases, where any doubt exists as to the proper plan of treatment, to adopt one almost purely negative, as saline diaphoretics and a mild antiphlogistic diet, (paying due attention to the bowels,) than to have recourse to any extreme measures.

Local hemorrhage, when trifling in its amount and occurring early in the disease, it may not in all cases be advisable to interfere with. It has in several well-attested cases appeared to be a salutary effort of nature, and has removed the symptoms of the disease. Where the hemorrhage is protracted, or dangerously profuse, the usual means (pointed out in the article Hemorrhage, and in those which treat of the individual hemorrhages) must be had recourse to to arrest it; and of these there is none so generally efficacious as the application of cold.

Some particular modes of treatment have been recommended in this disease, of which we cannot speak from experience, and therefore we shall merely refer to them. The oil of turpentine was employed with success by Dr. Nicholl in several cases of purpura unattended with fever, and which he conceived to depend on mere relaxation of the extreme vessels. A successful case of its employment has since been published by Dr. Magee; but it should be noticed that both these physicians employed it in combination with laxatives. Dr. Mason Good and Dr. Mackintosh recommend the vegetable acids in purpura, in preference to the mineral; the latter especially speaks in favour of "fresh lime-juice, not only taken internally, but applied externally." Spirit-lotions, or a solution of chloride of lime, or cloths dipped in vinegar and water, are advised by Rayer to be applied to those parts of the skin which are spotted with petechiæ and ecchymoses; we confess we do not understand on what principle.

Dr. Belcombe, Physician to the York County Hospital, has recently applied with success to this disease the principles of treatment which Dr. Stevens has advocated in certain diseases conceived by him to depend on a morbid deterioration of the blood, and especially in the fevers of hot climates and in epidemic cholera, namely, the administration of neutral saline remedies, not intended to act as cathartics. In a decided and severe case of purpura hemorrhagica, in which Dr. Belcombe adopted this treatment, according to the formula of Dr. Stevens, (bicarbonate of soda 3ß, muriate of soda 3i, chlorate of potass gr. vii.;) the result was the recovery of the patient; and in two other cases of petechial eruption which have since occurred to him, he has had recourse to it with the same success.

(George Goldie.)

PUS, (from πύον, *matter,*) a yellowish-white, bland, cream-like fluid, having a sweetish taste and faint smell, heavier than water, (Sp. gr. about 1.03,) found in abscesses, on the surface of ulcers, and occasionally deposited on free surfaces, or in the tissue of organs.

An account of the various opinions entertained of its formation, as well as a description of its physical and chemical properties, will be found under Abscess, Inflammation, and Suppuration.

(A. Tweedie.)

PYLORUS, DISEASES OF.—See Stomach.

PYROSIS, (Gr. πύρωσις, *burning, inflammation;* from πυρόω, *to burn;* th. πῦρ, *fire.*)—This is the generic name of a disease adopted into their nosological classifications by Sauvages, Sagar, and Cullen, and, according to the definition of the last mentioned writer, synonymous with the cardialgia *sputatoria* of Linnæus and Mason Good. Sauvages has defined it, "Sensus ardoris in ventriculo et œsophago sine febre acutâ;" and Sagar, "Ardor œsophagi ad ventriculum usque extensus sine febre, vulgo soda dicitur;" both corresponding to the character of soda in the system

of Vogel, formerly a common but now obsolete name for *heartburn*. But the peculiar combination of symptoms which the early writers on medicine had included in their general descriptions of gastric disorder, particularly under the term cardialgia, and which previous nosologists had classed as one of several species of the same genus under the generic name of pyrosis, Cullen was the first to consider as the indications of a distinct idiopathic disease, which he separated accordingly, and placed in his class Neuroses, and order Spasmi, with the following definition, "epigastrii dolor urens cum copia humoris aquei, plerumque insipidi, aliquando acris, eructata." Such has been the general and limited acceptation of the word pyrosis in this country since the time of Cullen, and the signification we attach to it in the present article.

This form of disease is known in England by the popular name of *black-water*, and in Scotland by that of *water-brash*. It is most frequently to be observed amongst the poor, but sometimes, though rarely, in persons of more fortunate condition in life. In Scotland, Lapland, and Iceland, it has been observed to be endemic, and probably is a prevailing disease in many other countries; in England it is strictly sporadic. The subjects of it are most commonly persons under middle age: it seldom appears before puberty, and very rarely in advanced life. Females are more often affected with it than males, sometimes during pregnancy, and occasionally it seems incidental to this state, subsiding when it terminates, and recurring with its repetition. It most frequently, however, occurs in the unmarried; and of the married, most frequently in those who have never been pregnant: in many instances it appears when leucorrhœa has been present. Having once taken place, it is apt to return for a long time after; and though often extremely difficult to cure, is seldom if ever directly attended with danger to life.

The causes by which it has been induced have never been satisfactorily determined; but the facts of its endemic occurrence, its almost exclusive prevalence among the lower classes of the community, even where it is only sporadic, as in this country, and regard to the functions of the particular organ which appears to be chiefly implicated, have raised a prevailing belief that the ingesta have a powerful influence on its production. It was remarked, however, by Cullen, that he had not observed its occurrence in connexion with any particular diet, and that persons using animal food were subjects of it, although he thought more frequently those whose subsistence was milk and farinaceous substances. In Scotland, however, (the field, be it remembered, of Cullen's observations,) unfermented meal forms the bulk of the diet of the poor; and up to the present time the same substance in the form of oat or barley cake has stood as an article in the diet of the great mass of the people, in the same relation as wheat-bread to the diet of the people of this country. The similar use of other articles of food defective in its nutritious quality, and difficult of digestion, has been commonly observed to precede its occurrence, and in those whose idiosyncrasy predisposes them to be so affected, (a condition of which we acknowledge our entire ignorance,) all those circumstances which obstruct the natural functions of the stomach are, more or less, conducive to the development of pyrosis.

In some instances the use of indigestible substances has appeared to us to have been an *exciting* cause of the attack; but those which are most generally considered so, are suddenly diminished temperature, particularly in the application of cold to the feet, and extraordinary emotions of the mind.

The paroxysms of pyrosis, according to Cullen, (whose description of the symptoms has been considered most faithful,) usually come on in the morning and forenoon after food has been abstained from for some hours, though in our experience the period has not uncommonly been two or three hours after dinner: its first symptom is a pain at the epigastrium, described as that of extreme heat (emphatically called by the French *fer chaud,*) with a sense of constriction, as if the stomach were drawn towards the back, the pain being greatest when the body is in the erect posture, and causing it to be bent forwards; it is often very severe, and after continuing for some time is followed by an eructation of thin fluid, varying in quantity, but in appearance always resembling water; to the taste it is often absolutely insipid, but sometimes extremely sour. Though apparently the occasion of a sense of extreme heat in the stomach and œsophagus, the ejected fluid in passing through the mouth occasionally impresses it with an opposite sensation of cold in a very remarkable degree. The eructation is frequently repeated, and the pain which preceded it does not immediately cease, but does so after a time, and terminates the paroxysm. These paroxysms vary in their duration, both in the same and in different individuals, recurring often successively every day for a considerable time, and sometimes intermitting for one or several days, but always with great irregularity. Cullen has declared that pyrosis is often unattended by any symptoms of dyspepsia, but the remark is not only inconsistent with his own definitions of the two diseases and his observations upon them, but (we presume to say) with general experience. That the symptoms vary in number and degree we doubt not, but their entire absence we conceive to be extremely rare: one which has appeared to us to have been almost invariably present has been pain at the epigastrium immediately consequent to swallowing any ordinary food. We are, moreover, without proof or reason of probability that the morbid condition of the stomach which gives rise to pyrosis differs in any essential degree from that which occasions some other forms of dyspepsia, certain variations in the phenomena of which are as much beyond our explanation, as the specific distinctions by which they are severally characterized. The distinguished writer we have so frequently had occasion to cite, seems indeed to have been unconscious of the approximation of his own ideas on this point in reference both

o dyspepsia and pyrosis, having defined the roximate cause of dyspepsia, "an imbecility, oss of tone, and weaker action in the muscular bres of the stomach," and spasm (which can e viewed in no other light than a consequent ondition, and of the same structure), as the roximate cause of pyrosis. "It seems," says e, "to begin by a spasm of the muscular bres of the stomach, which is afterwards in a ertain manner communicated to the blood-essels and exhalents, so as to increase the mpetus of the fluids in these vessels while a onstriction takes place on their extremities. While, therefore, the increased impetus deter-mines a greater quantity than usual of fluid nto these vessels, the constriction upon the xtremities allows only the pure watery parts o be poured out, analogous in every respect o what happens in diabetes hystericus." An-ther and opposite view has been suggested by Iason Good, who considers that in some in-ances pyrosis may be induced by a peculiar uresis or inactivity of the proper absorbents of e stomach,—an hypothesis founded on some xperiments of Majendie, proving the rapidity f the absorption of fluids from the stomach in state of health, even when its pyloric orifice as been encircled by a ligature; but the ab-rption of other fluids, and the regurgitation ly of the morbid product, reflects a degree f improbability on this conjecture. We are, deed, without any evidence that the latter actually secreted by the stomach, and it has een surmised, from the resemblance between e natural secretion of the pancreas and the ected fluid, that it may be derived from this urce: the writer, however, is not aware that e latter has been submitted to chemical ana-sis, but the result of this process promises eans of comparison whereby the supposition ould be further confirmed or invalidated. *priori* it appears improbable that a fluid so ncongenial to the sensibility of the stomach ould be admitted into it by an inversion of e natural action of the duodenum without ore violent efforts than are manifested, or that e fluid itself proceeding from this source ould appear entirely free from any admixture bile.

Prognosis.—Pyrosis in its simple form is ver attended with danger to life, nor does it mmonly even prevent the sufferer from pur-ng his ordinary occupation. The physician, owever, is frequently baffled in his attempts cure it, and even when there has been a asonable hope of the remedial means having en successful, a recurrence of the watery uctation has not unfrequently exposed its llacy.

Treatment.—The doubt in which our know-dge of the pathognomonic causes of pyrosis involved, obscures the indications on which e method of treating it should be grounded d pursued with a rational anticipation of ccess; nor has observation even up to the esent period in any satisfactory degree sup-ied the deficiency. Opium will certainly heve the paroxysm; and its various pre-rations, as well as other anodynes and anti-asmodics, as hyoscyamus and conium, with camphor, the compound spirit of sulphuric ether, and the aromatic spirit of ammonia, variously selected and combined according to the peculiarities of the circumstances of the patient, will all be found useful for this purpose, but relief of the paroxysm appears only to be a temporary advantage: to render it permanent, the intermediate state must be the object of our more particular consideration. We have the warrant both of reason and experience for concluding that digestion cannot be perfectly accomplished whilst the functions of an organ so important to it as the stomach are subject, whether primarily or secondarily, to the frequent interruptions occasioned by the accessions of this disease. A morbid state of the pancreas we know also will materially obstruct this process. The regulation, therefore, of the diet is a most essential point in the plan of treatment: all substances which are likely to ferment are difficultly digestible, and manifestly productive even of temporary discomfort or uneasiness, and the farinacea should as far as possible be avoided. It might be even advantageous, and especially when the disease is endemic, to effect an entire change in the articles which have constituted the general diet, so regulating the quality and limiting the quantity as if the cure of indigestion, whether evident or not, were the object to be effected. Any deviation from the natural state in the functions of the liver or alvine canal should be corrected by remedies appropriate to their particular condition; but in the special plan of the treatment of pyrosis, it will be found advantageous occasionally to produce a laxative effect on the latter, and for this purpose aperients which occasion a sense of warmth in the stomach have been found most suitable; such, for instance, as the compound decoction of aloes, combinations of the powder of rhubarb with magnesia, the compound tinctures of rhubarb and cardamoms, and peppermint-water, the powder and compound tincture of rhubarb, with carbonate of ammonia and camphor mixture, &c. It has further been the practice pursued to attempt to restore the supposed loss of tone in the muscular fibres of the stomach, and at the same time to neutralize the acid secretions which are commonly present. The particular medicines used with this view have been various combinations of the vegetable tonics with aromatics, and large doses of alkalies and the alkaline earths; of the former, particularly the carbonate of ammonia and its preparations. Tonics of the same kind with the mineral acids, particularly sulphuric, have also been recommended for this purpose. The various preparations of iron and zinc have also been had recourse to, but we believe it to be the result of general experience, as it has been of our own, that however such means may have counteracted any other co-existent symptoms resulting from dyspepsia, or have mitigated or suspended the painful accessions which constitute this affection, its recurrence has too often taken place as usual.

Cullen distinctly states that all the remedies for the cure of indigestion have been applied

to it without success, and the late Dr. Baillie has left it on record that, consistently with his experience, it had been little benefited by medicine. He added, however, that a drachm of compound tincture of benzoin rendered miscible with water by trituration with mucilage, he had found the most efficacious of any.* We know it to have been also a favourite prescription of another experienced eminent physician in the treatment of pyrosis. Astringents, such as the compound powder of kino given three times a day in doses of ten grains, have been considered serviceable in cases of dyspepsia in which pyrosis has been a prominent symptom. Linnæus, who had frequent opportunities of witnessing the disease, recommended the nux vomica for its relief, in doses of ten grains three times a day; but this has been regarded, and doubtless is, a very hazardous quantity to commence with. We are not aware that strychnine has been substituted for it; but the preceding recommendation points it out as worthy of trial, in doses of from a twelfth to a sixth of a grain every eight hours. The subnitrate of bismuth, suggested as a remedy in cases of gastrodynia and other painful affections of the stomach by Dr. Odier of Geneva, and favourably reported of by Dr. Marcet in the fifth volume of the Memoirs of the London Medical Society, in similar cases, was particularly recommended as a useful medicine in the cure of pyrosis by Dr. Bardsley of Manchester, in his "Medical Reports of Hospital Practice," published in the year 1807. His recommendation is accompanied with a detail of several cases in which its use was successful; and with the comment, that in pyrosis and disorders of the same kind it exerts a local and specific action upon the organs of digestion, restoring the stomach to a state of vigour and consequent healthy secretion, essential to the removal of the symptoms of acidity, spasm, and pain. Dr. Bardsley prescribed it in doses of five grains with from fifteen to twenty grains of compound powder of tragacanth, two or three times in the day; a mode which we have found useful in similar cases. Dr. A. T. Thomson speaks highly of it in combination with extract of hops, having found it, as he states, extremely beneficial in pyrosis, gastrodynia, and some other varieties of dyspepsia; and when there has been merely atony of the digestive organs without organic mischief, almost universally successful. Mason Good has spoken in high commendation of the internal use of soap in pyrosis, combined with opium if it should be attended with much pain; he refers the efficacy of the former to its decomposition allowing the alkali to unite with the acrid secretion, whilst the oil defends the stomach from the action of any acrimonious matter which may be present. He has not, however, mentioned the quantity or form in which he has prescribed it; but from the benefit we have known it to produce with rhubarb and extract of gentian in some of the modifications of dyspepsia, we should be inclined to adopt a similar combination in prescribing it for the cure of pyrosis. On the principle of allaying irritation, and thereby favouring a slower, and consequently more healthy gastric secretion, hydrocyanic acid has been recommended for the relief of pyrosis; but experience is yet required to determine whether it possesses any lasting power over it. The decided advantage derived from its use in cases apparently allied to pyrosis, leads us to anticipate that it will be found a valuable medicine in the treatment of the latter affection. Commencing with a dose of two minims, we may gradually increase it to five; and it will be suitably prescribed diluted with an ounce and a half of water and a dram of tincture of calomba every eight hours.

In conclusion, we refer the reader to the article INDIGESTION, in which the various disorders of the stomach commonly classed under the term dyspepsia have been fully discussed, and particularly to the third section of that article, which describes pyrosis in relation to them, under the head of *irritable gastric dyspepsia*.

(William Kerr.)

RAPE.—The high value set upon female purity, and the heavy penalty incurred by its loss, in the banishment of the delinquent from society, have led most civilized countries to inflict the severest punishments on the individual guilty of a forcible violation of the weaker sex. When we consider, on the one hand, the condition of a virtuous female thus plunged into an abyss of misery, a release from which by death has been voluntarily sought by many; and, on the other, contemplate the number of profligate persons who are found in all countries and societies, whose chief occupation seems to be the corruption and debasement of the female sex; we cannot fail to rejoice that the strong arm of the law should interpose its protecting shield, and visit with its severest judgements one of the grossest crimes that vice can perpetrate. By the law of England, rape is defined to be the carnal knowledge of a woman against her will, and death is its penalty. All classes of females are equally protected, the virgin, the married woman, and even the common prostitute is included, because she may at the very time have determined on a reformation of her former habits. In Scotland the ravisher is exempted from the pains of death, only in case of the woman's subsequent consent, or her declaration that she yielded of her own free will; and even then he is to suffer an arbitrary punishment either by imprisonment, confiscation of goods, or a pecuniary fine.* In the state of New York, death was formerly the punishment for committing a rape on a married woman or a maid; and it was also ordained at the same time, that if a woman had been ravished, and afterwards consented to her ravisher, her husband, father, or next of kin, might sue by appeal against such offender.

* Lectures and Observations on Medicine, by the late Matthew Baillie, M.D. 1825.

* Edin. Encyclop. vol. xi. p. 823.

These laws, however, have been repealed, the punishment altered, and appeals of felony abolished. The acts now in force prescribe the punishment of imprisonment for life in the state-prison, of the offender and his accomplices, if he have any, for ravishing by force any woman-child of the age of ten years and upwards, or any other woman. An assault, with an intent to commit a rape, may be punished by fine and imprisonment, or both.

In the case of adults, it is necessary, in order to constitute a rape, that the act shall have been committed against the will of the female; but in the case of children, in whom the power of judging between right and wrong is not supposed to exist, the matter of consent is of no moment, and the deed is equally criminal whether it be obtained or not. "A female infant under ten years of age is in law deemed incapable of consenting to any act, much less to her dishonour; the carnal knowledge of such infant, whether she yield or not, is therefore virtually a rape; but whether if the child be above ten years of age, it be also a felony, has been questioned. Sir Matthew Hale was of opinion that such profligate actions, either with or without consent, amount to rape and felony, as well since as before the statute of Queen Elizabeth; but in his Summary, the learned judge appears to have altered his opinion; and the present practice is, that if the child be under ten years of age then it is felony by the statute; but if she be above ten and under twelve, then it is no rape if she consented, but only a misdemeanour."* The French code extends the period to fifteen years, and punishes the crime committed on a child of that age by hard labour for a limited time.† "In New York the carnal knowledge of a woman-child under ten years of age is punished by imprisonment in the state-prison for life. In Massachusetts and Illinois, death is the punishment. In Virginia, New Hampshire, Connecticut, and New Jersey, imprisonment either for life or a long term of years is directed. All these specify the period of ten years. The law in Vermont varies from this. It directs that whenever any individual over the age of fifteen shall abuse any female under eleven with or without her will, he will suffer fine and imprisonment."‡

By the ancient law of England, the woman was required to make her accusation immediately after the commission of the outrage. At a subsequent period she was allowed forty days as the utmost limit; but by the law as it at present stands, there is no time of limitation fixed. However, although there is no limit fixed by law, public opinion demands an early discovery; and an accuser who has postponed her complaint for any unreasonable length of time, is listened to with great caution by a jury. In fact, this is a crime so easily charged, so hard to be proved, and so much harder to be rebutted, that it is of the utmost importance that no time shall be allowed for concocting a malicious tale, particularly if medical testimony is to be adduced, as a few hours are often sufficient to efface appearances that might have been evident on an early examination. Indeed, in all cases, the greatest caution is necessary in judging of the guilt of an accused party. There is generally no witness to confirm the direct testimony of the accuser as to the fact; the whole case turns upon the woman's assertion, and unless there is strong collateral evidence, such as a speedy disclosure to her friends and the authorities, and an early medical examination, we are of opinion that it should require the clearest and most unshaken testimony on the cross examination to gain credence with a jury. It is better that ten guilty should escape than that one innocent man should suffer; and however we abhor the crime, and would wish the heaviest punishment to overtake the guilty, we cannot help offering this caution to medical men and jurors, knowing as we do the depravity of the human heart, and the lengths to which it will sometimes go to accomplish the ends of malice or revenge. It is not impossible, nay, it has sometimes happened, that a woman who has freely consented to surrender her virtue will afterwards turn round on her paramour, and denounce him as her ravisher. This becomes a case of the greatest intricacy from the fact of the principal feature (that of the venereal congress having taken place) being true. It now passes out of the hands of the medical jurist, and becomes a question with the jury whether they believe the deposition of the woman as to consent or not. This, it must be confessed, is a most difficult question to solve, and it requires all the ingenuity of the bar to sift to the bottom all external circumstances which may contribute to prove the negative. Cases of a mixed kind are also sometimes met with; as when a woman will at first resist the advances of a suitor, and even continue her resistance for a time, but afterwards, from the excitement of passion or some other cause, yields to his desire. This is a case, if possible, more puzzling than the former, because marks of violence on the limbs of the female, from her previous struggling, may be evident, which would naturally lead to the supposition that the act had been accomplished by force. We confess that we should be inclined to deal harshly with a man under such circumstances, from the difficulty of understanding what constitutes consent. The act is committed in secret; there are no witnesses; the woman is bruised on the limbs and body; and her person is violated: it is not likely that a formal question of "Will you consent?" has been put, followed by an answer of yea or nay; and yet, after the employment of so much force, the man defends himself by saying the woman consented, which she denies. The jury alone can determine which is to be credited; but, as we have already said, appearances are strongly in favour of the woman, and a struggle of such violence and duration, followed by coition, amounts, in our opinion, if not to a legal, at least to a moral rape. Having spoken thus generally

* *Paris and Fonblanque*, Med. Jur. vol. i. p. 419.
† *Capuron*, p. 1.
‡ *Beck*, p. 60.

of some of the difficulties attending the investigation of accusations of rape, we proceed to consider some of the points upon which medical testimony is more particularly required.

Of the physical signs of violation.—These are the absence of the signs of virginity, marks of violence, tumefaction, or laceration of the pudenda, with effusion of blood, and bruises on other parts of the body, particularly on the breast, arms, and thighs. It must be evident that the most important of these, that is, the want of the attributes of the virgin state, together with the injuries inflicted on the genital organs, as evidenced by inflammation and tumefaction, cannot apply to all women, but only to virgins; for in married women, or those previously in the habit of sexual intercourse, the negative signs are of course of no value, and the positive are not likely to occur. And this narrows our present observations to the signs of rape committed on virgins.

The investigation of this subject must be preceded by an exposition of the signs of virginity. This is a question which has occupied the attention of anatomists and physiologists from an early period; but it does not appear that any very accurate conclusions have been agreed upon.

The existence of the hymen is the sign upon which the greatest stress has been laid by some authors, while, strange to say, its presence has been esteemed by others, among whom we find Ambrose Paré, Columbus, Dionis, and Buffon, as an unnatural formation. However, at the present day, it is generally considered as an attribute of the human virgin. The hymen is a membranous or membrano-carneous structure, which is situated at the entrance of the vagina, and serves to form a boundary between that passage and the external genitals. It is formed by duplicatures of the lining membrane of the vagina, and is usually of a crescentic form, leaving an opening into the vagina at its upper part. This opening serves as an outlet for the menses, and in the average of adult subjects is large enough to admit the index finger sufficiently high up into the vagina, to effect an examination of the os uteri, without injury to the hymen. Dr. Davis states that in breech presentations he has sometimes introduced his finger into the vagina of the infant without injuring this membrane. The shape of this membrane, however, is various and uncertain. In some cases it is more or less circular, presenting through its centre a round aperture of three or four lines in diameter. At other times only a part or exclusive portion of the orificial extremity of the vagina, sometimes the superior, at other times the inferior portion of it, is seen to be veiled over with this structure. In some rare cases the hymen is an imperforate circular membrane attached to the edge of the orifice of the vagina in every part, so as to close the canal completely. We have already alluded to some of these cases in the article IMPOTENCE. Another form of the hymen is, when there are two crescental portions attached to the more carneous structure of the external orifice laterally. The structural tissue of the hymen seems in some measure to vary in different instances. "In most fœtal subjects it seems to be distinctly membranous, whilst in some others it partakes also of a carneous character. Hence, probably, the very different descriptions given of it by different authors. By Soranus it is accordingly described as being membranous; by Avicenna as veinous and ligamentous; by Riolanus as carneous; by Berengarius as retiform, consisting of vascular and delicate ligamentous tissue; by Columbus as a thick substance; and by Spigelius as partly carneous and partly nervous."* In order to see this membrane in the living subject, it is necessary to separate the labia and even the thighs to a considerable distance from each other; for the opening into the vagina is quite closed up by the external parts in the ordinary positions of the body. The hymen is usually torn by sexual intercourse, and its rupture is attended by an effusion of blood; an appearance upon which so much reliance was placed by the Jews as a test of virginity, that the nuptial sheets were constantly exhibited to the relations on both sides, and preserved by the friends of the woman as evidences of her chastity. In case this token of virginity was not found on them, she was to be stoned to death at her father's door. After the rupture of the hymen, its remains shrivel towards their base into several small excrescences at the orifice of the vagina. These are thick, red, and obtuse at their extremities, and from their fancied resemblance to a myrtle-berry, have been called *carunculæ myrtiformes*. They generally disappear after frequent connexions or deliveries. The carunculæ which are found at the opening of the vagina are not, however, always remains of the hymen. Dr. Conquest† remarks that the carunculæ may be found when the hymen is entire. Dr. Davis‡ observes that the greater part of the circle at the basis of the hymen when that structure remains, and at the same locality when it has suffered rupture, may occasionally be seen studded with caruncles of different origin; such extra caruncles in some cases being few and small, but in others large and numerous. He alludes to one case, which was that of a young lady of unquestionably good character, who, in consequence of some irregularities imputed to a gay husband, to whom she had been recently married, became the subject of a professional examination: there presented at the orifice of the vagina on either side, and in immediate contiguity to the carunculous remains of the hymen, two large multifoliated masses of structure, disposed in parallel layers in such a manner as scarcely to fail to suggest the idea of a pair of epaulettes. These are the forms under which the hymen is usually found; but it should be borne in mind by the medical jurist that it is liable to certain malformations, with which

* Princip. and Pract. of Obstet. Med. by Dr. Davis, p. 100.

† Outlines of Midwifery, p. 17.

‡ Loc. cit. p. 101.

: should be acquainted. It is commonly a in membrane, easily ruptured by any large ody introduced into the vagina. But it some- mes occurs that it is possessed of so much nness as to resist the intromission of the enis. This unusual degree of thickness and rength may belong to a hymen composed of ne uniform membrane; or to that conforma- on of it termed cribriform, from its being ierced by a number of holes. In this latter ondition the membrane is commonly exceed- gly strong, and capable of resisting the or- inary means of rupture. It is a state, how- ver, that does not prevent impregnation, some ases of which are related by Dr. Davis; and s they relate to an important medico-legal oint we refer to them, in addition to those ready mentioned in the article Impotence. ne of these cases of cribriform hymen we anscribe in consequence of its great interest: It was usually narrated in his peculiarly terse yle by the late Dr. Haighton, in his lectures n midwifery in Guy's Hospital. The subject f it had been the lady of one of the physicians o that or to the neighbouring hospital of St. homas. It was become matter of post-mortem istory even in the time of Dr. Haighton. The ymen was perforated by many small apertures; ut it nevertheless was so strong that it had esisted all the efforts of the husband to effect s rupture. That gentleman, however, con- ealed his chagrin; nor did he take any means o accomplish artificially what he had failed to ffect by the ordinary means. Under these ircumstances the lady drooped and became nhappy; but she also, at no distant period, ecame the subject of faintings and sickness, nd eventually of great abdominal enlarge- ent, and of anasarca of her lower extremities. During the urgency of those symptoms she as advised to go to Bath for the benefit of ne waters and of the other good things to be btained at that celebrated city. No remedy as found, however, even there for the lady's ropsy, and the symptoms became more and ore urgent every day. Finding no relief at Bath, and giving up all hope of recovery any here, she determined, after a residence of ome weeks at that place, to return to London, n order that her remains might the more con- eniently be deposited in the monumental ault of her family. Whilst on this journey, hich she was performing in a post-chaise, she as seized with a severe abdominal pain, which he naturally enough ascribed to a spasm of he intestines. This colic, which was moderate nd bearable at the commencement, became so xtremely violent in its progress that she was bliged to stop suddenly at an inn on the road, here in less than an hour she was radically ured of her dropsy by becoming the mother f a well-grown living child. The hymen was hen ruptured without the assistance of art."*

We have alluded to these cases to shew that t is possible for all the moral guilt of a rape to e incurred without the conditions necessary o satisfy the law upon the point, namely, in- romission of the penis, &c. Besides these sources of difficulty presented to the medical jurist in malformation of the hymen, there are some cases, and probably not a few, in which this membrane has never existed at all; or having been at first formed of great tenuity, has been ruptured and destroyed in early life. Accidental circumstances may also serve to obliterate it, such as disease, improper practices, or acrimonious discharges; and instances are not wanting where it has been destroyed by the pressure of the confined menstrual fluid. From the cases alluded to above, it appears that impregnation may take place without rupture of this membrane, but in these instances perforation is not supposed to have occurred. It is, however, stated by Zacchias that intromission may be effected when a disproportion exists between the organs, when the hymen does not exceed the ordinary size, but is thick and hard, and when connexion has taken place during the presence of menstruation, or fluor albus, without damage to this membrane. Gavard* found it perfect in a female thirteen years of age, who was labouring under the venereal disease. Ruysch† has said, that if coitus take place during or immediately after the menstrual excretion, this membrane is often not ruptured.

From these several circumstances of variety in the original formation and appearance of the hymen, its power of resisting the natural means of rupture in some cases, and its yielding in others to the slightest force, we are inclined to think that the accuracy necessary in forming a medico-legal opinion cannot be attained by looking to this sign alone. We must, however, agree with Dr. Beck‡ that it would be difficult to support an accusation of rape where the hymen is found entire, although its presence cannot be considered as an unequivocal proof of virginity; for, as we have stated, it has been asserted by good authority that it is not always ruptured in coitu. An instance is related by Dr. Smith,§ in which an accusation of rape fell to the ground in consequence of the presence of this membrane. This occurred in the case of a man named Stewart, who was tried at the Old Bailey in 1704 for ravishing two female children. The evidence being at variance as to the fact of penetration, the children were sent out of court to be examined, and the eldest was found to have the signs of virginity.

The state of the vagina is the next point worthy of consideration. In young subjects it is extremely small; but as the female advances towards puberty, it becomes encreased in its dimensions. In a healthy adult virgin the parietes of the vagina are remarkably firm and substantial, and from the only function it has to perform, that of giving exit to the menstrual excretion, it is rigid and narrow. The internal surface is lined with a mucous membrane which is remarkable for the peculiarity of being much wrinkled or folded together into shallow irregularly transverse rugæ, the pecu-

* Op. cit. p. 104.

* Foderé, Méd. Lég. t. iv. p. 340.
† Observ. Anat. Chirurg. xxii.
‡ Elem. of Med. Jur. by Darwall, p. 52.
§ Prin. of For. Med. p. 410.

liar use of which is to qualify the passage for being indefinitely developed during parturition. These folds are removed by frequent sexual intercourse, and nearly obliterated in women who have borne one or two children. The dilatation of the vagina, and smoothness of its internal surface, are not, however, to be taken as unequivocal proofs of want of chastity, for these appearances may arise from other causes. There are disorders of which the tendency is to render it so, as fluor albus, chlorosis, or menorrhagia; and certain malpractices will also occasion the same dilatation as sexual intercourse; and, on the other hand, coitus may have taken place, and the vagina afterwards re-assume its contracted condition.

Generally speaking, in virgins the external labia are thick, firm, elastic, and internally of a bright red colour, with their edges so opposed as to occlude the entrance into the vagina; while in married women, or those accustomed to coition, they are soft, pale, and have an interval of greater or less extent between them. But these signs will be found to vary according to the age, temperament, and state of health of the individual. Thus, in persons of a sanguine temperament, although in the habit of venereal enjoyment, the colour, firmness, and thickness of these parts will be preserved; and virgins of advanced age and weak leucophlegmatic habit of body, or those afflicted with leucorrhœa or menorrhagia, may present appearances which, if the above signs were supposed to be valid, would lead to a conclusion of an opposite character. The same observations will apply to the state of the frenum labiorum, or posterior commissure of the pudenda. Some authors have esteemed the integrity and rigidity of this part as a proof of virginity, but no positive conclusion can be drawn from it, for it frequently remains untouched even after parturition.

From the observations just made, we feel ourselves compelled to acknowledge that there are no anatomical signs by which we can attest the presence of virginity. Taken singly they are all fallacious, and even viewed in connexion, they can only favour the conclusion as to the chastity of the female; but the converse is not established by the absence of these signs, as they may be all absent from causes already enumerated, although their absence may serve to corroborate the opposite opinion in suspected cases.

Signs of defloration.—In this inquiry it is necessary to take into account the age, strength, and state of mind of both persons concerned. The sexual organs of both should be examined, and this as speedily as possible after the alleged assault, for if the woman have reached the period of puberty, no satisfactory information can be obtained by a professional examination unless made immediately after the commission of the act. In children, from the great disproportion of the parts, the violence is greater, and the effects consequently remain for a longer time; but in a subject of full organic development, the appearances consequent to connexion are very fleeting. If the examination be made early, and particularly if the female have been a virgin, besides the state of mental excitement in which she may be found, there may be physical signs consisting in local marks of violence. The parts are found lacerated, tumified, and bloody or inflamed, and painful to the touch; the hymen most commonly ruptured; and sometimes the presence of semen can be detected. Besides these marks upon the genitals, there are usually bruises or ecchymoses on other parts of the body, particularly on the arms, thighs, nates, and breast. In children the local appearances are more evident, from the greater injury the parts have received; and the inflammation is sometimes so great as to incapacitate them from walking. But in married women, even a very speedy examination will fail to afford much assistance, from the previously dilated condition of the parts. It should be borne in mind that the female genitals are liable to diseases which may imitate the appearances just pointed out. Of this fact, a case related by Dr. Percival* is a striking example. A girl, four years of age, and in good health, was suddenly seized with inflammation of the pudenda, and symptoms of defloration, with pain in making water. She had slept two or three nights in the same bed with a boy fourteen years old, and had complained of being very much hurt by him during the night. The symptoms increased in violence, and the child died on the ninth day. An inquest was held on the body, and Mr. Ward, under whose care the patient had been in the Manchester Infirmary, deposed that death was caused by external injury. A verdict of murder was returned against the boy, and he was accordingly taken into custody. A very short time afterwards, however, several similar cases occurred in the same neighbourhood, in which there was no ground for supposing that violence had been offered. Fortunately for the boy his trial had not come on, and Mr. Ward now informed the authorities of the mistake he had committed, and the prisoner was discharged. This kind of disease appears to be to a certain extent epidemic, and is very fatal. Thus, out of twelve cases mentioned by Mr. Kinder Wood,† only two recovered. It is usually preceded by febrile symptoms for two or three days, and when the genitals are examined, they are found inflamed and swollen. The colour is dark, and ulceration with gangrene quickly follows. The fever assumes a typhoid character, and death shortly takes place.

The presence of the venereal disease in the female, when its invasion corresponds with the period at which the outrage is stated to have occurred, that is, in from three to eight days afterwards, is a very strong corroborative proof of defloration, if the aggressor is found on examination to be afflicted with the same disease. This is not uncommonly the case in young children, in consequence of a very prevalent notion entertained by the lower orders, that connexion with a virgin is a certain cure for the disorder. Appearances resembling gonorrhœa,

* Medical Ethics, p. 103 and 231.

† Med. Chirur. Trans. v. vii. p. 84.

however, should be looked at with a very scrupulous eye, as it is now perfectly well known that children, particularly those of strumous delicate constitutions, are liable to purulent discharges from the vagina, which very much resemble the consequences of impure connexion. These discharges take place during dentition, or from the presence of worms in the intestinal canal, and are also sometimes observed in the male sex from the same causes. We are indebted to Sir Astley Cooper* for the following energetic observations on this peculiar affection. "There is a circumstance on which I am exceedingly anxious to dwell—I allude to a discharge from young females, and I hope that there is not one here this evening but will be strongly impressed with the importance of the subject. Children from one year old, and even under, up to puberty, are frequently the subjects of a purulent discharge from the pudendum, chiefly originating beneath the prepuitium clitoridis; the nymphæ, orifice of the vagina, and the meatus urinarius, are in an inflamed state, and pour out a discharge. The bed-linen and rest of the clothes are marked by it. It now and then happens to a nervous woman to be alarmed at such an appearance, and she suspects her child of having acted in an improper manner; and perhaps not quite clear herself, she is more ready to suspect others, and says, dear me, (if she confesses,) it is something like what I have had myself. She goes to a medical man, who may unfortunately not be aware of the complaint I am speaking of, and he says, 'your child has got a clap.' I can assure you a multitude of persons have been hanged for such a mistake. I will tell you exactly what takes place in such cases; the mother goes home and says to the child, 'who is it that has been playing with you? who has taken you on his knee lately?' The child innocently replies, 'no one, mother; nobody has I declare to you.' The mother then says, 'Oh, don't tell me such stories; I will flog you if you do.' And thus the child is driven to confess what never happened, in order to save herself from being chastised; at last she says, 'Such a one has taken me on his lap.' The person is questioned, and firmly denies it; but the child, owing to the mother's threats, persists in what she has said. The man is brought into a court of justice; a surgeon who is ignorant of the nature of the discharge I am now speaking about, gives his evidence; and the man suffers for that which he never committed. The mother is persuaded, if there be a slight ulceration on the parts, that violence has been used, and a rape committed.

"If I were to tell you how often I have met with such cases, I should say that I have met with thirty in the course of my life. The last case I saw was in the city; a gentleman came to me, and asked me to see a child with him who had a gonorrhœa on her. I went, and found that she had a free discharge from the preputium clitoridis. I said that there was nothing so common as this. There was considerable inflammation, and it had even proceeded to ulceration, which I told him would soon give way to the use of the liquor calcis with calomel. 'Do you tell me so?' he replied; 'why, suspicion has fallen on one of the servants; but he will not confess. If he had appeared at the Old Bailey, I should have given my evidence against him; for I was not aware of what you have just told me.' I told him that if the man had been hanged by his evidence, he would have deserved to be hanged too. I am anxious that this complaint should be known by every one present, and that the remarks which I have made should be circulated throughout the kingdom. When a child has this discharge, there is a heat of the parts, slight inflammation; and this sometimes increases, and goes on to ulceration. This disease sometimes occurs in children at the time of cutting their teeth."

In the year 1831 a man was arrested in the city of Dublin on a charge of rape committed on a child; the only evidence of which was the presence of a purulent discharge from the pudendum. Popular opinion, as is usual in such cases, ran high against him; and it was only through the positive opinion of an intelligent surgeon that the case was explained, and the man liberated. A case of a somewhat similar nature lately came under the observation of the writer. A lady and gentleman came to his house one evening in a state of great alarm and excitement, accompanied by their child, a girl of four years old, whom they stated to be afflicted with a terrible disorder, communicated to her by some person in their employment. They had previously shewn the child to an apothecary, who confirmed their worst apprehensions, and at once declared that the girl had got a clap. On examination, the parts were found in a state resembling that just described, with a free purulent discharge; and it was with no small degree of pleasure the writer was able to console the parents by assuring them that their child was labouring under no uncommon affection, and that a few days would set all to rights. It has rarely fallen to his lot to witness a more sudden transition from grief to joy than this announcement effected.

Dr. Ryan* mentions the case of a delicate girl, aged eleven years, who had a purulent discharge from the external genitals, and accused a young man of eighteen, whose genitals were developed in an extraordinary degree, of having violated her person. Two apothecaries swore the girl had been violated, a rape committed, and gonorrhœa communicated. Dr. Gordon Smith, Mr. Whitmore, and Dr. Ryan were of a different opinion. The case was grievously mismanaged for the prisoner; the only evidence produced in his favour was Dr. Smith's, which was contrasted with that of the two medical witnesses for the prosecution, who had refused to examine the person of the prisoner, although assured that he had no discharge from the urethra, and had not had any for six months previously. The man was found guilty at

* Lectures on Surgery.

* Med. Jur. p. 185.

the Middlesex sessions, and sentenced to six months' imprisonment, and lectured by the chairman on his good fortune that he was not hanged. The mother of the child confessed to Dr. Smith that she had had the discharge since she was five years old.

From these and other similar instances, we cannot too strongly urge the necessity of an early examination of both parties. By following this course, it has happened that the man has been acquitted where marks of disease were discovered in the female, because no signs of gonorrhœa have been detected about himself. A case related by Sir Matthew Hale* furnishes an instance where an innocent man might have been saved from a malicious prosecution, to the hazard of his life, by this precaution. Foderé† mentions two cases from Zacchias, where the falsehood of an accusation was determined by a comparative inspection of both parties. Besides the presence or not of disease, there are other points to be determined by examination. Thus it may happen that the man is impotent; the penis may have been lost by sloughing, accident, design, or cancer; the female organs may be so constructed as to prevent the possibility of penetration; in all of which cases an inspection of both parties can alone give grounds for conclusive opinions. It has been remarked by a writer in a celebrated periodical work, with reference to the purulent discharge of which we have just spoken, that "we must take care not to run into the opposite error of ascribing inflammation, ulceration, and discharge in cases where violence has been alleged, to this disease without sufficient grounds; for it is extremely improbable that diseases which occur so rarely should happen to appear in a child to whom violence was offered, unless that violence had some effect in producing it."‡ On this point we think it right to observe that the laceration, tumefaction, and inflammation consequent to the violation of a child are very different from the disease under consideration, and could scarcely be confounded with it. Its great resemblance is to true gonorrhœa; and that point can be settled by a personal examination of the man accused. Dr. Dewees§ states that when this disease arises in very young subjects, it almost always proceeds from a neglect of cleanly attention to these parts, either by withholding a frequent use of lukewarm water, or permitting the child to remain too long wet. Children, however, of a more advanced age have also discharges of a purulent character, that seem to arise from a morbid action of the mucous membrane of the vagina. This frequently shews itself about the fifth year, and may continue, if neglected, to almost any period. It should be recollected that violence has been sometimes inflicted on the external genitals for the purpose of sustaining an accusation against an innocent person. A remarkable case of this sort is related by Foderé.‖ A female at Martigues, in 1808, accused eight or ten of the principal persons of the place of having violated her grand-daughter, aged about nine years and a half, at an inn. She laid her complaint before the juge de paix, and stated that she would withdraw it provided the accused would accommodate the matter with her. She had procured a daughter of the innkeeper, aged sixteen and an idiot, as a witness. As the charge was obstinately persisted in, Foderé, with two officers of health, was ordered to examine the child in presence of the judge; and suspicion was immediately excited from the delay used in admitting the visitors. On examining the parts, he found the hymen untouched, and the vagina extremely narrow. Around the pudenda, however, a red circle about the size of a crown was observed, which appeared to have been induced recently; and this was indeed the fact; for at the end of half an hour the circle had decreased in size, and the redness disappeared. Had this been the effect of great violence, it is natural to suppose that it would have increased in intensity of colour. A report was prepared, stating the above facts; and the consequence was, that the accuser was put in prison, and finally ordered out of the city.

The chief point in an accusation of rape, necessary to be proved, is the act of coition; but as considerable difference of opinion has existed as to what legally constitutes this act, it is necessary to make some observations upon it. Some authorities have maintained that simple penetration was sufficient, while others have judged that without emission the crime is not complete. In the case of Russen, the schoolmaster, who was tried for a rape committed on a girl under ten years of age, it was proved by two surgeons on behalf of the prisoner, and corroborated by four others who had examined the girl, that the hymen (which they considered an indubitable mark of virginity) was whole and unbroken, and that the passage was so narrow that a finger could not be introduced. But Mr. Justice Ashhurst, who tried the case, left it to the jury whether any penetration were proved; for if there were any, however small, the rape was complete in law. The jury found him guilty, and he received judgment of death. But before the time of execution, the matter being much discussed, the learned judge reported the case to the other judges for their opinion, whether his directions were proper; and upon a conference it was unanimously decreed that the directions of the judge were perfectly right. They held that, in such cases, the least degree of penetration was sufficient, though it may not be attended with the deprivation of the signs of virginity. It was, therefore, properly left to the jury by the judge; and accordingly, the prisoner was executed. This occurred in the year 1777. On the other hand, Lord Coke, Sir Matthew Hale, and Hawkins held that there must be both penetratio and emissio seminis, and this appears to have been the decision of Skynner, C. B. Gould, Willis, Ashhurst, Nares, Eyre, and Hotham, against Lord Loughborough, Buller, and Heath; Lord Mansfield,

* *Paris and Fonblanque*, Med. Jur. vol. i. p. 418.
† Méd. Lég. vol. iv. p. 363.
‡ Edin. Med. Surg. Journ. vol. xiii. p. 491.
§ Treatment of Children, pp. 236, 435.
‖ Méd. Lég. tom. ii. p. 456.

though present, having given no opinion of his own. The argument is stated to have turned on the words carnal knowledge, to which the majority contended that emissio seminis was absolutely necessary.* This state of the law rendered cases of rape extremely difficult to prove; for in virgins it is not at all likely they would be conscious of any such circumstance having taken place, particularly when we consider the state of fright, pain, and weakness into which they are necessarily thrown; and even in married women it does not appear that they are always conscious of emission—indeed, we should be inclined to suppose the reverse. Judge Buller stated, in giving judgement on a case in 1787, that he recollected a case where a man had been indicted for a rape, and the woman had sworn that she did not perceive anything come from him; but she had had many children, and was never in her life sensible of emission from a man. Again, in the case of children, it is manifestly impossible that evidence of emission can be obtained; and, as has been well remarked by Dr. Paris, if it be true that certain eunuchs have the power of erection, and consequently of penetration, they may morally ravish without incurring the punishment of rape; for it is certain that they can have no emissio seminis; or a man may have perpetrated all the more atrocious parts of his crime, and yet being incorrupted in the least voluntary constituent of it, escape the well merited vengeance of the law; while it is evident, on the other hand, that the innocent victim has suffered in body, mind, and reputation, as much as if the crime had been legally completed.† It has been stated in defence of this practice of requiring proof of emission, that it is quite necessary to make the proof of the crime difficult in order to avoid false accusations, for it often happens that the only chance an innocent man has is the cross-examination of the prosecutrix; if, therefore, it be necessary to prove all the circumstances, including emission, it follows that there is a greater likelihood of the witness tripping in her evidence.

The question with respect to requiring proof of seminal emission in cases of rape has been recently settled by an act (9 Geo. IV. c. 31, passed June 1828,) which cites, "that upon trials for the crimes of buggery and of rape, and of carnally abusing girls under the respective ages hereinbefore mentioned, offenders frequently escape by reason of the difficulty of the proof which has been required of the completion of these different crimes; for remedy thereof be it enacted, that it shall not be necessary in any of these cases to prove the actual emission of seed in order to constitute a carnal knowledge, but that the carnal knowledge shall be deemed complete upon proof of penetration only." By the same act the crime of rape, or of the abuse and carnal knowledge of a girl under ten years of age, is punishable by death. Abuse and carnal knowledge of a girl between ten and twelve years of age is considered a misdemeanour only, punishable by imprisonment, with or without hard labour.

In Philadelphia, where the law is the same as with us, it has become common of late years to indict for an attempt to commit a rape, rather than for the crime itself, and chiefly from the difficulty of proof. Emission, however, is not considered essential in Pensylvania (according to Judge Cooper); and properly, he adds, for it is not the essence of the crime, and it may happen without being perceived in cases of violence. In Illinois it is expressly enacted that so much of the law regulating the evidence in case of rape as makes emission necessary is hereby repealed.*

This crime may be committed on a female at any period of life after she has passed mere infancy. We have already mentioned the law as applied to children. In this case the charge of violation requires the most accurate inquiry, because the material evidence in other cases, that of the sufferer herself, is wanting, from her being incapable as a witness in consequence of her youth. "If the rape be charged to have been committed on an infant under twelve years of age, she may still be a competent witness, if she hath sense and understanding to know the nature and obligation of an oath, or even to be sensible of the wickedness of telling a deliberate lie; nay, though she hath not, it is thought by Sir M. Hale, that she ought to be heard without oath, to give the court information; and others have held that what the child told her mother or other relations may be given in evidence, since the nature of the case admits frequently of no other proof. But it is now settled by a solemn determination of the twelve judges, that no hearsay evidence can be given of the declarations of a child who hath not capacity to be sworn; nor can such child be examined in court without oath: and there can be no determinate age at which the oath of a child ought either to be admitted or rejected; but their admissibility depends upon the sense and reason they entertain of the danger and impiety of falsehood, which is to be collected from their answers to questions propounded to them by the court."† Females, before they reach the time of life at which menstruation commences, are generally ignorant of the consequences likely to result; and this, coupled with want of physical power, may often tend to facilitate the commission of rape. But at the age of puberty it has been doubted whether a woman of ordinary strength may not successfully resist the attempts of a single man.

Farr, in speaking of this subject, expresses himself in the following terms:—"But the consummation of a rape, by which is meant a complete, full, and entire coition, which is made without any consent or permission of the woman, seems to be impossible, unless some very extraordinary circumstances occur. For a woman always possesses sufficient power by drawing back her limbs, and by the force of her hands to prevent the insertion of the penis,

* *Paris and Fonblanque*, Med. Jur. vol. i. p. 433.
† Loc. cit.

* *Beck*, p. 67.
† *Paris and Fonblanque*, vol. i. p. 421.

whilst she can keep her resolution entire."* Dr. Beck quotes the following answer given by the medical faculty of Leipsic to the question, whether a single man could ravish a woman. "Si circumstantias quæ in actu coëundi concurrunt consideramus, non credibile, nec possibile videtur, quod unus masculus nubilem virginem (excipe impubem, teneram, delicatam, aut simul ebriam puellam) absque ipsius consensu, permissione atque voluntate vitiare, aut violento modo stuprare possit; dum feminæ cuilibet facilius est si velit, penis immissionem recusare, vel multis aliis modis impedire, quàm viro eidem invitæ planè intrudere."† It is necessary, therefore, to be extremely cautious in admitting the truth of accusations, unless the bodily power of the man far exceeds that of the complainant. At the same time, however, we should not entirely agree with the positive opinions just quoted, for we think it possible that by long continued violence, intimidation, or other circumstances, the man may ultimately prevail.

The question naturally arises here, can a female be violated without her knowledge? in which case the crime would be equally great, for it would be still without her consent. There are different ways in which we may suppose this to be effected, as during natural sleep, or stupefaction caused by inebriation or narcotics, or during a fit. As to the possibility of rape being committed on a virgin during natural sleep, we are very much inclined to doubt it, notwithstanding the decision of the faculty of Leipsic, "Dormientem in sella virginem insciam defloravi posse."‡ When we consider the violence inflicted, and the pain that attends a first intercourse, we think it scarcely possible that any natural sleep could be so sound as to preserve the woman unconscious of what was going forward. The case is not exactly the same with married women, in whom from previous sexual intercourse the parts are more dilated. In such case we must admit the possibility, but not at all the probability, for even in them natural sleep, however heavy, would be most likely broken by the attempt at violation. That a female, whether virgin or not, may be ravished during the insensibility attending intoxication, the administration of narcotics, or disease, will be readily granted. As the sufferer can give no direct testimony as to the fact, the only corroboration to be obtained is from a personal examination; but as we have already mentioned, this can be of use alone in the case of her being a virgin. There is reason to think that narcotics have been not unfrequently administered for the purpose of facilitating the commission of rape, which circumstance is justly considered a great aggravation of the offence, and, when proved, is sure to draw down the heaviest punishment on the perpetrator. A case occurred in Dublin, in April 1831, in which a gentleman was tried for a rape, and convicted, chiefly in consequence of an impression made on the minds of the jury, that some soporific had been administered by him to the young lady, by means of which he was enabled to effect his purpose.* There is another mode in which this crime may be committed, wherein, although the woman is not unconscious, she makes no resistance, neither does she consent: that is, when a man obtains admission to the bedroom of a married woman, and imposes himself on her as her husband. This constitutes a case of rape, and subjects the offender to the usual penalty. The same holds good in the case of forcible abduction, where a woman is compelled to marry and is afterwards violated by force.

The fact of sexual intercourse being proved or admitted, it now remains to be ascertained whether the woman consented or not. If she be dead, which sometimes happens from the violence employed, the most material part of the evidence, her own testimony, is of course wanting, unless she have lived long enough to give information before her death. In the well known case of Abraham Thornton, who was tried some years ago, in England, for the murder of Mary Ashford, (a case remarkable for being the last in which a wager of battle was offered, such right having been immediately afterwards abolished by the statute 59 Geo. III. c. 46;) the prisoner admitted having had carnal knowledge of her, but stated that it was with her own consent; and although the general tenor of the evidence was in opposition to this assertion, the death of the unfortunate woman rendered it impossible to ascertain the truth. It was formerly imagined that the occurrence of pregnancy after violation was evidence of the consent of the woman. This opinion was maintained by Dr. Bartley† and Dr. Farr‡ on the supposition that women under the influence of the depressing passions, such as fear, terror, &c. could not conceive. It is said by Mr. Dalton, that if a woman at the time of the supposed rape do conceive with child by the ravisher, this is no rape, for (he says) a woman cannot conceive unless she doth consent. Such an opinion was founded on the idea that a certain amount of enjoyment on the part of the female is necessary towards conception. But it has been clearly ascertained that this is not the case, and the process of impregnation may go forward, totally without the will, consent, or enjoyment of the female. "That so absurd a notion as that conception evidenced consent, should in modern times have obtained amongst any whose education and intellect were superior to those of an old nurse, is indeed surprising: at this day, however, facts and theory concur to prove that the assentation of nature in this respect is no ways connected with violation of mind."§ Such is the opinion of all medical jurists of modern times; and it is supported by the many facts on record, of im-

* P. 41.
† Valentini Pandectæ, vol. i. p. 61.
‡ Valentius, Novellæ Med. Leg. cas. I.

* Dublin Morning Post, April 20, 1831.
† P. 43. ‡ p. 43.
§ Burn's Just. tit. Rape.

pregnation having taken place in consequence of connection had with females during insensibility from disease or the influence of narcotics.

It was ruled, in the case of the king against Fleming and Windham,* A.D. 1779, that if the party be dead, the deposition of the girl, taken before the committing magistrate and signed by him, may after her death be read in evidence at the trial of the prisoner, although it was not signed by her, and she was under twelve years of age; provided she was sworn and appeared competent to take an oath; and all the facts necessary to complete the crime may be collected from the testimony so given in evidence. But, as is the practice in other criminal cases, it is not necessary that the female should be sworn, if her testimony is given while she is dying, she being conscious of her state at the time; for it is considered that the awful situation in which she is placed is as sure a guarantee of the truth as any form of oath could be. At the same time it is quite necessary to have proof of the soundness of her understanding at the time, for without this the solemnity of the occasion, and the anticipation of death, may not have a sufficient impression on her mind.

(T. E. Beatty.)

REFRIGERANTS (from *refrigere*, to grow cold), may be defined, medicines which diminish the *morbid* heat of the body. Their influence is generally admitted, but the theory of their operation is not well understood; and, consequently, many and very opposite hypotheses have been advanced upon the subject. The first of these which deserve notice is that of Cullen, based upon a doctrine of Needham: it forms a remarkable instance of the obscurity into which hypothesis leads men otherwise distinguished for the perspicuity and soundness of their reasoning. This hypothesis supposes "that there is every where, in nature, an expansive and a resisting power; and that, particularly under a certain degree of heat, the expansive power appears in all the parts of organised bodies, in consequence of which they shew a singular vegetating power; while, at the same time, there is, in other bodies, a power resisting and preventing the action of this vegetating power, and, at least, of diminishing its force." And it is assumed that this power is found in those substances which are usually employed as refrigerants.† It is unnecessary to comment upon these opinions; indeed, their obscurity is such as to render them scarcely intelligible.

A later theory is that of Dr. John Murray, whose habit of reasoning upon chemical principles led him to call in the aid of these to explain the operation of refrigerants. He founds his opinion on the presumption of the truth of the theory of Dr. Crawford, that, in the process of respiration, the arteries in the lungs absorb the calorie liberated there; and, owing to the great capacity of arterial blood for caloric, they instantly render it latent, in which state it remains until the subsequent conversion of the arterial into venous blood, when it is liberated equally through the system. Now, Dr. Murray considers that the consumption of oxygen in the lungs, supplying the calorie to the arterial blood, is greatly influenced by the nature of the food and other ingesta received into the stomach. He supposes that when these substances contain a small proportion of oxygen, the demand for that component of the air, and its consumption by the lungs, are augmented; and, consequently, the animal temperature is elevated; whereas an opposite effect takes place when the ingesta contain much oxygen, more especially if it exist in a loose state of combination. According to this theory, therefore, all substances containing much oxygen capable of being extricated by the powers of the stomach, should possess a refrigerant influence. Plausible as this theory appears to be, its accuracy is very questionable; but, in order to reason correctly upon its merit, it is necessary to take a cursory view of the theory of animal heat upon which it is founded; for if the difference of capacity of arterial and venous blood for caloric be insufficient to account for the temperature of the living body, Dr. Murray's theory of the changes produced by refrigerants must necessarily fall to the ground.

Dr. Crawford's object was to prove, as already stated, that arterial blood has a greater capacity for caloric than venous blood; and this is also the case in reference to common or atmospherical air and carbonic acid gas. The latter fact explains the augmentation of temperature arising from the change which the air undergoes in the lungs when carbonic acid is present in them; but as the caloric thus evolved is absorbed by the arterial blood, and rendered latent, the sensible temperature of the blood is not augmented; and it only becomes so as the arterial blood changes to venous in the course of its circulation. By this evolution of caloric the loss of temperature which the body sustains is compensated. Respiration, therefore, and the greater capacity of the arterial than the venous blood, are, according to this theory, the true sources of the peculiar temperature of the living body.

Many facts might be mentioned as favoring the truth of Dr. Crawford's hypothesis; for example, the greater the comparative size of the lungs, and the greater the quantity of blood which passes through them, the higher is the temperature of the animal. Thus, the capacity of the lungs is greatest in birds, which have the highest temperature among animals; and it is a well known fact, that whatever lessens the free action of the lungs and diminishes the consumption of oxygen, reduces the temperature of the animal. Individuals who labour under a malformation of the heart sufficient to prevent the arterialization of the blood, are always of a temperature below the natural standard. In hybernating animals, also, the temperature falls as the respiration is suspended; and it

* Leach's C. L. p. 996, and Paris and Fonblanque, vol. i. p. 439.

† Mat. Med. ii. 121.

rises with the return and the progress of respiration: and, farther, M. Gallois ascertained, by experiment, that the temperature of the body falls exactly in the ratio of any diminished quantity of oxygen consumed in respiration. These opinions are strengthened by some experiments of Dr. Wilson Philip; and, upon the whole, it is tolerably well ascertained that the temperature of the body sinks, if it be not maintained by the chemical changes which occur in respiration.

But, notwithstanding the support thus given to Dr. Crawford's opinion, many and as strong facts have been advanced in support of that view of the subject which regards nervous energy as the source of animal heat. The most important experiments on this side of the question are those of Mr. Brodie. He found that, by maintaining the action of the heart by artificial respiration after the brain is removed, although the blood undergoes its ordinary changes, yet that the temperature of the animal thus treated is rapidly lowered. Mr. Brodie's experiments were made on rabbits, in which the functions of the brain were suspended by dividing the spinal marrow: the blood, in both systems, underwent no change different from that which occurs in natural respiration. "It may perhaps be urged," says Mr. Brodie, "that, in these experiments, the secretions had nearly, if not entirely, ceased: it is probable that the other changes which take place in the capillary vessels had ceased also, and that, although the action of the air on the blood might have been the same as under ordinary circumstances, yet there might not have been the same alteration in the specific heat of the fluid as it flowed from the arteries into the veins. But, on this supposition, if the theory of Dr. Crawford be admitted as correct, there must have been a gradual but enormous accumulation of latent heat in the blood, which we cannot suppose to have taken place without its nature having been entirely altered. If the blood undergo the usual change in the capillary system of the lungs, it is probable that it must undergo the usual change in the capillary system of the greater circulation also, since these changes are obviously dependent on and connected with each other." From the experiments of Mr. Brodie it appears that, when the functions of the brain are suspended, the power of generating animal heat is also suspended; although the same quantity of oxygen be consumed as in natural respiration under ordinary circumstances. It is, nevertheless, proper to mention here the opinion of M. Gallois, that, owing to the nature of artificial respiration, upon which Mr. Brodie's conclusions are founded, the temperature may fall, and the animal be killed by cold, although every part remain uninjured. The air in artificial respiration does not enter the pulmonary cells in the same manner as in natural respiration, but is forcibly propelled into them; a large formation of frothy mucus occurs, which both prevents the air coming in contact with the lining membrane of the air-cells, and by its evaporation tends to cool the body.

Many other facts concur, also, to prove that the temperature of the body is regulated by the nervous energy. It is true that these demonstrate its effect chiefly in maintaining the heat of parts; but if its influence on parts be admitted, it is not easy to conceive on what grounds its power over the entire system can be denied. Sir Everard Home divided the nerves going to the growing antler of a stag, and found that the temperature almost immediately fell; and although, after a few days, it rose again higher than before, yet this may have originated from the re-union of the divided nerves: at all events it does not invalidate the fact that the temperature fell on the division of the nerves, and, consequently, was regulated by their condition. In paralysed limbs the temperature sinks, although in many cases the circulation in the limb is unaffected, and the paralysis is confined to the sensibility of the member. In a case recorded by Mr. Earle, in which the axillary plexus of nerves on one side was crushed, the paralysed limb of that side was of a lower temperature than the opposite limb: indeed, in general we find that increased nervous action, whether depending on affections of the mind or on other causes, augments the heat of the body; whilst the effect of depressing passions, which diminish nervous energy, is followed by either general chilliness, or coldness of the extremities.

These facts undoubtedly go far to prove that animal heat is a vital principle closely connected with the integrity of the nervous system; but at the same time, as the stimulus of arterial blood is requisite for the excitement of the brain and nerves, and arterialization is the result of respiration, the influence of respiration in the production of animal heat must be so far admitted; for without the function of the lungs the brain would lose its energy, and the temperature of the system be necessarily greatly lowered. This opinion receives also considerable support from some experiments of Dulong to ascertain whether the quantity of caloric, developed by the consumption of oxygen in respiration, be equivalent to the quantity given out by the body. He found that in carnivorous animals the proportion is equal to forty-nine and fifty-five parts in one hundred of the heat generated by the whole body during the same interval of time; and, in phytivorous animals, to betwixt sixty-five and seventy-five parts; and that the whole quantity of caloric and water together is equivalent to sixty and eighty parts only; so that the animal heat is greater than can be accounted for by the fixation of oxygen during respiration. Upon the whole, the examination of both sides of the question leads us to conclude that both opinions are to a certain extent true; that animal heat is influenced chiefly by the state of the nervous system, but partly, also, by the chemical changes which take place in the lungs during respiration.

If this view of the sources of animal heat be correct, it presents a considerable obstacle to the admission of Dr. Murray's explanation of refrigerants, which can only be regarded in the light of an ingenious hypothesis. The subject,

therefore, remains as he found it; and the question presents itself—can no rational explanation of the operation of refrigerants be suggested? The writer of this article, although he does not venture to offer a theory likely to be generally adopted, yet conceives that some approach to a rational explanation may be attained by ascertaining how far the action of refrigerants taken into the stomach resembles that produced on the skin by similar substances.

In abstracting caloric from the surface of the body, or, in other words, cooling the skin, whatever agent be employed, whether diluted acids, salts in a state of solution, cold air, or cold water or ice, the activity of the capillaries of the part is immediately diminished; and as their action cannot be materially lessened without the whole vascular system being more or less influenced, the vigour of the heart and arteries is also materially depressed. The consequence of this diminished vascular action is immediately felt on the respiration; the blood does not undergo its necessary change; venous blood is conveyed to the brain, the function of which being impeded from defect of stimulus, a state somewhat resembling paralysis of the nervous system ensues, so that torpor of every organ, the function of which depends on the energy of the brain and nerves, must necessarily follow. The effect of the abstraction of caloric on the nerves is strikingly illustrated by the numbness and insensibility which follow the exposure of the hands, in many individuals, in cold weather; a result which is more likely to arise from the direct influence of cold on the nerves themselves, than from the diminished supply of blood to the parts. Indeed, as in this case the effect on the nerves is partial, we can scarcely imagine any other cause of the diminished action of the capillaries than the depression of the nervous energy. Now if we suppose,—and the supposition is far from being unreasonable,—that an effect resembling that produced on the surface takes place in the stomach when refrigerant agents are introduced into it, we may readily admit that the effect on the capillaries of that organ is extended by sympathy over the system. The possibility of such a result is equally probable in the one case as in the other. This opinion receives some support from the fact that nitrate of potassa operates as a powerful general refrigerant when it is swallowed at the instant of its solution; but it acts as an excitant when it is not taken into the stomach until after it have been some time dissolved. The sensation of cold which the nitre, during solution, causes in the stomach, is evidently owing to a partial abstraction of stimulus, and the effect of this being extended through the nerves to the heart and larger branches of the arterial system, a general reduction of action is produced, and this is followed by a sensation of cold over the whole body. Let us now enquire how far this theory is borne out by the known effects of refrigerants upon the functions of the stomach, the lungs, and other organs.

1. In the healthy condition of the *stomach* refrigerants exert little perceptible influence upon it; but when it is either in an irritable state, or affected with inflammation, the continued use of refrigerants, particularly cold and iced water and lemonades, allays the sensation of heat, nausea, and general uneasiness. Even when no local inflammation exists, cold water and other cold, bland fluids, received into the stomach, moderate general excitement and control febrile action; an effect which can only be explained by the influence of the refrigerants on the nervous energy. The same results follow the administration of refrigerants in enteritis.

2. Refrigerants exert no evident influence on the *circulating* and *respiratory* organs, in the state of health; although in some individuals, owing to idiosyncrasy, acidulated fluids cannot be taken without so powerfully affecting the larynx as to cause a temporary loss of voice: but in a diseased state of these organs the influence of refrigerants is well marked.

In an excited state of the vascular system, when the pulse is both quicker and stronger than natural, acidulated drinks reduce both states, both moderating the action, and relaxing the tension of the pulse; nor is their effect on the capillaries less manifest; and it is to their influence on these that we must attribute the diminished temperature which follows their administration. It is surely unnecessary to say how intimately this is connected with their impression on the nerves of the stomach. In the febrile state, the effects of refrigerants on the circulation are necessarily communicated to the lungs; but besides this sympathetic influence, some of this class of medicines, in particular, acids, seem to operate directly on the pulmonary tissue. In acute inflammation of the air-tubes, or even of the pleura, acid fluids greatly augment the cough and oppress the breathing, when administered before the excitement be subdued; and after this is effected, we still perceive the evidence of their action on the mucous membrane by the aid which they afford to expectoration.

3. But the most decisive illustration of the extent to which the nervous system is influenced by refrigerants, is observed in the effects which acidulated fluids produce on those who are labouring under diseased conditions of the spinal cord. The author had an opportunity of witnessing this in a gentleman who was labouring under subacute inflammation of the spinal theca. Whenever he swallowed a spoonful of lemonade, or even an ordinary effervescing draught, a sensation of pricking was felt over the surface, the skin became so sensitive as scarcely to admit of being touched, and the whole system restless and uneasy. Hypochondriacal and hysterical persons, not unfrequently, suffer in a similar manner from the internal use of acids; and, as this effect is not confined to particular individuals, it cannot be ascribed to idiosyncrasy.

Upon the whole, it is evident that refrigerants operate to a certain extent as sedatives; diminishing the force and rapidity of the pulse, depressing morbid temperature, and calming, generally, the disturbance which always attends acute diseases.

The substances employed as refrigerants

operate either on the organic functions or on the sensibility of the body in a state of disease.

1. The refrigerants operating on the organic functions are chiefly vegetable acids. The influence of *acetic acid*, in its diluted impure state or as vinegar, in cooling the body labouring under disease, was very early known. In its undiluted state it is a powerful stimulant; and when daily taken in large doses into the stomach in its diluted form, it produces great uneasiness, cramps, and colic, and gradually destroys so effectually the texture of the organ and its digestive function, as to cause emaciation of the body. When it is only occasionally taken, largely diluted with water and moderately sweetened, it displays decided soothing and refrigerant properties, and is employed with advantage in inflammatory and bilious fevers, for quenching thirst, calming the vascular excitement, re-establishing the perspiratory function of the skin, and restoring the action of the kidneys. In inflammatory affections of the lungs, however, it increases the cough, and augments the morbid sensibility of the mucous membrane in the same manner as all other acids; and, therefore, it is contra-indicated in such diseases, even as an expectorant, until the excitement be subdued.

The refrigerant influence of diluted vinegar on the surface is undoubted; it not only diminishes heat but allays pain. In hemorrhagic affections, the cold feeling which it produces on the skin is extended to the whole system; hence the benefit derived from it in internal hemorrhages, and in the inflammation of cavities; as, for instance, in uterine hemorrhages applied to the thighs and abdomen; and in acute meningitis applied as a lotion to the shaved scalp. In general fever, sponging the body with vinegar and water is applicable to every case in which the skin is preternaturally hot, when no idiosyncrasy stands in the way.

When diluted acetic acid is internally administered, if opium be prescribed at the same time, it should be recollected that it decomposes the meconate of morphia of the opium and forms an acetate, which is a more powerful narcotic than the meconate. The combination of this acid with ammonia, in the preparation known by the name *liquor ammoniæ acetatis*, possesses refrigerant powers nearly equal to those of the diluted acid, acting at the same time as a diaphoretic; and it is more generally employed than the acid in modern practice. The salts procured by the combination of acetic acid with the other alkalies operate chiefly on the kidneys.

The *citric acid* is more frequently employed than the acetic as a refrigerant; but chiefly in its combined state as prepared by the hand of nature, in the juice of the lemon, the orange, and other fruits. It is more grateful in its combined than in its uncombined state; a fact which is quickly perceived by patients in fever, when it is ordered to form the common effervescing draught for checking nausea and vomiting. When simply diluted with water, in the proportion of the juice of two moderately-sized lemons to a pint of water, and slightly sweetened, forming lemonade, citric acid constitutes a most serviceable and agreeable beverage in fevers; and in those of a typhoid character this is rendered more grateful and beneficial by using water impregnated with carbonic acid gas instead of common water. In the ordinary condition of the stomach, citric acid, either pure or combined, does not weaken the stomach; and in some irritable states of that organ, characterized by a sensation of heat, painful digestion, an unpleasant taste in the mouth, and a disgust of food, it removes these symptoms and proves decidedly beneficial; but on the other hand, when the stomach is highly irritable, and its nervous susceptibility great, lemon-juice, or the citric acid, even when largely diluted, causes heat, uneasiness, and pain, and not unfrequently obstinate vomiting. Nevertheless, as M. Broussais has remarked,* the citric acid is that which the stomach supports best when suffering under inflammation.

The citrates of potassa and of ammonia are also refrigerant: the citrate of soda, which is not an officinal preparation, operates as a purgative.

The above remarks are applicable to the juice of the orange, the apple, the currant, and the gooseberry, all of which owe much of their acidity to the citric acid.

The *tartaric acid*, except as it is contained in the tamarind, is much less frequently prescribed than the citric as a refrigerant, being more apt to disorder the digestive organs, to produce colic and to purge; and its morbid influence on those labouring under affections of the spine is more constant and evident than that occasionally resulting from the employment of citric acid: indeed, so obvious is this, that patients sometimes refuse to continue taking it on account of the nervous agitation which it causes. Its combination in the form of the *bitartrate* is more frequently employed; and in small doses at moderate intervals, it does not operate as a purgative, but as a simple acidulous refrigerant. It is best administered in the form of whey, or of cream-of-tartar beverage; it moderates febrile heat and softens the skin; but when its employment is followed by a red and dry tongue, it ought to be discontinued. Both the acid and the bitartrate are incompatible in mixtures with the nitrate of potassa, which it decomposes, and, uniting with its alkaline base, forms either a bitartrate or a tartrate.

The *oxalic acid* in the form of the binoxalate, as found in the oxalis *acetosella* and rumex *acetosa*, was formerly much prescribed as a refrigerant; but these plants, and, indeed, the oxalic acid in any form, are now rarely employed.

Nitrate of potassa, in small doses, is a well-known refrigerant: it produces a powerful sympathetic effect on the nervous system, depressing the strength and diminishing the frequency of the pulse, and lowering the animal heat: the skin becomes pale, and a sensation of lan-

* Phlegmas. Chron. t. iii. p. 254.

uor is felt. To obtain the full refrigerant ffect of nitre, the salt must not only be admiistered in small doses at short intervals, but should not be dissolved until the instant in hich it is to be administered. As a refrierant, the dose should not exceed a scruple, , at the utmost, half a drachm.

The *bicarbonate of soda*, although seldom prescribed as a general refrigerant in this country, et is frequently administered in inflammatory brile affections on the continent. It is, however, better calculated for operating as a local an as a general refrigerant.

2. The refrigerants operating on the sensility of the body are few; but they are more irectly refrigerant than those which have been ready noticed. *Cool air*, the first of these, so agreeable to the feelings in a heated ate of the body, that observation alone might ave led to its early employment as a remedial gent; and nothing marks more strikingly the erversity of mankind than the opposition of hysicians, at one period, to the indulgence f the instinctive desire for this remedy in fever atients. Its utility in moderating high vasular action and operating as a sedative refrierant is now generally acknowledged; and onsequently its admission to the apartments f the sick, in febrile diseases, is almost uniersal.

If cool air be beneficial in the above-mentioned conditions of the body, *cold water* and e are still more so; and their application is xtensive. For an account of the effects of old water and ice in reducing the temperaure of the body in its healthy condition, we ust refer our readers to the articles Bathing nd Cold. When cold water and ice are mployed as curative agents, their influence ay be obtained either by their internal admiistration or by their application to the surface: n both cases their effects are extended by symathy over the system; but they are modified y the manner in which these agents are used. f the body be immersed in the *cold bath*, the ost striking effect is the shock or nervous mpression which produces the vascular rection so beneficial when cold bathing is used s a tonic; an effect, however, which must be voided as much as possible when the refrierant influence only of the bath is required. o insure simple refrigeration, the water should e of a temperature not much below that of he skin; but as, even at such a degree of heat, he sudden immersion of the body is likely to ause more reaction than would be safe in ases requiring mere refrigeration, the cold bath s rarely or never employed in this country for roducing that effect. The shock and reaction aused by dashing cold water over the body, onstituting the *cold affusion* as it is termed, is s considerable as when the cold bath is used, ut it is more transitory, and therefore it is more useful refrigerant. *Sponging* the body ith cold water, as far as a simple refrigerant ffect is desired, is preferable to either the cold ath or the cold affusion: there is no shock; he fluid, being left to evaporate, merely cools he surface; and by persevering in the process, the cooling effect is fully obtained, and rendered permanent. One great advantage of sponging the surface with cold water is the facility of limiting the extent of the effect according to the feelings of the patient: in general it may be continued until the sensation of chilliness comes over the body, when the patient should be dried and placed in bed. The more simultaneously the influence of the cold water is extended over the surface, the better; the process of sponging should, therefore, be performed by several attendants with large sponges on the different parts of the body at the same time. In ordinary cases the temperature of the water may be regulated by the feelings of the patient, as the beneficial effect depends on the evaporation, which may be aided by the addition of vinegar or alcohol. *Evaporating lotions* applied to a part operate locally in the same manner as general sponging; the sedative and refrigerant influence is not confined to the part, but extends to other parts of the body, even to the interior, as, for instance, to the brain, the contents of the abdomen, and to joints. The sedative effect is still more powerful when a small stream of cold water is directed upon the part: the author of this article has seen this most strikingly exemplified in burns; the mere immersion of the part in cold water, or the application of cloths dipped in cold or even iced water, is much inferior in its effect to this method of employing cold water. It is scarcely necessary to comment on the influence of the local application of *ice*, which operates exactly in the same manner as evaporating lotions, but more effectively, owing to the steady continuation of the same low temperature to the part.

The foregoing remarks lead to this conclusion—the utility of refrigerants as curative agents is more limited than that of most other classes of remedies. They are chiefly employed to depress inordinate vascular action, and thereby to lower temperature; consequently, it is in inflammation, active hemorrhages, and febrile affections that they are found beneficial; and in such cases they are, undoubtedly, most valuable remedies.

In local inflammations on the surface of the body, cold water and evaporating lotions prove highly serviceable; whilst in those more deeply seated, as for instance, inflammation of the brain and its membranes, ice applied to the scalp is to be preferred: the steady abstraction of caloric which it effects, operates not only upon the vessels and nerves of the integuments; but, by diminishing action in the carotids and large vessels, it produces the most decisive benefit in reducing the vascular action within the cranium. These applications have been lately recommended in other internal inflammations, even those of the thorax and abdomen, and under proper circumstances have been found highly beneficial.

Hemorrhage arising from increased action, or accompanied by it, is frequently checked by the sedative influence of refrigerants. When the bleeding is internal, the degree of cold should be such as to operate sympathetically

on the whole system; and to lessen not only the action of the vessels of the part, but to restrain, to a certain degree, that of the heart. Thus in hemoptysis, not only should the patient be freely exposed to cold air, but ice and cold acidulous fluids should be freely administered; indeed, the temperature may be with safety, and even with advantage, diminished so much as to be uncomfortable to the feelings of the patient. In such a case the low degree of temperature is accompanied with an evident diminution of the irritability of the contractile fibres of the whole vascular system, and, consequently, aids greatly in checking the flow of blood. The liquids administered as drink should be cooled down to 32°, either by ice or by a freezing mixture, and slowly swallowed. The influence of nitre has long been regarded as considerable in such cases; and much of the benefit received has been attributed to a chemical change effected on the blood; but if the opinions advanced in this article be correct, it is unnecessary to assert that this explanation of the operation of nitre must fall to the ground.

In hematemesis occurring in young and vigorous persons, the same assiduous employment of refrigerants is requisite as in hemoptysis; and when the bleeding is so violent as to threaten quickly serious consequences, the other refrigerant plans may be aided by injecting iced water into the rectum, and by the local application of cold to the epigastrium. In no species of hemorrhage is the sympathetic influence of refrigerants more strikingly obvious than in epistaxis. Thus dashing cold water on the genitals has sometimes instantaneously suppressed bleeding at the nose; and on the same principle is explained, what it is scarcely necessary to notice, the popular remedy of applying a large cold key or a piece of metal between the shoulders under the clothes.

It is superfluous to say that, however useful refrigerants may prove in all cases of active hemorrhages, their employment in the passive is to be most carefully avoided.

But it is in fevers that refrigerants under every form are to be regarded as the most valuable set of therapeutical agents. In continued fever, the vegetable acids largely diluted are internally administered, especially those found in fruits; and not unfrequently nothing is more grateful to fever patients than cold water slightly acidulated with either the sulphuric or the nitric acid. It is, however, the general application of cold to the surface which proves the most useful refrigerant in continued fever. In those forms of the disease which assume a typhoid type, ventilation and the free admission of cool air into the apartments of the sick are absolutely necessary: irritation is allayed, debility obviated, and the whole complexion of the disease often changed in a few hours, by the removal of the patient into a cool and well-ventilated, from a close and filthy apartment. The most direct and effective refrigerant, however, in continued fevers is the cold affusion; but its employment requires certain cautions, without attention to which much mischief may be incurred. In the first place, the exact temperature of the body must be carefully ascertained. In this country, in the severest attacks of fever, it has rarely exceeded 108° Fah., but in tropical climates it rises sometimes to 112°; the higher the temperature of the patient, the more benefit may be anticipated from the cold affusion. The temperature of the water should vary according to the season of the year and the feelings of the patient, the average range being from 40° to 70° Fah. The effect is to diminish the morbid heat of skin, to lower the force and retard the rapidity of the pulse, and to induce perspiration and sleep; and when such results follow, the cold affusion proves beneficial in any form of fever.

The thermometer is employed to determine the temperature of the patient; but if he feel cold when that instrument indicates an augmented morbid temperature; or if he feel hot when the thermometer demonstrates that the heat of the body is below that of the natural standard; then in neither case should this form of refrigerant be resorted to. It is also improper when the skin is bedewed with perspiration; or if the patient dread greatly its use; nor is it less so during menstruation, and in the latter months of pregnancy. In the advanced stages of fever, refrigerants of any kind are injurious.

With respect to the kinds of continued fever in which refrigerants are indicated, we may enumerate six.

1. In inflammatory fever, *(synocha,)* a rare disease when unaccompanied with topical inflammation, the advantages to be derived from refrigerants are well understood. The cold affusion is admirably adapted for rapidly abstracting the stimulus of heat, diminishing general excitement, and operating as a powerful sedative. In the more advanced stages of the disease, cool sponging is often substituted for the affusion; but when the patient can bear the fatigue of the affusion, it is always to be preferred. The greater frequency of this form of fever among the ancients than the moderns explains their constant employment of cold drinks and cold bathing in continued fever.

2. In fevers of a typhoid type, the disease has been cut short by the cold affusion; but in this case more perhaps is to be attributed to the shock and the reaction which follows, than to the refrigerant influence of the affusion.

3. In synochus or inflammatory fever, gradually assuming the typhoid character, refrigerants in general, but more especially the cold affusion, are chiefly applicable to the early stages of the disease; and, indeed, no form of remedy is more advantageous when there are no local determinations; but when these exist, particularly if the lungs be affected, much caution is required.

4. In remittent fevers, especially those of warm climates, and in their more intense and excited variety, the cold affusion may be employed with great benefit. In severe attacks, also, much advantage is derived from the

application of ice or cold water to the scalp; in the remissions, however, the application of cold in any form must be suspended. In yellow fever, the safety of the patient frequently depends solely on the early application of the cold affusion.

5. If hectic be symptomatic of pulmonary affections, or determination to internal organs, the cold affusion is decidedly contra-indicated; but even in such cases much benefit is often obtained by sponging the trunk of the body with cold water mixed with vinegar, whilst the lower extremities are kept warm in bed. We must, nevertheless, bear in mind that, under any form of hectic, although general refrigerants are useful auxiliaries, yet the cold affusion can scarcely be regarded as admissible.

6. In most eruptive fevers, except measles, the body should be freely exposed to cool air; and even the cold affusion may be safely and advantageously prescribed, should the state of the surface require it, nor should the presence of the eruption operate as a reason against its employment. The Hindoo physicians plunge their patients, during the eruption of small-pox, into cold water, and with the best results. It diminishes the fever, lessens the number of the pustules, and is said to prevent pitting. The writer of this article has long been in the habit of employing the cold affusion in scarlatina during the height of the eruption, and has seen the severity of the disease instantly checked by it.

In intermittent fevers, when the skin is dry and parched, and the general heat greatly augmented, cold in every form applied to the surface, and cold acidulated fluids taken into the stomach, are of the same value as in continued fever, and greatly favour the accession of the sweating stage. The affusion should be used in the hot stage of the paroxysm, and continued until the temperature of the body of the patient be reduced to the natural standard.

It is unnecessary to discuss the nature of the various diseases, besides idiopathic fevers, in which refrigerants are indicated: in all, much depends on the degree of the attendant fever, and the existence of local affections. In one local disease, phrenitis, however, their advantageous effects are very conspicuous: the most furious delirium is quickly subdued by allowing cold water to drop on the vertex, whilst the rest of the scalp is covered with cloths moistened with vinegar and water. The degree of collapse, indeed, which is thus produced, is often so great as to require most active measures to counteract it; when such occurs, the state of sinking is to be treated exactly in the same manner as when extreme debility suddenly appears from other causes: external warmth, particularly the application of bladders of hot water to the scrobiculus cordis, friction, electricity, and sometimes artificial respiration, are the means to be employed to restore animation; and when the power of deglutition returns, the administration of excitants, especially aromatics and ammonia, is to be resorted to.

From the foregoing remarks, it is evident that, although, as we have already said, refrigerants constitute a class of medicines of limited application, yet they are of much value in a few important diseases. Like every other class of therapeutical agents, their utility will be more or less obvious as the discrimination, the judgment, and the observation of the practitioner are properly exercised, in determining the exact condition of the body which demands their employment.

(A. T. Thomson.)

RHEUMATISM, from ῥεῦμα, *a defluxion*. This term, originally adopted when diseases accompanied with swelling were usually attributed to the flow of some special humour to the part affected, has been used for ages to designate an affection which has so much of distinct character as to justify its being considered a special disease. So loosely, however, has the term been applied, that a host of ailments, with no character in common save that of pain, have been classed under it, and much both of false experience and of bad practice has thence resulted. Diseases called rheumatic have been relieved by stimulant remedies, which from the character thus acquired have been empirically resorted to in states of constitution for which they were utterly unsuited. In acute rheumatism, a disease intensely inflammatory, we have known the use of the most powerful stimulants confidently urged by well-meaning but misguided friends, who in support of their prescription have pleaded the wonderful cures which they had seen their favourite specific perform in what they assumed to have been rheumatism; thus misled by a name to recommend in active inflammation what could have benefited only in a totally opposite state of the system. As many affections really rheumatic present an equivocal character which to superficial observation too often appears to justify the use of stimulants, it is very necessary to discriminate the real disease, so as to distinguish it from those diseases with which it is liable to be confounded; and however difficult it may be to class the latter, it is better to leave their place in nosology unassigned, than, by ranging them under the head of rheumatism, to beget confusion where clearness and precision are of the first importance.

In the investigation of rheumatism, the best mode, similar to what was followed in treating of gout, is to consider, first, the simple disease in its most perfect form; and then, with the lights thus supplied, to elucidate the more complex conditions which the larger portion of rheumatic affections presents. So contradictory, and, we may add, so ineffectual are the means ordinarily used in treating the latter, that no greater benefit could be conferred both on patients and practitioners, than to divest the treatment of perplexing confusion and inconsistency by reducing it to fixed principles, and bringing it within the pale of rational and scientific practice.

In determining the diseased condition to which the name of rheumatism should be specially assigned, it is expedient to examine the representations given of it by the systematic nosologists. Sauvages describes rheumatism

as "dolor diuturnus in parte carnosa artuum," and places it in the class *Dolores*, order *Vagi*, of his nosology. According to Linnæus it is "musculorum dolor ad motum, a tunica cellulosa injecta;" class *Dolores*, order *Extrinseci*." Vogel places it in class *Dolores*, as merely "cutis et musculorum dolor." It would be difficult to recognise in these brief and meagre specifications the ordinary disease of rheumatism, such as we daily witness it.

Sagar is both more copious and more precise. He describes two diseases, a chronic one ranged in the class *Dolores*, order *Vagi;* and an acute under the specific name of myositis, in the class *Phlegmasiæ*, order *Phlegmasiæ musculosæ*, giving respectively the following definitions. "*Rheumatismus.* Dolor diuturnus in parte carnosa tendinosa artuum, vagabundus, sæpius sine coryza, rheumate, catarrho, erysipelate, et sine febre notabili; (acutus rheumatismus facit genus inter Phlegmasias, myositin a me dictum;) sanguis missus rheumatismo laborantium, est gelatinosa crusta tectus, et urina sæpe ad sulphureum colorem tendit." "*Myositis.* Febris acuta inflammatoria, dolores in diversis musculis artuum, eorundemque involucris, diu noctuque discruciantes, motum vetantes fere omnem, ad noctem exacerbantes; sanguis missus est tectus crusta inflammatoria subgelatinosa, vel pelli tenui tenaci: hic morbus vulgo audit rheumatismus acutus." It is worthy of remark that Sagar notices the blood drawn in chronic rheumatism as exhibiting a buffy crust. Cullen considers acute rheumatism alone as a special disease, regarding the chronic form as only a sequel of it. He places it in the class *Pyrexiæ*, order *Phlegmasiæ*, and gives the following definitions. "*Rheumatismus.* Morbus ab externa et plerumque evidente causa; pyrexia; dolor circa articulos musculorum tractum sequens, genua et reliquos majores, potius quam pedum vel manuum articulos infestans, calore externo auctus." "Rheumatismi sequela est, *Arthrodynia.* Post rheumatismum, nisum violentem vel subluxationem, dolores artuum vel musculorum, sub motu præsertim aucti, plus minusve fugaces, calore lecti vel alio externo levati; artus debiles rigidi, facile et sæpe sponte frigescentes; pyrexia nulla; tumor plerumque nullus. Rheumatismus chronicus auctorum."

I.—Acute rheumatism.

This disease is often designated by the trivial name of rheumatic fever, a term which implies a constitutional disturbance as well as a local. The ordinary phenomena which characterise it are so familiarly known, that a very brief account of its accession and progress will here suffice. That given by Sydenham, derived as it was from actual observation, and marked by his wonted truth and accuracy, presents in few words as clear a description of the early seizure as can well be rendered.

"This disease happens at any time, but especially in autumn, and chiefly affects such as are in the prime of life. It is generally occasioned by exposing the body to the cold air immediately after having heated it by violent exercise, or some other way. It begins with chillness and shivering, which are soon succeeded by heat, restlessness, thirst, and the other concomitants of fever. In a day or two, and sometimes sooner, there arises an acute pain in some or other of the limbs, especially in the wrists, shoulders, knees; which shifting between whiles, affects these parts alternately, leaving a redness and swelling in the part last affected. In the beginning of the illness the fever and the above mentioned symptoms do sometimes come together, but the fever goes off gradually, while the pain continues, and sometimes increases."

The latter circumstance Sydenham, in conformity with the pathology then prevalent, attributes to the "derivation of the febrile matter to the limbs," which he conceives to be sufficiently shewn "by the frequent return of fever from the repulsion of morbific matter by external remedies." The theory here propounded may be questionable as resting on hypothesis, but the facts with which it is connected are not the less valuable.

It appears, then, that acute rheumatism presents a state of active fever accompanied with local inflammation of one or more joints. And here one of the most important questions respecting rheumatism arises,—whether the local inflammation be the cause of the fever, or only its attendant? On the solution of this, much both of the pathology and treament of rheumatism must depend, and accordingly its elucidation will form a prominent part of the present article.

In the foregoing description of Sydenham, it appears that the state of febrile excitement precedes the local inflammation. In theoretic speculations this fact seems generally recognised, yet it does not appear to have been kept steadily in view either by speculative or practical writers. The term symptomatic fever, so often applied to the constitutional disturbance, implies that this was regarded rather as a contingent result of the local inflammation, than as a precursor or cause of it. To determine this point is of much importance, for by the decision must the whole course of treatment be influenced. If the local inflammation, whether seated in the *muscular*, though more frequently in the *fibrous* tissue of the affected parts, be the cause of fever, as implied by the term symptomatic, the reduction of local inflammation by the most direct means would be the best and most effectual relief; and this being duly attended to, the contingent fever might, according to the familiar axiom, *sublata causa tollitur effectus*, be little regarded. On the contrary, if the state of fever, or rather that condition of the habit which gives rise to fever, be the real source of rheumatic seizure, then should the constitutional state be chiefly attended to, and local treatment be only subsidiary to that by which the derangements of the constitution are rectified. We hope clearly to shew that the constitutional state is that which chiefly claims our regard in the treatment of rheumatism.

When acute rheumatism occurs in its most active state, so intense is the inflammatory fever

attendant, that whatever theory of the disease be entertained, the fever claims its full portion of attention, and is met by adequate activity of treatment. Bleeding, purging, and other means of reducing fever are promptly and freely employed, the more so as experience has shewn this treatment to be indispensable for abating the local inflammation. This being the case, then, it may be asked, of what importance is it to decide whether the local or constitutional affection is to be regarded as the primary disturbance, inasmuch as the same treatment relieves both? It would be sufficient to answer that truth ought always to be ascertained, for it can never be unimportant. Were acute rheumatism in its more active state to be alone considered, the importance of the decision might be less, both the local and constitutional disturbance demanding the vigorous employment of corresponding means. But when the minor degrees of the same disease, constituting what is termed chronic rheumatism, come to be investigated, it will be seen that their essential character involves the point at issue; and that unless this be determined as truth and reason dictate, the practice in a malady which is more prevalent, causes more suffering, and leads to more decrepitude than almost any other, must be vacillating, imperfect, and unsuccessful.

It will materially abridge the present article to refer to certain general principles of pathology already detailed in the articles Gout and Plethora. These principles apply directly to rheumatism, and through them alone can its pathology be adequately unfolded, or its treatment rationally explained.

Acute rheumatism principally attacks the young and vigorous. The period of life most subject is said to be from puberty to thirty-five years. Though no age is exempt, it yet more rarely occurs in the very young, or in advanced life. This circumstance alone would seem to indicate some connexion between rheumatism and fulness of habit, or that approximation to plethora which was formerly noticed as exuberance of health; and if rheumatic seizures be duly scrutinized, they will be found to take place in those who from plethora, whether absolute or relative, are prone to fever or inflammation on any exciting cause being applied. The extraordinary health so often remarked by patients as having immediately preceded the rheumatic attack is sufficiently intelligible. But direct evidence of the state of constitution in which attacks of rheumatism occur is amply shewn in those who, having had the disease, are liable to its recurrence, and on this account compelled to watch the premonitory indications of an attack. In these, constitutional disturbance of a febrile kind, marked by all the phenomena formerly detailed as denoting the transition of plethora into febrile excitement, will be invariably found to exist for a sensible time before the disease presents its full character by the establishment of a local inflammation. And to these premonitory indications should the earliest attention be given, for it is in this stage that relief can be most speedily and effectually afforded. By reducing plethora and subduing febrile action in this stage, the local inflammation may be wholly averted, and thus may be prevented not only the injury which the joints, when affected, are liable to sustain, but also the susceptibility to impression from slight causes which reiterated attacks of rheumatic inflammation never fail to leave.

The local inflammation of acute rheumatism undergoes a change during its progress which seems to have escaped observation. It exhibits at different stages two conditions, which may be conveniently distinguished as primary and secondary. The former is the immediate result of the rheumatic seizure, and must be attributed to the specific cause, whatever it may be, from which the disease derives its distinctive character. It differs from common inflammation in being more transient, for it is capable of rapid subsidence without any trace of its attack remaining. When this inflammation migrates from joint to joint, the occurrence of a fresh inflammation is oftentimes followed by a quick subsidence of that which immediately preceded. Still more signally does this rapid subsidence take place if active treatment for the relief of the constitutional inflammation be resorted to immediately on the attack occurring, and before the secondary inflammation has had time to supervene. In this respect the primary or specific inflammation of rheumatism has a close analogy with that of gout, from which it differs, however, in having a stronger tendency to pass into inflammation of a more ordinary and permanent kind. This specific inflammation is promptly relievable by constitutional treatment, no local applications being at all needed.

When from the severity of the attacks, or from neglect or delay in having recourse to suitable discipline, the specific inflammation lingers in a joint, a secondary inflammation results, more permanent in its nature, which does not immediately subside on the constitutional inflammation being subdued, and which generally leaves some traces of its existence, in effusion into the cellular membrane or bursæ mucosæ, or in more or less thickening and rigidity of the ligaments and other membranes surrounding the joints. The distinction here noticed is important, because it has a sensible influence on the local treatment of rheumatism, both acute and chronic.

Causes of acute rheumatism.—The chief, if not the only exciting cause, is the application of cold to the body when unusually heated. Cold is more liable to produce this effect when combined with moisture, whence a cold and humid atmosphere, and wet or damp clothes, are the most frequent sources to which rheumatism can be traced. Partial cold, as when parts of the body are subjected to currents of cold air, is very apt to give rise to rheumatism. When the body is predisposed, a very transitory exposure of this kind will suffice to bring on an attack; if the current be sustained for any time, few will wholly escape some contingent suffering. Of the fact that rheumatism is so excited there can be no doubt. When it

is reflected, however, that for every instance of rheumatism so induced, numbers continually endure a much or greater exposure to the alleged cause without any disease ensuing, too much importance should not be attached to it.

Of far greater moment is it to regard the predisposition, without the concurrence of which either no rheumatism will take place, or it will be slight and partial, exhibiting none of the constitutional disturbance and febrile excitement which characterise acute rheumatism. A predisposition is said to be given by many circumstances, as age, temperament, climate, season of the year. Even hereditary liability has been classed among the predisposing causes, and possibly with reason. Each of these merits attention, but the circumstance common to all of them, and that which has most influence in producing the disease, is a state of general constitution, which from the prevalence of plethora, either absolute or relative, is prone to be aroused by any excitement into febrile or inflammatory action. This subject having been fully discussed in its proper place, (see Plethora,) it will suffice on the present occasion to apply to the consideration of rheumatism the doctrines already explained. It furnishes a presumption, at least, of these doctrines having some foundation in truth, that corresponding principles have been advocated by one of the most enlightened pathologists of the present day. M. Andral, in various parts of his luminous Treatise on Pathological Anatomy, traces a variety of structural lesions, as well as the inflammatory actions which induce them, to a redundancy of nutritive matter in the blood, supporting his views with a copiousness of illustration, matured experience, clear discernment, and sound judgment, which claim the respect and confidence of every intelligent mind. These views, too, are so reiterated throughout the work as to shew that they were not a mere transient conception, but a deliberate conviction deeply impressed.

A few extracts will evince that in these assertions we do not misrepresent this acute and philosophic writer. In discussing the effects of hyperæmia, or excess of blood, on particular tissues, he says, "The hyperæmia, instead of being confined to a simple organ, may exist at the same time in every organ of the body. The general capillary system is thus overloaded with blood, and the whole system is said to be in a state of plethora or polyæmia. I shall not enter into a detail of the circumstances which characterise this state, the essential character of which seems to consist in the formation of a greater quantity of blood than is necessary for the purposes of nutrition and secretion. There are some individuals who, according to common observation, naturally make a greater quantity of blood than others. In general, those persons who live high, and make but little exertion, mental or corporeal, are most liable to this affection. It has been said, but without the slightest proof being adduced in support of the assertion, that an appearance of plethora has been produced in some individuals by an inordinate expansibility of the blood. When the bloodvessels contain a greater proportion of the nutritive fluid than is necessary to supply the demands of the different organs, the superabundant quantity becomes a permanent source of excitation to the solids, and at the same time the blood has a remarkable tendency to accumulate in different organs; so that, in such case, the whole system is in a general state of excitation, and some of the organs may become the seats of local congestions of various degrees of duration and intensity. Indeed, the phenomena which result from the plethoric diathesis cannot properly be termed morbid unless when some local congestion is formed. Sometimes the brain is the seat of the congestion, and then follow the various symptoms of cerebral disease, giddiness, headach, drowsiness, alteration of the sensorial and intellectual faculties, &c. which may be so violent as to induce death, and yet leave no trace of disease except a little more blood than usual in the cerebral vessels. Sometimes the congestion more particularly affects the pulmonary organs. The dyspnœa which accompanies this form of the disease arises from an unusual quantity of blood transmitted through the lungs, which necessarily requires a corresponding quantity of air to fit it for the purposes of the general circulation. It is this want of proportion between the blood which requires to be aerated, and the quantity of air inspired for that purpose, which produces the dyspnœa. In other cases the complication of palpitation with various degrees of dyspnœa proves that the heart has become the seat of congestion."

Corresponding effects are traced through other organs and tissues, and due notice is taken of the constitutional derangements resulting from polyæmia when no organ more especially suffers, as well as of the prostration of strength or false adynamia, as it is expressively called, which so generally attends this state. The section closes with remarks which are too apposite to our present purpose to be omitted, however reluctant we may be to indulge in lengthened quotations. "The morbid state which I have now described, and to which may be referred some of the species of continued fever described by the older nosologists, may terminate in recovery or death. When the termination is favourable, the symptoms gradually improve as the superabundant quantity of blood, the original source of all the accidents, is diminished by abstinence and bloodletting. When death ensues, the post-mortem examination generally exhibits traces of well-marked inflammation of one or more organs. This inflammation seems to have taken place subsequently to the commencement of the febrile paroxysm; at least the symptoms would lead us to this conclusion. But on other occasions no trace of inflammation can be discovered, and the only morbid appearance consists in a simple accumulation of blood in the capillaries of the different organs, their textures remaining perfectly unaltered.

These slight congestions affecting simultaneously several organs, may, by the various morbid sympathies which they excite, produce as violent and formidable symptoms as the most serious organic lesion of any individual organ. In such case, where are we to assign the origin of the disease?—Wherever the blood is distributed, there derangement of function is found. In the blood, then, indisputably resides the first cause of the disease; the lesion of the solids is only a secondary affection, but may, notwithstanding, become, during the progress of the disease, the prominent affection, and give rise to many and formidable accidents."

In noticing fevers, he particularises one class which he refers specially to excess of fibrine in the blood. "Lastly, the third class of fevers appears to be more particularly connected with alterations of the blood. On this head I can but refer to what I have already said, when treating of the diseases that may arise from that source. I shall content myself at present with repeating that the fever termed inflammatory seems to me often to arise from no other source than the blood being too rich in fibrine." Again, in considering the lesions of the blood, he refers the occurrence of inflammatory fever, not only to a general hyperæmia or excess in quantity of the circulating fluid, but more particularly to an altered condition of its quality arising from redundancy of fibrine. "I have already established the fact that, under the influence of a state of general hyperæmia, every organ becomes excited; that death may result from such excitation; and that a superabundance of blood is found all over the body, but in no part is there any serious lesion, any alteration of texture. In such cases there exists that state of pyrexia, termed by nosologists inflammatory fever. But if, instead of being simply in excess, the blood contains more fibrine than ordinary, its exciting power will be still greater, and what it did in the former case merely by its increased quantity, it will now do by its alteration of quality." In fine, he applies the doctrines thus propounded to the particular disease which is the subject of the present essay. "Now if we mark the symptoms and progress of acute rheumatism, we find that very often a well-marked febrile action with a strong reaction, but without any symptom whatever of local affection, precedes the pain. In a word, there is first an inflammatory fever, and then rheumatism. Next observe the extreme mobility of the rheumatic pains. They run along in a manner wherever the blood is distributed; the application of leeches often removes the pain from one part, but it soon shifts to another, and not unfrequently it quits the articulating tissues and fixes on different internal organs, producing, by the derangement of their functions, symptoms more or less severe. It often happens that bleeding from a large orifice puts an end to the disease, as if by diminishing the mass of blood it proportionally diminished the stimulus that promoted all these shifting irritations."

The doctrines here advanced we believe to be founded in truth, and capable of furnishing much valuable guidance in the investigation and treatment of disease. In such copious extracts we may appear to have made too free with the pages of an author whose works are so generally known, but we could not resist the temptation of fortifying, by the authority of so distinguished a pathologist, principles which we have long maintained, and which we have endeavoured already to illustrate in the articles Gout and Plethora. They will suffice, we trust, to justify the assertion lately made, that whatever importance may attach to the exciting cause of acute rheumatism, the predisposition induced by a plethoric state of constitution is far more entitled to the practitioner's attention.

Diagnosis of acute rheumatism.—This may be briefly disposed of. The only disease with which it is liable to be confounded is gout, in treating of which the distinctive character of each malady has been sufficiently noticed. Formerly discrimination in this respect was deemed of high importance, the prevailing theories of gout demanding a course of treatment very different from that to which rheumatism was subjected. In the present day a juster pathology of gout assimilates the treatment of both diseases sufficiently to render extreme accuracy of discrimination of very slight moment.

Prognosis of acute rheumatism.—The prognosis is so dependent on the promptitude with which suitable treatment is resorted to, that any remarks on the natural course or duration of the disease are of little worth. Generally speaking there is little immediate danger to life, there being no inflammatory disease of equal intensity which so little deranges the vital functions. This, most probably, is owing to the disease expending its violence on the joints and other external parts, and being little prone to attack the viscera. The peculiar character of the inflammatory action too, and the little liability which it has to pass into suppuration, or undergo the other changes consequent to phlegmonous inflammation, may account for the safety with which even the metastasis of rheumatism to internal parts is borne. It is certain that such metastasis is not attended with so much danger as the severity of the symptoms would seem to denote. In early life we were often appalled by the metastasis of rheumatism from the joints to the heart, an organ more peculiarly liable to this transition than any other. More extended experience abated such fears, by shewing that the immediate danger was by no means commensurate with the suffering experienced.

If an attack of rheumatism be treated at the onset with due activity and discrimination, it may be relieved in a very few days without the affected joints sustaining any injury. But both with respect to time and local ravages, much will depend on suitable discipline being resorted to and adequately pursued, ere the specific inflammation of the joints becomes complicated with that which we have termed

secondary. The specific inflammation we have repeatedly seen subside in twenty-four hours, leaving behind but little trace of its accession. When secondary inflammation, however, has been suffered to supervene, the case is materially altered, and greater obstinacy of local affection may be expected. It might be laid down almost as an axiom, that the severity and duration of the disease are proportionate to the degree of plethora present, the activity of inflammation, and the length of time during which the morbid actions are suffered to prevail unrestrained. If the plethora be great, inflammation high, and much delay take place in resorting to efficient means for correcting the constitutional derangements, then would it be difficult to assign limits either to the constitutional disturbance or local ravages, both of which may continue, though with abated force, for months or years, to undermine health and cripple the limbs; in other words, acute rheumatism may then pass into chronic of the most inveterate and intractable kind. Thus, though acute rheumatism rarely destroys life by its immediate seizure, however violent, this furnishes no excuse for supineness or inactivity in the treatment; for if not radically relieved in its early stage, the disease, even when of no extraordinary violence, may become so confirmed as to yield afterwards with difficulty to the most active and judicious use of remedies, while progressive disorganization of joints may entail protracted suffering and lasting decrepitude.

It is true that a slight rheumatic seizure may, like a gouty paroxysm, pass away without medical interference, the efforts of the constitution sufficing for relief. But this is not its general character; and to rely on such a contingency would be in the highest degree rash and inexcusable. Whenever an attack of acute rheumatism occurs, the constitution must need some relief, which enlightened practice will never withhold. To neglect of this principle may be ascribed a very large proportion of the decrepitude which the victims of rheumatism so continually present. There is no truth of which we are more thoroughly persuaded, than that if rheumatism were at its onset treated as its real nature demands, and if due care were afterwards taken to guard against its recurrence by prophylactic measures judiciously directed and adequately pursued, there need not from this malady be one case of disorganized and crippled joints for every hundred that are so afflicted. The effects of the earlier treatment will, therefore, in general, decide the prognosis. There is inflammatory fever to subdue, local inflammation to remove. If early bloodletting in subduing the fever make prompt impression on the local affection, so that both pain and swelling quickly subside, thus marking the local inflammation as still retaining its specific character unmixed with secondary effects, speedy and effectual relief may be confidently predicted, medical treatment judiciously conducted being fully capable of ensuring it. When febrile action is inveterate, and it is oftentimes very obstinate, though chiefly so when the earlier periods of disease have been neglected or inadequately treated, a tedious progress may be expected, for so long as fever remains unsubdued are the local inflammations incapable of removal, either keeping their ground unmitigated, or if abated by topical remedies, continually recurring. Again, when abatement of fever is not followed by quick subsidence of local swellings, in consequence of the latter having passed into the secondary stage, and especially when effusion and organic changes have already taken place in the affected joints, then is the restoration of the joints much more tedious, though great local derangements will admit both of speedy and decisive relief, provided the local mischief be not rendered inveterate, or continually renewed by unsubdued fever.

Much, too, depends on the state of constitution in which acute rheumatism occurs. In a healthy subject, capable of bearing the depletory and other treatment required for relief, great reliance may be placed on the efficacy and certainty of the curative process. When the constitution is depraved by long continued relative plethora, with its attendant febrile excitement, and especially if the feebleness, natural or acquired, be such as to render caution necessary in carrying bloodletting and other remedial processes to the requisite extent, more protracted disease and more tedious recovery must be the natural and inevitable consequence.

It is said that rheumatic inflammation does not tend to suppuration or gangrene, and the remark is generally true. Yet we have seen abscess of the cellular membrane supervene on rheumatic inflammation, and we have also witnessed sloughing ensue when leeches have been applied to a highly inflamed joint without adequate constitutional treatment being conjoined. The most frequent consequences are, gelatinous effusion into the bursæ, thickening and rigidity of the ligaments and other membranes surrounding the joints, contractions of the limbs, and wasting of the muscles, all of which will come under consideration in the latter part of this essay, where it treats of chronic rheumatism.

Treatment of acute rheumatism.—The indications are here to subdue fever and remove inflammation. It has been already shewn that the former claims the first consideration. The promptitude with which the local inflammation in its earliest stage yields to the treatment by which a plethoric state of constitution is corrected, and febrile action allayed,—and the obstinacy of the local ailments, whenever the constitutional state is overlooked or inadequately treated, furnish the best proofs of the correctness of this pathology. In its simplest form and early stage, acute rheumatism is speedily and effectually relieved by antiphlogistic treatment, properly directed and adequately pursued. Bleeding, purging, salines with antimony, diluents, and abstinence, suffice both for subduing the general fever and removing the local inflammation. It continually happens, however, that these means, how-

ever actively or perseveringly employed, will not succeed in re-establishing health; a lurking fever remaining unsubdued, the blood retaining its buffy crust even when the crassamentum is reduced far below its natural and healthful proportions, and the local inflammation maintaining its hold of the affected joints. Further means are then required, which will be noticed in their proper place. The treatment of the simpler and more manageable form must be first discussed.

One of the earliest practical writers on this complaint was Sydenham; and so direct and judicious was his practice, that we cannot do better than to make it the text on which to comment in treating this part of the subject. Sydenham's theories of disease often involved the pathological fantasies prevalent in his day; but it is his signal merit that he never suffered them to mislead him from the path which his clear discernment and practical experience enjoined him to follow. He attributed the local affection to "the derivation of the febrile matter to the limbs," which, as he observes, "the frequent return of the fever from the repulsion of the morbific matter by external remedies sufficiently shews." But we cannot perceive that he was influenced by this hypothetical principle, further than to adduce it in explanation of facts which his experience had taught him. He had witnessed the inefficacy of local treatment, and also the increase of constitutional disturbance which resulted when this alone was trusted to, and he wisely abstained from repellent applications. Having described the disease with some of its modifications, he gives the following concise instructions for its cure. "Since both kinds of this disease seem to arise from inflammation, as appears from the concomitants just mentioned, and especially by the colour of the blood taken away, which exactly resembles that of persons in pleurisy, which is universally allowed to be an inflammatory disease, so I judge that the cure ought to be attempted only by bleeding, the heat of the blood being in the mean time abated by cooling and thickening remedies along with a proper regimen. Accordingly, as soon as I am called I order ten ounces of blood to be immediately taken away from the arm of the side affected, and prescribe a cooling and incrassating julep. To ease the pain I order a cataplasm prepared of the crumb of white bread and milk tinged with saffron, or a cabbage-leaf to be applied to the part affected, and frequently renewed. With respect to diet I enjoin a total abstinence from flesh, and even from the thinnest flesh broths, substituting in the place barley-broth, water-gruel, panada, and the like. I allow only small beer for drink, or, what is more proper, a ptisan prepared of pearl-barley, liquorice, sorrel-roots, &c. boiled in a sufficient quantity of water, and I allow the patient to sit up some hours every day, because the heat which arises from lying always in bed promotes and increases the disease. The next day I repeat the bleeding to the same quantity, and in a day or two after, as the strength will allow, I bleed again. Then interposing three or four days as the strength, age, constitution of the patient, and other circumstances indicate, I bleed a fourth time, which is generally the last, unless too hot a regimen has preceded, or heating remedies have been exhibited without necessity. But the use of opiates requires more copious bleeding; and, therefore, though the pain be ever so violent during the whole course of the disease, yet when I intend to effect the cure solely by bleeding, I judge it highly necessary to refrain from opiates, because the disease is fixed thereby, and does not yield so readily to bleeding; so when such medicines are given too frequently, bleeding must in consequence be oftener repeated than is otherwise necessary. Besides, in the height of the disease, they do not answer the expectations we have conceived of them. Whilst the above mentioned remedies and regimen are carefully continued, I inject glysters made of milk and sugar, between times on the intermediate days of bleeding, earnestly recommending the exact observance of these directions for at least eight days after the last bleeding; and then I prescribe a gentle purging potion to be taken in the morning, and in the evening a large dose of the syrup of white poppies in cowslip flower-water, whereby a check is put to the tumultuary motion of the blood which might otherwise occasion a relapse. This being done, I allow the patient to return by degrees to his customary way of living in relation to diet, exercise, and air; but, at the same time, caution him to refrain for a considerable time from wine and all spirituous liquors, salt or high-seasoned flesh, and, in general, from all food of difficult digestion. After having repeated bleeding as above specified, the pain greatly abates, though it does not go quite off; but as soon as the strength returns, which bleeding had greatly impaired, the symptoms will vanish, and the patient perfectly recover."

In the simplicity, fitness, and activity of the foregoing course of treatment, there is much to admire. It comprises the more essential articles of antiphlogistic discipline, bleeding and abstinence; it discourages the premature use of narcotics, which, when employed too early, or in substitution of depletory measures, only mask the symptoms even when they allay pain, while they too often exasperate the disease, rendering it both more violent and more obstinate. It also inculcates a salutary reserve in the return to animal food and fermented liquors. That under this simple treatment many would pass safely through the disease, there can be no doubt, although recovery would certainly be slower than it might be rendered. But cases continually occur in which this treatment would be utterly inadequate, the febrile action maintaining its ground, and the local inflammation migrating from joint to joint, notwithstanding the diligent employment of all the means which Sydenham's practice in the disease comprises. In this practice one great deficiency is observable, the use of purgatives in aid of bloodletting not being at all enjoined. For regulation of the bowels clysters of milk

and sugar are trusted to, and not until eight days after the last bleeding is a gentle purging potion prescribed. In this and other respects, later experience has added much to our means of combating acute rheumatism.

When this disease occurs in its most active state, the means suited for reducing plethora, abating fever, and checking the progress of inflammation, must be promptly and adequately employed; full bloodletting and active purging, with the united powers of colchicum and antimony, being required to lower the circulation and arrest the evils which inflammatory action when unrestrained is sure to occasion. The first procedure in respect both of time and importance is bloodletting. In many instances the use of this directed by Sydenham would suffice, but in many it would fail. As a rule of practice, therefore, Sydenham's directions in this respect are defective, as not embracing conditions of disease which are of frequent occurrence, and for which the depletion directed by him would prove utterly inadequate. Indeed, no express rule in this respect could be laid down, both the amount and frequency of venesection being in every instance dependent on the degree of plethora existing, the activity of fever and inflammation present, and the natural powers of the constitution to be acted on. The pathology of inflammation, and the use of bloodletting most effectual for subduing it, have been so amply discussed in the articles Gout and Plethora, that to recapitulate what has been already advanced on these points must be needless. We shall proceed, therefore, on the presumption of the principles inculcated in those articles being clearly comprehended, and in conformity with these principles state practically how the lancet can be most successfully used. In ordinary cases the loss of twelve, sixteen, or twenty ounces of blood may suffice to check disease and prepare the way for the subsidiary treatment. But if absolute plethora be considerable, inflammatory action high, and the constitution robust, blood must be drawn to much greater extent if adequate impression is to be made on disease. In such case the rule should be not to abstract any assigned quantity, but to carry the bloodletting to the extent of making a sensible impression on the force of circulation. Thirty or forty ounces of blood may require to flow ere this is effected, and so essential is the impression alluded to, that even large bleedings, if not carried to this extent, will fail to produce their full effect in restraining inflammatory action. It continually happens in cases of active inflammation, that notwithstanding the loss of thirty or forty ounces of blood, the pulse does not yield, but maintains its hardness, while the abstraction of a few ounces more, by inducing a disposition to syncope, completely checks the inflammatory action and abates the violence of the disease. By making the constitutional powers the measure of the depletion, less bleeding on the whole is needed; thus by this mode blood is virtually saved and unnecessary exhaustion prevented, a single venesection carried to the necessary extent being far more effectual than reiterated bleedings to a far greater aggregate amount, if these be respectively of insufficient extent. Bleeding to actual syncope is not desirable, but if inflammation be high, some impression on the pulse should be manifested. If this begin to falter, while nausea is felt, the lips grow pale, and perspiration begin to bedew the forehead, such bloodletting may be relied on for accomplishing all that this remedy is capable of effecting. This use of the lancet, however, can only be required where severity of symptoms with vigorous habit demands such active treatment. In a large proportion of cases much more moderate depletion will suffice. From twelve to twenty-four ounces of blood may be regarded as the ordinary limits, and many repetitions are never advisable; for when bloodletting to such extent, assisted by purging and other febrifuge treatment, does not make sensible impression on disease, other more adequate means of arresting its progress must be resorted to. Blood may be drained away until the body is blanched and the crassamentum reduced to a tithe of its just proportions, yet febrile action will continue, inflammation be unsubdued, and the blood drawn be still buffed and cupped.

It is right to mention here, that although a full and hard pulse is generally attendant on acute rheumatism, yet the absence of hardness is no evidence of active inflammation not being present, or of bloodletting not being needed. If the general symptoms concur to indicate inflammatory action, then, though the pulse be soft and compressible, bloodletting is nevertheless essential, the blood drawn in such case being almost uniformly buffed and cupped, the pulse rising after venesections, and disease more rapidly subsiding.

The next measure is to purge freely the stomach and bowels; and here again we must refer to what was formerly advanced on this subject in illustration of the necessity of suitable and adequate purging being employed in aid of bloodletting. As soon as may be after bloodletting, a full dose of calomel combined with antimony (either James's powder or tartarized antimony) should be given, and in a few hours after a cathartic draught. The bowels being well evacuated, diaphoretic salines with antimony and colchicum contribute much to allay fever, quieting the pulse, and promoting the several excretions.

One of the best forms of saline for this purpose is a combination of acetate of ammonia, camphor mixture, antimonial wine, and wine of the colchicum seeds, as in the following formula:

℞. Liquor. ammon. acet.
Mist. camphoræ, *aa* ℥ß.
Vin. sem. colch.
Vin. ant. tart. *aa m.* xx.
Syrup. aurant. ℥i. *m.* fiat haustus quartis vel sextis horis sumendus.

The properties of colchicum and the best modes of administering it have already been so fully discussed in the article Gout, that to avoid needless repetition, we shall refer to

what is there stated. It is only necessary to remark that the effect of colchicum on the bowels requires to be watched, for when it irritates them so as to excite active purging, its use must be discontinued. In our early trials of colchicum in gout and rheumatism, we were accustomed to give it in full doses, but, for reasons already explained, we have for many years discontinued them, the salutary effect of the remedy being fully attainable from the more moderate exhibition of it which has just been prescribed. When the use of it irritates the bowels, producing frequent watery stools, discontinuing the colchicum suffices in general for the relief of this disturbance; but should it continue troublesome, moderate doses of Dover's powder are sure to allay it. It has been surmised that the use of colchicum has through irritation of bowels led to ulceration of their mucous membrane, but this effect we altogether distrust. It must be a very rash use of the remedy which could produce any such effect, and where it has appeared to result, our persuasion is, that the membrane was in an advanced stage of sub-acute inflammation ere the colchicum was exhibited. We have given colchicum freely and extensively for many years, with caution certainly, though not greater than is required in the administration of every active drug, yet a single instance has never occurred to us in which we could trace any injury to its use, while its medicinal properties have rendered valuable aid, not only in gout and rheumatism, but in many other inflammatory diseases.

As the extent and repetition of bloodletting must depend on the activity of disease and vigour of constitution, so must the use of purgatives be regulated by the condition of the bowels, and the necessity for purging which the stools may evince. So long as these are dark, slimy, fetid, and otherwise unhealthy, must purgatives be used; and the most effectual are those by which the morbid secretions of the alimentary canal are evacuated. Pills of colocynth, calomel, and tartarized antimony should be given at intervals, and, if necessary, cathartic draughts should be interposed. When fever declines, and the stools present a more healthy appearance, milder aperients will suffice. Under such treatment low diet and a cooling regimen are indispensable. Barley-water or toast-water is quite sufficient during the inflammatory stage. Animal food and fermented liquors of every kind are prejudicial, and should be carefully withheld.

The several means now pointed out will in many instances suffice to allay fevers, remove inflammation, and restore health. But cases occur in which neither fever nor inflammation can be thus subdued. If active treatment be not resorted to on the first accession of disease, or if it be not urged to the requisite extent, inflammatory action acquires an inveteracy which simple antiphlogistic treatment is quite unable to correct. In such circumstances bloodletting may be pursued until the patient become nearly exanguious, yet the blood will still be buffed and cupped, febrile action will remain unsubdued, and local inflammation continue to disorganize and cripple the joints.

Even in milder cases of this kind, although permanent injury may be averted, and perfect recovery ultimately ensue, yet the successive migrations of local inflammations prove harassing to both patient and practitioner. We have seen such inflammation traverse almost every joint of the body, attacking several a second and a third time before the disease yielded. When the progress is favourable, each successive inflammation becomes slighter, until towards the close a mere blush of redness marks the morbid effort.

But this course of proceeding is at best tedious and unsatisfactory, even where an issue so favourable as has just been mentioned is attained. Such result, however, is not to be relied on; for in the form of disease now considered, it will more frequently happen that unsubdued fever will exhaust the general powers, and inflammation inflict its ravages on the joints, producing effusion, thickening of ligaments, with enlargement, rigidity, or contraction. When, therefore, one or two full bloodlettings, assisted by purging, abstinence, and other means, fail to make adequate impression on the disease, it becomes necessary to call in other aids in order to prevent the exhaustion and other ills which repeated bloodletting would occasion. And fortunately one exists which is worthy of our fullest confidence. This is mercury, which, when judiciously administered and made subsidiary to bleeding and purging, is capable of subduing rheumatic inflammation with as much certainty as attaches to the operation of any remedy in any disease. The practice of arresting the progress of rheumatism by means of mercury has been before the public sufficiently to have made it more generally known and more justly appreciated than it appears to have been. It originated with Dr. Robert Hamilton of Lynn Regis, who published, in the Medical Commentaries of the year 1783, an interesting account of the success with which he had administered calomel and opium in the treatment of several inflammatory diseases. So far back as the year 1764 he had been induced to employ calomel for the cure of hepatitis. Its efficacy in the disease and in several other inflammatory affections led him to extend his views of its applicability, and to conceive that it was a suitable remedy for inflammation in whatever viscus or tissue this might be situated. He accordingly employed its aid with the best effects in inflammations of every part, and particularly in acute rheumatism. His practice in the latter was to take blood in proportion to the violence of the inflammatory symptoms and to the age and constitution of the patient; after which he exhibited calomel and opium at suitable intervals until the disease yielded, or until the influence of the remedy on the constitution was evinced by increased secretions from the salivary glands, bowels, or skin. If in twenty-four hours after the use of mercury was commenced, relief did not ensue, or if inflammatory symptoms continued unabated, he bled again, and gave the

calomel more frequently. Salines, antimony, camphor, and other auxiliaries were combined with bleeding and mercury, and through their united agency he found disease subside with a promptitude which no other mode of treatment could command. When this treatment was employed early in the disease, recovery was soon accomplished; if postponed to a later period, its effects were more tedious and uncertain. His experience also taught him that the curative process was most favourable when the salivary glands became affected by the medicine. This brief account of Dr. Hamilton's rational and effective practice in rheumatism embraces so many essential points of the treatment of this disease, that we shall have little to add save the detailed instructions which the young practitioner may need for conducting that treatment with discrimination and effect. In confirmation of the truth and accuracy of Dr. Hamilton's views, we may here remark, that having for five-and-twenty years pursued the practice and applied the principles which he inculcates, our faith in them has never wavered, and that with ample opportunities for subjecting them to the test of experience, we can truly say that we know of no fact in medicine better established than the power which mercury possesses of subduing inflammations, when used as subsidiary to bleeding and purging.

Every case of acute rheumatism does not require mercury for its cure. Bleeding, purging, abstinence, and salines, with antimony and colchicum, will frequently suffice. But if, after twenty-four hours, the early discipline has not produced sensible effect on the disease; if after this period fever continues unabated, inflammation unallayed, and further bloodletting be required; as obstinacy of disease is here sufficiently announced, it is expedient to lose no more time, but to resort to the only means by which an adequate check can be given to the malady.

Profuse use of mercury is not needed; both the amount of dose and frequency of exhibition must be determined by the circumstances of the particular case. Although it is desirable to obtain evidence of the constitution being affected by the remedy, so far as tenderness of gums indicates, it is not expedient to produce this effect very speedily, and there are many reasons for enjoining caution in the administration of this medicine. It is not necessary to urge on its full operation, for the curative effect commences ere the specific action on the salivary glands appears. Unless the plethoric state of constitution, too, be adequately relieved by depletion, there is considerable risk of pressing the use of mercury. On this subject we must once more refer to what has been already advanced respecting it in the article Plethora. The susceptibility of impression from mercury, too, varies greatly in different persons, so much so, that while some cannot be salivated by any quantity, a few grains of calomel will in others induce severe ptyalism, with inordinate swelling of the jaws and extensive sloughing. On every account, then, it is advisable to incline to the minimum quantity capable of acting on the disease. The expediency of combining opium with calomel, when exhibited for this purpose, admits not of question. When thus conjoined, it allays pain, abates irritability, prevents the calomel passing off too quickly by the bowels, and promotes its more certain absorption. In general, two grains of calomel and a quarter of a grain of opium is a sufficient dose, and the frequency of its exhibition will be best guided by the severity and threatened obstinacy of the attack to be combated. In severe cases it is beneficial to commence with five grains of calomel, one of opium, and one of tartarised antimony at bedtime, and to pursue the course the next day with the smaller dose. In mild cases it may suffice to give this night and morning; to administer it thrice a day is no inactive practice, and by this use the gums will in general soon become affected. Given every six hours, so that, in the four-and-twenty, four doses are taken, is perhaps the frequency that will most commonly be needed. We have never had occasion to enlarge the dose, nor to exhibit it oftener than every four hours; but to this extent we have been occasionally compelled to employ it. The cases, however, requiring this active use of it are rare. The circumstances to guide its use are the curative effects on the constitutional and local symptoms, and its specific effects on the salivary glands, bowels, and skin: if any of these be signally induced, the use of it should abate, and the intervals of its exhibition be lengthened. Unless active salivation take place suddenly and unexpectedly, it is never expedient to withdraw it wholly so long as fever lurks or inflammation keeps its ground. The best practice is to lengthen the interval, and to do this progressively by reducing the employment from four times a day to three, then to twice, and finally to continue a single dose daily for a short time. By this cautious proceeding, if bloodletting be adequately practised, the bowels freely purged, and no error in diet committed, the beneficial effects of mercury may be ensured without any risk of injury and scarcely of inconvenience. Should salivation chance to advance beyond what would be wished, the evil is but a slight counterbalance to the benefit which mercury confers in the case of this most painful and disorganizing malady. When the mouth becomes painfully affected, we may here remark that saline purges abate the distress, and that gargles of chloride of soda or of nitrate of silver have considerable power in allaying the morbid sensibility of the gums and tongue which is sometimes experienced. There are constitutions on which mercury acts so unfavourably, producing great derangement of the nervous system, that its use cannot be borne. When such sinister effects occur, its use must of course be abandoned; but such instances are not common, and when they do occur, we strongly suspect that neglect of early depletion is more in fault than any idiosyncrasy inimical to the remedy.

While mercury is exhibited in the way directed, the salines formerly prescribed should

be continued, and occasional purges should be interposed. The use of the latter should be regulated by the degree of fever and the state of the stools. If fever continues high, with a dry tongue and costive bowels, or if the stools be very dark and slimy, purgatives must be the more freely used. When the bowels are unusually torpid, it is often expedient to substitute for the diaphoretic saline a solution of sulphate of magnesia in rose infusion, giving this at such intervals as shall keep the bowels free. It is generally conceived that purgatives impede the constitutional operation of mercury, and in consequence, when this operation is the object in view, purgatives are usually withheld. Without discussing this point, we shall merely observe that if the degree of fever or the foulness of bowels demands purging, it should be carried to the full extent required, without regard to its supposed interference with the effects of mercury. Under such circumstances greater injury would result from the neglect of purging, than even the unimpeded action of mercury would compensate.

There are cases in which it is not expedient to combine opium with the calomel, but they are rare. If headach prevail,—if the tongue, instead of becoming moist and clean, grow parched and dark, and the skin be hot and dry,—opium should be withheld, and the calomel given either alone or conjoined with James's powder.

The progress of recovery and the experience of a few cases thus treated will readily guide the practitioner in that adaptation of remedies to the exigencies of each case which no specific rules could prescribe. He who possesses himself of the principles on which the treatment here directed is founded, will commit no error in the extent or duration to which he may carry it.

There is a period, however, in the progress of rheumatism, even when actively and judiciously treated, which calls for something more than has yet been enjoined. In a large proportion of cases, the treatment now prescribed will fully suffice. It will subdue fever, remove local inflammation, prevent disorganization of joints, and restore the patient in moderate time to health and the free exercise of limbs. But it occasionally happens that notwithstanding the full employment of all the means directed, a certain degree of fever lingers, the skin continues dry with some morbid heat, the tongue too white, and pains of acute character are still felt in the joints. When this state first met our view, so completely did the assemblage of symptoms simulate active inflammation, that we hesitated whether there was not an actual relapse of disease, and a necessity for reverting to active remedies. But the indecision was of short duration; for assured by the treatment already pursued, and the effects produced by it, that inflammation had been successfully combated, we could not regard the supervening state as corresponding in its nature to that which we had already corrected, and instead of recurring to bleeding and mercury, we made trial of bark as a preferable agent, and with such benefit, that we have seen it remove, in twenty-four hours, the whole train of symptoms which we have just mentioned. Half a drachm of bark with ten grains of nitre is the combination on which we most rely, giving this twice or thrice a day; and so effectually does it answer the purpose that we are slow to change it. What we have now stated may serve to explain the confidence with which some writers have advocated the use of bark as almost a specific in rheumatism. There is undoubtedly a stage of the disease in which it may be beneficially given, but in the acute stage, to which we have hitherto chiefly referred, we at least would not compromise the patient's safety by trusting to bark, while bleeding, purging, and mercury were applicable; and even in what is called chronic rheumatism we would as little rely on it so long as plethora was unrelieved, the pulse high, the bowels loaded, and active fever predominant. When the general state of constitution is restored to the proper balance of its several functions, should some febrile indications linger, and pains continue to infest the joints or muscles, bark furnishes then a valuable and unexceptionable means of correcting the slight remnant of disease, but not before.

The cure of rheumatism by profuse perspiration has fallen so much into disuse that it can hardly be necessary to notice it. Yet it was held in high estimation not many years back, and very generally deemed the most effectual mode of treatment. The late Dr. Gregory, in his lectures, used to represent sweating as the evacuation most to be relied on for the cure of rheumatism, and to bear his testimony to its efficacy. He gave a caution, however, against resorting to it until the pyrexia had been abated by bloodletting, and stated that his test was, never to employ it until the pulse was reduced to 100. The chief agent was Dover's powder, given in doses of ten grains every two or three hours, assisted by warm covering and copious diluents, the latter to be used only when the perspiration commenced. To be effectual, this required to be kept up for forty-eight hours. This practice has, we believe, been very generally, and, as we think, judiciously, laid aside, the treatment recommended in the foregoing pages being far more certain and effectual, producing less exhaustion, and leaving less susceptibility to recurrence of disease.

We have hitherto treated chiefly of constitutional disorder, and have considered the local inflammation only so far as it was connected with or dependent on the constitutional state. It is necessary, however, to scrutinize the local affections still further. So directly is the local disturbance dependent on the constitutional in the incipient stage, that if the latter be promptly and vigorously treated, the former will very speedily subside without any local treatment being needed. We have seen the local inflammation thus subside in rheumatism equally as in a first attack of mild gout, leaving as little trace of its visitation. It must be admitted, however, that such speedy decline is not the

general character of this local affection. Notwithstanding the abatement of fever, some pain, heat, and swelling will continue to affect the joint for a longer or shorter time, and in order to understand the treatment which this requires, it is necessary to bear in mind what was formerly stated respecting the change of character in the local inflammation. If on fever becoming subdued by the means directed, the local inflammation declines, no topical treatment whatever is needed, nor is it expedient that any should be resorted to. Decline of inflammation thus obtained affords conclusive evidence of disease being arrested at its source, and relapse need not here be apprehended; while, if the local inflammation be checked by topical remedies, its abatement affords no such assurance, and if the constitutional derangement be not thoroughly rectified, repeated renewal of the local inflammation with successive migrations from joint to joint will most probably ensue. But independently of this consideration, there are other objections to the early use of topical remedies which ought not to be overlooked. Repellent applications may remove inflammation from any particular part; but only to transfer it to some other, if not to the heart, stomach, or other internal organ. Local bloodletting would beget less danger of this kind, but neither is it free from objection. The inflamed part is ill suited to sustain the operations by which blood can be abstracted. We have seen leeches when applied to a rheumatic joint prematurely and without sufficient regard to the constitutional state, exasperate every symptom, and cause increase of inflammation both in the skin and cellular membrane, ending in extensive sloughing, with troublesome ulceration, and followed by thickening of the ligaments with rigidity and contractions of unusually obstinate kind. So long as it is possible, therefore, to procure decline of local inflammation by the constitutional treatment, we consider it the better practice to abstain from topical remedies.

When inflammation continues in the joint, however, after fever has been sufficiently subdued, thus manifesting its having passed into what we have distinguished as the secondary state, it then becomes necessary to regard it as a local disease, and by appropriate topical treatment to avert those ravages which its continuance would occasion. The means are cupping, leeches, warm fomentations, poultices, cold lotions, modified according to the degree of inflammation, the sensations of the patient, and the effects produced. By such means, the local inflammation in this its secondary state may be so corrected as to prevent organic lesion, and preserve unimpaired the mobility of the joint.

We would here impress, as we formerly did when treating of gout, the importance of an early renewal of motion in the affected joints, as indispensable for re-establishing their health and preserving their flexibility and power. From neglect of this, much protracted confinement and ultimate decrepitude continually result. On the subsidence of inflammation, the parts so lately disturbed are indisposed to motion, and some pain attends the early attempts at its removal. Yet leaving them at rest is not the means by which the power of motion is best restored. Exercise of the parts is necessary not only to restore those which have been morbidly affected to their healthy functions, but to preserve in due energy and activity the muscular apparatus by which they are moved. By exercise healthy circulation is maintained, effusion prevented, absorption promoted, and flexibility preserved. By it, too, the muscles subservient to the motions of the joint are kept in a healthy and efficient condition. When, from too great apprehension of exciting pain or renewing inflammation, quiescence is too long continued, the ligaments and other parts surrounding the joints become rigid; if these be kept bent, contractions take place, and the mobility of the part becomes permanently impaired; while the several muscles, from want of exercise essential to the maintenance of their nutritive and healthy actions, progressively waste and lose power. This latter contingency is, we are persuaded, much more frequently owing to the continued inactivity to which the muscles are consigned than to any morbid action induced in them by the disease; and as we before observed, so satisfied are we of the mischiefs resulting from long-continued rest after rheumatic inflammation, that we would in our own person much rather hazard any renewal of inflammatory attack, than suffer those derangements to proceed which spring from a state of inaction too long continued.

What remains to be said respecting acute rheumatism, and the sequelæ occasionally left by it, will be more properly noticed in the division of the subject which treats of the chronic form of the disease, to the consideration of which we shall now proceed.

II. Chronic Rheumatism.

It would simplify the consideration of this form of the disease, if it were limited to that morbid condition to which analogy with the acute affection discussed in the foregoing pages would justify the name of rheumatism being applied. So many and various, however, are the derangements loosely classed under this generic term, that to give any history of the disease which should comprise the whole, would present a mass of confusion, if indeed it were not utterly impracticable. It has been too much the practice to pronounce as rheumatic every chronic pain of which the nature is obscure, or to which no other specific character is assigned. Practical writers have not overlooked this tendency; it is noticed by Heberden in the following very expressive passage: "Multi dolores quibus nomina nondum propria imposita sunt, quamquam inter se distent, ex causis longe diversis orti, tamen ad rheumatismum pariter referuntur." In order to ensure as much clearness as possible in the following observations, it will be expedient to commence with that modification of disease which, presenting all the essential characters of rheumatism, differs from the acute affection already

treated of only in being less violent in its symptoms, and of longer duration. The distinctive characters of this malady are a febrile state of the general system, with more or less of pain and swelling in certain tissues and joints. And in this, precisely as in acute rheumatism, the continuance of febrile action undermines the general health, while the local inflammation, however indolent, disorganises the joints, occasioning eventual decrepitude. The pain and swelling of joints with progressive thickening of the ligaments, and effusion in the several bursæ, sufficiently evince the morbid actions from which such effects result. But, coincident with these will generally be found in the instances now referred to, evidences of constitutional derangement sufficiently marked to denote that a plethoric and febrile state of the circulation is also present. A quickened pulse, some increased heat of skin, and a furred tongue, are in greater or less degree the invariable attendants of chronic rheumatism of the joints so long as the disease in them continues to advance. It, no doubt, occasionally happens that in the course of time all febrile symptoms disappear, and the morbid action in the joints ceases to make further ravage. In such cases there is no longer rheumatism, but only the disorganization produced by it; and the distinction is important, for where such ravages alone remain, so far as they are concerned, constitutional remedies can be of no avail, and any treatment, to be effectual, must have special reference to the local lesions by which the free motion of the limbs is impeded. In the larger proportion of cases, however, the disease is strictly rheumatic, that is, it consists of a constitutional derangement having a febrile character, and of a local inflammation seated in the joints. This condition may be, and frequently is, the sequela of acute rheumatism; but it may be fully formed without any particularly acute attack having preceded. Cullen regarded it in the former light, as appears from his definition of arthrodynia being introduced as "rheumatismi sequela." In the definition itself he somewhat incongruously represents this as ensuing to violent sprains and luxations, though why the pains resulting from such accidents should be deemed rheumatic it is difficult to imagine. In this definition, too, which ought to embrace every form in which chronic rheumatism presents itself, he states somewhat too positively the absence of fever and of swelling,—"pyrexia nulla, tumor plerumque nullus;" characters which do not apply generally to the disease, and which seem to have been introduced as an antithesis to the definition of acute rheumatism. This imperfection obliged him, when treating of chronic rheumatism, to enter into explanations rather at variance with his own definition, and in the following passage he describes more correctly and intelligibly the transition of the acute into the chronic stage. "The limits between the acute and chronic rheumatism are not always exactly marked. When the pains are still ready to shift their place,—when they are especially severe in the night time,—when at the same time they are attended with some degree of pyrexia, and with some swelling, and especially with some redness of the joints, the disease is to be considered as still partaking the nature of acute rheumatism. But when there is no degree of pyrexia remaining,—when the pained joints are without redness, when they are cold and stiff,—when they cannot easily be made to sweat, or when, while a free and warm sweat is brought out on the rest of the body, it is only clammy and cold on the joints,—and when especially the pains of these joints are increased by cold and relieved by heat applied to them, the case is to be considered as that of purely chronic rheumatism." If the character of chronic rheumatism is to be derived from the most numerous and predominant instances, then we would say that the former of these descriptions is far more applicable to the disease, as generally met with, than the latter; for though all the phenomena recited as indicating the continuance of febrile and inflammatory action may not attend, it rarely happens that some or other of them are not present. As the former condition is capable of indefinite duration,—for it may endure for years, and is hence strictly entitled to be called chronic,—it could not, where any distinction were made, be classed with the acute disease lately treated of; while, if it constitute any part of the chronic malady, a definition professing to characterise this ought assuredly to embrace it. Perhaps the more perfect representation of the disease, if it be necessary or beneficial to make any such distinction, would be to include both descriptions under arthrodynia, subdividing this into sthenic and asthenic. In this view the sthenic arthrodynia is by far the most frequent form in which the disease presents itself; and, what is no less important, it is that which, if unrelieved or improperly treated, is productive of the greatest mischief and of most distressing results; for under it the disease both local and constitutional, however indolent it may appear, is yet sufficiently active to continue and extend its peculiar ravages, deranging the general health, enfeebling and crippling the body through progressive disorganization of joints, and consequent wasting of muscles. In the asthenic form, the mischief is already done, and, however the body may suffer under the ravages sustained, there is no longer the active constitutional derangement inflicting further injury, which forms so essential a part of rheumatism. In the latter form there is little to do but support the general health, and remedy, as far as may be, the local lesions. But sthenic arthrodynia both admits of and demands more corrective treatment, the judicious, discriminating, and persevering use of suitable remedies being capable of accomplishing much, both in renovating health, and restoring power of motion to the still inflamed though rigid and contracted joints. With the consideration of this form we shall now proceed.

It is a prevailing impression that a chronic disease cannot be inflammatory. How this originated it is needless to conjecture; but,

however the misconception arose, it is a familiar truth that the term chronic conveys to most minds not the simple idea of duration, which alone it expresses, but something the opposite of inflammatory; some state to which the treatment proper for inflammation cannot be applicable. The pure chronic rheumatism of Cullen, as described in the foregoing extract, is unquestionably of this latter character; but as the disease comprises, in addition to this, the subacute or sthenic condition also noticed by him, it is necessary to understand the term chronic, when its application is thus extended, in that restricted sense alone which rightly belongs to it.

Practitioners who are accustomed to regard chronic rheumatism as asthenic, and to treat it accordingly, are little aware of how long a decidedly inflammatory character may attach to it. Years may elapse, yet a distinctly febrile state, indicated by its appropriate phenomena, prevail, accompanied with evidences of disorganizing inflammatory action on the joints. And so long as this state endures, is there progressive deterioration of general health, and increasing structural derangement of joints. It gratifies the writer of this article to see this fact unequivocally stated by Dr. Elliotson, in his excellent clinical lectures delivered at St. Thomas's Hospital. He acknowledges the inflammatory character, and also the great length of time for which this may be retained, specifying this form of rheumatism as active in contradistinction to the term acute, which in its strict sense could not apply to it. The same character was long ago indirectly recognised by Sagar, when, in his definition of chronic rheumatism, he stated the blood drawn to exhibit a buffy crust. In this form, however subdued the symptoms may be, the characteristics of rheumatism, as they have been exhibited in the acute disease, are distinctly traceable. There is a febrile state of the general constitution, and more or less of inflammatory action in the joints; and the principles of treatment are precisely similar, though they require to be modified in their application so as to adapt this to the derangements, both constitutional and local, which need relief. It will assist in comprehending the real nature of this form of the disease to bear in mind what was formerly stated in treating of relative plethora. Certain delusive appearances were then noticed, as misleading practitioners from a right conception of the state of circulation or condition of health existing; and to similar delusions has it been owing that the febrile character of active or sthenic arthrodynia has been so frequently overlooked. An apparently feeble and compressible pulse induces the persuasion of debility; the enfeebled powers of the body sanction the conclusion; and relief is sought from a class of remedies which, in such case, cannot give other than transient relief, if, indeed, they do not aggravate every symptom. Were we sure that the doctrines of plethora formerly illustrated were rightly understood, we could at once close the discussion of the constitutional state prevailing in sthenic arthrodynia, by representing it briefly as that of relative plethora. It differs from the condition formerly described as relative plethora, only in having the local inflammations with their consequences superadded. In order to determine accurately this state of constitution, it is necessary to judge, not from any one indication, but from that assemblage of evidences which, when collectively present, cannot mislead. The pulse, if alone trusted to, may deceive, at least where the practitioner is not on his guard against the delusive lowness of pulse which belongs to incipient plethora, or is unacquainted with the peculiar changes which the pulse undergoes when the congestive state is passing into that of febrile action. Though apparently low in force, it yet evinces some resistance to pressure, and is more or less quickened; the skin, too, is hotter than natural, and the tongue is white and furred. The gastro-intestinal membrane will also be found charged with redundant mucus, such as it generally secretes under febrile action. When all these phenomena are present, and especially when they are accompanied by evidences of local inflammation in the joints, no doubt need be entertained either of the nature of the disease, or of the principles of treatment. In this form of disease, then, it is obvious that the indications of cure are in no respect different from those which have been already shewn as applying to acute rheumatism, namely, to subdue fever, and remove local inflammation. And the rationale of the practice suited for fulfilling these indications will be clearly perceived by those who have taken the trouble to comprehend the doctrines respecting the pathology of the circulation advanced in the article Plethora.

The constitutional state of sthenic arthrodynia bears the same relation to relative plethora that the acute form does to absolute; and in the principles of treatment laid down for the correction of relative plethora, with its concomitant disturbances, will be found the best guidance for conducting with precision and effect that of active chronic rheumatism. On the same principle as in acute rheumatism, it is the constitutional state which demands the first attention; for, unless this be radically corrected, all efforts to cure permanently the local ailments must fail, or be only of transient effect. In treating the constitutional disturbance, it is necessary to bear in mind that it is connected with relative rather than absolute plethora; that, consequently, the derangements existing are more complex, and that the practice must hence embrace considerations which it was not necessary to insist on particularly in discussing the acute disease. In acute rheumatism, active bloodletting was directed; the object being not only to reduce plethora, but to make speedy impression on febrile action, in order to arrest promptly the injuries which unrestrained continuance of this would occasion. In the more chronic form it is necessary to diminish plethora, but not equally so to make so speedy impression on

febrile action. This latter requires to be regulated, but not extinguished; for some increased energies of circulation are absolutely necessary for correcting the concomitant derangements of function produced by defective capillary circulation. To restore the impeded circulation of the capillaries, and renew the secretory and excretory processes of which they are the agents, seems to be the final cause for which febrile action is instituted; it is assuredly the end which it often attains, and hence, when natural fever fails to accomplish it, we are accustomed to institute an artificial fever through the operation of mercury to effect the purpose. This, however, is not to be forced; it requires time for safe and salutary progress: minute vessels long obstructed cannot be all at once rendered pervious and efficient for the discharge of functions long disused; and hence, in treating the febrile state of chronic rheumatism, the practice, though corresponding in principle with that of acute, must be much less energetic. Bleedings must be of smaller amount and at longer intervals; a free state of excretion must be moderately but steadily maintained; and mercury must be employed for that renewal of function in the capillary vessels and their secerning extremities, which the powers of the constitution, unaided by mercury, are inadequate to accomplish.

It will be recollected that in relative plethora the redundancy of blood results more from its imperfect appropriation than from absolute excess; and that correction of this state requires, not only that the larger vessels be relieved from the load which oppresses them, but that the aggregate capacity of vessels be enlarged by renewal of the suspended activity of the capillaries, and also by promoting the natural expenditure of blood through the several secretions and excretions. These are the curative effects of febrile action; they constitute also the beneficial operation of mercury on the system, and on regulating them conformably with the views here displayed will the success of medical practice in a great measure depend, not only in this but in many other diseases. In the diseased state now under consideration, the first object should be to relieve the oppressed circulation, and thus arouse the energies of the system by taking away some blood; and in conducting this part of the treatment, judgement and discrimination are so requisite, that, even at the hazard of being deemed unnecessarily minute, we must dwell on the several circumstances from which any guidance can be derived.

If, with the general evidences of plethoric oppression and febrile action, the powers of the constitution be very low, and the pulse very feeble, it may be advisable to suspend for a while direct depletion, and to trust to purgatives. It may, in such case, be even expedient to employ gentle stimulants in order to arouse the dormant energies, and enable them to bear direct bloodletting; this being the end to which the use of stimulants should in this stage be directed. The necessity for this degree of caution, however, is not of most frequent occurrence. Much more generally may the curative treatment commence with small bleedings; and in these it should never be forgotten that the object is not to make impression on the moving powers, but to withdraw a portion of the circulating mass, and this with a view of arousing the natural powers to the discharge of functions required for the re-establishment of health. Small bleedings here suffice; and the extent of six or eight ounces will best answer the end designed. According as power increases, larger bleedings will be borne; but beyond twelve ounces it is rarely necessary to carry them. In general, even the first portions of blood drawn will be buffed, if not cupped; and under such circumstances the pulse, if previously low, will be found to rise under bleeding. As was before remarked, a soft pulse is no contra-indication of bloodletting; for we continually find buffy blood and increase of power after venesection, where the previous softness and feebleness of pulse would, to unreflecting observers, appear to prohibit all direct depletion. This deceptive character of pulse is too often allowed to influence the practice even in acute rheumatism; yet it has been so often the subject of remark, that practitioners ought to be fully aware of it. Dr. Gregory, who in the treatment of acute rheumatism did not employ bloodletting indiscriminately, nor deem it essentially necessary, but who trusted rather to sweating as the preferable evacuation, used to acknowledge that he had been obliged to have recourse to bleeding after several weeks duration of disease, where he had at first been apprehensive of employing it from the smallness and apparent debility of the pulse; and that after bleeding the pulse rose and disease subsided. This is not peculiar to rheumatism, but a general fact connected with derangement of circulation, and worthy of attention in many diseases. The explanation of it has been fully and clearly given in the article PLETHORA; and if the principles there inculcated be duly regarded and discriminately applied, there will be little hazard either of bloodletting being withheld where it is needed, or of its being carried to any injurious extent.

Next to bloodletting, the most important evacuation is purging, which requires to be regulated both according to the degree of febrile action present, and to the state of the bowels as manifested by the stools. In proportion as fever is active will the free use of purgatives be required, and saline cathartics be needed in aid of those which more peculiarly deterge the mucous membrane of its morbid secretions; but so long as these continue dark, slimy, and unnatural, must suitable purgatives be assiduously employed. Pills of calomel, colocynth, and antimony, with occasional doses of sulphate of magnesia and senna, are the most effectual means of adequate purgation. According as active fever prevails, as evinced by a quick pulse, hot skin, and white or

furred tongue, salines with antimony and colchicum, assisted by antiphlogistic regimen, should also be conjoined.

If under this treatment febrile action does not speedily abate, and local inflammation subside, mercury will be required, and for purposes similar to those for which its use was directed in acute rheumatism. According as fever is active will calomel and opium be necessary, for the proper administration of which no further instruction can be here needed, it being only necessary to observe, that as the morbid actions requiring correction yield more slowly than in acute rheumatism, a more slow and cautious administration of the remedy is here expedient. The direct agency of the medicine is to excite freer circulation in the capillary vessels, by which the larger vessels become relieved, both through the increased capacity thus given to the vessels through which the mass of blood circulates, and the increased expenditure of blood in the several secretions and excretions thus promoted. Whoever bears these facts and principles in mind, will experience no difficulty in regulating the administration of mercury in this or any other disease.

In many cases, however, febrile action, though sufficiently manifested by its appropriate phenomena, is less developed than in those just referred to. The pulse is feeble and irregular, the several secretory and excretory functions are inactive, and the whole frame displays a deficiency of power. Here stimulants are needed, and the most effectual for arousing the dormant energies is mercury. The milder preparations in small doses, repeated at intervals, are what should here be employed. The compound calomel pill, blue pill, hydrargyrum cum creta, are the remedies chiefly in use where a slowly alterative effect is desired. In old and obstinate cases minute doses of the oxymuriate have effect when other preparations fail. When the latter is resorted to, decoction of sarsaparilla is beneficially combined. Whenever mercury is employed for such purposes, it is highly necessary to watch closely the state both of the circulation and of the bowels. If under its use the arterial system becomes excited, and the pulse rises, becoming full, hard, or resisting, blood should be taken; and as mercury, when so administered, promotes the intestinal excretions, these should be assiduously evacuated by suitable purges, which in such case serve the double purposes of removing from the intestines a source of irritation, and of maintaining the excretories in an active exercise of those functions which so materially assist the curative process.

Under the foregoing treatment part of the local inflammation will subside without any topical remedies being applied. But as these inflammations have long reached the secondary stage, and as local derangements, such as were formerly noticed, have become more or less established, the local treatment suited to the special circumstances of each case is here indispensable. According as the local inflammation presents an active character, cupping or leeches will be required; and by these, with fomentations, or with cooling and sedative lotions, much impression may be made. Blisters, too, in time, are of much effect, especially where the bursæ are loaded with glairy effusion, the ligaments thickened and rigid, and the whole joint enlarged. To these changes all the joints are liable; they peculiarly occur in the wrists, where they materially impede the motions of the hands, rendering the patients very helpless. These swellings, when accompanied with heat and redness, require leeching and cold lotions; otherwise, repeated blisters are the means by which the enlargement can be best reduced, the effusions absorbed, the ligaments attenuated, and the flexibility of the articulations restored. In the intervals of blistering, stimulant embrocations are very serviceable; and frictions, especially the kind of manipulation termed shampooing, are of much avail.

In the inveterate cases which continually occur in practice, it is not any one remedy that can be relied on. The combined agency of all is required, and they should be assiduously employed in such succession and alternation as enlightened judgement may direct. By a judicious and steady use of them many a case, apparently hopeless, may be restored to the enjoyment of good general health, and to considerable freedom of the affected limbs. Throughout the whole course of treatment warm bathing is signally beneficial, as is largely attested by the records and daily experience of the noble institution to which the writer of this essay is indebted for much practical knowledge—the Bath Hospital. It cooperates with the constitutional treatment to improve general health, promoting a free circulation in all the capillary vessels, and calling into renewed activity the highly important excretory functions of the skin, while its special effect on the pained and crippled joints is eminently salutary. For the latter purpose, pumping on the limbs, as it is termed, that is, directing against those affected a stream of tepid water, impelled with such force as to exert a mechanical influence on the part, is oftentimes a very powerful auxiliary. Even when general warm bathing is not admissible, this partial application of warm water may be used with much advantage for the relief of local ailments.

Subsidiary to these several means, one of the most effectual aids for restoring motion to rigid or contracted joints is the persevering endeavour to render them flexible by assiduous exercise; and the more this can be promoted through the appropriate muscles of the affected joints, the greater will be the benefit resulting; for the muscles previously wasted will thus recover bulk and strength, and through renewal of exertion will prove a most valuable instrument both in preserving and extending any power of motion that may be gained. Frictions and shampooing are a sort of passive exercise, and through this, as well as by promoting absorption and inducing a freer circulation in

the extreme vessels, their effect on enlarged or rigid joints is considerable.

But even where, from great rigidity and extreme muscular feebleness, the joints are incapable of being exercised by their own proper muscles, the advantage derivable from passive exercise is not to be despised. Frictions and shampooing may lessen rigidity, so as to give more effect to the feeble muscles in their languid efforts. When the wrist and finger joints are affected, the parties may materially benefit themselves by moderate but continually renewed attempts to move the joints of each hand by means of the other. The joints may resist for a long time, but this should not discourage, and the slightest renewal of mobility should be hailed as the sure harbinger of further improvement. It is needless to urge this further. The principles are obvious, the effects proved by ample experience; and at all events perseverance in such endeavours, however little it may in extreme cases accomplish, holds out to the rheumatic cripple the only hope of recovering mobility in joints rendered inflexible by the effects of rheumatic inflammation. Attempts to restore mobility in such cases by internal medicines alone, is worse than fruitless. They may correct constitutional derangements where these coexist, and, by restoring general health, prevent further mischief; but they can have no effect in renewing either mobility or power to limbs so affected.

It has been shewn that the secondary inflammation of acute rheumatism may survive the cause in which it originated. In like manner the local inflammation of chronic rheumatism may continue, although the febrile state which nurtured and aggravated it may have wholly subsided; and, further, the ravages of rheumatism in the joints may remain when all fever, as well as local inflammation, whether primary or secondary, has ceased to exist. Chronic rheumatism, therefore, may be said to present three conditions which deserve to be practically distinguished;—active fever with local inflammation;—inflammation unaccompanied with fever;—and structural derangements of joints unattended by either fever or local inflammation. Each of these conditions requires to be treated on principles applicable to its peculiar state; and any treatment adopted merely on account of its being specifically suited for rheumatism, must, if indiscriminately applied, be productive of much mischief.

There is another diseased condition often consequent to rheumatism, namely, a loss of nervous energy, which constitutes a modification of paralysis; but this demands a separate consideration, which belongs rather to paralysis than to the present subject.

The first condition of chronic rheumatism, or that which comprises both active fever and local inflammation, has been sufficiently discussed. The next in order is where the local inflammation, with the attendant pains and other derangements, endures after fever has subsided. This form also is of frequent occurrence, and it differs from the former in not requiring general bloodletting for its cure. Local depletion and occasional blisters constitute the principal topical treatment; and mercury with sarsaparilla and other such auxiliaries, is the chief agent for inciting the constitutional energies to cooperate in the cure. It is this form of the disease that has misled even intelligent practitioners into pronouncing that general bloodletting is not necessary in chronic rheumatism. Dr. Elliotson in his admirable clinical lectures has expressed himself of this opinion, and declared that he has relinquished general bleeding in active rheumatism, unless when some internal inflammation coexists. That in many such cases the treatment recommended by him, namely, local bleeding, colchicum, and mercury, will succeed without general bleeding, we are well aware; but we are no less assured that in very many it would prove very tedious, if not wholly fail. We consider, therefore, that Dr. Elliotson has stated this opinion somewhat too broadly; and that on reconsideration he will himself admit that the criterion for employing the lancet should be, not the presence of an internal inflammation, but such degree of plethora and febrile excitement as in itself demands direct depletion, independently of all coexisting local derangements. Topical bleeding, low diet, colchicum, and mercury, form a combination of influences which has great power in subduing febrile and inflammatory action; but if plethora exist to a certain extent, even their united agency will be insufficient, unless direct depletion be conjoined. And in such case it requires to be borne in mind, that, as has been already explained, the operation of mercury is not devoid of danger. When there is local inflammation without plethora or fever, the treatment recommended by Dr. Elliotson cannot be improved. Even where plethora and fever exist only in slight degree, it may also succeed, although the progress will be slower than when venesection is conjoined. But when plethora and fever exist to any extent, then, even though there be no internal inflammation, general bleeding ought unquestionably to form part of the treatment.

Chronic rheumatism has been sometimes distinguished into hot and cold,—the hot being the active rheumatism of Elliotson, the cold the arthrodynia of Cullen. In the last, various stimulants are of much avail, and for the relief of such disease they should undoubtedly be resorted to. It is to be hoped, however, that their misapplication to acute or to any active rheumatism as the appropriate remedies, has passed away, or is confined only to ignorant empirics. It illustrates the difficulty of adapting treatment explicitly to the name of a disease, or even to special degrees of it, that there are modifications of active rheumatism in which even stimulants, cautiously administered, are not only safe but beneficial; and this circumstance confirms the necessity of all medical treatment being regulated, not by express rules, but by those principles from which all rules ought to emanate, and to which they ought to be subservient.

It would be vain to enumerate the various

stimulants which have obtained character for the cure of cold rheumatism. The principal are essential oils drawn from resinous substances, such as turpentine; various balsams and gum-resins; the latter either in substance or in simple or ammoniated tinctures; sudorific decoctions; electricity. Any of these may benefit according as the general constitution is prepared for their operation, or as the special ailments may require. If there be no plethoric or febrile state present, their use will at least be harmless, if not beneficial; but should the case be such as to need depletory treatment and the operation of mercury, then must the use of such stimulants as are now named be watched with great caution.

Warm bathing and active exercise are among the unexceptionable and most powerful means of relieving chronic rheumatism. The local treatment formerly directed for the sequelæ of acute rheumatism also requires to be assiduously employed.

There are some affections generally regarded as rheumatism, which, however connected with rheumatic, seem to depend chiefly on a morbid condition of particular nerves. Of this kind are *sciatica* and *lumbago*, both of which differ so much in their symptoms from acute rheumatism, as scarcely to admit of their being classed under it. A mere error of arrangement, however, is of little consequence, as the same principles of treatment apply to all. If the state of constitution be such as to require for its correction bleeding, purging, colchicum, and mercury, these remedies must be employed, else the local affection will not readily yield. That sciatica arises from some lesion of the sciatic nerve or its investments, most practitioners are agreed. That this lesion results from a primary congestion or inflammatory action, seems evidenced both by the whole train of symptoms, and by the treatment most successful in giving relief.

When there is only the local affection to treat, repeated cupping or leeching, and blistering, with the warm bath, and a cautious return to exercise, will do much to effect restoration. Stimulant and sedative embrocations too, are occasionally of service.

In lumbago, though the spinal nerves affected are less distinctly indicated, yet the character of the pain marks it as more neuralgic than rheumatic. Free cupping and the general treatment of acute rheumatism will best succeed in relieving this disease.

But there is a form of neuralgia occasionally attendant on rheumatism which causes much suffering, and which does not seem to be generally understood. It occurs in paroxysms of great intensity, attended with a severity of pain which few can patiently endure. This may arise ere the febrile state has thoroughly subsided; and this circumstance is apt to mislead, for a continuance or removal of inflammation is thus apprehended, and depletory treatment is pursued, under which the disease is aggravated instead of relieved. The character of this affection is best denoted by the suddenness of the painful accessions. The nature of the pain, too, so different from that which attends inflammation, seems to distinguish it. For this affection the most certain and effectual remedy is iron; but it must be largely used, and assisted, if necessary, by full doses of opium. The carbonate is the best preparation, and this should be given in doses of two drachms three or four times a day. By administering it with equal parts of treacle, as directed by Dr. Elliotson, its constipating effects are obviated. Should opium be required, it should be given in full doses, and the best preparation for the purpose is Battley's sedative solution, of which from thirty to ninety minims may be given at bed-time without any sinister effect resulting. Under this treatment it may be necessary to purge occasionally with the common senna draught, which is sensibly improved by the addition of half a drachm of spirit of ammonia.

In the progress of rheumatism the chest is apt to become affected with pain and great dyspnœa, the distress being referred to the lower part of the chest, and described as if the point of the sternum were drawn back to the spine. This arises from the extension or translation of rheumatism to the diaphragm. The means of relief are bleeding, purging, and colchicum, with calomel and opium. So soon as the gums are touched the distress finally ceases.

One of the most important affections connected with rheumatism is that in which the heart or its investments becomes the seat of rheumatic inflammation. This inflammation may be of the most acute kind, constituting complete carditis or pericarditis; or it may be only such increased action of bloodvessels as ultimately leads to hypertrophy. For the acute attack the most active treatment is required; full bloodletting, purging, antimony and colchicum, but above all the early and decisive operation of calomel and opium. If the latter be not speedily and effectually obtained in subserviency to bloodletting, this will be required to such extent as to render recovery extremely doubtful, sink greatly the powers of life, and occasion a very tedious convalescence. Some interesting cases of rheumatic pericarditis have been recently published by Dr. Davis, the senior physician of the Bath hospital. He seems, however, to have trusted to general antiphlogistic regimen, without calling in the aid of mercury. The principles advocated in this article display the merits of mercury as an adjuvant; and the experience of the writer fully confirms their truth and practical utility. But independently of this acute seizure there is continually found in connexion with rheumatism inordinate action of the heart, with evidences of actual enlargement or hypertrophy of that organ. The treatment of this affection, we can from much experience say, is best conducted on the principles inculcated in this article. Moderate bleedings are indispensable, the blood being almost invariably buffed and cupped. In judging of the state of circulation, the pulse at the wrist would mislead, for it may be soft and compressible even when the action of the heart is tumultuous. The carotid should here be examined as furnishing a more certain criterion.

Free bowels and antiphlogistic discipline are indicated by the same necessity which calls for abstraction of blood. Mercury with opium is also required to produce its specific effects, by which alone the morbid action can be effectually or permanently subdued. The use of this requires to be cautiously conducted, for its slowest operation is that which is here most beneficial. The morbid condition is generally of slow formation; the changes wrought are not of a nature to be suddenly rectified; and attempts to accelerate the case beyond what nature permits, would beget mischief and lead only to disappointment. Cupping and leeching over the heart are valuable auxiliaries, and blisters are occasionally needed.

In fine, when inflammation both general and local is allayed, and the action of the heart still continues inordinate, or is too easily excited, the application of belladonna to the side, in the form of plaster, affords a valuable means of quieting the heart's motions, and of procuring rest from a disturbance which is always distressing.

By the cautious adaptation of such means, and steady perseverance in their use, the disturbance of heart here treated of may in time be effectually relieved. Time, however, is required, for the disease yields slowly; and though impression be made on it by the early procedures, months may elapse ere perfect tranquillity of circulation can be restored. The patience, however, which can await this result, and pursue steadily the means of accomplishing it, will be amply rewarded.

There is one more form of rheumatism which requires to be noticed, namely, that which is called *rheumatic gout*; and so far as a name is concerned, this appellation, though only a popular term, is not misapplied. So much has this disease in common both with gout and with rheumatism, that it is scarcely possible to regard it otherwise than as a hybrid malady, in which the elements of both these diseases coexist. Its accession corresponds most with rheumatism; its ravages have a greater resemblance to those of gout. The enlargement of joints to which it is so prone presents much more of the character of gout than of rheumatism. Dr. Haygarth has described this disease, and proposed to denominate it *nodosity of the joints*. Of its history and treatment there is little to be said beyond what has been already advanced under the heads of gout and of rheumatism. It is more frequent in women than in men. Its commencement is often marked by active fever, and in proportion as this is disregarded or inadequately treated, are its ravages more severe and inveterate. But in many it advances by a slow and insidious progress, disorganizing the joints without materially deranging the general health. The local swellings long retain the character of active inflammation, being hot, red, and painful. They in general surround the whole joint, and, so far as mere touch can determine, they seem to arise from a general enlargement of all the structures constituting the joint. It seems strange that the structures actually enlarged have not been long since ascertained by actual dissection; yet we are not aware of any account of them, founded on anatomical examination, having been published. In 1805 Dr. Haygarth had not met with any such account, as appears from the following paragraph of his treatise: "In this disease the ends of the bones, the periosteum, capsules, or ligaments which form the joint, gradually increase. These nodes are not separate tumours, but feel as if they were an enlargement of the bones themselves. *This point might be anatomically ascertained without any difficulty or doubt.*" The disease, according to Dr. Haygarth, does not appear to shorten life; the first patient whom he saw so affected reached the age of ninety-three.

As to treatment, this must be regulated according to the state of constitution and local symptoms, and on the principles inculcated in this article. By local treatment much relief may be rendered. Frequent leeching has much effect in abating heat, swelling, and pain. In the purely chronic stage, successive blisters contribute much to reduce swelling and restore flexibility. As the hands particularly suffer from this malady, it becomes necessary to blister each finger separately, and even each joint; a process which, however irksome, is yet ultimately recompensed by the increased power of using the hands which may be thus obtained.

(E. Barlow.)

RICKETS—Rhachitis, Rachitis. The term *rhachitis* was derived by Glisson from the Greek ῥάχις (spine), because this disease affects, in an especial manner, the spinal column; but he acknowledges that he was induced to adopt this term from its near resemblance to *ricketts*, a word by which the malady was commonly known in England even before his time.* The work of Whistler, and the remarkably clear and full account of rickets afterwards given by Glisson and his associates Bate and Regemorter, have procured a currency for their opinion that the disease made its first appearance in the western parts of England towards the middle of the seventeenth century, and have obtained for rickets among continental writers the designation of the *English malady*, (Morbus Anglicus, Maladie Anglaise, Englische Krankheit.) That rickets was never distinctly described by any medical author before the times of Whistler and Glisson, we readily admit; but that it was of such recent origin as the period stated above, we conceive to be quite inconsistent with the several terms in the Greek and Latin languages denoting deformity and decrepitude of the human body, and with the instances recorded in ancient history of persons so afflicted who were distinguished in various departments of letters and even in arms.

The essential characteristic of rickets is a softening of the bones; but the exact change

* *David Whistler*, Dissertat. Inaugur. de Morbo Puerili Anglor. dicto "The Rickets." Lugdun. Batavor. 1645. This work, which preceded that of Glisson, is now exceedingly rare: a copy still exists in the Bodleian Library.

which takes place in their structure, and the general symptoms by which this alteration is attended, are considerably different at different periods of life. Taking the term rhachitis in this extended sense, to which perhaps *osteomalakia* would be more properly applied, the disease may be divided into two species:—1st, softening of the bones of children, or common rickets; 2d, that of adults, mollities ossium, or osteo-sarcosis. Softening of the bones, like scrofula, is not unfrequently met with among the inferior animals. Thus Lordat dissected a ricketty monkey; Bicherod found softening of the ribs of an ox;* Dupuy describes the skeleton of a ricketty horse;† Mason Good‡ asserts that rickets occurs in the lion; and Comber has written a dissertation on the disease as it appears in sheep.§ But to descend from the researches of the learned to the information of those who are observant of the manners and diseases of our domestic animals, curvature of the bones and swelling at the joints are not unfrequently seen in whole broods of young geese and ducks, when they have been continually exposed to cold and wet. The same affection is met with in young pointers, and more frequently in greyhound puppies, when kept in confined and cold damp kennels. In pigs, the same disease is in some places named krinckets; its causes are cold and moisture, and bad nourishment; and for its cure baths of hot grains are used, oily frictions, nutritious food, and removal to a warm and dry place.

I. RICKETS OF CHILDREN.

1. *History.*—This disease rarely appears before the seventh month, and most commonly does not declare itself until the child first begins his attempts to walk, or until he suffers from the severity of the first dentition. Rickets has also been observed at birth, and in the fœtus: of the former Glisson,‖ Henckel,¶ Klein, and Lepelletier,** have given examples; and of the latter Bordenave,†† and Pinel.‡‡

When a child is about to be affected with rickets, he becomes dull and languid, the appetite is variable and capricious, the bowels are irregular, the stools unhealthy and usually pale. Constitutional disturbance now arises, and a febrile state is soon established: the limbs become emaciated, the belly tumid, the face full, and the head disproportionately large, the forehead projecting, and the sutures of the cranium remaining open or perhaps expanding slightly. The extremities of the long bones which are least concealed by muscle, as those of the wrists and ankles, and the sternal ends of the ribs, particularly these last, are swelled out into knobs. Some have doubted the tumefaction of the extremities of the bones in rickets, ascribing the appearance of swelling to the emaciation of the limbs; but an attentive examination of ricketty cases has convinced us of the correctness of the former opinion. The firm texture of the bony framework of the body now begins to yield, and its increasing softness becomes apparent by the change of form which takes place. The sides of the chest are approximated by the combined operation of the pressure of the child's arms, the weight of the body when laid on its side, and the mode in which children are usually carried; and thus the sternum is made to project like that of a bird, or like the keel of a boat. The lower extremities bend under the weight of the body, while they yield at the same time to the action of the most powerful muscles: the knees are usually bent inwards and the feet thrown out, so that the patient when he walks rests on the inside rather than on the sole of the foot. At other times the whole of each lower extremity forms an irregular curve with its convexity looking outwards, and thus the knees, instead of knocking against each other, stand far apart. Among some of the native tribes of North America, this particular form of the limbs is esteemed handsome; and the utmost care is taken in early infancy to mould them by continued pressure into the admired shape, which, therefore, must not be regarded as any proof of the previous existence of rickets. In this disease the natural convexity of the thigh-bone is often so much increased as to form an elbow; and the angle between the neck and the shaft is converted from an obtuse to a right angle, or even to an acute one. The pelvis is usually deformed in the reverse direction of the chest, the pubes approaching to the sacrum; but in all cases where the pelvis suffers, its cavity is diminished, which to the female in after-life is necessarily attended with more or less dangerous consequences in the event of pregnancy. The vertebral column exhibits in a remarkable manner the effects of rickets in retarding the completion of the bones, and softening their texture: the spinous processes of the last dorsal and of the lumbar vertebræ are sometimes deficient, and the natural form of the spine is variously changed; its uppermost portion is often bent backwards, while the dorsal part projects into a hump, the loins fall in, and the extremity of the sacrum is unnaturally protruded: thus the gait of the hunchback, who has survived the severity of

* Act. Maris Balthici, 1707.

† Dupuy, De l'Affection Tuberculeuse.

‡ Study of Medicine, vol. v. p. 327.

§ Letter on the Rickets in Sheep. Lond. 1772.

‖ De Rachitide, p. 178.

¶ Abhandl. Chirurg. Oper. Th. ii. p. 14.

** Maladie Scrofuleuse, Paris, 1830.

†† Mém. de Mathemat. et Physique, tom. iv. p. 545.

‡‡ In Fourcroy's Journal, La Médecine eclairée par les Sciences Phys. tom. i. p. 111. This was the case of a ricketty fœtus of eight months, in which the distortion was chiefly confined to the lower extremities. Farther illustrations of fœtal and congenital rickets will be found by referring to the following authorities.

Soemmering Abbildung. et Beschreib. Einiger Missgeburten, p. 30, pl. 11.

Otto. Seltene Beobachtung. I. Sam. tab. i. fig. 1.

Romberg. De Rachit. Congenit. Berol. 1817, cum tabulis.

Sartorius. Rhachit. Congenit. Observ. 4to. Lips. 1826, cum tabulis.

Loder. Index Præparator. &c. Mosquæ, 1823. Sect. II. D.

the disease, is stiff and formal, and the face directed upwards. The distortion of the arms of ricketty children is usually outwards at the upper part of the humerus from the action of the deltoid, and in other parts also it is chiefly determined by the operation of the most powerful muscles; but much will depend on the positions in which the limbs may chance to be placed at the time when the bones are recovering their strength and firmness. Rickets is considered by some to produce little or no change on the bones of the cranium, face, hands, and feet. Those of the two last, we believe, are little affected; but the vertex in ricketty children is, with few exceptions, unnaturally flattened, the centres of the parietals are expanded, and the forehead is prominent from an enlargement of the frontal sinuses: the bones of the face also appear in most cases to undergo some change of form, indicated by the shortness of visage and elongated under-jaw usually observed in those who have suffered from general rickets. In such children the process of dentition is protracted, and the teeth soon decay: the enamel of the permanent teeth is often craggy and worm-eaten, shewing its imperfect formation, though sufficiently hard; but the fang during the progress of the disease has been found somewhat softer than natural.*

The rapidity with which the bones are softened by rickets is sometimes altogether extraordinary. Brunninghausen observed the whole of the bones in one instance become soft in the short space of six weeks, and the case proving fatal, he preserved the skeleton.

As the disease proceeds, the bones are readily fractured when even a slight force is applied, and it is remarkable that, softened as they are, they usually re-unite; at length they become completely pliant. We have seen those of the forearm of a child of four years as flexible as a piece of soft gristle, bending with the weight of the hand whichever way it was turned. The muscles grow more and more flabby, the abdomen more tumid, the appetite becomes keen, and the bowels sluggish. The urine in rickets is rarely healthy, sometimes clear, but more frequently turbid, depositing a copious whitish or light brown sediment, indicating the very disordered condition of the digestive organs, and consisting in all probability of lithate of ammonia, with a large admixture of the phosphates. During the continued progress of rickets, the febrile excitement abates until its latter stages, when at length a regular hectic is established, and contributes by its perspirations and diarrhœa to exhaust and destroy the patient.

The intellect of the subjects of rickets generally possesses a degree of development far beyond what is usual in healthy children of the same age; the children exhibiting a quickness of perception and a fluency of language sometimes astonishing. In other instances, though much more rarely, they are taciturn and stupid, or even verge to a state of idiotey. The frequent precocity of understanding has been ascribed to the expansion of the skull, and the earlier development of the brain consequent on that determination of blood to the head which appears always to exist at least in the first stages of rickets; but when this disease does not occur until the sutures of the cranium have closed, the same circumstance of an increased flow of blood acting on a part no longer capable of yielding has been assigned as the cause of the mental torpor or fatuity occasionally met with.

Almost all those who become ricketty soon after birth perish, but many in whom the disease has appeared later recover before their fifth or sixth year; the general health gradually improving, the tumefaction of the abdomen subsiding, and the bones acquiring firmness, though retaining, with scarcely an exception, a certain degree of deformity. The head remains disproportionately large, the child preserving its acuteness and vivacity. At other times recovery takes place after smart febrile re-action, which is occasionally accompanied by the appearance of a cutaneous eruption. Sometimes the child at the approach of convalescence exhibits an extraordinary liking to particular articles of food. We have known the desire for common salt so strong that the little patient would devour it as others do sweetmeats. The quantity taken in one instance was very great, and to the parents it seemed as if the salt had proved the means of cure.

After the cessation of the disease, the bones acquire a degree of solidity and strength even greater than natural, and many persons whose form proves that they were ricketty in early years, are in after-life distinguished for robustness and activity. The deficiency of earthy salts in the bones, which existed during rickets, is succeeded by their excessive deposition; and that state is induced which has been named hyperostosis: the long bones become more rounded and massy; and the sutures of the cranium are often obliterated, and the lines of junction raised into flattened ridges. In some instances rickets has been followed after some interval by a remarkable tendency to the production of bony growths. There is related by the Bishop of Cork in the Philosophical Transactions for 1740, 1741, the case of a man who had been so ricketty in his youth that almost every bone in his body was distorted. At the age of eighteen he began to grow stiff, and at length, having lost all use of his limbs, he became like a statue: he survived till his sixty-first year, and at his death his skeleton was found to be one continuous bone from the top of his head to his knees. Many osseous growths, some of them of the most grotesque forms, branched from his head, back, and haunches; and a portion of fully-formed bone was also found imbedded within one of the large muscles.

Should the disease not yield before the seventh or eighth year, the individuals, if they

* *Wilson*, Lectures on the Human Skeleton.

survive, are condemned to a life of infirmity, which is seldom prolonged beyond middle age. Such persons suffer exceedingly from the unnatural pressure and displacement to which the organs of the chest, and even the most important of those of the abdomen, are more or less subjected. The stomach in these cases is frequently pushed as low as the umbilicus, and even the urinary functions have been disordered by a projecting vertebra pressing upon the kidney. These unfortunate individuals are remarkable for their shrill voice, dilated nostrils, and panting respiration; and life is generally cut short by one of those attacks of pulmonary inflammation to which they are peculiarly prone; at other times they are destroyed by the development of tubercular disease, and occasionally by dropsy.

In rickets, as in most chronic disorders, the change which takes place at puberty is productive of amendment, or of an increase of the disease. Ravaton has detailed a remarkable case, which serves well to illustrate this influence. A girl, whose legs were so deformed that at thirteen years she was only three feet high, was seized with continued fever; the catamenia appeared, the limbs then gradually straightened, and in less than three months her height was five feet one inch.

The progress of rickets is accelerated by confinement and exposure to cold and damp, by bad clothing, imperfect nourishment, and careless nursing; and retarded by circumstances the reverse of these: hence it may be that the disease is now of less frequent occurrence than in former times, and that it has been observed to make less progress in spring and summer, and to advance most quickly in winter and autumn. But the progress of rickets often varies without any obvious cause; it sometimes appears to be arrested as if recovery were at hand, then revive, and proceed with more rapidity than before. As the disease advances to a fatal termination, the little sufferer cannot bear even to be moved in bed, and the attempt is often productive of the fracture of some bone: hectic fever is now established, with its attendant colliquative perspirations and diarrhœa. At this period also, a variety of nervous symptoms sometimes present themselves; such as temporary deafness, or blindness, irritation of the bladder or inability to expel the urine, or paroxyms of epilepsy, or convulsions. Should these last not prove the cause of death, the patient at length sinks under debility, and dies exhausted.

On examining the bodies of those who have died while still labouring under rickets, the brain is found disproportionately large, but often in other respects quite natural; in some instances the ventricles are filled, or perhaps considerably dilated with a limpid fluid; and a similar fluid is also found in the basis of the skull and within the canal of the vertebræ. The cavities of the thorax and abdomen likewise sometimes contain serous or bloody liquid; the lungs are compressed and occasionally displaced by the alteration in the form of the thorax; marks of inflammation are often apparent in the pleura and pulmonary substance, which last is sometimes hepatized, and at other times contains numerous tubercles in various stages of advancement. It is remarkable that in some cases of ricketty children from one to ten years old, the thymus gland has been found much enlarged, and the upper part of the sternum bulging out, so as to form a concavity, within which the overgrown organ was lodged.* The heart is not found diseased where death occurs during the active progress of rickets; but in those who have survived with deformity of the chest, the obstacle thus occasioned to the circulation, especially through the lungs, rarely fails to produce in the end hypertrophy of that organ.† The liver and spleen of ricketty subjects are almost in every case enlarged, the former in particular. The mesenteric glands are usually enlarged, and often filled with tuberculous matter; and the other absorbent glands, both within the abdomen and externally, present similar alterations.

In the soft parts little or no adipose substance is found; the muscles are pale, flabby, and wasted; and the rigidity of death is rarely met with in such subjects. The bones, during the active stage of rickets, are found to resemble very vascular cartilage; the medullary cavities are filled with a bloody gelatinous-like substance in place of marrow; and the osseous texture presents every where, even in the cortex, numerous minute cells, from which a thin bloody fluid can be pressed. The appearance of ricketty bones has been well compared to that of a healthy bone deprived of its earthy materials by immersion in a weak acid; but there is this difference, that the ricketty bone is much more vascular, and that the cartilage of which it consists is of so loose a texture, that it is soluble in the same acid which will deprive common bone of its earthy constituents. We are not acquainted with any analysis of recent bone affected with infantile rickets; and the examination of those which have been dried cannot afford much accurate information respecting the constituents of parts which obviously contain so unnaturally large a proportion of fluid and easily destructible ingredients. Nothing, indeed, has tended so much to obscure the pathology of the bones as the almost exclusive practice of macerating and preserving them in a dry state. When the bones of those who have recovered from rickets are examined, their texture is found to be more dense, in consequence of a morbidly increased deposition of the earthy salts; even small exostoses and bony spiculæ are sometimes observed; and in cases where the spine is deformed, the bodies of many of the vertebræ are found united by new osseous substance. The bones of the cranium are observed to be much heavier and thicker than natural, the sutures often obliterated, and the grooves

* *Lobstein*, Anatomie Patholog. t. i. p. 54.
† *Hope*, on Diseases of the Heart, p. 194.

formed by the meningeal arteries greatly deeper than common. Wherever the bones have been bent during their yielding state, a larger deposition of earthy salts is observed in the interior of the curve where its weakness had been the greatest; and to such an extent does the deposit of osseous matter sometimes take place, that the bone at the point of curvature has been converted into a solid substance, the medullary cavity being wholly obliterated.* Perhaps to some it may appear sufficient to say that the earthy salts are thus deposited, because they are most wanted at the weakest point of the bony shaft; but the real cause of this arrangement seems to be that the bending of the bone has compressed into the interior of the curve a larger quantity of cartilaginous substance, which is afterwards filled with an earthy deposit; while it stretches and attenuates that on the exterior of the arch, and so diminishes there the matrix for the reception of earthy materials. It may be observed also, that the effect of bending the pliant bone is to bring its opposite sides into closer approximation, and thus to prepare the way for that ossification throughout its whole diameter to which allusion has already been made. Bones which are distorted are commonly named ricketty, whether in the active stage of that disease or after its cure, when they have acquired an unnatural density from hyperostosis: hence some confusion has arisen in stating the composition of ricketty bones; and the assertion has even been hazarded that a deficiency of phosphate of lime is not an essential, but merely an adventitious circumstance in rickets. Dr. John Davy found 100 parts of the dry tibia of a healthy subject of fifteen to yield 46·4 of animal matter, and 53·6 of earthy; while the same quantity of the dry tibia of a ricketty child contained 74 parts of animal and 26 of earthy substance.†

2. *Causes.*—Rickets appears under very different circumstances, and therefore may be supposed to derive its origin from a diversity of causes. It is met with among the children of the affluent, enjoying every advantage of careful nursing, warm clothing, nutritious food, and airy apartments; and it is found likewise in the damp unwholesome dwellings of the artizan and labourer, where the child is neglected, scantily clothed, and poorly fed. In the former of these classes it is almost always a hereditary disease, or if not, it exists in connexion with a scrofulous habit transmitted from the parent: in the latter it may also arise from hereditary influence; but it seems more generally to originate from those unfavourable circumstances in the rearing of the child which have just been enumerated. Some writers have endeavoured to trace a connexion between rickets and gout, syphilis, and scurvy; but it has not been satisfactorily shewn that any of these diseases, either in parent or child, can operate as causes of rickets excepting by the debility which they may induce, and the predisposition to the malady which may thus be occasioned. Of scrofula, on the other hand, we would speak in very different terms; for the connexion of this disease with rickets appears to be very intimate; although we are far from agreeing with Dr. Thomas Young in the propriety of classing rickets as a mere species of scrofula (*scrofula rhachitis*).*

Rickets rarely occurs excepting in delicate and sickly children: instances are occasionally met with where robust children, born of healthy parents, have been attacked with the disease; but it may be questioned whether such cases were truly ricketty, or if the yielding of the bones had not rather arisen from the great weight of the infant's body, and from too early endeavours to make him walk.

Many cases have occurred which prove the close connection which exists between rhachitic disease and affections of the encephalon, such as hydrocephalus and convulsions. Büchner† relates that he saw almost the whole of a family of eleven brothers affected with rickets. Most of them died of the disease in an advanced stage, while the rest were carried off by convulsions.

Rickets has been observed to prevail in particular localities, probably from their unhealthiness, and the indigence and misery of their inhabitants. Hence it may be regarded as occasionally an endemic disease: it is so described by Glisson in reference to England,‡ and instances are recorded where it assumed the same character in different parts of Germany.§

3. *Treatment.*—During the existence of the acute febrile symptoms of rickets, it will be proper to administer moderate doses of antimonials, to employ the tepid bath, and in some instances even to apply leeches to the forehead or nape of the neck, according to the urgency of the case and the strength of the little patient. The impaired appetite, morbid stools, and disordered urine require the use of small doses of calomel or hydrargyrum cum creta; followed by magnesia and rhubarb, or rhubarb and soda, with an occasional dose of a more active aperient, such as castor-oil or senna. If the disease have occurred at a very early age, it may be advisable to try the effect of changing the wet nurse; and in general it will be proper to wean the child about the end of the ninth month, for protracted suckling is certainly one of the debilitating causes which dispose to rickets. While the child continues at the breast, the diet of the nurse ought to be carefully attended to, in order that her milk may prove nutritious and easy of digestion; or its powers may be assisted by allowing the infant, in addition, small quantities of isinglass jelly, beef tea, or yolk of egg, provided the absence of febrile excitement will

* *Stanley*, Lond. Medico-Chir. Trans. vol. vii. See also Wilson's Lectures on the Human Skeleton.

† *Monro*, Elements of Anatomy, vol. i. p. 27.

* Introduction to Medical Literature.

† De Rhachitide in Haller. Disput. Medicæ, tom. vi.

‡ De Rachitide, p. 3. Lugd. Batav. 12mo. 1761.

§ Acta Nat. Curios. vol. ii. obs. 153. Ephemerid. Nat. Curios. cent. i. et ii. append. p. 23.

permit. After the child has been weaned, the diet must be suited to the degree of constitutional irritation which exists; but one leading principle should be to support the strength as much as possible without quickening the circulation or oppressing the stomach. Farinaceous food has been condemned by many writers as injurious to ricketty patients from its inferior nutrient properties; yet it will not be denied that, during the existence of febrile symptoms, the various preparations of starch will be found to yield a mild and appropriate nourishment. Whenever the state of irritation has so far subsided that a more substantial diet can be borne, it ought to be given freely, and even a little wine or sound ale may be allowed as long as it causes no morbid excitement.

In the second stage of the disease our principal objects in selecting the means of cure are, to give tone to the system, and improve its nutrient and reparative powers; and for these purposes the cold plunge bath, the affusion of cold water with salt, careful friction of the whole body, and the employment of tonic medicines, will be found very useful. Among the tonics best adapted for cases of rickets may be enumerated sulphate of quinia, gentian, calumba, oxide of zinc, and various preparations of iron, of which, perhaps, the wine and carbonate are to be preferred. With many of these it will be found highly advantageous to combine the alkalies and alkaline earths, the choice of some of them being determined by the state of the bowels and the rapidity or languor of the circulation; carbonate of soda being preferable when the bowels are relaxed, and carbonate of ammonia when the action of the heart is languid. In ricketty cases, where the nervous energy appears defective, it may be proper, in addition to the means of invigorating the frame already enumerated, to employ electricity or galvanism, but in a very cautious manner.

The clothing of the child ought to be warm, and great care should be taken to preserve it free from damp. The apartment in which he sleeps should be dry and well ventilated, and his residence should be in a pure temperate atmosphere, either in the country or on the seacoast; and when the weather permits, he should be carried about in the open air as much as possible. When the ricketty child is carried, it should be alternately in either arm; and when placed in a chair or laid in bed, his position should be such in regard to the various objects of attraction around him, that he shall not incline continually to one side only; or so varied from day to day, that the formation of any fixed deformity may if possible be prevented. His bed should be smooth and comfortably firm, and the head but little elevated; the bedclothes light, yet sufficiently warm. As soon as the constitution appears to be rallying, and the bones acquiring renewed strength and firmness, attempts should be made to restore them to their natural shape by well directed manipulations, and the employment of such mechanical contrivances as will give support without injurious confinement. Considerable success is known to have attended the treatment practised by the Baron Dupuytren* in deformity of the chest. His plan is to place the child with his back against the knee or a wall, and make moderate and gradually increasing pressure with the palm of the hand on the sternum, so as to diminish the antero-posterior diameter of the chest, and force out the ribs towards their natural convexity. This practice is repeated day after day very frequently, and at suitable intervals, with increasing force and for a longer time, augmenting and relaxing the pressure so as to suit the movements of respiration; until at length, after long and careful perseverance, the natural shape of the thorax is to a certain extent restored.

II. Rickets of adults.—*Mollities ossium.*

1. *History.*—The softening of the bones which is met with in persons of adult or advanced age, presents itself in various degrees of severity. Sometimes it is merely a protracted form of infantile rickets, which has continued with numerous checks and interruptions, and successive revivals and increase of symptoms, even to advanced life. On other occasions, and these are not rare, softening of the bones occurs during pregnancy or follows parturition, and increases in severity during each successive gestation. The parts of the osseous system chiefly affected in these cases are the spine and the pelvis; hence the difficulties of childbirth are usually augmented at every succeeding confinement. But the disease has been observed in its most aggravated form among males as well as females, although certainly more often among the latter. Several notices of this intense form of mollities ossium are to be met with among the early historians and biographers of modern times: thus Abbon, the monk, who lived in the ninth century, relates an extraordinary instance where a very large man was reduced by it to the diminutive size of a child.† And Abulfedda asserts that the body of the prophet Gatleb was without bones, so that his limbs could be folded up like a garment.‡ Perhaps the first medical writer who has made mention of mollities ossium is Hollerius:§ he states briefly that there was a woman in Paris whose whole body was soft and flexible, and without solid bones. The next case on record, and it is a well marked and interesting one, is that detailed by Abraham Bauda, which occurred at Sedan in 1650.‖ Since that period many instances of mollities ossium have been published in different countries, references to the most important of which will be found in the present article.

The softening of the bones in this disease is preceded by severe and long-continued pains, which are usually confounded with rheumatism, and have sometimes been supposed to arise from syphilis: a gradually increasing debility seizes the limbs, the nervous system acquires

* Répertoire générale d'Anat. et de Phys. Patholog. tom. v. p. 198.

† Guerres de Paris.

‡ Vita Mohammed.

§ De Morbis Internis. Rara Quædam, No. 7. 4to. Paris 1609.

‖ Microcosmus Mirabilis. Sedan, 1665.

an excessive morbid irritability, the patient walks with the utmost fearfulness, and the slightest jar or concussion of the body causes agony.* Some bone now suffers fracture, which all the efforts of the surgeon are perhaps unable to unite; the patient being constantly confined to bed, the bones soften more and more, assume the most strangely distorted forms, and before death have in some cases been so completely disorganized that the extremities were as limber as a rag.† The patient lies coiled up in bed, sometimes scarcely preserving, except in countenance, the semblance of a human being; the limbs appearing more deformed, and the stature much more shortened than they are actually found to be after death. Every attempt to alter the position of the patient produces agonizing pain, and perhaps new fractures, if the bones be not already too much softened to snap asunder. In such circumstances it is truly astonishing to observe how little the general health suffers, the appetite, digestion, and excretions remaining unimpaired till within a few weeks of death, and the mind continuing calm and intelligent, almost to the last. The urine in such cases is frequently turbid, depositing a copious white sediment; and in some instances small urinary calculi have been voided. But this morbid state of the urine is not constant, for it becomes clear and then again turbid, and occasionally clear for weeks before death. At length hectic fever comes on, sometimes with a feeling of intense burning heat, such that the patient can bear with difficulty the thinnest covering, and requires the windows to be kept open even in the middle of winter.‡ Diarrhœa and perspirations now exhaust the patient, and death at length, after years of protracted suffering, comes to his relief.

The appearances on inspection after death from mollities ossium differ considerably from those which are observed in the bodies of ricketty children. The bones, instead of presenting the appearance of cartilage, as in rickets, are reduced to a mere shell resembling the rind of cheese, and are sometimes described as soft and membranous, and of the thickness of the peritoneum; in one instance the form of some of the bones seems to have been preserved merely by the periosteum;§ and in the case related by Saviard,‖ the remnants of the bones are described as crumbling between the fingers like the rotten bark of a tree. The cavity within the changed and wasted bone has been found filled with a soft red or liver-coloured substance, which in the living body has been ascertained to be devoid of sensibility;* at other times the contents have been a reddish fluid of the consistence of thick honey, and free from any disagreeable odour.† In Mr. Howship's case‡ the contents of the wasted bony shell were various in their appearance: one mass resembled coagulated blood, another gorged liver, a third light fibrinous matter, and a fourth was like compact fleshy substance. The last portions of the long bones which undergo these remarkable transformations are the extremities; and the remnants of osseous substance which they present are found softened and honey-combed with numerous irregular apertures, appearing, when macerated, like a thin piece of ice when partly melted; thus affording unequivocal evidence of the powerful action of the absorbent vessels to which the osseous tissue had been subjected. The cartilaginous coverings of the articular extremities of the bones have sometimes been found entire, at other times attenuated, but the surface polished and raised into eminences; the cavities of the joints sound; and even when unused for six years, filled with healthy synovia.§

Although fractures of the bones have not appeared during the life of the patient to have united, yet after death a callus has occasionally been found to have formed, sometimes only within the cavity of the disorganized bone, occupying it completely at the point of fracture; at others it has appeared externally as a prominent ring, and formed within a solid osseous partition;‖ thus proving that the solution of continuity had served to restore to the part its ossific powers while they were everywhere else deficient. The muscles, in cases of mollities ossium, are found pale, and in general totally altered in their appearance, so that it would be quite impossible from their adhesions and displacement to unfold them by dissection. The viscera of those who have died of this disease have sometimes been found quite healthy,¶ and in most of the cases they are not stated to have suffered much serious alteration; in one instance indeed the liver was enlarged,** in another the gall-bladder was contracted, and contained no bile, but many minute black calculi.†† It is obvious, however, from the histories of other cases, that the lungs and mucous membrane of the bowels must in these instances, if carefully examined, have presented abundant traces of active disease.

* See a very interesting case by Mr. Howship, Ed. Med. Chir. Trans. v. ii.

† *Bevan*, in Philos. Trans. v. 42.

‡ *Planck*, de Osteosarcosi Commentatio, 4to. Tubing. 1782. This writer has been quoted as an authority on osteosarcoma, but his essay refers wholly to mollities ossium, of which it contains a very interesting case with an able and learned commentary.

§ Case of Madame Supiol, *Moraud*, in Mém. de l'Acad. R. des Sciences, 1755.—*Hosty*, in Phil. Trans. 1753, 54.—*Bromfield*, Surgical Cases, vol. ii. p. 36. Here she is called Queriot, her maiden name. The skeleton of Madame Supiol is still preserved in the Museum at the Jardin des Plantes in Paris.

‖ *Saviard*, Nouv. Recueil d'Observat. Chirurg. p. 276.

* *Thomson*, Med. Observ. and Inquiries, vol. v. p. 259.

† *Bevan*, Phil. Trans. vol. xlii. p. 488.

‡ Edinb. Med.-Chir. Trans. vol. ii.

§ Case by Thomson, Med. Obs. and Inquiries, vol. v.

‖ *Planck*, de Osteosarcosi Comment.

¶ *Saviard*, Rec. des Observ. p. 276.—*Howship*, Ed. Medico-Chir. Trans. v. ii.

** *Bevan*, Phil. Trans.

†† *Thomson*, Med. Ob. and Inq.

2. The *causes* of mollities ossium are exceedingly obscure: syphilis, gout, rheumatism, and scurvy, have all been accused as the sources of this singular disorganization of the solid framework of the body. The sagacious Saviard observes that syphilis produces caries; but this is a softening and melting down of a totally different nature: as to the other diseases named above, they possess nothing in common with that now under consideration, excepting pain, langnor, and debility. In well-marked and extreme cases of syphilis, gout, rheumatism, and scurvy, where death has been the result, we do not meet with mollities ossium as a concomitant, yet authors gravely tell us that softening of the bones arises from the diseases now enumerated lying hid in the constitution and tainting the habit. This affection appears to be closely connected with an enfeebled and relaxed state of the system. Long confinement to bed, after acute diseases in young persons, is often productive of some degree of softening of the ligaments and bones, and consequent deformity; we have seen the pelvis in a delicate boy, after tedious convalescence from measles, elongated diagonally, producing great deformity and lameness; in old age, we have known a lady, who was long bed-ridden, fracture her clavicle by the mere effort of attempting to raise herself in bed by the help of a cord. Indeed, the progressive alteration which the bones naturally undergo in advanced life is itself an approximation to decay, the cortical part becoming thin, and the medullary cavity enlarging; but the former still preserves its hardness of texture. A careful examination of the bones, after a long period of inaction, shews that their healthy state is almost as much dependent on the due exercise of the muscles as that of the muscles themselves. In the vegetable kingdom we see the effect of exercise remarkably exemplified by the increase which it occasions in the bulk and density of the woody fibre. The wood of forest-trees which have stood alone, and exposed to the full force of the blast, is much closer in its texture and more durable than timber raised in natural groves or crowded plantations; and the size and strength of the roots of trees is always much greater in the side which stands exposed to the prevailing wind.

Females are much more liable to mollities ossium than males; and pregnancy and parturition favour in a remarkable manner the progress of the disease. Under such circumstances, the weight to be supported, the drain of nourishment for the supply of the fœtus, and the distending throes and exhausting consequences of labour, must all prove powerful causes of relaxing the connexions of the bones and lowering the strength of the system. Softening of the bones is observed to occur most frequently in persons of a strumous habit; and this peculiarity of constitution may be fairly regarded as forming at least a strong auxiliary cause in the development of the disease.

3. *Treatment.*—Mollities ossium, unlike the rickets of children, occurs at a period of life when the reparative powers of the system have lost their early vigour, or perhaps when they are already in a state of decay: hence a cure of this disease very rarely or never takes place; but it may proceed with greater or less rapidity, and may be checked in its progress by judicious management. We have been unable to discover any case of mollities ossium in which a satisfactory cure has resulted, either from the unassisted efforts of nature or from medical treatment; but instances of the milder form are known to us, where the disease has proceeded slowly for years, and some of the individuals have attained even an advanced age. The influence which pregnancy has been observed to exert in accelerating the progress of mollities ossium, renders it necessary that the patient should live as in a state of celibacy; and every thing which tends in any degree to weaken the frame ought to be carefully avoided. Frictions of the whole body, gestation in the open air, nutritious diet, mild tonics, great attention to the state of the digestive organs, and removal to a dry, warm, and pure atmosphere, are the principal points to be attended to in our endeavours to arrest the progress of this disease. Benefit is likely to be derived, also, from sponging the body with sea-water, or the strong acetic acid obtained from wood; and if the strength be not too far reduced, the cold shower-bath, or sudden immersion in sea-water, may be tried with caution.

Before concluding our account of the several species of softening of the bones, it is proper that we should say a few words on the subject of lateral curvature of the spine, which of late years has engaged so large a share of the attention of medical men of both branches of the profession. In rickets, the curve assumed by the spine is, with few exceptions, confined nearly to the mesial line; and in mollities it is sometimes so, and sometimes lateral; but a very large proportion of the cases of lateral curvature of the spine are wholly independent of both rickets and mollities ossium, and arise from debility or habitual malposition of the body, such as are too often induced by the restraints and fatigue to which young persons are subjected in the course of education.* Hence arise sinking of the spinal column into the flexures naturally assumed under feelings of languor and exhaustion, and twisting of a part of the vertebræ upon their axes: after a time they remain stationary in their new situations, both the ligaments and muscles being so changed that the latter are no longer capable of restoring the bones to their proper positions. Thus, lateral curvature becomes established, and the figure of the patient is permanently deformed.

On examining after death the individual bones of the spine in such cases, we often find them quite healthy and natural in their form, but more or less twisted upon their axes: in some instances we have seen traces of inflammation, and new bone formed uniting them to each other; and, more rarely, we have ob-

* *Shaw*, Essay on the Nature and Treatment of Distortions of the Spine and Chest.

served the bodies of the distorted vertebræ somewhat attenuated and expanded in the interior of the curve where they were most exposed to pressure—a change which was probably the effect rather than the original cause of the deformity.

The treatment of lateral curvature of the spine falls chiefly within the province of the surgeon, but it will be the business of the physician to direct the application of those means which tend to restore the general health of the patient, and thus render effectual the exercises and training, the manual efforts and mechanical contrivances of the surgeon, which would otherwise prove unavailing or injurious. A carefully regulated diet, strict attention to the bowels, mild alteratives and tonics, relief from the restraints of education, and removal to a pure air, friction of the body, gentle exercise in a carriage or on foot, sea-bathing, or the cold shower or plunge bath, or tepid or warm bathing according to the circumstances of the case, constitute the principal remedies by which the physician is enabled to lend effectual assistance in the treatment of lateral curvature of the spine.

(W. Cumin.)

ROSEOLA.—This term is applied to a cutaneous efflorescence of a rose colour, not sensibly prominent, usually preceded and accompanied by mild febrile symptoms. In some cases the rash is diffused generally over the skin, but frequently it is partial or limited to certain regions of the body, as the face, neck, trunk, or extremities; in which situations it occurs in patches variously figured, and of more or less extent. It has not unfrequently, especially by the older writers, been mistaken for measles or scarlatina; hence, probably, originated the notion, which many entertain, that scarlatina, unlike other exanthematous fevers, may occur more than once in the same individual.

Roseola is generally preceded by smart feverish symptoms—irregular chills alternating with heat of skin—pain in the head and limbs—languor and lassitude—and sensation of faintness. After these symptoms have continued for a few days, the rash appears first on the face and neck, spreading in a day or two afterwards over the whole body, and is generally attended by tingling or itching. When it first comes out, the eruption is of a bright red, but it soon assumes its characteristic rose colour. It begins to decline about the third day, and on the fourth, a few dark red specks are only perceptible, which wholly disappear on the fifth, at which period the whole disorder in general terminates.

From the redness and sensation of roughness in the throat, it would appear that the efflorescence extends over the mucous membrane of the mouth and fauces; and this circumstance tends to render the diagnosis between roseola and scarlatina more obscure.

The efflorescence is not always so generally diffused over the skin; in many cases it is partial, appearing only in patches on the face, neck, breasts, or shoulders: it frequently recedes and comes out again, its recession being followed by symptoms of gastric disturbance, which cease when the rash reappears. The recession and reappearance of the rash cannot often be traced to any evident cause, though in many instances irregularities in diet and other indiscretions have been supposed to be powerful agents.

Though roseola may occur at any season of the year, it is more frequently observed in summer, *(Roseola Æstiva,)* and is usually attended by smart feverish symptoms. On the first day the eruption is very liable to be mistaken for measles; but the peculiar character of the eruptive fever, the absence of the catarrhal symptoms, and the form, colour, progress, and duration of the rash, are sufficient to distinguish the two diseases. The rash, which is accompanied by sensation of itching or tingling, is observed first on the face and neck, and in the course of twenty-four to forty-eight hours spreads over the whole body. The spots are distinct and scarcely prominent, of a circular or oval form and deep rose-colour, the intervening portions of the skin preserving their natural appearance. The patches are at first very small, but gradually increase in size. The duration of this form of roseola is from three to four days, unless, as sometimes happens, the rash reappears at irregular intervals, and then its course may be protracted indefinitely. It generally disappears without sensible desquamation of the cuticle.

A similar form of roseola is occasionally observed in autumn *(Roseola Autumnalis)*. It differs from the preceding in being unattended by itching or tingling, or feverish indisposition, and in the eruption appearing chiefly if not exclusively on the arms.

Another variety of roseola has been described by Willan *(Roseola Annulata)*, in which rose-coloured rings, with central areas of the natural colour of the skin, appear on almost every part of the body, attended with sensation of heat, pricking, and tingling, especially during the night. The eruption, which is preceded by symptoms of acute fever, rigors, headach, flushing of the face, nausea, and pain of limbs, may last four or five days, and disappear as the feverishness abates; or, as now and then happens, it may be unattended with fever, and be of much longer duration. In these latter instances the eruption generally appears most vivid in the evening, or when the individual becomes warm in bed, and continues till morning, when it fades. It is sometimes also sensibly elevated, and very often, more especially when the eruption suddenly recedes, attended with considerable gastric disturbance.

Though roseola is not confined to any period of life, it is a frequent cutaneous disorder of infants, more especially during dentition, derangement of the bowels, and various infantile diseases attended with fever *(Roseola Infantilis)*. Dr. Willan states that this efflorescence continues in some instances for a night; in other cases

it appears and disappears for several successive days, being attended with symptoms of violent irritation. He has seen, even in infants but a few days old, an efflorescence on different parts, in numerous coalescing patches, rounded, though not exactly circular, of about the size of sixpence, and of a strong red colour. These continue five, six, or eight days, with a slight elevation of the cuticle, and terminate by desquamation, but are not always attended with constitutional disorder. Occasionally during the first stage of dentition, a single patch of efflorescence appears on one arm, or on the neck: it remains three or four days, then disappears, and is in a short time succeeded by another, perhaps on the opposite arm. This fades and disappears in about the same period, when a fresh patch rises in another place, and thus the eruption may be continued two or three weeks.

Roseola occasionally occurs also previous to the eruption of both the natural and inoculated small-pox, but seldom in the former; and when it does occur in connexion with the natural small-pox, it always indicates a severe and often fatal disease, though some inoculators deemed it an indication of a favourable variolous eruption. The early writers on small-pox observed this roseolous efflorescence, which they regarded as measles converted into small-pox. Dr. Willan, who applied the term *Roseola Variolosa* to the rash when it occurred in connexion with small-pox, states that it appears in about one case of fifteen in the inoculated small-pox, on the second day of the eruptive fever, which is generally the ninth or tenth after inoculation. The rash is first observed on the face, breast, and arms, and on the following day spreads over the trunk and lower extremities. It sometimes assumes the form of oblong irregular patches: in other cases it is diffused with numerous interstices; and occasionally it extends over the whole body, so that the skin presents a continuous redness, with slight elevation in some places. The rash continues about three days, on the second or last day of which the small-pox pustules make their appearance, and may be distinguished in the general redness by their prominence and hardness.

A similar efflorescence, but appearing generally in a congeries of dots and small patches, and slightly elevated, takes place in some children about the ninth or tenth day of vaccination, and about the same time that the areola forms around the vesicle. To this rash, which spreads irregularly over the surface of the body, Dr. Willan gave the name *Roseola Vaccina*. It is generally attended with slight febrile indisposition, though from the statement of Dr. Jenner it would appear to be seldom observed, as his notes did not furnish him with a single instance of it, nor did he recollect in any case more than one or two slight patches of redness, which very soon disappeared.

Lastly, roseola sometimes appears in connexion with various acute disorders—miliaria, various forms of continued fever, acute rheumatism, and with gout. When it occurs under such circumstances, it is to be regarded merely as an accidental complication or concomitant.

Though attention to the appearance of the efflorescence and the constitutional symptoms by which roseola is accompanied will seldom leave any doubt as to its nature, there are some acute eruptive disorders which it resembles in some particulars, and from which it must be distinguished.

Measles may be discriminated by the catarrhal symptoms which precede and accompany the eruption, which generally appears on the fourth day of the eruptive fever, and declines about the seventh or eighth; by the crescentic form and vivid red colour of the rash; by the tendency to bronchial or pulmonary inflammation during the course of the disease, and by its being propagated by contagion. In roseola, the patches are larger, more irregular, and more varied in their form; the eruption disappears after four or five days' febrile indisposition, is not preceded nor followed by any peculiar local inflammation, and is never communicated by contagion.

In scarlatina, the bright-red or scarlet colour of the eruption, which is more generally diffused, and more evident about the flexure of the joints; its appearing on the second day of the eruptive fever; the peculiar appearance of the tongue; the affection of the throat when it exists; the desquamation of the skin at the decline of the rash, and its propagation by contagion, will seldom fail to distinguish it from roseola.

It is scarcely possible to mistake roseola for erythema, in which the diffused or continuous redness of the skin without any distinguishable efflorescence, the trifling amount or total absence of constitutional disturbance, and its being generally symptomatic of some other affection, render the discrimination sufficiently easy. (See Erythema.)

The treatment of roseola includes the adoption of an antiphlogistic regimen modified according to circumstances. The little constitutional disturbance with which it is usually accompanied, and the comparatively slight irritation which it in general induces, render any active measures unnecessary. All that in the majority of instances is required, is to keep the patient cool, to prescribe light diet and acidulated drinks, to administer from time to time a mild aperient; and as the mineral acids have been found useful, they may be ordered according to the feelings of the practitioner. Dr. Bateman was of opinion that the decline of roseola was expedited by the use of sulphuric acid in the infusion of roses, or the infusion of gentian, in combination with small doses of sulphate of magnesia. The occasional employment of the warm or tepid bath may be conjoined with these measures.

When roseola occurs as a complication of some internal disorder, the treatment must be directed to the removal of the disease of which it is merely symptomatic.

(A. Tweedie.)

RUBEOLA, (Measles,) derived from rubio, *red*. This word appears to be of Spanish origin, and probably emanated from the school of Cordova: it was formerly written *rubiola*, or *rubiolo*. Another term by which this affection has been designated is *morbilli*, or the minor plague, being the diminutive of *il morbo*, as the Italians called the plague. The restriction now adopted in the application of the term rubeola is of rather modern date, and owes its establishment to Sauvages, before whose time great confusion prevailed in the naming of several of the exanthemata: rubeola, in particular, was used to signify equally scarlet fever and measles. A similar inaccuracy was to be found among the French writers also, for the word *rougeole*, their common name for measles, meant at one time *scarlatina*, and that so decidedly, that when it was thought necessary to apply distinct names to the two diseases, in consequence of the difference between them becoming fully understood, Chevenau informs us that the Marsellois used the word rougeole to signify scarlatina, and distinguished measles by the name of scnapion.* In our own country, Morton maintained the identity of these two exanthemata, and considered the relation existing between them the same as that between distinct and confluent small-pox.† Even so recently as 1769, Sir William Watson confounded these two diseases,‡ the correct diagnosis between which ought probably to be referred to the time of publishing the second edition of Dr. Withering's Essay on Scarlet Fever in 1793. But this was by no means the only or the most remarkable inaccuracy which in former days prevailed on this subject, since we find Sennertus, in the middle of the seventeenth century, discussing the question "why the disease in some constitutions assumed the form of small-pox, and in others that of measles;"§ and in a posthumous work of Diemerbroeck, published in 1687, it is laid down that small-pox and measles are only different degrees of the same affection: "Differunt (morbilli) a variolis accidentaliter, vel quoad magis et minus."‖ The same doctrine was still more recently maintained by Lange, a professor at Leipsic: "Præterea tam morbilli quam variolæ sunt eruptiones in eo duntaxat discrepantes, quod vel minus vel magis appareant," &c.¶

Later and more accurate investigations have very clearly shewn the distinction that exists between these diseases, not only in their essential characters, but also in the treatment which they require; so that we no longer hesitate in separating them, or feel doubtful as to the elements of a correct diagnosis between them.

By the term rubeola, or measles, in modern times, is understood a contagious inflammatory disease, affecting at once the skin and gastro-pulmonary mucous membrane, in which, after catarrhal fever has continued about three days, a rash appears on the skin, at first in small stigmatized dots, not unlike flea-bites, which, presently coalescing, form patches of a crescentic or semilunar figure, first on the face, and thence spreading gradually downwards over the whole of the body and limbs, at the end of four days disappear by desquamation of the cuticle.

Rubeola occurs at every period of life, but infants and persons of advanced age are less frequently affected by it than those of the intermediate stage. In childhood and adolescence, however, the disease is most common. It is asserted by Rosen, Vogel, and others, that infants have been born with the traces of measles. Guersent mentions* having seen an infant born with measles on it, having taken the disease from the mother; but we presume such instances must be of exceedingly rare occurrence.

Measles are not unfrequently epidemic; they generally prevail from the beginning of spring to the vernal equinox, and decline about the summer solstice, though this is only a general observation to which numerous exceptions occur. It has been frequently observed that whenever measles rage as an epidemic, small-pox prevails at the same time; and, generally speaking, the rubeolous contagion, if received into the system previously to that of variola, has the power of suspending the variolous action till the measles have run their course. This has not, however, been invariably the case, for instances have occurred in which both diseases proceeded together; "this," we are informed by Dr. M'Bride, "was observed particularly in the Foundling Hospital of Dublin in 1769. A number of the children having been inoculated for small-pox, in the mean while were seized with the measles, and both species of eruption were perfectly distinct; they nevertheless all recovered:"† and Mr. Russell has described two cases in which the two eruptions ran their course together in the same individuals, when these diseases were epidemic at Aleppo in 1765.‡

The general law with regard to measles, in common with others of the exanthemata, is, that they affect the system but once, and this peculiarity is maintained with much greater strictness and fewer exceptions than the statements we are accustomed to hear in society would lead us to believe; very many indeed of the cases of secondary measles so reported, originating merely in the parties having confounded roseola or some other cutaneous efflorescence with rubeola. Of this we have detected several instances, and almost invariably it has been acknowledged that the former disease had not been seen by any competent judge: that exceptions have occurred, however, in this disease, as in scarlatina and small-pox, cannot be

* Obs. Med. p. 454.
† De Morbillis et Scarlatina, Exercitat. iii.
‡ Med. Obs. and Enq. vol. iv. p. 132.
§ Medicin. Prac. lib. iv. cap. 12.
‖ Tract. de Variolis et Morbillis, cap. xiv.
¶ Miscell. Med. Curios. § xxxiv.

* Dict. de Méd. tom. xviii. p. 513.
† Practice of Physic, vol. ii. p. 112.
‡ Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. ii. p. 90. See Frank, tom. ii. p. 367. French ed. See, also, a "Case of the simultaneous Occurrence of Small-Pox and Measles," Med. Chir. Trans. vol. xiii. p. 163.

denied, but that they have been very rare is proved by the few instances which have been recorded. Guersent mentions having seen children affected with the disease twice in the course of the same year; in one child he observed two very regular eruptions of measles in six weeks, and in the interval between their first and second appearance the child had a variety of small-pox.* The cases of this kind related by Dr. Baillie† are not only the most decisive of which we are aware, but also the most remarkable, as shewing not merely an individual but a family susceptibility. In the first instance five brothers and sisters had it in succession a second time, four of them after an interval of six months, and the fifth after a lapse of twenty-one years. In the other instance two sisters had a return of the disease after four months. An observation of Dr. Burns‡ deserves to be noticed here: he observed that "when the measles were epidemic, it was not uncommon to find those who had formerly had the disease affected sometimes with catarrh without any eruption, sometimes with an eruption preceded by little or no fever and without any catarrh: this was very distinctly observed during every season when the measles were prevalent;" but he is doubtful as to the exact nature of the eruption. Frank§ says that a second attack of measles is more common than of variola, an opinion which appears to be at variance with general experience, and decidedly with our own. It is also a well ascertained fact that the imperfect form of measles, generally denominated *rubeola sine catarrho*, does not afford any protection against a recurrence of the disease.

The contagious nature of measles is, we believe, universally acknowledged, and there is even reason to believe that it is infectious before the appearance of the eruption;‖ but, as in other contagious diseases, there is a great difference in the susceptibility of different individuals equally exposed. We very lately attended a young lady with this complaint, whose younger sister slept with her during the whole of the eruptive fever and for two nights after the eruption made its appearance, and yet escaped the disorder. Heberden mentions that an infant who sucked a nurse till the measles appeared on her was not affected.

With regard to the latent period of measles, our own observation would lead us to fix it at about nine or ten days, but this is a point difficult to determine: after inoculation the symptoms of fever appeared about the seventh day. Dr. Burns¶ states the latent period to be about twelve or fourteen days; Heberden** from ten to fourteen days; Dr. Gregory†† from eight to fourteen days; Dr. Elliotson‡‡ from five days to a fortnight. Dr. Willan says he knew a person who passed through the measles and became convalescent, whose clothes infected a child in the country; this child had the eruption sixteen days after being exposed to the fomites.

Progress of the disease.—The symptoms of the antecedent fever are not usually such as to excite much attention. The child appears at first not so well as usual, is less active, and out of spirits; the appetite is impaired, and the sleep is disturbed: this derangement of the system is presently explained by the patient exhibiting symptoms of catarrh, — frequent cough, sneezing, running from the nose and eyes, which are tender and generally itchy, so that the child frequently rubs the eyes, and picks the nose: the skin is hot and dry, with occasional chills; and the pulse is quickened. When these symptoms have continued about three days, the child feels on the fourth still more decidedly sick, and is unwilling to leave its bed. Sometimes the precursory symptoms are so slight as scarcely to be felt by the patient or noticed by others. We had lately under our care a young lady of seventeen who was in constant attendance on her sister in measles, and the first notice we had of her having caught the disease was the appearance of the rash on her face.* In other instances the precursory symptoms are very severe: there is high fever, with violent catarrhal symptoms, rigors, total loss of appetite, intense thirst, burning headach, suffused eyes, intolerance of light, constant somnolence, but little or no sleep, or if the patient happens to fall asleep he starts from it as if frightened; the pulse is rapid and sharp, the throat sore, and the cough incessant, with pain or soreness in the chest. There is an evident exacerbation of these symptoms towards evening, accompanied often by difficulty of breathing, and not unfrequently by nocturnal delirium.

When the rash appears, which it usually does on the fourth day, it is not in general productive of much relief of the precursory symptoms, which are indeed more frequently somewhat increased: it is first perceived in general about the roots of the hair, on the upper parts of the forehead, and on the chin, in the form of small red spots somewhat resembling flea-bites, which are at first distinct, but soon coalesce and form patches of an irregularly crescentic or semicircular figure, of a dull red colour, slightly elevated, and having between them portions of the skin retaining its natural appearance. If the finger be passed over the surface, the patches of eruption are felt slightly prominent and rough;† this roughness is frequently stated to be perceptible only on the face, but we have repeatedly found it most remarkable on the arms. In a case which we very lately attended, the elevation of the

* Dict. de Médecine, tom. xviii. p. 512.

† Trans. of Soc. for Improving Med. and Chir. Knowledge, vol. iii. pp. 258 and 263.

‡ Principles of Midwifery, p. 646. ed. 7.

§ Tom. ii. p. 367.

‖ See Rust's Magazine, Feb. 1827.

¶ Principles of Midwifery, &c. p. 642.

** Commentaries on Diseases, p. 322.

†† Elements of Practice of Physic, p. 127. ed. 3.

‡‡ Medical Gazette, Oct. 1832. p. 99.

* See also Heberden, Comment. p. 317.

† It appears very singular that Rayer should describe the patches of eruption as not rising above the surface; his words are "ces taches ne donnent pas sous le doigt la sensation d'une surface inegale et prominente."—Maladies de la Peau, tom i. p. 18.

patches on the latter parts attracted our particular attention. In the course of the fourth day the eruption spreads over the face; spots also may be observed on the palate and fauces, of a dark red colour, which are still more distinct after another day, the inflammation attending which causes a sensation of dryness and roughness in the pharynx, and increases the hoarseness. On the next day (the fifth) the eruption extends over the neck, breast, and upper parts of the trunk; it is now very vivid on the face, which is not unfrequently so much swelled, especially the eyelids, that the eyes are quite closed up as in small-pox, while the other features are from the same cause greatly altered. Towards the close of the same day, the eruption begins to appear on the arms, and spreads over the lower part of the trunk. On the sixth day the eruption is vivid on the trunk and arms, and appears on the lower extremities about as far as the knees, while it is declining or nearly faded on the face. On the seventh day it is fully out on the legs and feet and on the hands, while on the body it is fading, which it does in the same order as to parts as it appeared on them. On the eighth day the rash is fading from the parts last invaded, so that on the ninth it is hardly perceptible, and by the tenth it has in general entirely disappeared. While the fading proceeds, the elevations of the cuticle drop off in the form of little scales, so that the surface of the body appears as if it had been sprinkled over with fine bran.

Such is the usual course of the disease in its simple and regular form; but we occasionally meet with deviations or peculiarities requiring to be noticed. Thus the eruption, sometimes anticipating the usual time of its appearance, comes out on the third or even the second day of the eruptive fever, while in other instances it has been delayed many days beyond the ordinary period. Buchobz gives an instance of its not appearing till the twenty-first day, and Dr. Elliotson in his description of the disease says, "these catarrhal symptoms will sometimes last two days, sometimes twenty before the appearance of the eruption: in some instances the disease is ushered in by severe vomiting, and occasionally, though rarely, free salivation takes place." Heberden* tells us of a patient who on the first day of the eruption "was seized with a spitting which continued to tease him for forty-eight hours, without suffering him to rest at all by day, or to sleep by night; the cough in the mean time almost ceased, and all the other symptoms were as mild as in a favorable sort of the measles." Convulsions also have occasionally preceded the attack, as happens sometimes in small-pox; and one person is mentioned by Heberden, who had a most excruciating pain in the back, which continued for a day or two after the eruption. In some instances the spots have appeared first on the body instead of the face, and in a few rare cases the rash has not spread to the arms during the whole course of the disease. Sometimes the eruption is not followed by desquamation. In many the rash is accompanied and intermixed with a very full crop of miliary vesicles of such size and distinctness as to lead to a suspicion of the approaching disease being small-pox. The production of these vesicles has been ascribed by some writers to an unusual intensity in the inflammatory action attending the disease, but this is certainly incorrect, as we have seen them very numerous in perfectly mild cases. It has happened, but we believe very rarely, that the eruption has broken out anew: Dr. Conolly* relates the case of a young lady at school, who became the subject of a very singular hysterical affection, a few months after having had rubeola in an unusual form; the eruption came out and seemed to be disappearing at the usual period, when it suddenly broke out afresh, and to such an excessive degree as to make it impossible to recognize the features of her face: very nearly the same thing was observed in a case detailed by Frank.†

Treatment.—The treatment of measles in its ordinary and simple form may be comprised in very few directions. The patient should be kept in bed, with so much covering only as will secure comfort, avoiding equally too much heat or exposure to cold; on these points we almost always have to contend against one or other of two prejudices, the most common of which is, that a breath of cool air is most pernicious to a patient in measles, and in consequence of this belief the individual is kept constantly enveloped in a smothering heap of bed-clothes with drawn curtains, and the room well heated by fire, by which means the fever and all its concomitant dangers are greatly augmented; others again, who have had children in the small-pox, insist upon the advantages of cold, not being able to discriminate between the widely different natures of the fevers accompanying the two diseases. The patient should be kept free from disturbance or noise, and, on account of the tenderness of the eyes, a subdued light only admitted into the chamber; he should be liberally supplied with mild mucilaginous drinks, and little or no food, and whatever is taken should be of the simplest kind; he should be solicited to inhale watery vapour by inclining the face over a basin of warm water or of chamomile infusion, by which means the tender eyes have at the same time the advantage of the soothing effect of the vapour; sponging the face, chest, arms, and hands with the same infusion, or with vinegar and warm water, is productive of great comfort by removing the heat, dryness, and itching of the skin, which are often distressing; for a similar reason mild diaphoretics should be given, which may be advantageously combined with gentle aperients in such quantity as the state of the bowels absolutely requires, active purgation being neither useful nor safe. In the opinion of some the administration of an emetic should form part

* Commentaries, p. 317. See also Frank, tom. 2. p. 370.

* See article HYSTERIA in this work, vol. ii. p. 564.

† Tom. ii. p. 377.

of the treatment, but the propriety of such a remedy has always appeared to us doubtful, and we think we have had reason to be satisfied that its effects were often decidedly injurious by exciting disorder of the alimentary canal.

However favourable may be the condition of the case, we should guard against being lulled into security as to the event. There is no disease in which a change of symptoms occurs more suddenly, or danger more quickly takes the place of safety; we must therefore at every visit carefully ascertain the state of the head, chest, and abdomen; since from these, and especially the two latter, are likely to arise those dangers which may compromise the life of the patient. Thus the discovery, at any period of the disease, of severe headach, with pain piercing through the temples, and perhaps accompanied by delirium and suffused eyes, to which the least ray of light is torture, with a rapid hard pulse, is calculated to excite great apprehension, and demands the immediate adoption of very active measures. The state of the lungs should most particularly engage our attention, as being the organs most constantly and most severely affected in this disease. The period at which danger may generally be apprehended from this source is about the decline of the eruption, that is, from the seventh to the ninth day; but we should be equally on the watch at all times to detect the first symptom of inflammation within the chest, and for this purpose we would strongly inculcate the necessity, where there can be the slightest doubt, of always determining the point by auscultation, instead of trusting to the ordinary symptoms to be collected from the state of the pulse and respiration, or the expression of the countenance, all of which, under the peculiar circumstances of this disease, are but little likely to afford satisfactory information. When once we have satisfied ourselves of the presence of inflammation, our sheet-anchor is bloodletting. We should bleed at once; and if the symptoms are not subdued, bleed again:* we would even say, if there be doubt, bleed, but of course very cautiously,—carefully watching the effect, which, in ninety-nine cases out of a hundred, will be decidedly beneficial. Heberden,† Cullen,‡ and others of our most celebrated physicians, appear to have considered bloodletting as an essential part of the treatment in almost all cases, and to have practised it in every stage of the disease. Mead§ makes no exception, but directs it in every instance. We should, however, be very far from recommending an indiscriminate adoption of such a practice, which under the ordinary circumstances of the disease is not required, and might often be injurious. Bloodletting is seldom necessary during the eruptive fever; and when the rash has appeared, we must take care not to fall into the error of mistaking the hurried and labouring respiration and quick pulse which accompany the disease during the height of the eruption, for proofs of pulmonary inflammation, these conditions being merely symptomatic, and subsiding after a day or two, without any morbid condition of the lungs coexisting, as may be ascertained by the careful application of the stethoscope. Should the character of a prevailing epidemic or of a particular case be low, typhoid, or putrescent, the abstraction of blood would be altogether inadmissible; we must also bear in mind that a great majority of our patients are of tender years and must be treated accordingly. In most cases all we desire may be accomplished by the application of a few leeches, which should always be applied over a part where there is a solid resistance to pressure, should it become necessary to restrain the bleeding; in general the back of the foot is preferred for this purpose in most of the diseases of children. If the object be to relieve the head, the leeches may be applied to the temples, or still more advantageously behind the ears. Whenever we find the patient harassed with an incessant hacking cough, complaining of pain or soreness within the chest, with a sensation of tightness or constriction across that cavity, increased by a full respiration, and with a full hard pulse, we should not hesitate to bleed, even though we may not be able fully to satisfy ourselves of the absolute existence of thoracic inflammation, the effects of which we shall too probably have to lament if we postpone the application of the most effectual remedy for its control.

We do not propose to enter here into the details of the treatment of pneumonia, bronchitis, or pleuritis, which may be consulted in full under their respective titles in other parts of this work: we will only here observe, that the remedial agents on which our reliance must be placed for subduing the inflammations incident to this disease are—bloodletting, leeches, blisters, or vesicating liniments, calomel, ipecacuan, tartar emetic, and the warm bath. Vesicating liniments will often be found preferable to the common blister in treating this and other diseases of children, from the much greater quickness with which they may be made to act, and their not being nearly so apt to produce ugly sloughing sores,—an effect which is too often found to follow the action of the common blister, especially in measles; besides we can very conveniently regulate the degree of their activity by altering the relative proportion of their components. A very eligible formula for such an application, the efficacy of which we have repeatedly proved, is three or four parts of linim. camph. comp. or linim. ammoniæ with one part of ol. terebinth. If this liniment be applied warm to

* "I have with great success ordered even the tenderest infants to be blooded in the arm, in such quantity as their age and strength indicated. And sometimes, also, when the disease (pneumonia) has been urgent, I have not feared to repeat the operation; and in reality, by bleeding, I have snatched abundance of children from imminent death. This disorder attacks children upon the departure of the measles, and proves so fatal, that it may justly be esteemed one of the principal ministers of death, destroying greater numbers than the small-pox."—*Sydenham*, p. 177-8.

† See Commentaries, p. 321.

‡ Practice of Physic, vol. ii. p. 180 and 181.

§ Medical Works, p. 261. Edit. 1767.

the skin, by sopping in it a fold or two of lint of whatever size and shape may be thought necessary, it will produce vesication generally within twenty minutes. M. Luroth has recently recommended frictions with strong tartar emetic ointment over the chest and epigastrium in this disease; but when we consider the extreme irritability of the skin in children, it would require a strong conviction of the indispensable necessity for such an application before we should venture to resort to it. Cold affusion has been recommended,* and in a few instances adopted in the treatment of measles, and it is said successfully. Kœmpfer assures us that at Java the children die of measles if they are not washed with cold water; and Guersent says he would not hesitate to use it where there was pure debility free from disease in the chest.† We have never witnessed the adoption of this practice, and we confess that it appears to us so hazardous and so unnecessary, that it would be difficult to induce us to venture on the experiment.

It sometimes happens that the rash comes out imperfectly, or having appeared properly, suddenly retrocedes and disappears: under such circumstances the nurse will almost certainly, if not well watched, give the child a good dose of sulphur in diluted spirit, or a glass of punch containing saffron, which are considered specifics for helping to bring out the eruption. The pernicious results of such remedies it is unnecessary to point out, especially when we consider that in almost every such instance the retrocession is the effect of some internal disorder which is generally inflammatory, or of too high a degree of fever, the reduction of which should be the primary object of our treatment. If the retrocession have been caused by exposure to cold, the use of the warm bath, diaphoretics, and warm or perhaps slightly stimulating drinks, are all that will be required. Should debility appear to have been the cause, a stimulating plan must be adopted, not only because the rash has receded, but because it has done so in consequence of a condition of the system which, if allowed to continue, might place the patient in danger. The improper use of active cathartics may have been the source of the evil, or it may have arisen from a spontaneous diarrhœa setting in from the commencement; if so, the state of the alimentary canal claims our particular care. Should there be tenderness and other evidence of inflammation, we must bleed, or apply leeches, and use the warm bath; if the discharges are ill-coloured and of very foul odour, we should give calomel, or mercury with chalk and rhubarb; afterwards an anodyne injection may be advisable. These observations apply to the treatment of diarrhœa when it comes on at the termination of the disease: Sydenham says, "Bleeding, also, cures the looseness which succeeds the measles;"‡ but we must observe that we cannot always venture to bleed when there is tenderness present, which may exist without any other evidence of inflammation. On the contrary, there may be much debility; and here we must have recourse to blisters, irritating liniments, the warm bath, opiates, astringents, and a rice diet, with removal into the country to complete the cure.

Varieties of rubeola.—1. *Rubeola sine catarrho* is a form of the affection in which the eruption appears unaccompanied by the usual symptoms of fever and catarrh, and its invasion does not protect the individual against a second attack. This variety has been called by the German writers *rubeola spuria*, and by Dr. Good *rubeola incocta*. Rayer denies the existence of this form of measles, and maintains that such cases are merely roseola mistaken for measles; but the descriptions of Willan, Heberden, and many other very accurate observers, leave no room for doubt on the subject. The most satisfactory example the writer ever saw of it was in one of his own children; the rash was perfect, but the catarrhal symptoms were entirely absent. There is nothing peculiar in the management of this variety, but we should warn the parents that they may expect the occurrence of the disease in its usual form. Frank, in his general observations* on the exanthemata, maintains that as "there is no exanthem which does not occasionally exist without its peculiar fever, so on the other hand there is not one of the exanthematous fevers which does not in certain cases pursue its course without any cutaneous eruption, and *with the same consequences as in other cases.*" This appears in some measure supported by the observation of Dr. Burns already quoted, but we confess that our own experience has made us very sceptical on the point. Rayer is of opinion that the cases which have been supposed *rougeole sans eruption* were neither more nor less than *catarrhus sans rougeole*; and it is to be remarked that Frank himself, speaking of measles, declares "he never met with the fever of measles without the eruption (febris morbillosa sine morbillis), and doubts its existence, until it shall have been proved by inoculation that persons who have had such a fever are not susceptible of taking measles."†

2. *Rubeola nigra.*—This designation is applied to a peculiar appearance which the rash occasionally assumes about the seventh or eighth day, the spots becoming of a livid colour; or, more properly, of a brownish hue, inclining to yellow. It is generally accompanied by languor and a quick pulse, but seldom lasts more than a week or two. Guersent,‡ however, met with a case in which it continued for more than five weeks; he thinks it ought to be distinguished from measles. Practically it is not a matter of much importance, as it is not productive of any bad consequence, the patient recovering quickly under the use of tonics, of which Dr. Willan preferred the mineral acids, which may be very conveniently and advan-

* See Bateman's Synopsis, p. 61. and Edin. Med. and Surg. Journ. April, 1814.
† Dict. de Méd. tom. xviii. p. 516.
‡ Works by Swan, p. 178.

* Tom. ii. p. 216. French edit.
† Tom. ii. p. 370.
‡ Dict. de Méd. tom. xviii. p. 309.

taneously given in combination with sulphate of quinine. It is to be recollected that this is a condition totally distinct from the presence of petechiæ, which mark a debilitated and broken-down state of the system, likely to occasion great danger.

3. *Rubeola putrida vel maligna.*—This distinction has been made to designate a class of cases in which the concomitant symptoms are such as accompany the low form of typhous fever, with a tendency to putrescency throughout the system. The form of disease described by Sir William Watson* as prevailing in the Foundling Hospital in 1769, which proved very fatal, was evidently scarlatina in its malignant form, and not measles. At that time the two diseases were confounded, and Dr. Watson was one of those who even thought that the term scarlatina might be altogether dispensed with.

This variety of the disease is said to have prevailed at Plymouth at 1745, in London in 1763, and at Edinburgh in 1816.† In these epidemics the symptoms of the eruptive stage were particularly violent: the patients were early seized with extreme debility, restlessness, sometimes with coma; the tongue became dry, hard, and black; the fauces were of a deep red colour, accompanied with great irritability of the stomach; the eruption did not exhibit its usual characters; it frequently receded very soon after it made its appearance, was less elevated than it ought to be, and of a dark or livid colour. A large majority of these cases died, and on examination there were found well-marked evidences of inflammation within the thorax. In Edinburgh the retrocession of the eruption was almost always a fatal symptom. Such a form of the disease we believe to be extremely rare in this country, at least we have never met with it. At the same time, however, it is not to be doubted that in particular constitutions, or under certain contingencies, the complaint may assume these characters. Thus Dr. Perceval mentions that in a charity-school where measles prevailed, typhous infection was introduced, and a corresponding change was immediately observed in the character of the measles. Dr. Thomson saw a case in which the languor and state of the pulse were alarming, and the skin rubbed off like a moist cobweb, but the patient recovered by the use of wine and cordials, the administration of which, with the addition of some of the preparations of bark and ammonia, with the warm bath, constitute the chief remedial agents suited to such a condition of the system.

4. *Morbilli variolosi* is a variety mentioned by Dr. M'Bride,‡ in which he says "the eruption is prominent, the face swells greatly, and many pustules actually suppurate like those in the small-pox;" and he adds, "the cough and other catarrhal symptoms are the things which distinguish this from the small-pox." Such a disease as that here described we have never seen, except it should be merely what we have already alluded to,—measles accompanied by a great number of miliary vesicles, some of which occasionally suppurate, but bear no resemblance whatever to small-pox: the occasional conjunction of the two diseases has been already spoken of.

Inoculation.—Some time about the middle of the last century it was proposed to adopt inoculation of measles for the purpose of rendering the disease milder; and Dr. Home* of Edinburgh performed several experiments on the subject, inoculating with a little blood drawn from one of the exanthematous patches. The result does not appear to have been either very decisive or satisfactory; nor has the eligibility of the practice been at all proved by subsequent trials, many of which failed altogether; and even where they succeeded in producing the disease, the operation did not always ensure a mild form of the complaint; on the contrary, many of the cases so produced were as severe as those arising naturally. On this point we have no evidence to offer from our own experience, never having seen the practice put to the test; and we can only find that authorities of equal weight are completely at variance on the subject. Theurmen and Tellegen, as we learn from Rayer, inoculated five infants without any other result than the production of slightly inflamed spots where the punctures were made. The same want of success attended the trials made by Dewees and Chapman at the Philadelphia Dispensary in 1801. The most recent trials of which we are aware are those made by Professor Speranza of Mantua: he inoculated in the first instance six individuals, and afterwards himself, with blood taken from a vivid patch of the eruption: in a few days the measles appeared, and proceeded mildly and regularly; in consequence of this he made further experiments, and he says they were all successful. Dr. Elliotson thinks "it likely that the vesicles which occasionally accompany the eruption may contain the contagion itself in a concentrated form."

Prognosis.—The prognosis in simple measles is almost always favourable; but nothing is more certain than that the mildest form may be speedily converted into the most dangerous; a sudden change taking place in the symptoms which could not have been foreseen, or produced by improper treatment, such as the administration of stimulants, by too much heat, or by exposure to cold. It is to be recollected that it is not the eruption or the mere disease which endangers the safety of the patient, but the internal inflammation which may accompany or follow it; and hence the great necessity for ascertaining exactly the degree of their developement by a most careful examination of the organs of respiration and digestion, to enable us to form a correct opinion as to the probable result. There is a very general impression that adults are in greater danger from measles than younger subjects; but as far as our experience enables us to judge, we should pronounce exactly a contrary opinion, sup-

* Med. Obs. and Enq. vol. iv. p. 132.
† See Edinb. Med. and Surg. Journ. Jan. 1817.
‡ Practice of Physic, vol. ii. p. 116.

* Clinical Facts and Experiments, 1758.

posing each to be in an equally good state of health at the time of being attacked. Of course, if an adult encounters the disease with a constitution naturally delicate or previously broken up by intemperate habits, or with some old pulmonary complaint, such a patient would be in great danger; but as a general rule, young children are most likely to suffer severely, because they are most disposed to severe attacks of pulmonary inflammation; so that, in our opinion, the younger the subject the greater the danger. Pregnant women are known to bear all the exanthematous diseases badly, and especially small-pox; this might, *à priori*, be expected, because their system is already in a state very unfavourable for the reception of an inflammatory disease. Rayer considers measles under such circumstances peculiarly dangerous. The cases which the writer has seen have done well; and Heberden* expressly mentions that he "attended several who were greatly harassed by the violence of all the usual symptoms in this illness, but never knew it make one woman miscarry, or be in more danger on account of the pregnancy."

The character of a prevailing epidemic should always be taken into account: thus that of 1670, described by Sydenham, was particularly mild, while that of 1674 was remarkable for the frequency of pneumonia.† The season of the year also has no inconsiderable influence on the progress and issue of the complaint, which is likely to proceed more favourably and safely in mildly warm and temperate weather than when there prevails either extreme of heat or cold. When measles and some other disease are conjoined, as for instance variola or pertussis, or when measles follow close upon the subsidence of some other ailment, especially if that has affected the lungs, the danger to be apprehended will be greatly increased: the same may be said when this disease attacks persons of a scrofulous or a plethoric habit. The following may be considered as the general circumstances which should forewarn us of danger:—great violence in the symptoms of the eruptive fever; the eruption appearing too soon or too late; the approach of pulmonary or abdominal inflammation; severe headach with delirium, suffused eyes, or coma; a hacking cough, with a hard pulse; extreme dyspnœa; retrocession of the eruption, which is generally owing to some serious internal derangement; the accession of typhoid symptoms; the appearance of petechiæ; profuse hemorrhages, inducing prostration of strength:‡ while, on the other hand, a favourable case may be known by the regularity with which the eruption appears and proceeds, and its equal distribution on the different parts of the body successively; by the absence or slightness of the symptoms of thoracic or abdominal inflammation; freedom from headach; the soft state of the pulse; the naturally moist condition of the skin; and the patient obtaining a sufficiency of refreshing sleep. From the London bills of mortality, it appears that there died, from December to October 1831, of measles 532, of small-pox 436, and during the same period in 1832 the number of deaths were, of measles 508, of small-pox 532; making a total of measles 1040, of small-pox 968. Morton has given a very highly exaggerated account* of the mortality during the epidemic of 1672, when he says the deaths from measles were *three hundred every week;* whereas it appears, from the public bills of mortality, that the whole number of deaths for that year by measles amounted only to 118.†

Sequelæ.—Measles are very frequently followed by a train of symptoms indicative of serious pulmonary lesions, very generally by a distressing and tedious cough, by chronic bronchitis, chronic pleuritis, pneumonia,‡ tubercles and phthisis; chronic diarrhœa, generally of an inflammatory character, sometimes harasses and exhausts the patient; ophthalmia, ear-ach, and running of the ears, occasionally also supervene. There are several cutaneous affections apt to appear after measles; amongst them is a very troublesome eruption of inflamed pustules, sometimes terminating in ulceration. In a few instances gangrene of the inside of the cheeks, gums, and lips, in the horrid form of *cancrum oris*, has been observed: in other instances the mortification has affected the vulva. Anasarca has been known to appear after measles, as it very often does after scarlatina; but this is so rare an occurrence, that where anasarca is found, and said to have been preceded by measles, there is much reason to suspect that the previous disease was scarlatina.§ Dr. Harty, who has had extensive opportunities of observing this disease, informed the writer that he has very frequently found during convalescence from measles that the pulse became unusually slow, about forty or fifty beats in a minute; but it did not appear to be connected with any thing unfavourable in the condition of the patients, whose recovery was uninterrupted.

(William F. Montgomery.)

* Commentaries, p. 322.

† The number of deaths from measles that year amounted to 795; while for the three preceding years, taken together, they amounted only to 141.

‡ When females, especially girls, are the subjects of measles, it very frequently happens that during the eruptive stage of the disease the catamenia make their appearance perhaps a week or two before their natural period, and sometimes much more profusely than is natural: this we have repeatedly observed to happen, not only without injury, but we have thought with advantage.

* Append. ad Exer. de Morb. Acutis, p. 427.

† See paper by Dr. Dickson in Med. Obs. and Enq. vol. iv. p. 256.

‡ Laennec thinks that the suffocating orthopnœa which sometimes very suddenly carries off young children after measles is produced by an idiopathic œdema of the lungs. In the greater number of cases examined after death by the writer, the morbid alteration existing was the condensation of the pulmonary structure ordinarily found as the effect of pneumonia.

§ Frank, tom. ii. p. 372, op. cit. Guersent, Dict. de Méd. art. *Rougeole.*

RUPIA, from ῥύπος, *sordes*, may be characterized as an eruption of flattened and scattered bullæ, each surrounded with an inflamed areola; the bullæ filled with serous, purulent, sanious or dark bloody fluid, and succeeded by thick dark-coloured scabs covering unhealthy ulcerations. Bateman and Biett describe the varieties of rupia under three species or heads, viz. rupia *simplex*, rupia *prominens*, and rupia *escharotica*. The last of these, rupia escharotica, being the same disease as gangrenous or infantile *pemphigus*, and as such already fully described in the article Pemphigus; the other two species, rupia simplex and rupia prominens, alone demand a place here: moreover, as these differ from one another merely in degree of severity, they may be comprised under one general description.

The bullæ of rupia are observed most often on the lower extremities, but are also frequently seen on the loins, the upper extremities, and about the shoulders. They are always few in number, and are generally scattered at some distance from one another. In the mild form, (rupia simplex,) one or more oval bullæ arise with little or no premonitory redness of the skin. These bullæ are flattened, and are filled with a sero-purulent fluid, and seldom exceed a sixpence in size. After the lapse of a few hours from their formation, they become partially flaccid; the contained fluid grows muddy and puriform, and dries into a dark-brown scab, thick in the centre, and thin towards the circumference. Around the scab there is a dusky red areola, the cuticle covering which is slightly raised or separated from the true skin, and continuous all round with the thin edges of the scab. The latter is in general easily removed, or falls after a few days, leaving an unhealthy-looking ulceration of the skin, which either becomes crusted with a fresh succession of scabs, or heals, leaving a dark purple mark. In the aggravated degree of the disease, (rupia prominens,) a circumscribed inflammatory redness precedes the formation of the bullæ. The bullæ rise slowly, and, instead of serous fluid, contain purulent matter or a mixture of purulent matter and blood, which constitutes the blackish fluid already mentioned as sometimes found in the bullæ. The contained fluid dries into a very dark-coloured scab, which covers a deeper ulceration, and is surrounded by a wider inflammatory areola than in rupia simplex, and as the ulcerated surface is continually secreting pus, and at the same time enlarging in circumference, the scab is increased by successive layers, each wider than the preceding, and at length, at the termination of ten or twelve days, acquires a conical shape similar to a limpet-shell, sometimes extending at the base to the size of a dollar in area, and protruding in the centre an inch above the surface of the skin: hence the name of this variety of the disease—rupia prominens. This scab is superficial, and if removed is either replaced by a fresh scab, or leaves exposed a pale unhealthy spreading ulcer, bleeding on the slightest touch, of a depth proportionate to the duration of the scab, with livid swollen borders, and in old persons often very difficult to heal, and even when healed leaving a dark-coloured cicatrix.

Diagnosis.—Rupia may be confounded with pemphigus, ecthyma, and venereal pustular eruption, but the bullæ of pemphigus are large, full, and very prominent, and generally contain a serous fluid, while the bullæ of rupia are small, flattened, quickly become flaccid, and contain a fluid, which, if not sanious or purulent from the commencement, very quickly becomes so. Gangrenous pemphigus pours out a sanious fluid, but does not form scales like rupia. The ulcerations of rupia are deep and indented, while those of pemphigus are superficial, resembling excoriations. The shape of the scab in rupia prominens at once distinguishes this variety from pemphigus. Rupia is frequently found in conjunction with ecthyma luridum and cachecticum, and Plumbe has classed rupia and ecthyma together. The two diseases are, however, very distinct in their pathology and appearance. Ecthyma commences as a pustule, rupia as a bulla. The scab of rupia is generally easily removed; the scab of ecthyma is strongly adherent. Around the circumference of the scab of ecthyma there is deep-seated inflammatory hardness, extending into the subcutaneous cellular tissue; around the scab of rupia there is only a superficial red areola, the cuticle over which can be traced in continuation with the surface of the scab. The scab formed on some of the pustular venereal eruptions bears a very close resemblance to the scab of rupia; and as both diseases are likely to occur in the same broken-down constitutions, there is risk of confounding them. The venereal scab and pustule are, however, found to proceed from pustules with hardened bases, not from bullæ as in rupia, and they are generally surrounded with the peculiar syphilitic copper-coloured areolæ. These characters, with the presence of some of the usual constitutional symptoms of syphilis, will suffice to distinguish the two diseases. Plumbe speaks of having seen evil result from mercury being administered for rupia, under the mistaken supposition of its being a venereal affection. Few practitioners, however, in the present day, after the clear and lucid views laid down for the treatment of venereal affections by Mr. Carmichael,* would push mercury to any extent for such appearances, even admitting them to be of venereal origin.

Prognosis.—The duration of rupia is very uncertain, running through its course in a few days, or extending to months. The disease is severe in proportion to the age of the patient, or weakness of the constitution. The slowly-healing ulcerations often keep up a low fever in the system, and thus injure the health, but rupia is scarcely if ever a fatal disease.

Causes.—Rupia may be considered as altogether a constitutional affection, being only

* An Essay on Venereal Diseases, and the Use and Abuse of Mercury in their Treatment, by Richard Carmichael, M.R.I.A. &c.

seen in the aged, or in the debilitated from any cause, but particularly from intemperance, abuse of mercury, or want. Acute diseases affecting the skin, and leaving much debility after them, predispose to it; thus it appears as a sequela of small-pox and scarlatina. The scrofulous are peculiarly subject to it, and it is most prevalent during the winter season among the poor who are badly fed and clothed.

Treatment.—From what has been just stated relative to the causes of rupia, its treatment is easily anticipated. The remedies are a light nutritious diet, cleanliness, the warm bath, attention to the state of the bowels, and sarsaparilla or cinchona, with the mineral acids. Dr. A. T. Thomson, in his edition of Bateman says that slight mercurial courses carried so far as to affect the mouth are sometimes necessary. Mercury, when used in this disease, should according to the best observers be used only as an alterative, and in its mildest forms, as in Plummer's pill. As to local applications, the scabs should be removed by a poultice, and the raw surfaces, if painful, are to be stuped with decoction of bran and poppy-heads. Relaxing or emollient applications, however, should be used only for a short time; the surfaces of the ulcers very soon require stimulating applications, and the strength of these must vary, according to the relaxed state of the ulcers, from a weak solution of nitrate of silver to the application of the solid nitrate, the strong nitric or muriatic acid, or ointment of red precipitate of mercury. Rayer recommends the ulcers to be dressed with saturnine cerate, pledgets of lint to be placed over this dressing, and all to be confined with a bandage which shall keep up a moderate compression. He recommends the ulcers when indolent to be dusted with powdered supertartrate of potass, or a solution of it to be used as a lotion. In this, as in all skin diseases where there is ulceration attended with low irritative fever, internal opiates given at bed-time to procure sleep form an essential requisite in the treatment.

(D. J. Corrigan.)

SCABIES.—This is the classical word now universally used to designate the well-known contagious vesicular disease of the skin, called popularly, in English, *itch*, French, *gale*, German, *krätze*, Italian, *rogna*, &c. These vulgar appellations, except the French, (the etymology of which is doubtful,) are derived from the property which our English expresses, the intense itching and irresistible scratching which it excites. Scabies is the word by which the Latins rendered the ψώρα of the Greeks, a term under which the latter comprehended a number of papular and squamous affections, although they at length appropriated it to the disease which we now denominate psoriasis. The confusion which for a long time attached to ψώρα necessarily involved its synonym scabies, and prevented it from becoming definite in its signification, until they were divorced by Celsus, who restricted the Greek term to scaly diseases, and excluded these from the comprehension of the Latin scabies. The Roman physician and his successors did not, however, confine its signification within its present limits, but included under it other pustular and pruriginous affections, and so caused an inaccurate latitude in its acceptation, which prevailed to a comparatively recent period. The advance of cutaneous pathology at length isolated the disease, but the verbal confusion was revived by Cullen and others, who, when scabies had been definitely fixed, chose for the designation of the itch the term anciently used in so indefinite a sense by the Greeks, *psora*, which (with a prolonged termination) Willan, with a greater regard to its old signification, appropriated to the scaly disease. No imputation of inexactness in this instance attaches to the old medical writers, for words must ever be varying and inconstant in their signification until the state of science permits the diseases which they represent to be investigated upon enlightened principles, and discriminated by a true nosology; but authors are to blame, who, after this period arrives, embarrass the received nomenclature by arbitrarily multiplying names, or changing them from their general acceptation.

Scabies is one of the cutaneous diseases the distinct identity of which is best confirmed by peculiar characters, yet in the description of which such a variety exists as to render it extremely difficult to give a comprehensive account of its history and symptoms. An artificial arrangement would be very desirable for this purpose, but in seeking for such we find how difficult it is to fix arbitrary bounds within which natural phenomena may be circumscribed. "This troublesome disease," says Bateman, "from its affinity with three orders of eruptive appearances, pustules, vesicles, and papulæ, almost bids defiance to any attempt to reduce it to an artificial classification."* A ready illustration of this statement is found in the fact that while Willan has placed it in his order "pustulæ," Biett and Rayer, who have adopted his system, classify it among the vesicles; and again, Dr. Paget, the author of a late ingenious essay on the classification of cutaneous diseases,† coincides with others who consider it as appertaining to the papulæ. It does not belong to our object to maintain the credit of the artificial arrangement, but we may remark that this discrepancy, which shows its defectiveness in this particular as a system, by no means detracts from its practical advantages; on the contrary, the purposes of study and description demand more urgently the aid of arbitrary methods of arrangement when the natural appearances are diversified.

It is admitted by the majority of observers that by far the greatest part of the eruption of scabies is composed of vesicles, so that we unhesitatingly agree with the French authors above cited in regarding its type as essentially vesicular. The transparent apex of the elevation is often so minute or so fugitive as to give the idea of a papula, if not observed atten-

* Synopsis, 7th edition, 1829. p. 278.

† Edin. Med. and Surg. Journal, vol. xxxix. p. 270.

tively and at the seasonable period of its course. With respect to the true papulæ, which are often interspersed amongst the vesicles, it is to be observed that in all eruptions of the skin (whether their real type be vesicle or pustule) there is a period at which the elevation is merely a papula, and it frequently happens that in a vesicular or pustular eruption some pimples proceed no farther in their development than the state of papulæ. Nothing is more common than to see among the pustules of porrigo several which have no purulent apex, having never advanced beyond the papular stage; but on this account their genuine character is not the less established, being properly regarded as *undeveloped* pustules. The papulæ which complicate the vesicles of scabies bear a larger proportion to the true type than in the example of porrigo, but they appear to possess a similar relation to it, being as it were *abortive* vesicles. The occurrence of pustules in scabies forms, indeed, a more decided variety, as one species of it seems to be truly pustular in its nature. Yet it is not to be overlooked that some of these apparent pustules are also primitively vesicles, in which an inflammation of more than ordinary acuteness has produced a purulent secretion instead of transparent serum. According, then, to the opinion here stated, we embrace the vesicular as the true type of the eruption, and regard the deviations of papulæ, and in part those of pustules, as caused by casual variations in the intensity of the inflammatory action. On the one hand, papulæ occur where the inflammation stops short of maturing vesicles; and on the other, pustules are met with when, proceeding to an immoderate degree, it fills the vesicles with pus in place of serum.

The contagious nature of this eruptive disease is the most essential character of its history. Its vesicles are minute and slightly acuminated, with a pearly semitransparency at their summit. They may arise at any part of the body, and spread until it cover every part except the face, which appears to possess a singular immunity from their invasion. The hands and arms are always principally affected, and are often so when no other part of the body partakes of the eruption, which is sufficiently accounted for by the fact that infectious contact usually occurs in this situation. The vesicles are mostly distinct, but have a disposition to accumulate at the flexures of the joints; being almost invariably found confluent on the soft fold of skin between the fingers and at the joint of the phalanges and wrist, and often at the larger articulations, if the eruption be more extensively spread. The intense itching which is the characteristic feature of this troublesome disease accompanies the first appearance of the eruption, and, indeed, seems generally to precede it, as the inflammatory elevation which generates the vesicle is much promoted by the scratching, which the pruritus irresistibly induces. It increases from the commencement until each vesicle attains a certain degree of maturation, when it decreases. The annoyance which it produces is in proportion to the extent of the eruption; if the vesicles be few in number, are developed slowly, and confined to a circumscribed locality, it may cause little attention; but when they are numerous and extensive, and come out with rapidity, the pruritus rises to an intolerable height, and produces inexpressible irritation. The patient then seeks to assuage it by scratching, from which, howsoever he may be cautioned against it, he feels it impossible to refrain. Temporary relief may be obtained from this by changing the itching sensation into the pain of laceration, but he only lays up in store a future visitation of greater intensity. The action of the nails increases the inflammation, which causes new crops of vesicles to spring up, and aggravates the pruritus in the old. More or less of the same consequences flow from any other circumstances which give rise to even a transitory excitement of the cutaneous circulation, as the warmth of bed, the digestion of a stimulating meal, or the use of spirituous potations.

Several days elapse between the time of infectious contact and the manifestation of the pruritus, which period is called in this as in other eruptive diseases the incubation. Its length is much modified by the age of the individual, as connected with the susceptibility of the cutaneous surface to impressions. In childhood, when the skin is soft and active in its functions, the incubation has generally three or four days' duration; in adults it averages ten to fifteen, and in old age, when the skin is rigid and has lost its vascularity, this period is still more prolonged. In the bilious temperament, in which the skin's function is less energetic than in the lymphatic and sanguine, it is also comparatively protracted. The relations of climate and seasons, moreover, have a sensible effect on it, cold and heat respectively retarding and accelerating the first appearance of the disease. The existence of an inflammatory affection of any internal organ is another condition which appears to diminish the susceptibility of the skin to its infection, and to add to the period of incubation. The circumstances connected with this latent period are worthy of attention, not only on account of their intrinsic interest as pathological facts, but because they afford an important practical deduction, which is as follows: the duration of this period has a relation to the actual course of the disease, and the facility with which it may be removed; when the eruption appears promptly after infection has been contracted, it may be inferred that the disease can be speedily conquered by the appropriate remedial applications; but if, on the contrary, the skin has exhibited a tardy inactivity in producing the eruption, when fully developed, the latter will be proportionately inveterate and less amenable to therapeutic means.

When scabies has fully appeared, although it may be modified as to its intensity by circumstances, it always assumes a progressive course, until arrested by treatment; it has no tendency like the exanthematous eruptions to a spontaneous cure. From its original seat it

spreads until the whole surface is affected, but collects especially where the skin is disposed in loose folds, subject to friction, as the axilla, the internal part of the thighs, and fold of the buttock, as well as the flexures of the articulations. The situation where it may first shew itself appears to be entirely dependent on the liability of different parts to contact with infected persons. This is demonstrable from the consideration of it in different individuals, whose conditions in life expose one part of the body more than the rest: for example, in tailors, sempstresses, and shoemakers, it commences on the hands; in infants in the nurses' arms, the nates are frequently found to be the part first affected; and if, on the contrary, the nurse receive it from the child, it breaks out on the hands, and sometimes (which is more in point) on the breast. An exception to this rule would seem to exist in the case of dyers, smiths, and sawyers, whose hands and wrists are rarely primitively affected, and often escape, while it infests other parts: this is to be ascribed to the rough hardened state which the hands of these tradesmen contract from labour, and doubtless in the first two their immunity must be in some part owing to the chemical agents with which their employments bring their hands in contact. Sulphuric acid and other powerful astringents form a main ingredient in the dyers' liquors, and the iron and embers of the forge constantly impregnate the smiths' hands with sulphureous vapours, which are at once its best prophylactic and cure. Redi asserts that he knew an instance in which the face became the first part affected, from the contact of the collar of an infected mantle; but its appearance on the face at all is so contrary to experience deduced from innumerable observations, that this has been denied to be a genuine case of scabies by later writers.

Willan and Bateman divided scabies into four species, derived purely from the variety of form which the disease assumes. They have not been followed in this by the recent authors who have borrowed their arrangement. As the framer of a system, Willan was disposed to attach too much nosological importance to his divisions, and his followers, conceiving that they imply theoretic error, have in many instances relinquished them. It does not appear, however, that by so doing they have attained either to more simplicity of arrangement or fidelity of description, but rather the contrary. In our opinion, the specific distinctions which Willan employed are as valuable as the grander divisions of his system, and to those who are jealous about natural arrangement they are less objectionable, as being the mere expressions of facts, which may be received without reference to any theory of classification. Artificial subdivisions of cutaneous diseases founded on real differences in external characters, if they have no other advantages, greatly facilitate their study, and without the aid derived from this source their description becomes necessarily either vague or defective. In scabies, these practical means of discrimination are particularly requisite, as its diagnosis, which is of great importance, is chiefly to be arrived at (where contagion cannot be proved) by an accurate knowledge of its external characters.

We now proceed further with its description, and in addition to the general remarks with which we commenced it, we recommend attention to the following divisions, which are the same as those proposed by Willan. Far from being the mere offspring of theory, they were suggested to him by their common use amongst the lower order, whose familiarity with it forces them to be intimately acquainted with the various forms in which it appears. Of these they distinguish four, designated the *rank*, *watery*, *pocky*, and *scorbutic* itch, which Willan adapted to his nomenclature under the following titles, viz.:—

Scabies papuliformis.
——— lymphatica.
——— purulenta.
——— cachectica.

Scabies papuliformis, or rank itch.—In this form of scabies the eruption is generally extensive, and accompanied with slight inflammation in the vesicles, and intense itching. It is found chiefly to infest the fingers and wrists, but also spreads extensively upon the trunk, particularly the front part of the chest and abdomen. The elevations resemble papulæ, and thus seem to evince an affinity between this form and prurigo and some varieties of lichen; but where they are fully developed and unbroken by scratching, a close inspection may always detect the transparent apex which indicates its vesicular character. The itching is so troublesome that frequent scratching is resorted to, and the abrasion of the vesicles and even of the skin which ensues, changes the primitive appearance of the eruption; "long red lines are here and there left, and the blood and humour concrete upon the vesicles into little brown or blackish scabs." When it occurs in a sanguine habit, or if it be inordinately exasperated by scratching or other circumstances, some scattered pustules sometimes make their appearance, filled with thick yellow purulent matter.

Scabies lymphatica, or watery itch.—The difference between this and the former is inconsiderable. The separate vesicles are larger and do not partake of the papular character, being full of serum to the base, which besides exhibits no inflammatory redness. The pruritus is extremely troublesome, and when the vesicles are ruptured, moist excoriations are apt to form, upon which after a certain time dark scabs concrete. The most ordinary appearance which this variety presents is a compound of the three stages just referred to, viz. the entire vesicle, the excoriation succeeding its laceration, and the scab which covers this ulcerated part when it begins to heal. It seldom extends like the former variety to the trunk, but is chiefly found collected at the lower parts of the extremities, on the fingers, wrists, back of the hands, and on the feet and toes.

Scabies purulenta, or pocky itch.—This possesses more the characters of a distinct species than any of the other forms, and evinces the

necessity of marking these varieties. As Bateman well remarks, "it is often mistaken by those who confine their notion of scabies to the ichorous vesicles of the varieties already noticed." Heberden had divided the disease into two species, comprehending in the first two former varieties under the name of "pustulæ exiguæ, aquâ plenæ."* The other he describes as "majusculæ enm fundamento rubro, et pure impleantur, fere tanquam variolæ." This resemblance of the round pustules which constitute this species to small-pox, caused the vulgar to denominate it pocky itch. They arise distinct, upon an inflamed base, above which they are considerably elevated; after a few days they maturate and break, having attained frequently to a diameter of two or three lines. The pruritus which they occasion is mixed with a painful tension of the part, different from that which occurs in the vesicular forms. After their breaking they leave a cracked ulceration behind, the heat and stiffness of which causes considerable pain. The pustules may spread like the vesicular form over the body, but seldom extend far from their original seat, which is usually the hands or feet In these situations they are largest, and two or three of them sometimes coalesce between the knuckles, especially between the index finger and thumb. The scabby concretions which at length form upon the ulcerations adhere for a considerable time during the healing process. The pustular scabies occurs usually in children before the age of ten years.

Scabies cachectica, or scorbutic itch.—This is not distinguished from the forementioned varieties by difference in external character; for it appears under the form of the other varieties, at one time indiscriminately mixed, at another exhibiting them separately in different parts of the body. It mostly occurs in persons of debilitated constitution brought on by indigence and intemperance, and is the most intractable form of scabies. It is not unfrequently combined in such individuals with other cutaneous maladies, as lichen, prurigo, ecthyma, and impetigo, and Bateman asserts that when the latter disease is superadded, it as well as the scabies possesses a contagious character. He also remarks that the most severe degree of it which his experience made him acquainted with, exhibited itself in persons who came from India, and he had often observed it in children brought from that country. It is there denominated "courap," a term which is equivalent to itch, and is the same which Bontius† describes under the name of herpes, seu impetigo Indica, and Sauvages under that of scabies Indica.

It was, perhaps, superfluous to make a separate species of this, inasmuch as it possesses no particular form which distinguishes it from the others; yet, as it is so disposed in Willan's divisions, it might be invidious in such a matter to use an arbitrary power in altering an established arrangement, which we have taken advantage of for greater facility of description.

In whatsoever form scabies manifests itself, it is to be regarded entirely as a local affection, being never like other vesicular eruptions connected with disorder of the internal organs. It gives rise to no disturbance of the circulation, except in severe cases of the pustular scabies, which, from the inflammation sometimes attending it, causes slight febrile action in children. Some authors recount a list of the most formidable diseases as liable to be produced by its retrocession and the metastatic transport of the cutaneous irritation to the vital organs. These notions, however, are now disregarded, being justly considered as the imaginary fabrications of an exploded theory, which pretended that a specific virus residing in the serum of the blood was the cause of scabies We conceive that the observations of others which assert that important diseases of the internal organs have been cured by its eruption are to be equally unheeded. Unprejudiced experience demonstrates that it exerts little or no pathological sympathy upon the internal organs, and therefore such cases as those narrated by Beer* and others can be only regarded as coincidences.

The disease chiefly shews itself amongst children, yet on this account it is not to be inferred that it shews a preference for youth more than age. This is to be attributed solely to the fact that children are more brought in contact with infection than adults, from their heedlessness of exposure and inattention to cleanliness. It depends upon the same cause that amongst the working classes males are more generally affected with it than females. Climate does not appear to have much effect in modifying its prevalence,—although it is certainly more common in the northern parts of Europe than the southern, an observation which we think must be connected with the fact that individuals of sanguine and lymphatic are much more liable to it than those of bilious temperaments. Habits of uncleanliness, however, are more powerful than this predisposition arising from the temperaments, of which its great prevalence amongst the Polish Jews and Spaniards affords examples; for amongst these people, as is well known, the bilious preponderates beyond comparison over the opposite temperaments.

It prevails in so general and constant a manner in some countries that it may be said to be endemic. In Poland and Hungary the mass of the population are constantly more or less infected, and it is equally rife in Galicia and Asturias in Spain, in Lower Brittany in France, and in certain parts of the highlands of Scotland. It is, however, no stranger amongst the indigent classes of every country,

* Comment. de Morb. Histor. et Curat. Frankf. ad Mœn. 1804. p. 102.

† De Medicinâ Indorum, lib. iii. cap. 17.

* Geschichte eines geheilten volkommenen, von zurückgetretener Krätze enstandenen schwarzen Staars, (Account of an Amaurosis caused by Retrocession of Itch, which was perfectly cured.) 8vo. Vienna, 1798.

and where it is found to infest one region with peculiar pertinacity, this is not to be attributed to any special influence of the atmosphere or the soil, which alone would properly entitle it to be called endemic, but to the habits of the poor population. It has been suggested that salt diet and the neighbourhood of the sea were concerned in maintaining it in some districts, but these circumstances have no influence in producing it, although they are frequent concomitants of that which is its true promoting cause,—inattention to cleanliness of the person, and particularly of the habiliments. Change of linen is the surest protection from it in a family or in a country, and we may with certainty predict its prevalence amongst every people where custom or necessity has precluded this best preservative of the health of the skin.

This malady inspires, as might be supposed, no friendly feeling in communities, and it is curious in this respect to remark the difference between it and those contagious eruptions which put life in jeopardy, as small-pox, measles, &c. With whatsoever dread the latter may be contemplated, they do not produce disgust; but the itch, being free from danger, may be treated more disrespectfully, and is very generally regarded as contemptible. However, different nations have different opinions on this subject; it is reported of the inhabitants of the Spanish provinces before mentioned that they retain it often from the cradle to the tomb, and that they are not only careless of its concealment, but regard it as a kind of hereditary possession: they even refuse to use means to be freed from it, alledging that they are not willing to change the customs of their ancestors.* But in countries where civilization is more diffused, its residence is less tolerated. Here even the imputation of the itch becomes almost injurious, and sometimes engages philosophers in its refutation, of which the following is an example. "Laennec was a true Breton, fond of his country and jealous of its honour. It is amusing to observe the high tone he assumes in refuting a charge brought by a certain writer against his native country, for being infamous for an epidemic itch. He solemnly assures us, that if in very truth 'la gale s'observe quelquefois en Bretagne, on en doit moins accuser les localités, que le passage et le sejour des matelots.'"† Equally patriotic renunciations of it have been made in our own islands.

Diagnosis.—There is scarcely any disease compromising the general health in so trivial a degree in which it may be more important to the reputation of the practitioner to be able to deliver a categorical diagnosis than in scabies. He is in fact frequently consulted for no other purpose than to decide whether an individual has not brought this contagious affection into his circle; and as the physician's opinion on the one hand sets him free from this suspicion, and on the other sentences him to a temporary banishment from society or even from his employment, it is obvious how much it behoves him to be able to distinguish it without error. In forming his opinion, he should learn to be as much as possible independent of the criterion furnished by its contagious quality, for it will be generally where this point is yet undecided that his judgment will be sought for. When some evidence of exposure to infection exists in addition to the proper characters of the eruption, there is no difficulty; but if such be unattainable, it will often require all the resources which an accurate acquaintance with it and other affections which resemble it supplies, to distinguish between them. The eruptions with which it is liable to be confounded are some forms of lichen, prurigo, and eczema. The papular elevations of lichen are attended with considerable itching, and are frequently abraded by scratching, so that considerable resemblance may exist between them and scabies, particularly the first variety of it above noted, (*s. papuliformis.*) If the latter be present, the apparent papulæ, examined in an unbroken state, will be found to be topped by a vesicular apex, and where they have broken spontaneously, a dark scab remains; but in lichen the papula is solid, even to the summit, and it passes away in a scurfy exfoliation. Lichen occupies the back of the hand, and the external surface of the limbs, and is seldom or never developed in the intervals of the fingers. Moreover the itching is not nearly so intense as in scabies, and is of a more remitting nature, and the papular eruption is commonly attended by some constitutional disturbance which is foreign to scabies. In the lichen *urticatus* the eruption is of a more acute nature, and has occasionally a few vesicles interspersed amongst the papulæ, which might confound an observer who relied on any single characteristic; but the diagnosis in this case is still easier than in the simple lichen—the inflamed wheal-like papulæ, causing rather a deep tingling than an intense itching, sufficiently distinguish this eruption. Finally, the suspicion of contagion will seldom attach to any form of lichen.

The itching of prurigo is of a still more vehement character than that of scabies; they were of old frequently confounded, insomuch that the former was sometimes erroneously denominated scabies *sicca*. (See Prurigo.) The diagnosis between them is not difficult if these points be held in memory. Prurigo occurs chiefly in elderly individuals, its papulæ are flat, and when abraded by the nails no serous fluid is effused, but a dark spot of blood concretes upon their surface. The situation also of the pruriginous eruption (as that of lichen) is distinguished from scabies by its preference to the surfaces of extension on the extremities, instead of those of flexion, which the latter particularly affects. Prurigo, moreover, is not contagious.

In eczema we have a vesicular eruption, which often bears a striking resemblance to scabies in the second variety, (*s. lymphatica.*) Its vesicles, however, are more flattened and

* Dict. des Sciences Méd. t. xvii. p. 183.

† Forbes's Translation of Laennec, Author's Life, p. xxviii.

confluent than those of scabies, which are acuminated and distinct. But when the disease is passed to an ulcerated and scabby state, such distinguishing characters may be wanting, and then other circumstances must be sought out. Eczema is for the most part a local affection, and when the itch has in any place assumed the ulcerations and soft scabs which resemble it, the eruption has proceeded to a considerable extent, and will doubtless shew its proper form in the parts which it has most recently invaded. The irritation of eczema is a stinging or tingling sensation very different from the pruritus of the itch, and its origin may be often traced to the action of irritating causes upon the skin, as sugar, lime, and other acrid substances, or to exposure to the solar rays or great heats.

Very lately a female presented herself to the writer with an eruption at the root of the right middle finger, which from its situation and appearance was difficult to distinguish from scabies. She ascribed its origin to milking cows, whose teats were in a diseased state. The pruritus was not that of scabies, and after a careful examination it was concluded to be a vesicular form of impetigo. Bateman calls attention to the possibility of confounding the pustular form of scabies with impetigo, and even with ecthyma; and although this seems remote, it is yet only a prudent caution to keep in mind every form of cutaneous disease which bears any affinity to it.

A circumstance in the history of scabies of the greatest moment, is the simultaneous presence of the diseases which we have just contrasted with it for the sake of diagnosis. This is indeed rare in ordinary cases of itch, but the fact of its occasional occurrence forcibly impresses the necessity of cautious examination, and adds much practical importance to the diagnosis, because those complications require a line of treatment quite distinct from that of scabies. They are met with in the cases in which much inflammation has attended the scabid eruption, and (which serves to illustrate what we have said as to their different treatment) they are very frequently produced by improper applications for its cure, such as powerfully irritant lotions or frictions. The actual complication which may be present will be much influenced by the constitution and age of the subject; in young and vigorous habits, the excess of irritation will mostly take the form of eczema or of impetigo, while in those of an opposite condition pustules of ecthyma may appear, or the inflammation may seize on the cellular tissue, and an eruption of boils be the consequence. Cazenave and Schedel remark that the same subject may present at once "vesicles of itch, pustules of impetigo, pustules of ecthyma, and boils,"* a case which would exercise the diagnostic tact of the physician to discover the primary contagious disease amongst so many complications.

Causes.—The universally diffused cause of scabies is contagion, and it appears to be the disease which of all is most readily communicated by contact. When it once gains admission into a family the greatest caution often fails in preventing it from infecting every individual. A question exists undecided amongst pathologists as to whether it ever originates from any other source than contagion. It was observed by Sir John Pringle, that in military hospitals the patients often became the subjects of itch after the crisis of fevers;* but there remains little doubt in our mind that this excellent physician in these instances mistook some of the papular eruptions, as lichen or prurigo, for scabies, for those are not uncommonly observed to occur when the skin recovers its tone in the convalescence from fever. We would make the same remark with respect to a kind of it which Heberden describes as primarily contracted by contagion, but which being cured by the customary remedies, "tamen non cessat redire semel vel bis quotannis.†" This is rather the description of the lichen simplex, occurring periodically in a person who has been once affected with scabies; for this faithful observer adds, that after its first attack it is no longer communicable by contagion, even to those who lie in the same bed, and that it as often terminated spontaneously as was removed by any remedy. Bateman thought that it might originate without contagion in crowded, close, and uncleanly houses, and wherever the means of cleanliness were not obtainable.‡ These are, however, just the circumstances which facilitate the propagation of contagion. On the whole, there are no facts which contravene the opinion of those who assert that the latter is its sole origin, and it appears to us that it agrees best with every analogy.

We have reserved to this head the notice of a very remarkable circumstance connected with the etiology of scabies, the existence of the insect called by Linnæus and by preceding naturalists "*acarus scabiei*." First in the writings of Avenzoar, the Arabian physician, and subsequently in those of Ingrassias, Gabucinus, and Joubert, notices of a minute insect occurring in a certain disease of the skin attracted the attention of the English entomologist Thomas Moufet, who examined and described them with considerable accuracy. They are, according to him, minute animalcules similar to the acari of decayed cheese or old wax, which burrow under the cuticle, and excite intense itching, with an eruption of vesicles. His observations were repeated by various naturalists in different parts of Europe, and Hyacinth Cestoni, at the end of the seventeenth century, investigated the characters of this insect with much exactness, and was the first proposer of the theory which regards it as the proximate cause of the itch.§

* Abrégé Pratique des Mal. de la Peau, Paris, 1828, p. 120.

* Bateman's Synopsis, p. 288, note.

† Op. cit. p. 102.

‡ Synopsis, p. 289.

§ This was communicated by Cestoni's coadjutor, G. Bonomi, in a letter to an eminent physician, Francisco Redi, in whose works it was first published, an. 1685. (Dict. des Sc. Méd.)

This doctrine gave rise to a controversy which has continued ever since, and seems at the present day to be as far from being settled as ever. In the order of time, two questions are involved in this subject. By the first the acarus, or (as Latreille denominated it generically) *sarcoptes* scabiei, was universally received; but issue was joined on the opinion, first mooted as a conjecture by Cestoni, that scabies is nothing else than the bite of these small insects, which produces the itching and an extravasation of serum collecting into vesicles; moreover, that the contagion is effected by the transfer of those insects from one individual to another. Experiments were made, and opinions were contested negatively and affirmatively, by many eminent medical men in different countries. Redi, Wichmann, Osiander, Pringle, and many others, considered the contact of the insect as the only exciting cause of the itch; while as great a number insisted that the acarus was produced by the disease. Again, a middle opinion was embraced by the majority, to which Morgagni attached himself. They held that in most cases the insect was the product of the disease, but admitted that in some instances the latter owed its origin to the insect. M. Galés, apothecary to the Hôpital St. Louis in 1812, undertook a series of investigations, which he conducted with the greatest variety and perseverance, and which finally seemed to leave nothing undecided as to the whole subject. He observed with the microscope upwards of three hundred of the insects taken from the scabious vesicles.* He confined the insect upon his hand with a watch-glass, and observed it penetrating the cuticle, upon which, after a few hours, three vesicles appeared, the intense itching of which left no doubt of their identity with scabies. He inoculated in the same manner three children with the insect, who became covered with the itch. These experiments were testified to by many of the first naturalists in Paris; and as they appeared to have the force of demonstration, after their publication the opinion that the itch was produced by the insect was ratified by the assent of almost all. They doubtless proved the presence of the acarus, and moreover that its penetration of the skin is an occasional cause of scabies; but with all, this may be a very secondary matter in the production of the disease. In fact, it seems to us somewhat singular that these observations were permitted to prove more than that the insect taken from a scabious vesicle, *being charged with the virus, the fluid of the vesicle*, by penetration of the cuticle, inserted this virus, and produced the disease, like the inoculation of cow-pox.

At a later period, however, the opinion supposed to be thus incontestibly fixed by M. Galés' experiments was not only called in question, but, singular to relate, the existence of the acarus was again doubted. M. Suriray of Havre, and afterwards MM. Lugol and Mouronval, revived the discussion of the subject, and, as the result of their researches, denied that any insect could be found. This extraordinary revulsion of opinion was confirmed by M. Biett, who, even with the use of microscopes of high power, was unable, in a great number of trials, to discover it in a single instance. Cazenave and Schedel state that many others have made an equally unsuccessful search for the insect; and rejecting for themselves the idea of its existence, they announce a kind of challenge to M. Galés to transport himself again to the Hôpital St. Louis, and demonstrate it anew.

It would follow from these negative researches, that while at one period the disease is attended by the acarus, at other times it exists without it. In these countries it is a notorious fact that the insect is frequently found. Moufet originally stated that the common people were in the habit of extracting it from the vesicles with the point of a pin; but that more usually it may be found in a small channel, which it frets from the vesicle in the adjoining cuticle. We have conversed with those who have frequently seen them, and whose description of their being found not in the vesicle, but in the red streak adjoining it, exactly coincides with Moufet. Bateman and Mr. Plumbe bear the same testimony; and the latter adopts an hypothesis proposed by Galés and Fournier,* by which it is conjecturally affirmed, that when the elevation becomes large and full of lymph, it being no longer possible for the insect to exist in it, in obedience to a preservative instinct it makes its way laterally, and is then found beside, and not within the maturated vesicle. He supposes, also, that it is sufficient to account for the ill success of those who have not found it, to presume that they happened to select for their researches vesicles which had been evacuated by the acari. This does not occur to us as by any means satisfactory; but the opinion of Sauvages, adopted by Bateman, seems more plausible, that the insect is generated only in some instances of scabies, of which cases Sauvages proposes to make a particular species under the title of "scabies *vermicularis*." This is not irrational; yet we deem it more consonant with the varying history of the researches to suppose that there is a variation in the *disease itself* in this respect at *different epochs*. This view is more consistent with analogy, as we know how often the type of diseases changes at different epochs in the same locality, without therefore losing their identity. Of this fever is a familiar example, which it is unnecessary to do more than mention in respect to its change of type; but an occasional phenomenon which it presents (as was remarked by M. Ranque of Orleans) may be adduced,

* His descriptions of the insect agree with those of Linnæus and Latreille, but are much more extended and exact. It has six legs, with a few filaments besides projecting from the body, and is not unlike the minute pulix sometimes accompanying prurigo. It lies in the centre of the vesicle, round the margin of which it deposits its ova.

* Dict. des Sc. Méd. art. *Gale*, tom. xvii. p. 199.

and reflected on in connection with the generation of the acarus scabiei. We allude to what is occasionally observed when a favourable crisis takes place at the last extremity of typhus; the head is sometimes swarmed by a sudden production of lice, so unaccountably numerous as only to permit the supposition that they are secreted by the skin.

According to the view here propounded, and in agreement with the analogy just mentioned, the animalcule of scabies is regarded as a secretory product of the disease, which at certain periods is endemic; but ignorance is professed as to the circumstances which give rise to it at one time more than another; and at the same time we agree with Bateman that the contagious property of scabies exists in the fluid, and not in the insect, which, however, may be the occasional means of transport of the latter. We would finally remark, with regard to the whole controversy, that it includes a lesson at least to medical theorists: here many ingenious men oppose each other in a matter of fact and observation; with what sobriety, then, should dogmatic opinions be entertained, when it is often so difficult even to lay their foundation in certain facts!

Treatment.—The cure of scabies appears to have been considered a matter of no slight medical interest. Treatises have been written upon it, and a vast variety of means discussed with so much earnestness, that we are led to the conclusion, (which we believe coincides with general tradition,) that it was formerly a scourge to the community of greater extent and virulence than at the present day. It is now regarded as of trivial importance. Never in itself dangerous, it gives much annoyance to the individual by its unappeasable itching; but the fear and restraint which it puts upon him of infecting others often causes as much discomfort to him as its action upon himself. Neglect of the appropriate means may indeed protract it to an indefinite length; but by their use its treatment is conducted with so much certainty that we have scarcely any other care in the choice of remedies than to select that which experience has approved of as effecting a riddance of the disease in the most secure and speediest manner. A multitude of such has been vaunted, but modern practice has contracted the most useful within a small circle; and it is unnecessary to enumerate here any of minor efficacy, as we are in possession of some whose virtues are almost infallible.

Sulphur is considered in the light of a specific remedy in the cure of itch. It is the basis of the applications which by universal consent are considered its most effectual antagonists. In the ordinary forms of the disease the common people have long used it as an ointment, mixed with equal parts of hog's-lard or butter, with which they smear the parts on which the eruption exists once or twice a day. They administer it internally at the same time, in doses of from ten grains to half a drachm given in milk at bedtime. By this treatment they scarcely ever fail to cure it expeditiously. The internal use of sulphur is adapted for it in children, and is occasionally combined with magnesia; in adults, however, it is unnecessary to have recourse to any but the external use of the sulphur ointment. The assiduous use of it for a fortnight is sufficient to cure the common forms of it, if they be attacked with it speedily after its first appearance, as the duration of the treatment will be longer if long neglect has permitted it to gain a certain inveteracy.

A great improvement was made in the application of the sulphur ointment by the combination of an alkali with it. This adds to the specific effect of the sulphur the advantage of a detergent action, which loosens and dissolves crusts or scabs, and permits the skin to be well penetrated by the ointment. M. Helmerich, a French army surgeon, became famous for a method of using sulphur which cured the itch more promptly, and also permitted the greasy stain of the ointment to be removed from the linen by washing, obviating an objection to the use of unguents which was very generally felt. He kept it a mystery, but it was analyzed by M. Burdin, and found to consist of the following ointment:—

Sublimed sulphur, two parts,
Sub-carbonate of potass, one part,
Axunge, eight parts, intimately mixed.*

This deserves a preference over all other methods of applying the sulphur externally. It has the most constant and prompt success, and is seldom attended by the cutaneous affections which sometimes result from the use of other stronger but more irritating sulphureous applications. It is the ointment which Biett has exclusively employed at the Hôpital St. Louis for several years. He orders half an ounce of it to be rubbed, morning and evening, over all the parts occupied by the vesicles. The action of this ointment is favourably promoted by the use of a tepid bath every second day during its application, which will rarely have to be continued beyond ten or twelve days. Another sulphureous friction which, in the Paris hospitals, rivals the reputation of the above-mentioned ointment, is made with the sulphuret of lime. A scruple or half a drachm of this powder is to be triturated with a small proportion of olive oil, so as to render it sufficiently fluid for using as a friction, and this quantity is to be rubbed upon the affected parts twice a day. This is a very effectual cure, but it is not so applicable as the former, when the itch has already spread to any considerable extent.

The use of ointments over an extensive surface of the skin may be considered unadvisable in some cases, as interfering with the cutaneous transpiration. When these objections exist, substitutes of no less efficacy are found in the proper use of lotions. None of these is preferable with regard to activity to the solutions

* For the sake of depriving this ointment of the smell and appearance of sulphur, it would be agreeable to add to each ounce of the axunge a few drops of oil of lavender or bergamotte, and ten grains of the hydrargyri sulphuretum rubrum (vermilion).

of sulphuret of potash, or of lime. These have been long known and extensively used in scabies, and a saturated solution of the latter is an excellent remedy in the mange of sheep or dogs. The following formula of a lotion was prescribed by M. Dupuytren, and highly extolled in France for the promptitude with which it effects the removal of the disease:—

R.—Sulphureti potassæ ℥iv.

Aquæ puræ lb. iſs.

Acidi sulphurici ℥iß, dissolve ut fiat lotio.

Whatsoever part the eruption has invaded is to be moistened by a gentle friction with this lotion twice a day. It has the advantage of not injuring the linen of the patient, nor does it compel him to renounce his employment during its use. However, it produces a smarting of the skin, which will sometimes require it to be used in much weaker proportions, and renders it not so appropriate in some irritable habits.

If the individual entertain insuperable objections to the use of sulphur from disgust to its odour, many other external remedies of approved efficacy are at hand. The ointment of white hellebore in the proportion of a drachm of the powder to an ounce of lard, is both a safe and expeditious application. Solutions of the chloride of lime or of soda have been extolled as highly beneficial by some practitioners; they are used as a lotion in the proportion of an ounce to a pint of water. The aqua chlorinii applied in the same manner is also mentioned with applause. Heberden strongly recommended a lotion composed of a solution of the muriate of mercury, made with one drachm, or two, (according to the inveteracy of the disease,) to a pint of water. This is acknowledged to be a remedy of great power in curing scabies, but it is objected to by some as liable to produce the constitutional effects of mercury. We have, however, been assured that these fears are vain, by an esteemed practitioner, who has had a very favourable experience of this lotion, and has used it on his own person with success; and in our own more limited sphere of observation, we never saw any such effects from it.

Sulphureous baths are an excellent auxiliary means in many cases of scabies. In cases of very irritable skin they are frequently the only form in which general applications of this remedy can be made to the surface; in young children, therefore, they are a very valuable resource. The artificial are found to answer the purpose equally well with the water of sulphureous springs, and their employment possesses the advantage of being proportioned according to circumstances. They may be prepared by simply adding to an ordinary sized warm bath six ounces of the sulphuret of potash in powder, and agitating it until it be dissolved, and the water be reduced to a lukewarm temperature.

Sulphureous vapour baths are another means which possess great power in this as well as in some other diseases of the skin. This is evident from the testimony of all who have used them, from M. Galés, who was the first to construct an apparatus for their convenient administration, to Mr. Wallace, who has also ably illustrated their use. Dr. Bardsley informs us, that he has "always seen the most obstinate and neglected cases of it yield very speedily to a few fumigations."* It is happily to such inveterate cases that they are mainly applicable; for even if they did possess the superior advantages over ordinary methods of treatment which are claimed for them, they are too stimulating to be employed in any cases except where the disease has become chronic through neglect, and has induced an unhealthy torpid condition of the skin. They are particularly contra-indicated where there exists any tendency to congestion in the gastric or pulmonary mucous membranes, and in females with complaints depending on morbid conditions of the uterine functions.

In the conduct of the treatment the practitioner has but little to be solicitous about; but, having used his discrimination in the adoption of the most appropriate remedy, he perseveres until the cure is complete. He should inculcate great attention to cleanliness and change of linen, especially during the convalescence. A vigilant inspection must be made for the purpose of detecting any of the complications previously noticed as apt to coexist with certain forms of the disease, or to spring up under improper treatment. If any of those be present, it will be necessary to modify his plan accordingly, and often to suspend the use of the stimulating remedies, with which he had commenced to combat the scabies. The state of the alimentary canal now demands particular attention; cooling laxatives and alteratives will be proper; and for topical applications recourse should be had to emollient fomentations, and the other soothing means specially adapted to the individual complication, for which we refer to Ecthyma, Eczema, Impetigo, Lichen, &c.

(James Houghton.)

SCARLATINA.—*Syn.* Morbilli Confluentes, *Morton*: Rubeola Rossalia, *Hoffman*: Febris Scarlatina, *Sydenham*: Febris Rubra, *Heberden*: Scarlatina, *Sauvages*, *Vogel*, and *Cullen*: Purpura, *Schultz*, *Juncker*: Enathesis Rosalia, *Good*: Fièvre Rouge, Scarlatine, *Fr.*: Der Scharlachaufschlag, *Germ.*: Scarlet Fever. Scarlatina designates a contagious febrile disease, the distinguishing characters of which are, a scarlet efflorescence of the skin and of the mucous membrane of the mouth and pharynx, appearing on the second day (though often later) of a febrile disorder, and terminating about the fifth; accompanied, in the majority of instances, with inflammation of the throat, either of a phlegmonous or gangrenous character; and occasionally with tumefaction of the cervical absorbents and subcutaneous cellular membrane. Other organs become also sometimes involved in the progress of the disease, giving rise to lesions of greater or less severity. The type of the accompanying fever is various, and modifies remarkably

* Hosp. Facts and Observations, p. 198.

the whole aspect of the malady. In some cases, the constitutional disturbance is so trivial as scarcely to attract notice; in others, the febrile symptoms are those of strong inflammatory excitement; while in individual instances, or during the prevalence of an entire epidemic, the fever is of a low typhoid form, the local inflammation, with which it is associated, partaking very much of the same character.

The origin of scarlatina is involved in great obscurity. It was evidently unknown to the ancients; no allusion to it can be discovered in the writings of Hippocrates, or in the early Greek and Roman writers; and, notwithstanding the opinion of some modern authors of the French school, that it was described about the middle of the sixteenth century, it is generally admitted that Prosper Martianus, an Italian physician, who gave a description of the disease as it prevailed in Rome about the middle of the seventeenth century, if not the first, is among the earliest writers on scarlatina. It made its appearance in London in 1689, and was described by Sydenham and afterwards by Morton, though it is evident, by comparing the description given by these two writers, that they had observed different epidemics; the one described by Sydenham being a very mild disease compared with that of which Morton has given an account. From the various names, however, given to scarlatina on its first appearance, it is evident, that about the period to which we refer, the notions entertained with regard to it were vague and unsatisfactory; indeed, it was scarcely distinguished from measles, roseola, or purpura. For example, it was named by Morton *morbilli confluentes;* by Hoffman *rubeola rossalia;* by Heberden, *febris rubra;* and even till within a little more than half a century, both these diseases (measles and scarlatina) appear to have been considered by medical writers as the same, or at least as so closely allied, as only varieties of a common species. Morton, indeed, maintained their identity, and considered their relative connexion to be nearly the same as that existing between the distinct and confluent small-pox.* The description of the epidemic given by Huxham under the name malignant ulcerated sore-throat, which prevailed in the year 1734, resembles in almost every particular one form of scarlatina—that form in which the eruption is accompanied with affection of the throat. The treatise on this subject is a valuable record of the characters of this epidemic, the description being evidently taken from what he had observed in his intercourse with the sick. Dr. Fothergill also has given the history of a "sore throat attended with ulcers," which appeared in London in 1747-8, which there can be little doubt was an epidemic scarlatina, and from the remarks he has made, it is evident, that he had observed various forms of the disease, from the mildest to the more malignant. Dr. Withering published an essay on scarlet fever in 1778, a second edition of which appeared in 1793; to this author is due the merit of having first accurately described scarlatina as a distinct disease; since that period, various treatises have appeared both in this and other countries.

* De Morbillis et Scarlatina, Exercit. iii.

Causes.—Nothing satisfactory is known as to the exciting causes of scarlatina. It appears to be induced, like the other eruptive fevers, by exposure to the influence of a specific poison. Attempts have been made to induce the disease by inoculation, by inserting the thin scales, which are thrown off at the period of desquamation, under the skin of individuals who have never had scarlet-fever, but hitherto without success. How far inoculation with the blood might be followed by different results is a question which can only be determined by experiment.

That scarlatina may be propagated by contagion is, we presume, admitted even by those who profess themselves sceptical on the question of contagion in general. Instances of the disease spreading in a manner which can only be explained by admitting its contagious origin are so numerous, that practitioners of the most limited observation must have had repeated opportunities of determining the question. We have known, in several instances, convalescents from scarlet-fever, on their removal to a considerable distance from the situation in which they had passed through the disease, infect individuals with whom they came in immediate contact, though several weeks had elapsed from the period of desquamation. The period of invasion after exposure to sources of contagion is exceedingly various. Some individuals are seized within a few hours; others do not exhibit any of the peculiar symptoms for several days; and in some more rare cases, five or six weeks have intervened between the period of exposure and the accession of the disease. The poison also appears to affect individuals very differently. Of a number of persons exposed to the same source of infection, some may escape altogether; others have a mild form of the disease; or it may happen, perhaps, that in several, the disease proves severe. Even in the same family the various forms which scarlatina presents may occasionally be observed. One or more may have both the efflorescence and the sore throat; in others there may be fever with the characteristic rash, but without any affection of the throat; another case may present the characters of the malignant disease; while, again, those who have been in constant attendance on the sick become indisposed with smart inflammation of the throat and a considerable degree of fever, which lasts for some days, and then subsides with the local affection. In these latter cases, (though there have been no efflorescence) desquamation of the cuticle occasionally occurs. Dr. Rush, in an account of an epidemic scarlatina which prevailed at Philadelphia, remarks, that such was the prevalence of the contagion which produced the scarlatina anginosa, that many hundred people complained of sore throat without any other symptoms of indisposition. The slightest occasional exciting cause, particularly cold, seldom failed of producing the

disease.* The same thing has been repeatedly observed in this country.

Although sporadic cases of scarlet-fever are met with at all seasons, it is more prevalent at the end of summer, and in the autumn, than at other periods of the year. Epidemic visitations have been most frequently observed after a warm summer, especially when the heat has been accompanied with continued rains; and when the succeeding winter has been open and mild, the disease has continued till it has been checked by frost. It generally disappears in the spring months, though it has been observed to continue uninterruptedly for one or more years.

It is necessary to advert in this place to the difference in the characters of epidemic scarlatina, though the causes of such remarkable variation are unknown. For a whole season, the disease may assume a mild aspect, so that a fatal case is rarely met with; in such instances, the danger is generally produced by some local inflammation which has supervened in the progress of the disease, or during the period of convalescence. On the other hand, it should be remembered, that during a comparatively mild epidemic, one or more cases may assume a malignant character and resist the best directed curative efforts. Sometimes, an epidemic of a malignant, or, as it is popularly termed, a *putrid* form of scarlet-fever suddenly breaks out and proves extremely fatal. From its commencement the symptoms often denote a severe form; at other times on its first irruption the disease is mild, but suddenly, without any apparent cause, the symptoms assume an unfavourable appearance, which continues so long as the epidemic lasts. It is therefore of great practical importance to ascertain the prevailing type of the disease, as the character which it assumes must regulate the treatment to be adopted.

Dr. Willan observed,† that when the scarlatina spread widely, it exhibited in the different persons affected every gradation of appearances, from the slightest to the most malignant form of the disease; yet during its diffusion through some large families and schools, he had seen it uniformly retain the series of symptoms which occurred in the first patient, with nearly the same degree of fever. In the autumn of 1786, and occasionally since that period, the scarlatina maligna above described affected the inhabitants of several districts in London, comprising narrow courts, alleys, and close crowded streets, and afterwards extended to some adjoining villages, in low, damp, or cold situations. It is, however, more frequently intermixed with the other varieties of scarlatina, and it sometimes unexpectedly supersedes the milder forms of the disease on the fourth, fifth, sixth, or seventh day of their course.

"It is truly singular," he adds, "that the slightest of all eruptive fevers, and the most violent, the most fatal disease known in this country, should rank together and spring from the same origin. Experience, however, decides that the simple scarlet-fever, the scarlatina anginosa, the scarlatina (or angina) maligna, and the scarlet ulcerating sore-throat, without the efflorescence on the skin, are merely varieties of the one disease. That all of them proceed from the same source of contagion is evident, because under the same roof in large families some individuals have the disease in one form, some in another, about the same period."

Scarlatina occurs more frequently in the early than in the advanced periods of life, and in our own experience females are more liable to the disease than males. Dr. Withering states, that the epidemic which appeared at Birmingham in the year 1778, affected children more than adults, but seldom occurred in the former under two years of age. In children, the number of boys and girls that suffered from it was nearly equal; but in the adults, the number of female patients considerably exceeded that of the male.

In order to determine its relative frequency in the sexes at different ages, we selected from the register of patients admitted into the London Fever Hospital, two hundred cases in the order of their admission. The following table gives the general results:—

Age.	Males.	Females.	Total.
From 6 to 10	7	8	15
10 to 15	8	15	23
15 to 20	17	40	57
20 to 25	14	39	53
25 to 30	8	21	29
30 to 35	6	10	16
35 to 40	1	2	3
40	1	0	1
42	0	1	1
48	0	1	1
57	0	1	1
	62	138	200

It is proper, however, to state that this table cannot be considered quite complete, the number of children under six years of age who take the disease not being ascertained, in consequence of the regulations of this hospital precluding the admission of children under six years of age. The table shews the great majority of females at every age, and also disproves the assertion of Sir Gilbert Blane* and others, that the majority of those who are seized with scarlatina are under puberty.

Scarlatina in general affects the same individual only once during his life, and in this respect obeys the general law of exanthematous fevers. Occasional exceptions have certainly been observed by practitioners, though, from the testimony of Dr. Willan, a second attack of scarlatina in the same individual is extremely rare; he states that he had never seen such a repetition among two thousand patients whom he had visited in scarlatina. We certainly have met with several well authenticated instances

* Medical Enquiries and Observations.
† On Cutaneous Diseases, p. 277 and 281.

* Select Dissertations, p. 213.

of a second attack of scarlatina in the same person.

It is proper to notice the discovery of the supposed efficacy of the extract of belladonna as a preventive of the infection of scarlatina. This was first suggested by Hahnemann, of Leipsic, in 1807. The belief that this narcotic possesses such a preventive power is gaining ground in some parts of the continent, and lately even in our own country. The following abstract will explain the views of Hahnemann on this subject. A favourite doctrine of this writer is, that diseases are to be combated by remedies, the effects of which are similar to the diseases for which they are given. This is the doctrine to which the term *homœopathia* has been given, and which has of late years gained many proselytes in Germany, France, and Italy. Hahnemann observed, that belladonna given in small doses produced heat and dryness in the throat, swelling of the submaxillary glands, and a cutaneous eruption, sometimes an efflorescence only, at other times a papular rash, like miliaria; he therefore inferred that this medicine, from its producing symptoms analogous to those of scarlatina, might prove a preservative against its infection. About ten years after Hahnemann had entertained this notion of the anti-scarlatinous power of belladonna, a severe and fatal epidemic appeared in several cities of Germany, and consequently the physicians were naturally desirous of adopting measures calculated to arrest its progress. From the result of the trials made by Berndt, of Custrin, who was the first who made a series of experiments, we find, that in an epidemic scarlatina which prevailed in Custrin in 1818 and 1819, he employed the belladonna as a preservative in one hundred and ninety-five children under fifteen years of age; though they were freely and constantly exposed to the contagion of scarlatina, only fourteen took the disease, and that after employing a stronger preparation of this drug, every individual escaped. A still stronger testimony in favour of its efficacy is given by Dusterberg, a physician of Warberg; he states, that every child who took the belladonna for a sufficient length of time before exposure to infection escaped; that when a child was left in an infected family to nature, (the belladonna not having been administered with the object of determining its efficacy), it was invariably attacked with scarlatina, while the others who took the remedy escaped. Behr, of Bernberg, also affirms that of forty-seven persons who took the belladonna as a preservative, only six were attacked. Professor Koreff, of Berlin, after extensive and long-continued trials, asserts, that if the belladonna be taken in proper doses for eight or nine days before exposure, and be continued till the period of desquamation, there is little danger to be apprehended from free intercourse with persons affected with scarlatina. Similar testimony has been given as to the efficacy of this narcotic by Hufeland, Kunzman, of Berlin, and others.*

The quantity administered is very minute. Three grains of the extract of belladonna are to be dissolved in one ounce of distilled water; of this solution two or three drops are to be given twice a day to a child under twelve months old, and one drop more for every year above that age. In general, no sensible effect is produced by it, but in some instances, it brings out an eruption similar to scarlatina. It is also asserted by those who have tried this remedy, that even when it does not prove a preventive of the infection of scarlatina, which may be in consequence of its not having been administered for a sufficient length of time before exposure, it renders the disease more mild, and even that if it be taken for four or five days before exposure, the disease never proves fatal. As we have never employed the belladonna as an anti-scarlatinous remedy, we can offer no opinion of its merits, though we certainly profess ourselves sceptical as to the powers ascribed to this drug. The subject is, however, worthy of further experimental inquiry. It has one advantage, that of being perfectly harmless, if it do not act as a preservative.

Varieties.—Scarlatina occurs under several forms, to which it is necessary to advert. In the first, the efflorescence is attended with mild febrile symptoms, but there is no inflammation of the throat *(scarlatina simplex)*. In the second, the fever is of a more severe character, and the efflorescence is accompanied with inflammation of the throat *(scarlatina anginosa)*. In the third, the whole character of the disease is more severe than in either of the preceding varieties: the fever is of a low or typhoid type; the throat is affected with gangrenous inflammation, accompanied with tumefaction of the cellular tissue and absorbents of the neck, and in general with an acrid discharge from the nostrils and ears *(scarlatina maligna)*. In other instances, the efflorescence is confined to the mouth and throat, and does not affect the skin. This form (to which no name has been given) is often observed during the prevalence of epidemic scarlatina; not unfrequently in adults, when some other form of the disease is prevailing in the family. It may be designated by the name *scarlatina faucium*.

1. *Scarlatina simplex.*—In this form of the disease there is only the efflorescence with a moderate degree of fever. The rash is preceded by slight symptoms of fever—irregular shivering, nausea, sometimes vomiting, thirst, and heat of skin. The degree of fever is by no means uniform; the symptoms are sometimes so moderate as scarcely to attract attention, though there is often smart constitutional disturbance, indicated by pungent heat of skin, flushing of the face, suffusion of the eyes, pain of head, restlessness, and occasionally delirium. The efflorescence or rash generally comes out on the second day of the

* Vide Arch. Gén. de Méd. Juin, 1824.—Journ. Complément. Juin, 1824.—Hufeland Journ. der practischen Heilkunde, Nov. 1825.—Rust, Magazin für die gesammte Heilkunde, xx. I. 182.

eruptive fever, but in some instances it does not shew itself till the third, and accordingly we find authors differing as to the precise period at which it appears. Sauvages and Cullen state that it does not come out till the fourth day after the accession of the febrile symptoms. Plenciz* does not limit the period, but affirms that the rash makes its appearance on the second or third day, or sometimes later. Heberden restricts it to the first or second day. It is, however, probable that in the majority of instances, the rash comes out on the second day of the fever, and that in cases in which it appears sooner or later, there is some peculiarity in the individual or in the disease to account for the variation.

The efflorescence, which is first perceptible on the face, neck, and chest, becomes gradually diffused over the body; in twenty-four hours or less from its first appearance the trunk is covered with the eruption; on the following day (the third) it extends to the upper and lower extremities, at which period the whole body is of a bright red colour, and pungently hot and dry. On the extremities, particularly the hands and fingers, the rash is diffuse and continuous, but on the trunk it is distributed in irregular patches, the colour being most deep on the loins, buttocks, flexure of the joints, and on those parts of the body which are subjected to pressure; it is generally more vivid in the evening, gradually becoming paler towards the morning.

This is the ordinary progress of the efflorescence in the skin: it is not, however, confined to the cutaneous tissue; the mucous membrane which lines the nostrils, mouth, and fauces being covered with the eruption, so that the lips, the tongue, the pharynx, the velum palati, the nostrils, and even the internal surface of the eyelids are of a bright red colour. The papillæ of the tongue become considerably elongated, the red points shooting through the white fur, and from which it derives its characteristic appearance. In cases where the tongue is clean, it has nevertheless a bright red colour, and the scarlet points may be seen shining through its polished surface.

The rash of scarlatina consists of innumerable red points or dots, which are at first of a pale red colour, but afterwards acquire a deeper hue, giving the affected portions of skin not only a uniform red appearance, but a perceptible roughness, which is most evident on the breast and extremities, in consequence of the greater determination of blood to the papillæ of the skin in those situations.

The efflorescence on its first appearance sometimes closely resembles a papular eruption, and occasionally small miliary vesicles make their appearance, though this latter phenomenon is rarely observed, except when the individual has been subjected to a heating stimulating regimen, or confined in a small crowded and ill-ventilated apartment. These papular or vesicular spots, however, are now and then observed when the disease occurs under the most favourable circumstances. Dr. Mason Good* supposes that they arise from the great determination of blood to the cutaneous vessels producing an effusion of coagulable lymph, which is not entirely absorbed by the time the efflorescence subsides, hence there is occasionally, though not often, an appearance of vesicles, sometimes nearly empty, and sometimes nearly filled with a pellucid fluid, according as the effused fluid has been more or less carried off. The occasional appearance of these vesicles during the progress of scarlatina has been noticed by Rush, Withering, Plenciz, and other writers; Sauvages, indeed, under a mistaken view of their importance, has constituted a distinct species, under the name *scarlatina variolodes*.

In ordinary cases of scarlatina, the eruption may be regarded at its height on the fourth day; it begins to decline on the fifth, disappearing in irregular patches; on the following day it is still more indistinct, and on the eighth day no trace of the rash is discernible. The various symptoms with which the eruption is accompanied gradually disappear with the efflorescence, but the tongue still remains morbidly red and clean. The desquamation of the cuticle, which begins about the end of the fifth day on the parts on which the eruption first appeared, proceeds, so that about the eighth or ninth, portions of cuticle are thrown off, the thickest and largest being those detached from the skin of the hands and feet.

2. *Scarlatina anginosa.*—In this form, the fever and efflorescence are accompanied with inflammation of the throat. The anginose inflammation sometimes precedes the fever, but most frequently appears at the same time with the febrile symptoms, though, in some cases, not until the rash or efflorescence is at its height: in the majority of instances, however, it is felt when the eruption appears, and goes through its progress of increase and decline with the cutaneous eruption.

The precursory symptoms of scarlatina anginosa indicate a more acute disorder than the scarlatina simplex. The headach is often accompanied with slight delirium; the heat of skin is more pungent, and the prostration more marked from the beginning. In the course of the second day, the patient complains of a sensation of stiffness or pain about the muscles of the neck, extending to the angles of the jaw and under the ears, with feeling of roughness in the throat, painful deglutition, and some degree of hoarseness. The viscid secretion from the mucous crypts of the tonsils and pharynx, which takes place in the more severe cases, aggravates the patient's sufferings, from the frequent and often ineffectual efforts made to expel it. On examining the fauces, the palate, uvula, and tonsils are red and swollen, and when the local inflammation is severe, coagulable lymph is effused in small irregular masses on the inflamed surfaces. These exudations are very liable, on a superficial examination, to be mistaken for ulcers, or, when the

* Tractatus de Scarlatina, 1776.

* Study of Medicine, vol. iii. p. 13.

subjacent surface is tender and disposed to bleed, the admixture of blood imparts to them a brown or almost black colour, and thus, more especially if there be fetor of the breath, they may be mistaken for gangrenous inflammation of the fauces. On attentive inspection, however, after cleansing the throat by acidulated gargles, the entire continuity of the membrane from which the crusts have been detached, at once distinguishes this form of acute symptomatic angina, from the gangrenous inflammation and subsequent ulceration observed in scarlatina maligna.

These exudations of lymph often extend to the lateral parts of the pharynx, and occasionally as far as the œsophagus, though, according to Rayer, they are never observed after death in the larynx or trachea. This coincides with our own experience, as in the dissections of scarlatina with anginose inflammation which we have made, we have not seen an instance of membranous exudation extending to the larynx.

As the anginose inflammation becomes developed, the febrile symptoms increase, the pulse rises, the respiration becomes oppressed, the skin more pungently hot and dry, (sometimes rising to 106°, 108°, or even as high as 112° of Fahrenheit,) and the thirst urgent. The mucous lining of the mouth as well as the tongue, especially at its point and edges, assumes a florid red colour, the papillæ being much elongated and protruding their inflamed points over its surface. All these symptoms are increased towards evening, at which period, the febrile restlessness is often succeeded by delirium.

The rash does not appear so early as in the simple form of the disease. It is sometimes perceptible on the second, but more generally on the third day, and comes out in irregular patches on various parts of the body, particularly about the elbows and wrists. It has been occasionally observed that when the attack is severe, the eruption is sooner thrown out, a circumstance which was noticed by Dr. Clark, who informs us that in an epidemic which broke out in Newcastle-upon-Tyne, in the year 1778, when it began with great vehemence the eruption was often observed on the first day, though commonly it did not make its appearance till the second or third, and sometimes not until the fourth. It evinces also a great tendency to recede, or entirely vanish the day after it first comes out, and in these cases, it re-appears partially and at uncertain times, but without any perceptible change in the other symptoms, only that the duration of the disorder is protracted. About the fifth or sixth day of the disease, the fever and inflammation of the throat begin to abate; at the same time the rash declines, becoming faint first on those parts on which it first came out, its disappearance being generally followed by desquamation of the cuticle. This process is, however, uncertain. When the rash is slight, or recedes soon after it comes out, desquamation does not take place: in the more severe cases, the cuticle begins to separate after the eruption and febrile symptoms decline, and continues to desquamate to the end of the second or third week, or sometimes later, during which large portions are thrown off: sometimes the cuticle of the whole hand and fingers is completely detached, resembling precisely a glove in shape.

Though this is the usual progress of scarlatina anginosa, the disease frequently assumes a still more severe character. Thus we observe, in some instances, acrid discharge from the nostrils or ears, often accompanied with deafness: enlargement of the parotid or cervical glands, appearing sometimes at the commencement of the disease, at other times about the fifth or sixth day, but occasionally not till the decline of the eruption, and followed in some cases by abscess of the surrounding cellular tissue: and towards the decline of the disease, ulceration at the corners of the mouth, or of the tongue. Though these local affections are painful, and keep up or even increase for a time the constitutional excitement, they are seldom attended with danger; and in general, after continuing a short time after the prominent symptoms of the disease have disappeared, they subside under judicious treatment.

In scarlatina, as in all febrile disorders, the condition of the several internal organs demands attention. We have often remarked, in investigating the complications of scarlatina, the great disposition to inflammation of serous membranes; therefore, when an organ becomes inflamed during its progress, the investing membrane is much more generally the seat of inflammation, than the substance or parenchyma.

In some cases, the general symptoms are accompanied with evidence of gastro-enteritis. The tongue is morbidly red and clean, and the patient is harassed with sickness, vomiting, and diarrhœa. These symptoms are not uncommon when scarlatina prevails in the autumn, at which season, bowel-affections generally prevail, and constitute a leading feature of an epidemic.

As we have already, in the article Fever, detailed the various complications which arise, and the symptoms by which they may be detected, it is unnecessary in the present article to enter into more minute details, especially as the exanthemata bear so close a resemblance to the other forms of fever. We deem it, therefore, sufficient earnestly to impress the necessity for minute inquiry into the condition of the several organs in scarlatina, and more particularly for watching the convalescence. Cases, apparently mild, are often rendered alarming from an attack of inflammation in some organ: the suddenness of the seizure and the rapidity with which it often proceeds, prove the necessity for vigilance, however mild the symptoms of the disease may be at its commencement. Dr. Armstrong has well observed, "that scarlatina anginosa is sometimes attended with moderate, and at other times with severe symptoms; and it is of great consequence to bear this in mind, more especially as the severe may follow the moderate symptoms at any period of its progress. In those cases where

the symptoms are moderate, the inflammation is chiefly limited to the throat and mucous membrane of the nose, and the excitement of the arterial system subsides without inducing actual inflammation of the viscera; yet where the symptoms are comparatively severe, the inflammation is not limited to the throat and nasal lining, but attacks some of the viscera commonly under a sub-acute character."*

3. *Scarlatina maligna.*—This variety has been described by some writers by the name of *angina gangrænosa* or *cynanche maligna*. Thus Cullen, in his nosology, places it as a variety of cynanche, and likewise makes it one of the species of scarlatina, from which circumstance much unnecessary confusion has arisen. He was, however, candid enough to remark, that the scarlet eruption appears on the skin under the same form in both diseases, adding, that he had five or six times seen the angina maligna united with the common scarlatina; and that in different epidemic constitutions, sometimes one disease predominated, and sometimes the other.

In fact, two names have been given to one disease, which has almost invariably the same characters, and requires nearly the same treatment, making due allowance for the variation observed in epidemics, and the ever varying circumstances under which it occurs. Indeed, we are inclined, from our own experience, to affirm that the scarlatina simplex, scarlatina anginosa, and the scarlatina or angina maligna, and the sore throat without efflorescence on the skin, are merely varieties of one and the same disease.

Though several Spanish and Italian physicians had described the angina maligna, which raged with great violence and mortality in Spain and Italy in the beginning of the last century, Dr. Fothergill was the first writer in this country who described this malignant form of scarlatina as it prevailed in London in the years 1747-8.† From the description he has given, it is evident, that he witnessed during this epidemic the various forms of the disease, and consequently the malignant variety. This is apparent from the following passage. "Thus much, however, seems to be true in fact, that, in some cases, the disease appears to be of so mild a nature, and so benign, as to require but little assistance from art. Persons even recover from it under the disadvantages of unskilful and injurious management, whilst in others the progress of the symptoms is so rapid, and the tendency to corruption so strong, that nothing seems able to oppose it. Just as it happens in the small-pox: the benign and the distinct sort bears ill treatment without injury; in the malignant flux kind, the utmost art and experience are too often insufficient to conduct the distemper to a happy issue. Whether this diversity in the sore-throat we are speaking of is owing to difference of constitution or of seasons, to the different quality or quantity of the contagion, or the manner of receiving it, or whether there are in reality distinct species, may perhaps hereafter be more certainly determined."

A few years afterwards Dr. Huxham gave a faithful account of a similar epidemic, as it appeared in London from the end of the year 1751 to May 1753, and was very mortal. It is evident, however, that in this epidemic, as well as in others which have been subsequently described, the malignant form was only occasionally observed.

In this form of the disease, the symptoms assume very early a malignant or typhoid character; to the affection of the throat and skin are superadded great cerebral disorder, and often inflammation of the pulmonary and gastric mucous membranes. On the first appearance of the disease, the symptoms may differ little from those of the other forms of scarlatina. The pulse is at first soft and frequent, but soon becomes small, rapid, and often irregular: the patient is restless, and at times delirious, the delirium being sometimes so violent as to require restraint, though more generally it is of the low muttering kind. The rash comes out later and is very uncertain in its duration, often suddenly disappearing a few hours after it is first perceptible; and, five or six days afterwards, coming out again for a period of perhaps two or three days. It may thus suddenly recede and re-appear several times. The colour of the rash is at first faint, except in a few irregular patches, which assume a deep rose hue, but the whole efflorescence is speedily changed to a dark livid red, and in the worst forms, is interspersed with petechiæ. The temperature of the skin is generally cool on the trunk of the body, and cold on the extremities: the eyes are suffused and often covered with a film of mucus: the countenance is pale and dejected, while the cheeks are of a dusky red colour; the tongue is covered with dry brown, or almost black fur; in other cases, it is smooth, red, and glossy, and often so tender and fissured that it easily bleeds; the odour from the skin and breath is extremely fetid.

The throat is not much swollen, but appears of a dark red hue, and covered with small ash-coloured sloughs surrounded by a livid base; the gangrene often extends with alarming rapidity, destroying the uvula and arch of the palate. A viscid secretion with which the fauces are covered aggravates materially the sufferings of the patient by increasing the difficulty of swallowing, as well as by the obstruction which it offers to the breathing, so that when symptomatic bronchitis occurs during the progress of the disease, there is great danger of fatal asphyxia. The inflammation generally spreads from the throat to the cervical glands, giving rise to enlargement and sometimes abscess; and when the inflammatory action extends to the nostrils, as it almost invariably

* Practical Illustrations of the Scarlet Fever, &c. by John Armstrong, M.D.

† An Account of the Sore-Throat, attended with Ulcers, by John Fothergill, M.D. 4th edit. London, 1754.

does, there is an acrimonious discharge, at first thin, but afterwards thick and yellow, which produces excoriation of the nostrils, lips, and angles of the mouth, which are generally in these instances covered with black crusts.

In the more severe cases of malignant scarlatina, the symptoms are more alarming from the first appearance of the disease: the pulse is small, rapid, and indistinct: there is more marked cerebral disturbance,—stupor, coma, or violent delirium; the ulcerations of the throat are more extensive, and covered with dark sloughs, and the colour of the rash becomes livid. We frequently also observe pulmonary disease in the form of latent bronchitis, which is often combined with inflammation of the gastro-intestinal mucous membrane, giving rise to diarrhœa and its pathognomonic signs. Some writers mention that hemorrhage from different surfaces,—from the mouth and throat, lungs, intestines, or bladder, takes place, under which the patient in general rapidly sinks, unless the constitutional powers have been unusually vigorous.

In a severe epidemic described by Dr. Withering, after detailing the ordinary progress of the disease, he gives the following outline of a fatal form which it frequently assumes:—"In children, the delirium commenced within a few hours after the first seizure. The flesh was intensely hot; the scarlet colour appeared on the first or second day, and they died very early on the third. In others who escaped this rapid termination, when the scarlet colour turned to brown, and their recovery might have been expected, the pulse still remained feeble and quick, the skin became dry and harsh, the mouth parched, the lips chapped and black, the tongue hard, dry, and dark brown; the eyes heavy and sunk; they expressed an aversion to all food, and extreme uneasiness upon the least motion or disturbance. Thus they laid for several days, nothing seeming to afford them any relief. At length a clear amber-coloured matter discharged in great quantities from the nostrils, or the ears, or both, and continued so to discharge for many days. Sometimes this discharge had more the appearance of pus mixed with mucus. Under these circumstances, when the patients did recover, it was very slowly: but they generally lingered for a month or six weeks from the first attack, and died at length of extreme debility. In adults, the rapidity of the fever, the delirium, &c. was such that they died upon the fourth or fifth day, especially if purging supervened. Some survived to the eighth, or to the eleventh day: in all these the throat was but little affected: the eyes had an uncommon red appearance, not that streaky redness which is evidently occasioned by the vessels of the cornea being injected with red blood, but an equable shining redness, resembling that which we remark in the eye of a ferret. But notwithstanding this morbid appearance in the eye, the strongest light was not offensive. This redness might often be discovered, by lifting up the upper eyelid some hours before it shewed itself in the part of the eye that is usually visible: and it was of some consequence to attend to this circumstance, as it greatly influenced the event of the case. These patients were extremely restless, clamorous, and desirous to drink; but after swallowing one or two mouthfuls, upon taking another they seemed to forget to swallow, and let it run out at the corners of the mouth; whilst others spurted it out with considerable force, and were very angry if urged to drink again. In these cases, the scarlet colour appeared very soon after the attack, but in an unsettled irregular manner, large blotches of red intermixing with others of white, and these often changing places. Besides the full scarlet colour described as above, there were frequently small circular spots of a livid colour, about the breast, knees, and elbows. The pulse from the very beginning was so quick, so feeble, and so irregular, that it was hardly possible to count it for half a minute at a time. It is needless to add, that the greater part of those who laboured under these dreadful symptoms died. A few recovered, and others fell into a state of debility bordering upon idiotism, from which they were rescued by time and generous living. In one patient, a man, the jaw was so perfectly locked upon the third day, that it was impossible to get any thing down his throat, and he died early upon the fifth day."*

In a few instances, we have seen the large joints suddenly become extremely painful, to which swelling with evidence of fluctuation succeeded, and the patient was destroyed in a very short time.

In many instances this malignant form of scarlatina proves fatal on the third or fourth day, though the patient often lingers till the second or third week: it is not uncommon for the patient to die suddenly on the second, third, or fourth day, without the practitioner being able to assign any satisfactory reason, or discover any lesion on the most careful examination of the body. Sometimes, on the other hand, recovery takes place under the most unfavourable circumstances, but the convalescence is exceedingly tedious, and often retarded by the recurrence of some local inflammation, which had arisen during the progress of the disease.

It should not be overlooked that, when the early symptoms have been comparatively mild, the disease may suddenly assume the malignant character. Indeed this form (scarlatina maligna) is more frequently intermixed with the other varieties of scarlatina, and it sometimes unexpectedly supersedes the milder forms of the disease, on the fourth, fifth, sixth, or seventh day of their course. (Willan.)

4. *Scarlatina faucium.*—It has been frequently observed, that when scarlatina prevails epidemically, cases occur in which there is no appearance of rash on the skin, the efflorescence being confined to the throat and mouth. In some cases, the characteristic red ap-

* Account of the Scarlet Fever and Sore Throat, p. 18.

pearance in the throat is unattended with swelling; in others, the efflorescence in the throat is accompanied with swelling of the tonsils, and consequent painful deglutition. Dr. Willan states, that this complaint seems peculiar to adults, and is evidently a species of scarlatina, because it affects some individuals of large families, while the rest are labouring under other forms, and because it is capable of communicating by infection all the varieties of that disease. It is sometimes succeeded by an enlargement of the parotid glands, but not by dropsical swellings. Persons who have previously gone through the scarlatina anginosa, experience, while conversant with the sick, very uneasy sensations in the throat: in some there is a swelling and inflammation, or ulceration of the tonsils, producing considerable pain and irritation, but without the specific fever and efflorescence.* Similar instances have been related by Dr. Johnstone, in the description of the epidemic scarlatina which prevailed at Worcester in 1778. Some individuals, at the first seizure, were more or less severely attacked with the scarlet eruption, with swelling, redness, and ulcers in the throat; yet others in the same family, infected from them, and by them, often had the ulcerated sore-throat, without any efflorescence or eruption on the skin. Again, the first seized sometimes had the simple ulcerated sore-throat only, and yet the others infected by them had the more severe attack of the disease, of fever, and scarlet eruption, as well as sore throat.†

In a paper by Dr. Lettsom, entitled Cursory Remarks on the Appearance of the Angina Scarlatina in the spring of 1793, several cases are given of this form of scarlatina. In one case the disease assumed the characters of scarlatina maligna, but without efflorescence. The sister of this patient, a day or two after, became also the subject of the disease; but in this case, the affection of the throat and fever of the malignant kind were accompanied by general florid efflorescence. In another family, one of the children had ulceration of the throat, but no eruption: a second, about a year older, caught the disease, but had both the affection of the throat and the efflorescence. In another family, some had the sore-throat without any eruption, others had the eruption with a very moderate degree of sore-throat; and this was observed not only among the children, but also among the servants.‡

These statements accord exactly with our own experience of epidemic scarlatina. We had very lately an opportunity of observing in one family the simultaneous appearance of the various forms of the disease. In one of the children, who was the first subject of it, the symptoms early assumed a most malignant aspect; the velum and uvula were destroyed by gangrenous inflammation, and death took place about the fifteenth day. Some days after the disease had appeared in this child, one of the servants became ill, and passed through a mild form of scarlatina anginosa without any untoward symptom. No sooner had this servant recovered than the father of the child began to be indisposed, and in a day or two, considerable fever, with efflorescence of the mouth and throat, and inflammation of the tonsils, came on. The fever and anginose inflammation lasted for several days, and terminated in desquamation of the cuticle.

It appears, then, that the various forms of scarlatina may be produced by exposure to the same exciting causes, and that the differences observed depend on some individual peculiarity or idiosyncrasy, which cannot, a priori, be ascertained.

Sequelæ.—Scarlatina is occasionally followed by troublesome local affections—ophthalmia—enlargement and frequently suppuration of the cervical glands—abscess in the pharynx—laryngitis—chronic bronchitis—inflammation of the ear, ending in purulent discharge from the meatus externus, or suppuration and consequently destruction of the internal ear.

In some instances, dropsical effusion comes on during the convalescence from scarlatina, and always proves an alarming affection.

Anasarca is the form in which the dropsy more generally appears, and though the fluid may be confined to the subcutaneous cellular tissue, it sometimes accumulates in the different cavities; when this is the case, the patient may be considered in great danger. It is singular, that the dropsy has been remarked to succeed as often to mild as to the more severe forms of the disease; but it has never been observed to supervene in cases of malignant scarlatina: it would, therefore, appear to be connected with the acute or subacute forms of scarlatina only. It is almost entirely confined to children, rarely occurring after puberty; Dr. Wells, however, had occasion to treat one case which occurred at the age of seventeen. It seems peculiar to some epidemics. We have seen it occur in several children of the same family, who had passed through scarlatina at the same time. Some writers seem to view this secondary affection as of trivial importance; others regard it as more serious than the primary disease. Plenciz, indeed, affirms that more persons die of it than of scarlatina. This, however, is not the result of the cases which we have witnessed, though in this country it occasionally proves fatal. It generally comes on ten or twelve days after the period of desquamation, and often without any evident cause: sometimes it does not come on for two or three weeks after the disappearance of the rash; and in one case which came under our care, the dropsical symptoms did not appear till five weeks after the desquamation. Previous to its appearance, the patient, after perhaps satisfactorily proceeding in his convalescence to a certain point, finds he does

* On Cutaneous Diseases, p. 274.

† Memoirs of the Medical Society of London, vol. iii.

‡ Ibid, vol. iv.

not advance, but rather retrogrades: he complains of unaccountable languor and lassitude, loses his appetite and strength, his sleep is disturbed, his pulse becomes quick, the bowels costive, and the urine scanty: sometimes there is considerable gastric disorder, indicated by sickness, vomiting, and purging. The swelling is first observed in the face and upper parts of the body, to which it is sometimes confined, though more generally it extends over the whole body, and occasionally effusion takes place in the brain, cavity of the chest, or belly. In fatal cases, fluid has been effused in these three cavities in a very short time. In an epidemic scarlatina, described by Dr. Hamilton, which occurred among the boys in Heriot's Hospital, in three cases the disease proceeded with a rapidity which afforded little opportunity for deliberation or action. The stomach gave way; all food, cordials, and medicines were rejected by vomiting. The watery effusion rapidly filled the cellular membrane, and inundated every cavity. Within less than six-and-thirty hours from the occurrence of the ailment, the boys died, labouring under symptoms denoting ascites, hydrothorax, and hydrocephalus.

In this form of dropsy, the urine generally coagulates by exposure to heat or the addition of nitric or muriatic acid, alcohol, or a solution of the chloride of mercury. Sometimes it deposits a dark-red or brown sediment, which seems to arise from the admixture of the red globules of the blood.

As dropsical effusion is to be regarded only as a secondary affection, it is of importance to ascertain its source. We have always regarded the dropsy succeeding to scarlatina as of an acute or subacute kind, arising from increased action in the sanguiferous system; the consequence of this increased action is the effusion of serous fluid into the external tissues of the body, or when there is a still greater degree of vascular excitement, into one or other of the cavities. That this is the cause of the effusion, if not invariably, at least in the majority of instances, and certainly in all those which have come under our observation, was evident from the character of the pulse as to frequency and power, the coagulable urine, the rapidity with which the fluid accumulated if not arrested by prompt treatment, and from the efficacy of bloodletting, purging, and other antiphlogistic measures, which were generally necessary to remove the dropsical effusion.

Burserius,* in the account he has given of an epidemic scarlatina which prevailed at Florence in the year 1717, mentions that on opening the bodies of several persons who had died of this disease, the lungs, pleura, intercostal muscles, diaphragm, kidneys, and intestines, were more or less inflamed: that peripneumony having been considered as the primary disease, and the dropsical swelling only a consequence, blood was taken from the arm in the succeeding cases, once or oftener, as the occasion required; and that no one afterwards died of the dropsy who was thus treated.

Morbid anatomy. — In scarlatina the appearances on dissection are by no means uniform; indeed, we have frequently been surprised, in examining rapidly fatal cases, to find no morbid appearances that could explain the cause of death: in such instances, it is more than probable, that the diseased condition of the blood and fluids has had an important share in the fatal issue. The skin runs rapidly into putrefaction: it is generally of a dark red colour, the redness being of a deeper colour in different parts, and frequently interspersed with livid spots. When there have been violent delirium and other symptoms of cerebral excitement, the arachnoid membrane is vascular or even opaque, with effusion of a serous or sometimes milky fluid underneath. In such cases, the substance of the brain is also unusually vascular. The mucous membrane of the mouth, cavity of the nose, pharynx, and sometimes even of the trachea and bronchi, is often red from sanguineous injection; and when there has been considerable acute anginose inflammation, there is swelling of the tonsils with exudation of lymph. In the malignant scarlatina, there is little or no swelling, but the membrane of the pharynx is sometimes of a dark livid colour, and occasionally in a sloughing state. In some cases, there is a small quantity of puriform fluid in the sacculi of the larynx, and in two or three instances we have seen ulceration of the cartilages. These appearances in the throat are, however, by no means uniform or frequently observed, and the state of the throat after death very often presents no appreciable morbid appearance, even when there has been considerable anginose affection during the disease. In the chest, redness and thickening of the bronchial membrane, the smaller bronchial tubes and air-cells being filled with a viscid secretion, and a gorged state, with extreme softening and tendency to rapid decomposition of the pulmonary tissue, are the principal morbid appearances. In the abdomen, there are seldom any appearances that can be called morbid; in some cases, the mucous membrane of the stomach or of some portions of the alimentary canal has been slightly injected, though more frequently this membrane throughout the whole tract of the intestines retains its natural colour. When purulent deposits take place in the joints — a complication or sequela which we have occasionally observed — there are not always marks of inflammation of the synovial membrane. In the last case of this kind, however, which we examined, in which pus was deposited in the left wrist and in both ankle joints, there was deposition of pus exterior to the wrist joint, among the carpal bones. The synovial membrane of the wrist and ankles was evidently redder than natural, but there was no abrasion. We are therefore inclined to think, that these purulent

* Instit. Med. Pract. vol. ii.

formations in the joints may occur without antecedent inflammation; and even in the case alluded to we doubt the co-existence of inflammation: it is more probable that the pus which was deposited was not the consequence of the inflammatory action, but that the purulent fluid was deposited from the blood, in the same way as it is sometimes deposited in other parts of the body.

Diagnosis.—It is seldom difficult to distinguish scarlatina from other acute eruptive diseases. There is some resemblance, in the cutaneous efflorescence, to *measles* and *roscola*.

It may be distinguished from measles, 1st, by the period at which the eruption appears; 2d, by the accompanying symptoms; 3d, by the character of the eruption; and 4th, by symptoms which are frequently observed after the disappearance of the rash. In scarlatina, the efflorescence generally appears about the second day of the fever, attended (with the exceptions stated) by affection of the throat, and the characteristic appearance of the tongue: in rubeola the rash does not come out till the fourth day, its appearance being preceded by sneezing, coryza, inflamed and watery eyes, cough, and other catarrhal symptoms, which continue during its progress. The eruption in scarlatina consists of innumerable minute dots or points, diffused in patches with uneven edges, of various sizes and forms, and gives to those portions of the skin on which it appears a diffused bright red colour. In measles, the efflorescence comes out in irregular semilunar or crescent-shaped patches, distinctly elevated, the spots being of a deeper red in the centre than in the circumference, and leaving intervening spaces in which the skin retains its natural pale colour. The desquamation of the cuticle is besides more general and more considerable in scarlatina than in measles. The sequelæ of measles are principally affections of the organs of respiration, croup, bronchitis, or pneumonia, which are more liable to come on towards the decline of the eruption. In scarlatina, there is more frequent affection of the glandular system, and liability to inflammation of the joints and serous membranes, and to anasarcous and dropsical effusion into the cavities.

Roscola is always a much milder disease than even the simple form of scarlatina: the efflorescence is more continuous, of a deeper rose colour, and does not terminate by desquamation. Besides, in roscola, the anginose inflammation and appearance of the tongue peculiar to scarlatina are awanting. The whole duration of roseola too is short, seldom exceeding five or six days, and it cannot be propagated by contagion. It is also often symptomatic of other disorders.

Prognosis and mortality.—It has been generally observed, that scarlatina proves more severe to adults than to children, and that when it attacks pregnant or puerperal women it is often fatal. It has been also noticed, that it is generally mild in spring and summer, but severe during the winter months.

Simple scarlatina is in general a very mild disease, and seldom proves dangerous unless some local inflammation supervene during its progress; but thus a form of scarlatina, mild in the beginning, may be rendered suddenly and unexpectedly dangerous.

Scarlatina anginosa is always a more severe disease than the scarlatina simplex, since to the more acute form of fever there is superadded inflammation of the throat. The anginose inflammation, however, seldom of itself renders the disease dangerous, especially if proper measures be adopted at the beginning. There is in general a manifest disposition in the affection of the throat to terminate in resolution, and it is often surprising how readily it yields to general or local depletion. A moderate degree of swelling, with bright red efflorescence in the throat, is a more favorable indication than when there is little or no swelling, and the redness assumes a dark or livid appearance. It was stated in the description of this variety of scarlatina, that the inflammation sometimes extended from the throat to the larynx: when this takes place, the danger is imminent; since if œdematous swelling of the glottis ensue, death almost inevitably ensues. Danger may also arise from inflammation in some of the cavities —cerebral, pulmonary, or abdominal disease being thus superadded to the anginose and cutaneous inflammations.

A favorable or unfavorable prognosis may be often, in some measure, inferred from the cutaneous efflorescence. In the scarlatina anginosa, the rash appears late in the disease, and though in most instances, it is diffused generally over the surface, it is often only partial, coming out in small irregular patches on different parts of the body. In these latter cases, it is more apt to disappear suddenly, which is a less favorable circumstance than when the rash is general and remains out for several days. The colour of the eruption seems also connected with the general character of the disease. A bright red or scarlet efflorescence is more favorable than the dark red, crimson, or brownish colour which it sometimes assumes. A very pale rash, more especially if it be partial and evanescent, is also unfavorable; and when the eruption, whatever be its colour or the extent of its diffusion, disappears suddenly, and afterwards reappears, or if it do not again come out, more especially if it have receded at the beginning of the disease, the danger is considerable. The more perfectly the desquamation takes place, the case is to be regarded as the more favorable, as secondary disorders are less likely to arise.

From the description which has been given of the scarlatina maligna, the danger in almost every case must be apparent, though it does not appear to arise from the visceral complications which occasionally supervene, as in fatal cases there is seldom discovered in the internal organs satisfactory evidence of the cause of death. In estimating the amount of danger and probable issue of the case, however, it should be kept in view, that though this form of scarlatina proves fatal in a much larger pro-

portion of cases than any of the other varieties, there is every intermediate shade or gradation between the less severe and most malignant cases. In this more severe form of scarlatina, some particular symptoms or appearances however modify the prognosis. Children are observed to struggle better against it than adults, though in some epidemics no age seems to be exempt from its ravages. The existence or non-existence of local inflammation in any organ must also be taken into account, in estimating the degree of danger, and it should be kept in mind how little such topical inflammations are under the control of the treatment, which it is necessary to modify according to the general powers of the patient; if active measures be resorted to in cases of malignancy, with the hope of subduing the low forms of visceral inflammation, the powers of the patient would be endangered, if not irrecoverably sunk.

With regard to the prognosis of malignant scarlatina to be deduced from particular symptoms, a favorable result may be predicted from the following circumstances—mild fever and moderate affection of the throat—early and copious eruption succeeded about the third or fourth day by gentle moderate perspiration, and general desquamation of the cuticle—the throat assuming a florid red colour, and if there have been sloughing, the ulceration looking clean and healthy—diminution in the frequency, with firmness and equality of the pulse—the breathing becoming soft and free, while the eye resumes its brilliancy, and the countenance its natural expression. On the other hand, the prognosis may be deemed unfavourable, when the following symptoms occur—a partial eruption disappearing suddenly—or assuming a dusky or livid colour, more especially if accompanied with petechiæ—smallness and great rapidity of the pulse—frequent sighing, with sensation of great faintness—hot dry skin—hurried breathing not depending on disease of the lungs—acrid discharge from the nose and ears—ulceration of the lips and angles of the mouth—paleness or shrinking of the features—sunken eyes—partial cold sweats—coldness of the extremities—low muttering delirium—coma—hiccup—subsultus tendinum—involuntary stools—gangrenous inflammation of those parts subjected to pressure, as the sacrum and hips—swelling and purulent deposits in the larger joints. Huxham observed in some individuals previous to the fatal issue, the face bloated and shining, and the neck swollen and of a cadaverous appearance, the whole body even became in some degree œdematous, so that the impression of the finger remained.

The *mortality* of scarlatina varies much in different epidemics, although nothing has been satisfactorily established as to the causes which influence the fatality of the disease. The difference observed in epidemics is not confined to scarlatina, but occurs in every variety of fever, whether of the continued, periodic, or eruptive form. In some epidemics scarlatina is a very mild disease throughout; and when it does prove fatal, the cause may often be traced to the supervention of some accidental inflammation; or it may happen, that in particular instances, the symptoms may assume a malignant character, though the general aspect of the epidemic be very mild. It is unnecessary to pass under review the histories which have been recorded of epidemic scarlatina which have at various times appeared; they are alluded to, principally with the object of directing attention to the influence which certain though unknown circumstances exert over the character and symptoms of this disease. It is often sufficient for the practical inquirer to be a diligent and faithful observer of nature, without attempting to discover the hidden causes, and invent explanations of her secret operations. The extreme mildness of some epidemics has induced many to assert, that the mortality of scarlatina has been overrated, and even Sydenham from his observance of the disease (its milder forms only having evidently been presented to his notice), came to the conclusion that it scarcely required medical aid, and when it did prove fatal, this result was to be traced to the *numia medici diligentia*. Had the attention of this illustrious physician been directed to the epidemic described by Morton, a very short time after this opinion was delivered to the world, his candour would have compelled him to acknowledge, that the views he entertained and promulgated of the nature of scarlatina had been formed on too limited experience of the disease. The rapidity with which patients are hurried off is often striking. In an epidemic scarlatina which prevailed in Paris in 1743, we are told that every individual who was attacked perished—many indeed within nine hours from its first invasion. That which raged at Bromley, near Bow, in Middlesex, in the year 1746, it is stated by Dr. Fothergill, seemed to yield to no remedies or applications; several of the inhabitants were greatly alarmed by it, some losing the greater part of their children after a few days' indisposition. These are by no means solitary examples of the great fatality of scarlatina, as similar epidemic visitations have been recorded by Huxham,* Cotton,† De Haen‡, Johnstone,§ Rush,‖ Lettsom,¶ Sims,** Willan,†† Bateman,‡‡ Blane,§§ Macgregor,‖‖ Tweedie,¶¶ Carbutt,*** Sandwith,††† and others.

* Dissertation on the Malignant Ulcerous Sore Throat.

† On a particular kind of Scarlet Fever, prevalent at St. Alban's in the year 1748.

‡ Philos. Trans. 1749.

§ Remarks on the Angina, and Scarlet Fever of 1788, in the Memoirs of the Medical Society, vol. iii.

‖ Medical Observations and Enquiries.

¶ Memoirs of the Medical Society, vol. iv.

** Ibid. vol. v.

†† Miscellaneous Works, edited by Ashby Smith, M.D.

‡‡ Reports on the Diseases of London.

§§ Med. Chir. Trans., vol. iv.

‖‖ Ibid. vol. v.

¶¶ Clinical Illustrations of Fever.

*** North of England Med. and Surg. Journ., vol. i.

††† Edin. Med. and Surg. Journ., No. cxvii., [a most excellent practical paper.]

Dr. Willan has given the result of his experience of an epidemic scarlatina, from cases which occurred in his own practice in the year 1786. Of 251 cases, there were 152 of scarlatina anginosa, 42 of sore throats without eruption on the skin, and 39 of scarlatina maligna. Dr. Clark, in the description he has given of an epidemic scarlatina which prevailed at Newcastle in 1778, observed, that of 131 patients, 75 had the emption with sore throat; in 33 the disease occurred with every distinguishing symptom of scarlatina maligna; and that in 23 cases it was succeeded by dropsy. He adds, when it is considered that great numbers had the distemper in such a mild manner as to require no medical assistance, and that application was only made for the advice of a physician when the patients were severely attacked, perhaps the malignant cases ought not to be estimated higher than as one to twenty in all who took the disease.

No deductions however can be drawn from these averages, as they have reference only to solitary epidemics, and it is well known that in one or several epidemics, a large proportion of the cases assume the characters of a malignant disease, while, as was formerly stated, a few malignant cases may only occur out of a large number of individuals affected.

We find from the register of cases kept at the London Fever Hospital, that the mortality of scarlatina shews great variation. In the years 1822 and 1823, the disease appears to have been extremely mild, as none of the patients died during these years. In 1824, the mortality was one in twenty-one; in 1825, one in thirteen; in 1826, one in twenty-nine; in 1827, one in forty-one; in 1828, one in ten; in 1829, one in six; in 1830, one in six; in 1831, the disease was not prevalent, and none of the cases proved fatal; in 1832, the mortality was one in forty; and during the last year, the average has been about one in twenty-two. Of 644 cases treated at this hospital, the gross mortality was thirty-eight; of these there were thirteen males and twenty-five females. The following table exhibits the comparative ages of the fatal cases:—

	Males.	Females.
7 years of age	0	1
10 ditto	1	1
11 ditto	0	2
12 ditto	0	1
13 ditto	1	1
18 ditto	0	1
19 ditto	2	3
20 ditto	0	2
21 ditto	0	2
22 ditto	1	2
23 ditto	1	1
24 ditto	2	2
25 ditto	2	1
26 ditto	2	1
27 ditto	0	2
30 ditto	0	1
33 ditto	1	0
40 ditto	0	1
	13	25

Treatment. From the description which has been given of the various forms of scarlatina, it is obvious that the measures to be adopted for its treatment must have reference to each individual case, as well as to the various circumstances with which it may be associated.

It is also indispensably necessary that the treatment should have reference to the prevailing type or character of the fever, an indication which it is of the utmost importance to bear in mind in the management of this disease. We have already endeavoured to impress this circumstance strongly in a former part of this article, so that it is sufficient merely to advert to it again.

1. In the *scarlatina simplex*, the symptoms are generally so mild, that it is only necessary to confine the patient to bed, to keep the apartment cool, to prescribe occasional aperients, cooling drinks, and abstinence from animal food, so long as there is any febrile indisposition. Should the skin feel hot at intervals, it is advisable to sponge the surface with cold water, by which the morbid heat is rapidly dissipated, and the feelings of the patient are rendered more comfortable. It is seldom necessary in this form of scarlatina to abstract blood, unless it be deemed expedient in cases where the fever runs high. In those cases, it may be prudent to take away a moderate quantity of blood, with the view of subduing the vascular excitement, and preventing the local inflammations which frequently arise in scarlatina. Whether bloodletting be deemed expedient or not, an emetic is often attended with good effects; after which the bowels should be freely opened by brisk aperients, and the various saline remedies, in combination with antimony, administered as circumstances require. It is necessary to watch every case of scarlatina, however mild at the beginning, as the character of the disease is often materially altered by the sudden accession of inflammation in some internal organ, by which a mild disease may in the space of a few hours be converted into one of severity and danger.

2. We have pointed out the more active nature of the symptoms in *scarlatina anginosa*. In adults of a plethoric tendency, more especially if the patient be young, bloodletting is sometimes necessary, and even in children, a moderate bleeding from the arm, when there is much excitement at the beginning, is often useful in moderating the fever, and diminishing the tendency to visceral inflammation. General bloodletting has been strongly recommended by several continental physicians in this form of scarlatina, more especially when there is much cerebral disturbance. Morton employed it with success in the epidemic he has described; and in the scarlatina which prevailed at Edinburgh in 1733, we find it stated, that few died who were timely and plentifully blooded, which weakened the fever, relieved the throat, and was the only medicine that removed the vomiting and

diarrhœa.* Huxham advocates this practice at the commencement of the fever, when the blood was often sizy, but recommends one moderate bleeding only, as patients did not bear a large bleeding, and scarcely any a second.

On the other hand, in some epidemics, evacuations of blood are less efficacious, or wholly inadmissible, either from the form of fever being of a less acute character, or from the tendency of the general powers to decline, when active depletion has been adopted. The successful treatment of the disease by bloodletting and other antiphlogistic measures at one season, does not warrant the practitioner in employing the same plan in another epidemic; the type of the fever, the pulse, and the general aspect of the symptoms must be his guide. In the epidemic described by Dr. Withering, such was the state of the pulse, that bloodletting was inadmissible, unless in the autumn, when the colour of the rash was not intense, or did not appear at all, the swelling of the throat great, and the pulse firm. Dr. Willan, also states, that during the years 1785, 1786, 1787, and since, when the scarlatina anginosa was epidemic in the metropolis, he never saw a case in which bloodletting appeared to be indicated. Whenever it had been employed, great depression and faintness were the immediate consequences, the pulse becoming more weak and frequent, and often irregular. Of two adults who had been bled largely, one died before the period of desquamation, the other lingered in a very precarious state upwards of twenty days, but at length recovered.

It is therefore almost impossible to lay down general rules for the treatment of a disease which varies so much in its character at different times. At one season, or in one epidemic, bleeding may be required—at another, the lancet is to be employed with the greatest caution, and not unless some urgent circumstance arise to require its use. We have seldom had occasion to bleed from the arm, unless in particular instances of unusual febrile excitement, or when some important organ was threatened with inflammation. We generally prefer the free topical abstraction of blood by cupping behind the neck, which is the most effectual mode of relieving the inflammation of the throat, or by the application of leeches under the jaw, or behind the ears. We have seen great benefit also from the free scarification of the tonsils when skilfully performed, though many patients object to this mode of topical bleeding, which is also often not easily performed in timid persons.

We have seldom observed any decided benefit from the use of gargles, indeed the inconvenience felt by the patient in their employment often precludes their adoption. The inhalation of the vapour arising from warm water gives much more decided relief.

The exhibition of emetics in the commencement of scarlatina anginosa as well as of the other forms, has been strenuously recommended by some physicians. Dr. Withering prescribed them not only in the beginning, but even in the later stages of the disease. Their employment, however, should be restricted to the period of invasion, as it has been observed that they are much more beneficial at this stage than when the symptoms are more advanced. The shock which is given to the system by the action of vomiting in the early stage of eruptive fevers is often followed by most decided improvement in the general symptoms and feelings of the patient. Dr. Rush exhibited an emetic, combined with calomel, in every case he was called to, which, besides inducing vomiting, seldom failed to produce two or three stools: in several cases he was obliged, by the continuance of the nausea, to repeat the emetic, and always with obvious and manifest advantage.

The abatement in the symptoms which is generally observed after the bowels have been freely evacuated has induced physicians to purge freely in the early stages of scarlatina anginosa, and certainly no class of remedies is more entitled to confidence than purgatives, when administered with discernment. Many writers have expressed their doubts of the safety of this practice, from the fear of inducing debility and repelling the efflorescence. Dr. Hamilton, however, has adduced powerful arguments in support of it, and has illustrated his views by an appeal to the result of cases treated in public and private practice. No variety of the disease, as appearing in different epidemics, or in the course of the same epidemic, has hitherto prevented this distinguished physician from following out this practice to the necessary extent. The pungent heat of surface, violent headach, turgescence of features, and full and quick pulse, the earliest symptoms in some epidemics of scarlatina, and which may have suggested and warranted the practice of bloodletting, are often quickly subdued by one or two brisk purgatives. Dr. Hamilton states, that full purging is not required in the subsequent periods of the disease, in which the sole object is to remedy the impaired action of the intestines; to secure the complete and regular expulsion of their contents; and thus to prevent the accumulation of fæces, which never fails to aggravate the symptoms and to prove the source of further suffering to the patient. He has added some very useful hints as to the same activity not being required in the exhibition of purgative medicines in every case of scarlatina, acknowledging, that he had not ascertained to what this different state of the bowels in scarlatina is to be ascribed, and observing that on whatever cause the difference depends, it is necessary to adapt our practice in the use of purgatives to the nature of the prevailing epidemic.

In the early stages, when there is nothing to contra-indicate the use of purgatives, a brisk aperient may be exhibited daily. We generally prescribe a combination of calomel and rhubarb

* Edinburgh Medical Essays, vol. iii. p. 27.

at bed-time, and on the following morning a moderate dose of castor oil, or infusion of senna with manna and sulphate of magnesia. When the cuticle begins to desquamate, and the febrile symptoms decline, active cathartics are improper: at this stage of the disease, it is necessary only to ensure the regular evacuation of the bowels, for which purpose the mildest aperients are best adapted.

Though we have advocated the employment of purgatives in the more severe cases of scarlatina, they are to be prescribed with the greatest caution, if not altogether withheld, when the mucous membrane of the intestines betrays signs of irritation or of inflammation. In such cases, the bowels are generally purged, and the dejections of an unhealthy appearance. Under such circumstances, the gastric irritation must be allayed by leeches applied to the abdomen, counter-irritation, and bland nourishment. Aperients, even of the mildest class, must be withheld, until the intestinal derangement is allayed; and should it become necessary to administer an aperient occasionally, the least irritating should be selected; none is preferable to castor-oil suspended in mucilage, with the addition of a few drops of laudanum.

The free application of cold is decidedly beneficial in the acute stage of scarlatina, and more especially, in the anginose form. The bed-chamber should always be properly ventilated by frequently renewing the air, and allowing a current of cool fresh air to pass round the patient. If the skin be hot, the body should be occasionally sponged with cold water, by which the morbid heat is rapidly abstracted, and the patient refreshed. The sponging should be repeated when the skin feels pungently hot. The testimony of Dr. Bateman, as to the efficacy of this practice, is very strong:—"We are possessed," he says, "of no physical agent, as far as my experience has taught me, (not excepting even the use of bloodletting in acute inflammation,) by which the functions of the animal economy are controlled with so much certainty, safety, and promptitude, as by the application of cold water to the skin, under the augmented heat of scarlatina, and of some other fevers. This expedient combines in itself all the medicinal properties which are indicated in this state of disease, and which we should scarcely *à priori* expect it to possess: for it is not only the most effectual febrifuge, (the "febrifugum magnum," as a reverend author long ago called it,) but is, in fact, the only sudorific and anodyne which will not disappoint the expectation of the practitioner under these circumstances. I have had the satisfaction in numerous instances of witnessing the immediate improvement of the symptoms, and the rapid change in the countenance of the patient produced by washing the skin. Invariably, in the course of a few minutes, the pulse has been diminished in frequency, the thirst has abated, the tongue has become moist, a general free perspiration has broken forth, the skin has become soft and cool, and the eyes have brightened; and these indications of relief have been speedily followed by a calm and refreshing sleep. In all these respects, the condition of the patient presented a complete contrast to that which preceded the cold washing; and his languor was exchanged for a considerable share of vigour. The morbid heat, it is true, when thus removed, is liable to return, and with it the distressing symptoms, but a repetition of the remedy is followed by the same beneficial effects as at first."*

Little confidence should be reposed in any of the ordinary saline remedies. We prefer the mineral acids, more especially the saturated solution of chlorine, prepared according to the directions given in the Dublin Pharmacopœia, which contains about twice its volume of chlorine. Of this remedy a fluid dram and a half, mixed with eight ounces of water, and two drams of syrup of lemons, may be taken in divided portions during the day. For children, ten or twelve drops every six or eight hours is a sufficient dose.

The solution of chlorine is readily decomposed by exposure to light and air, and in this state it is very apt to disorder the stomach and bowels, producing sickness, griping pain of the bowels, or diarrhœa. It is therefore necessary, that the remedy should have been recently prepared before it is exhibited. If recently prepared chlorine cannot be readily procured, (though it is obtained by a very simple chemical process,) the diluted sulphuric acid may be substituted.

In the advanced stages of scarlatina anginosa, when the general fever has declined, and the efflorescence has disappeared, it is often necessary to give, with due caution, a little support. Mild nourishment is often sufficient, but should the pulse be soft and rather weak, with a cool skin, small doses of quinine in acidulated infusion of roses are generally very beneficial. It is seldom necessary to administer wine, except under circumstances of unusual debility after a protracted illness. The moderate use of it in such cases tends much to assist the convalescence.

When visceral inflammation arises in the progress of scarlatina anginosa, no time should be lost in endeavouring to arrest it. In such cases, the judgment of the practitioner must direct him as to the extent to which it is necessary to carry the antiphlogistic treatment. We have already entered so fully into the management of the various local lesions which arise in the progress of fever, (and the indications to be observed in scarlatina are precisely similar,) that we deem it unnecessary to repeat what has been already advanced, (see Fever,) though the necessity of watching narrowly the state of the several organs, and of adopting suitable measures on the first evidence of local inflammation, cannot be too forcibly impressed on those, who may not have had much experience in the treatment of this disease.

* Practical Synopsis of Cutaneous Diseases.

3. In *scarlatina maligna*, the acute stage, in which only antiphlogistic measures can with safety be employed, soon passes off, and is succeeded by a low depressed state of the general powers, which renders any form of depletion not only doubtful but hazardous. If the practitioner be called on to treat this form of scarlatina at its very commencement, and before it is fully formed, an antimonial emetic is generally very beneficial, more particularly when the bowels are afterwards evacuated either by the antimony, or by an active aperient. If, however, those means be insufficient to subdue the excitement, moreover if the pulse be rapid and firm, the skin hot, and there be much pain in the head, or delirium, a moderate quantity of blood should be taken from the arm, and another aperient given. This treatment, if adopted at the onset of the symptoms, will generally not only moderate the fever, but shorten the duration and violence of the disease. In many cases, however, such is the violence of the symptoms, more especially if they have been neglected in the beginning, that the acute stage is speedily followed by symptoms of a low typhoid character, which require a cordial tonic plan of treatment. It then becomes necessary to support the sinking powers by animal broths, quinine, and a moderate allowance of wine.

The volatile alkali has been strongly recommended in cases of malignant scarlatina; it was considered by Dr. Peart to be endowed with a specific power over the malignant scarlet fever and sore throat. He directed two drams of the carbonate of ammonia to be dissolved in five ounces of water, of which the dose was two teaspoonfuls every two, three, or four hours, according to the urgency of the symptoms. This remedy was administered in every form and stage of the disease, and were we to judge from the result of the cases in which this remedy was given, it would appear never to have failed even in the worst. We certainly have tried this remedy repeatedly, but our experience of it does not warrant such an inference; nor do we deem it preferable to other diffusible stimulants. Capsicum is a remedy which appears to have been employed with much success by Dr. Stephens, in an epidemic scarlatina which prevailed at St. Christopher's in 1787, and of which an account was published in the second volume of the Medical Communications, and also in Duncan's Medical Commentaries for the year 1787. This remedy was used in the form of infusion prepared according to the following formula: two tablespoonfuls of small red pepper, or three of the common Cayenne pepper, and two teaspoonfuls of fine salt are to be beat into a paste, to which half a pint of boiling water is to be added. When cold, the liquor is to be strained off, to which half a pint of very sharp vinegar is to be added. Of this mixture, the dose for an adult is one tablespoonful every four hours, the quantity being diminished in proportion for children. This remedy has been commended by several writers who have employed it successfully; but having never employed it, we cannot offer an opinion on it.

When topical inflammations arise in scarlatina maligna, general bleeding is seldom admissible, unless they supervene in the beginning of the disease: the application of leeches, in numbers proportioned to the age and powers of the patient, is better adapted to the low forms of local inflammation which arise in this malignant disease.

With regard to the local treatment in scarlatina maligna, we may observe, that in the very beginning of the disease, the inflammation in the throat is best managed by the application of leeches under the jaw or behind the ears; but this treatment must be confined to the very onset of the anginose affection, since the inflammation in most cases very speedily passes into gangrene. The vapour arising from warm water may be frequently inhaled. Some physicians recommend the occasional exhibition of an emetic with the view of dislodging the viscid secretion with which the fauces are clogged, and unless the powers be so feeble as to render the shock of an emetic hazardous, benefit is often derived from their employment.

Acidulated bitter infusions, as of cinchona, cusparia, serpentaria, contrayerva, or an infusion of capsicum prepared as recommended by Dr. Stephens, may be used as a gargle.

A weak solution of the nitrate of silver, or of sulphate of copper, applied by means of a proper syringe, after the throat has been well cleansed by warm water, often improves the aspect of the ulceration.

Dr. A. T. Thomson recommends the chlorosodaic solution of Labarraque, in the proportion of ʃ3xii of the solution to ʃ℥vi℥ of water and ℥iv of honey, as an excellent gargle. The same solution, in the proportion of ℥vi to ℥v of water, without the addition of honey, if frequently thrown into the nostrils by means of an elastic bottle mounted with a tube, soon removes the coryza.*

Fumigations by the nitrous acid gas, (separated from pulverized nitre by the strong sulphuric acid,) or the nitro-muriatic acid gas, (chlorine,) (separated from a mixture of equal parts of pulverized nitre and of sea-salt, by the strong sulphuric acid,) have been strongly recommended by Willan.

It is almost superfluous to state, that proper ventilation is most essentially necessary in this, as in the other forms of scarlatina. The admission of fresh air around the patient generally invigorates his powers, and often proves a most excellent tonic. Warm sponging, a tepid bath, or, if there be much cerebral disturbance, fomentations to the extremities, may be employed in addition to the other measures.

The treatment of the dropsical effusion which we have described as an occasional occurrence towards the termination of scarlatina, is to be regulated by the condition of the system, and

* Bateman's Practical Synopsis of Cutaneous Diseases, edited by Anthony Todd Thomson, M.D.

more especially of the several internal organs. The effusion in general speedily disappears under judicious treatment; in all the cases which have fallen under our notice, the dropsy has been evidently dependent on general or local excitement, which it was necessary to subdue by bloodletting and purging, after the adoption of which measures the effusion quickly vanished. In some instances, when the state of the pulse did not require the abstraction of blood, a few doses of brisk purgatives have carried off the fluid: in others, the activity of the circulation, the heat of skin, scanty urine, and oppressed breathing, at once suggested the necessity of bloodletting, from which the most decided relief was immediately obtained, after purgatives and diuretics had completely failed. The efficacy of the antiphlogistic treatment of dropsy succeeding to scarlatina has been corroborated by many practical writers in other countries as well as our own; and though some still hesitate to adopt the practice, we are satisfied that in cases accompanied with phlogistic symptoms, it is the only safe and rational mode of treatment. Besides, when we consider the condition in which the internal organs have been occasionally found in fatal cases of scarlatina complicated with dropsy, the propriety of vigorous antiphlogistic treatment is apparent. We admit that in some instances, in which the symptoms are of a less acute character, bloodletting may be dispensed with: we allude more particularly to those in which, though the general powers be feeble, there is congestion or chronic insidious inflammation in some organ. Under such circumstances, topical bleeding, mild purgatives, and diuretics, with a bland diet, will be found more appropriate measures. As to the employment of tonics, on the supposition that the dropsical effusion depends on loss of power or tone in the exhalents, we confess we are sceptical as to this being the pathological state of the vessels in any case of dropsy succeeding to scarlatina, and therefore we are disposed to place little or no confidence in this class of remedies. When the effusion has been removed by suitable measures, pure air, mild nourishment, and attention to the bowels will be found the best mode of invigorating the general powers.

(A. Tweedie.)

SCIRRHUS.—The term σκίῤῥος, from σκίρος, marble, was given by the Greek physicians to certain tumours characterized chiefly by a great degree of hardness; but the application of the term scirrhus has for a considerable length of time been limited to tumours or portions of organs or tissues which present not only this character, but which terminate in the disease called cancer. Hence the state of induration to which the appellation of scirrhus is given is regarded as the first stage of cancer. We shall overlook for the present the propriety of this distinction, and instead of confining ourselves to the consideration of scirrhus, shall in the present article give a general view of those morbid conditions which have been denominated scirrhus, cancer, fungus hæmatodes, and the several kinds of sarcoma, under the generic term of *Carcinoma*. The reasons for our grouping together under the term carcinoma so many diseases which have generally been described as differing widely from that which is commonly known by this designation, will be fully exposed as we proceed. In the meantime, however, the following may be regarded as the more remarkable phenomena which these diseases, considered in a general and anatomical point of view, present in common with one another, and which we conceive, while they express in a concise and conspicuous manner those characters by which they are distinguished, justify our having brought them together under the same general denomination: —1. They are essentially composed of a solid or fluid substance, different from any of the solids or fluids which enter into the healthy composition of the body. 2. They often present in the early periods of their formation certain characters common to all of them, however much they may differ from each other in the subsequent periods. 3. They all terminate in the gradual destruction or transformation of the tissues which they affect. 4. They have all a tendency to affect, successively or simultaneously, several organs in the same individual. 5. They all possess, although in various degrees, the same reproductive character.

Specific divisions of carcinoma.—When we examine the several morbid conditions which we have included under the genus *carcinoma*, we find that they present differences, some of which are of considerable importance, others less so; and therefore it becomes necessary to separate them into distinct groups, and to arrange them into species and varieties. The differences to which we allude are referable to two states of the carcinomatous substance to which the diseases in question owe their origin. The first is that in which this substance has little or no tendency to become organized: its form and arrangement appear to be determined chiefly by external circumstances, and its formation and subsequent increase are entirely dependent on the nutritive function of the organ in which it is contained. In the second state this substance exhibits, on the contrary, a greater or less tendency to become organized: although it may at first assume a determinate form and arrangement, in consequence of the influence of external circumstances, it possesses in itself properties by means of which its subsequent arrangement and developement are effected, independent of the nutritive function of the organ in which it is formed, except in so far as the materials of its growth may be derived from this source.

On account, therefore, of these two opposite states of this particular substance, carcinoma may be divided into two species, the first of which we have called *scirrhoma*, the second *cephaloma*. Although neither of these terms expresses the essential characters of the respective states to which they are applied, we have not been able to find or devise others better calculated to accomplish this object; it is

therefore necessary to bear in mind that they indicate only one of the characters of these states, viz., a certain degree of consistence, and which, it may be observed, is far from being constant in either, because of various circumstances, which we shall afterwards endeavour to explain.

In these two species, scirrhoma and cephaloma, the carcinomatous substance presents itself under various forms, which may be regarded as constituting so many varieties of each species.

Varieties of scirrhoma.—The varieties of scirrhoma are determined chiefly by the relative quantity of the carcinomatous substance, the manner in which it is distributed, and the difference of colour and consistence which it presents. Thus it may be collected in numerous points in the form of a hard, grey, semi-transparent substance, intersected by a dull white or pale straw-coloured fibrous or condensed cellular tissue, and, as such, is commonly denominated *scirrhus*. When it assumes a regular lobulated arrangement, so as to present an appearance similar to a section of the pancreas, it forms what was called by Mr. Abernethy the *pancreatic sarcoma*.* Again, it may be disseminated uniformly throughout the texture of an organ, which it converts into a solid substance, resembling a slice of raw or boiled pork, and is then called by the French *tissu lardacé*. Lastly, when it presents the appearance of firm jelly, and is collected into masses of greater or less bulk in a multitude of cells, it is the *matière colloïd* of Laennec, the *cancer gelatiniforme* or *aréolaire* of M. Cruveilhier.†

Varieties of cephaloma.—The principal varieties of cephaloma are derived from the appearances which the carcinomatous substance presents either in different organs or at different stages of its developement. When it presents the appearance of firm coagulable lymph, or fibrine deprived of the red colouring-matter of the blood, possessing a uniform, fibriform, or lobuliform arrangement, with a certain degree of transparency and vascularity, Mr. Abernethy gave to it the name of *common vascular* or *organized sarcoma*. In this state the carcinomatous substance is generally collected into a mass of greater or less bulk, in which few or no traces of the proper tissue of the organ in which it is contained are observable. If, on the contrary, it be uniformly disseminated throughout the texture of an organ, so as to transform it into a substance resembling a section of the mammary gland, or the udder of the cow when boiled, the appellation of *mammary sarcoma* was given to it by Mr. Abernethy. When it presents an appearance similar in colour and consistence to the substance of the brain, it was called *medullary sarcoma* by the same distinguished surgeon; *matière cérébriforme* or *encéphaloïde* by Laennec,‡ and *spongoid inflammation* by Mr. Burns.* The *milk-like* tumour of Dr. Monro,† the *soft cancer* of various authors, and the *pulpy* testicle of Dr. Baillie,‡ are names which have been given to the same state.

Of all the varieties of cephaloma, the last is that in which a vascular organization is most conspicuous, and as the coats of the vessels with which it is supplied are remarkably delicate, the circulation of the blood through them is readily interrupted; hemorrhage from congestive rupture takes place, and the effused blood is mixed in greater or less quantity with the brain-like matter. From this accidental circumstance, together with the protrusion of this substance through the ulcerated integuments for example, in the form of a bleeding fungus, it has been described by Mr. Hey§ and also by Mr. Wardrop,‖ under the appellation of *fungus hæmatodes*. Sir Astley Cooper calls it *fungoid disease*.

Such are, we conceive, the principal varieties of scirrhoma and cephaloma, and the general characters by means of which they may be recognized. But although we have said that the essential difference between the two species of carcinoma consists in the former having little or no tendency, the latter a greater or less tendency, to become organized, it is by no means always easy, nay, it is sometimes impossible, to draw a distinct line of separation between them; for the carcinomatous deposit when first formed, and, indeed, frequently for a considerable length of time after its formation, does not furnish us with any signs which shew that it will or will not become organized. We cannot determine what those properties are by means of which it is afterwards to assume a definite arrangement, or to possess within itself the powers of contributing to its subsequent developement. These facts may be illustrated by the two following circumstances: 1. the carcinomatous deposit may exist as we have described it in the form of scirrhus, pancreatic sarcoma, or the lardaceous tissue, without its presenting any trace of organization; the textures which it invades being gradually destroyed by its presence, and both ultimately converted into a soft, granular, pulpy, or liquid mass, of the colour and consistence of cream or milk. 2. The same deposit may exist under the same forms as those we have just named, but it undergoes changes of an entirely opposite kind; that is to say, it assumes the characters of the mammary or medullary sarcoma, becoming more or less soft and vascular, and frequently terminating in hemorrhage by the rupture of its vessels, or in that state called fungus hæmatodes. Numerous examples might be given of scirrhus, medullary sarcoma, and fungus hæmatodes, as they are commonly called, originating in the same morbid state, and

* Surgical Observations, London, 1801 and 1816.
† Anatomie Pathologique, Dixième Livraison.
‡ Dict. des Sciences Méd. art. Encéphaloïdes.

* Lectures on Inflammation.
† Morbid Anat. of the Human Gullet. Edinb. 1811.
‡ Morbid Anatomy. London, 1795.
§ Pract. Observat. on Surgery. London, 1803.
‖ Observat. on Fungus Hæmatodes. Edin. 1809.

passing successively from the one into the other in the order in which we have named them. Indeed, we often meet with all the varieties which we have enumerated of both species, not only in different organs of the same individual, but even in a single organ.

If such are the successive changes observed to take place in carcinoma, the distinction of the disease into species and varieties may be considered by some to be of little importance. Such, however, cannot be the case, for we know that the curability of a disease often depends on the time at which a remedy is employed, or varies with the state or period of the disease; and therefore it is obvious that whatever means may be adopted for the cure of carcinoma, we can form no precise opinion as to their relative efficacy, unless the particular condition or variety of the disease be kept in view. And it is far from being an unimportant fact that several of the varieties of both species of carcinoma differ materially from one another as regards the comparative rapidity of their developement, as well as their reproductive tendency. Thus in both these respects the pancreatic differs from the lardaceous, the lardaceous from the mammary, and the mammary from the medullary sarcoma; the first often remaining stationary for a long space of time, months or years; the last frequently acquiring its maximum of bulk in a few weeks, and when removed being sometimes reproduced with a degree of rapidity which is never observed in any of the other varieties. It may be said that the more the varieties of both species of carcinoma partake of the characters of those accidental formations which resemble the healthy tissues of the body, as the cellular, cellulo-fibrous, and fibrous, they are, *cæteris paribus*, the less rapid in their developement, and have less tendency to be reproduced.

Before proceeding to the description of the physical, anatomical, chemical, and physiological characters of carcinoma, we shall endeavour to establish on the evidence with which our anatomico-pathological investigations have furnished us, the seat, origin, and mode of formation of this disease; for unless we possess clear and accurate notions on these important points, we should meet with numerous difficulties besides those which are inseparably connected with our subject, under the several points of view in which it is necessary to consider it.

Seat, origin, and mode of formation of carcinoma.—Various opinions have been entertained regarding the seat, origin, and mode of formation of carcinoma, some of which have attracted notice merely from their novelty, others from their possessing much higher claims to our consideration, and to these we shall more particularly allude.

There are several organs subject to carcinoma which, from the peculiarity of their structure or other circumstances, afford us the means of ascertaining the precise seat of this disease, its origin, and mode of formation. But to derive all the advantages which these circumstances are capable of affording, it is necessary to catch, as it were, the disease at its earliest period, that is to say, when the peculiar substance of which it consists has just been deposited, and has not effaced the texture or structure of the part in which it is contained. Investigated in this its first stage, we ascertain with greater or less facility that this substance becomes manifest to our senses either as a product of nutrition or of secretion. In the former case it is deposited in the same manner as the nutritive element of the blood, enters into the molecular structure, and assumes the form and arrangement of the tissue or organ into which it is thus introduced. In the latter it makes its appearance on a free surface, after the manner of natural secretions, as on serous surfaces in general.

Such are two of the modes in which the formation of carcinoma takes place, and also two of the principal differences in regard to the seat of the disease. Proceeding, however, still farther in our researches, we arrive at the important discovery that the carcinomatous matter exists in the blood under circumstances which can leave no doubt as to this fluid being the primary seat of its formation. As, in our opinion, too much importance cannot be attached to these three positions, viz., the formation of carcinoma in the molecular structure of organs, on free surfaces, and in the blood, we shall endeavour to demonstrate the truth of them by a statement of the evidence derived from our own researches on the subject.

1. The liver and stomach, organs in which carcinoma is of frequent occurrence, afford us the most striking examples of the formation of carcinoma in the molecular structure of organs. If we make a section of a liver containing what are commonly denominated carcinomatous tumours, that is to say, round or irregular masses of a substance resembling one or more of the varieties of scirrhoma or cephaloma, we shall often be able to detect the first stage of these tumours, and discover the manner in which they are formed. Thus, the first thing which we have frequently been able to perceive in those portions of the liver in which the carcinomatous matter was just making its appearance was a slight change of colour, observable only in a very limited and well defined space, and which could be distinctly seen to exist in those minute divisions of the organ denominated *acini*. This change of colour may take place in a single acinus, or in several of these bodies successively or simultaneously. The red or yellow colour which they naturally present gradually disappears, and is succeeded by a pale milk-white or straw-colour, accompanied by an increase of the consistence. But the most important circumstance is, that while these changes of colour and consistence are taking place, the *form* and *bulk* of the acini remain *unaltered*. Now it need hardly be remarked that the form and bulk of the acini could not remain unaltered unless the foreign substance, to which their change of colour and consistence must be ascribed, were introduced into them in the *same order* as the normal element of nutrition, unless it were deposited in the *molecular struc-*

ture of the acini in a manner precisely similar to that in which their *nutritive function* is carried on. Otherwise, along with the change of colour and consistence which they present, we should have a simultaneous increase of *bulk*. The more we examine the acini in this state, the more shall we be persuaded that they are thus *transformed* by the molecular deposition of that peculiar substance which constitutes the essential anatomical character of the disease in question.

By tracing the transformation of the acini from a lesser to a greater degree, we can perceive them forming groups, for example, of three, four, ten, or twenty, the re-union of which constitutes tumours varying from the size of a hemp-seed to that of a cherry, in all of which the structure of the liver as characterized by the form, bulk, and arrangement of the acini, is more or less conspicuously marked, but becoming gradually less so with the increasing bulk of the tumours, until it entirely disappears, being transformed into a uniform lardaceous mass, or into some one or other of the tissues or substances which belong to either of the species of carcinoma.

We have said that a similar mode of formation of carcinoma is observed in the stomach. It is, however, chiefly in the muscular coat of this organ that it is most conspicuously seen, on account of the difference between the natural colour of the muscular fibres of this coat and that of the cellular tissue which enters into its composition. The change of colour which accompanies the presence of the carcinomatous deposit is, therefore, hardly perceptible except in the muscular fibres. These, however, become pale and acquire an increase of consistence; but their bulk does not appear to be increased at first, and they retain their form and distribution. Such, also, is the state of the intermuscular cellular tissue at the same period, except as to colour, which is not sensibly changed on account of its being naturally pale. By-and-bye both acquire a greater or less increase of bulk, become remarkably distinct, and present that fibriform arrangement, hardness, and transparency which are regarded as so characteristic of scirrhus. At a more advanced period of the disease we no longer trace this nutritive process of transformation, the muscular and cellular tissues being converted into a homogeneous mass, which is afterwards softened down, or assumes the mammary, medullary, or hæmatoid forms of carcinoma.

2. The fact of carcinoma forming on the free surface of serous membranes is strongly corroborative of the accuracy of the preceding remarks; for although in the former case we refer the presence of the carcinomatous deposit to a modification of nutrition, and in the present to a modification of secretion, the difference is merely nominal. The distinction, however, between nutrition and secretion is valuable as regards the formation of carcinoma; for considered as a modification of the latter, we possess ourselves of the advantage of studying the disease where it presents itself under, perhaps, the most simple of its forms, viz., on extensive serous surfaces, such as that of the pleura or peritoneum. Here the carcinomatous substance is found to be effused on the free surface of these membranes, without our being able to perceive that they have undergone any previous change whatever. Multitudes of tumours are sometimes found on these two surfaces, varying in bulk, consistence, and colour. Some of them are as large as a plum or an orange; others of the size of cherries, peas, hemp, or millet-seed, and composed of a substance resembling pork, the mammary gland, brain, or a mixture of the latter, fibrine, and blood. We may, in fact, have almost all the varieties of carcinoma formed in these membranes, and, as we have said, without their having undergone any previous change. Under such circumstances we must refer the presence of these tumours to the separation of the carcinomatous matter from the blood, which, being effused in the form of a secretion, afterwards undergoes changes peculiar to itself.

3. The presence of carcinomatous formations in the blood is a circumstance of great importance, and unless it be clearly demonstrated that their presence is the consequence of a modification of the blood itself, in whatever manner produced, we should find it impossible to explain many of the phenomena which the disease presents, and more especially those which accompany its formation in the molecular structure and on the free surface of membranes.

The following facts may be adduced as furnishing strong evidence that the formation of the carcinomatous substance takes place in the blood, whether it be found in this fluid alone or in other parts of the body at the same time: 1. the presence of this substance in the vessels which ramify in carcinomatous tumours or in their immediate vicinity; 2. in the vessels of a portion or of the whole of an organ, to the former of which the carcinomatous substance is exclusively confined, and can be traced from the trunks into the branches and capillaries; 3. in vessels having no direct communication with an organ affected with the same disease, as, for example, when it is confined to a small extent of the vena portæ; and, lastly, in blood which has been effused into the cellular tissue and on the surface of organs.

The appearances which the carcinomatous matter presents in the blood are very various: sometimes they are perfectly similar to those which mark its presence in the substance or on the surface of organs. When contained in large veins, such as the vena portæ and its branches, the emulgent vein, &c. it may present the lardaceous, mammary, medullary, or hæmatoid characters, all in the same venous trunks. These varieties of the disease may be found mixed together in minute quantities, or isolated into masses so conspicuous that we can readily distinguish them from one another. Sometimes they lie merely in contact with the internal parietes of the vein: at other times

they are united with these by means of a thin layer of colourless fibrine; or minute blood-vessels pass from the one into the other, and are often very numerous and remarkably conspicuous in the cerebriform matter.

The divisions of the vascular system in which the carcinomatous substance has been observed, are the venous and capillary,—a circumstance which may be ascribed to the contractile power of the arteries preventing, under ordinary circumstances, the blood from accumulating, and consequently this substance from forming within them, and not to any peculiarity of function exercised by the former. The presence of the carcinomatous matter in the veins might be, and indeed is, in general, supposed to be owing to its having been absorbed by these vessels; but without entering into minute anatomical details which disprove such to be the case, we shall again repeat the fact that there are cases of carcinoma in which the venous blood alone is found to be the seat of the disease. There is no accumulation of the carcinomatous matter either in the vicinity of the veins in which the blood is thus affected, or in any other part of the body; and in those cases in which this complication exists, as well might we refer the presence of this matter in the veins to the exercise of the function of venous absorption, as that of cellular, fibrous, osseous, and cretaceous formations in the same vessels to a similar process, which we know not to be the case.

From this view of the origin of carcinoma in the blood, its formation in the intimate structure and in the free surface of organs, after the manner of nutrition and secretion, follows as a natural consequence. The material element of the disease is separated from the blood and deposited under a variety of circumstances which modify in a greater or less degree the form, bulk, colour, and consistence which it afterwards presents, in the several periods of its developement. We cannot therefore limit the seat of the disease to any one tissue, or ascribe its origin to any modification of structure or special organization, as has been done by several pathologists.

Perhaps the most ingenious attempt that has been made to explain the local origin of carcinoma is that of Dr. Hodgkin, published in the fifteenth volume of the Medico-Chirurgical Transactions. Dr. Hodgkin has endeavoured to shew that the presence of a serous membrane, having a cystiform arrangement, is necessary for the production of carcinoma and some other diseases of a malignant character. The existence of the former precedes, he believes, the formation of the latter, and consequently is at once the seat and origin of the disease. That such is the manner in which carcinomatous formations are sometimes formed, we can have no doubt, inasmuch as we have had occasion to see them as they have been described by Dr. Hodgkin. But we have here no new law in operation, nor even an exception established to that the prineiples of which we have several times alluded to. Cysts are a very simple modification of a serous membrane; they partake of the structure and functions of the latter, and, consequently, are subject to similar diseases. If, therefore, such cysts should exist in an individual having the cancerous diathesis, they may, in the same manner as a natural serous membrane, become the seat of any variety of carcinoma. But although carcinomatous tumours, such as those described by Dr. Hodgkin, are found in cysts, attached, single, or in groups, and covered by a reflected serous membrane, these tumours may, and frequently do, not originate in the cysts. They form in the cellular tissue external to the cysts, and during their developement project inwards, carrying before them as their common envelope the internal and serous lining of the latter. Such, in fact, is seen to be the origin of these tumours in most of the cysts represented by Dr. Hodgkin in the work referred to. They are situated external to the cyst, are supplied with vessels which do not belong to the cyst, and are placed in the same circumstances as tumours formed in the cellular tissue where no cyst is present.

As an objection to the general application of the cystic origin of tumours, it may be observed that there are numerous organs in which the presence of cysts is not to be detected at any period of the developement of carcinoma, and therefore, when they do occur in other organs, they must be looked upon as a mere coincidence, or as a consequence of the disease, and not as a cause or necessary condition of it.

After what we have just said on the cystic origin of carcinoma, it will not be expected that we shall do more than notice the theory which maintained that the formation of this disease depended on the previous existence of an accidental organization, which received the name of *hydatid*: how far such was the appellation it should have received must now be a matter of indifference.

Mr. Abernethy referred all adventitious formations to the coagulable part of the blood as their origin, and fixed their seat in the cellular tissue, in the parenchyma, and on the surface of organs. This plastic substance was supposed by him to be effused in one or other of these situations, to become organized, and to derive the materials of its subsequent growth from the vascular system of the surrounding parts.

According to Andral, the cellular tissue is in general the seat of carcinomatous formations; but, that as they depend on a modification of of secretion, they may form wherever this function is accomplished; the speciality of each being determined by a previous modification of the economy in general, or of the functions of nutrition, innervation, or hematosis in particular.

The only other opinion to which we shall allude regarding the seat and origin of these formations, considered in an anatomico-pathological point of view, is that of Cruveilhier. This pathologist regards all organic transformations and degenerations (as he calls them) as exclusively the result of the deposition of morbid products in the *cellular element* of organs. He believes that the *tissus propres* of organs are incapable of undergoing any organic lesion except hypertrophy and atrophy. Both these statements we have shewn to be

discordant with facts. The source whence these products are derived is, according to the same author, the venous capillary system, to which we formerly alluded, and we assigned a reason for their being found in these vessels, and especially in the venous trunks and their larger branches.

Physical characters of carcinoma.—The physical characters of this disease comprehend the form, bulk, colour, and consistence which it presents in the different tissues and organs of the body, and in the several periods of its developement.

Form.—Carcinoma presents considerable variety of form. In its first stage, and when the material of which it is composed is deposited after the manner of nutrition, carcinoma assumes the particular form or structure of the organ which it affects, as that of the liver and stomach, the acini of the former, and the muscular, cellular, and mucous tissues of the latter, determining in these organs respectively the primary form of the disease. In the brain, lymphatic glands, testes, we cannot, however, perceive any particular arrangement of the carcinomatous matter at this early stage, either on account of the colour, homogeneous aspect, or minute structure of these organs, preventing us from detecting its presence, and the manner in which it is deposited.

At a more advanced stage of the disease, the forms which the carcinomatous matter derives from the structure of the parts in which it is deposited disappear, and those which it afterwards presents are determined chiefly by external circumstances. The most important of these forms are the *tuberiform*, *stratiform*, and *ramiform*.

1. *Tuberiform* carcinomatous matter is by far the most frequent, and presents considerable variety. When this matter is deposited in organs possessing a uniform density, and in parts submitted on all sides to an equal degree of pressure, it assumes a globular form. Although at first globular, it becomes pyriform on natural and accidental serous surfaces, either on account of the mode of its attachment, or of less resistance being opposed to its growth in one direction than in another. It assumes a fungiform shape when placed in circumstances which facilitate its lateral, and retard its peripheric developement, as when it passes from a dense into a soft tissue, or escapes from beneath the skin to the surface of the body. It often presents a lobulated appearance when accumulated in separate portions of the cellular tissue into rounded masses, grouped together and included within a common capsule; and in the submucous tissue in particular it frequently exhibits the external arrangement of the cauliflower or mulberry. That appearance of carcinoma which resembles the structure of the pancreas depends generally on the agglomeration of very small globular or pyriform tumours, separated from one another by cellular or cellulo-fibrous tissue, but inclosed in a common capsule.

2. *Stratiform* carcinomatous matter is chiefly met with in the subserous cellular tissue. Although it may be deposited in layers of various extent, which present no definite arrangement, it more frequently assumes the form of thin circular patches, varying from the breadth of a pin's head to an inch or more in diameter, and presenting an appearance similar to what might be imagined to follow the infusion of a small quantity of milk into a number of isolated points of the subserous cellular tissue. Patches of this kind, which are composed of a substance having the colour and consistence of cream or milk, are most frequently met with beneath the pia mater and pleura pulmonalis, and are remarkably conspicuous in the latter situation, on account of their white pearly aspect contrasting so strongly with the surrounding dark colour of the lungs. These patches may occur in the situations we have named without the substance of the brain or lungs presenting any trace of carcinoma; but we have never met them unless when the disease existed in some other organ, as the breast, eye, liver, stomach, kidney, or uterus. In some cases, lymphatics filled with fluid carcinomatous matter are observed to communicate with the patches; in other cases no such vessels are observed.

3. We formerly alluded to the *ramiform* arrangement, when treating of the seat and mode of formation of carcinoma in the molecular structure of organs and in the blood. This arrangement, as well as the seat of the carcinomatous matter in the veins on which it depends, may readily be detected in the liver, where this matter is collected in the form of tumours of various sizes. When such tumours are divided and submitted to pressure, we can often perceive the carcinomatous matter issuing from a number of small circular orifices in the state of a creamy fluid; and if these orifices are attentively examined by a careful dissection of the tumour from its cut surface towards its circumference, we find that they are the cut extremities of veins filled with this matter to a greater or less extent beyond the tumour. But there is no organ in which the ramiform arrangement of the carcinomatous matter is so conspicuously seen as the kidney. The whole of the venous system of this organ, including the emulgent vein to its termination in the vena cava, is sometimes found completely distended with this matter, either in a fluid state, of the consistence of brain, or as firm as the pancreas. When the kidney thus affected is divided, it appears as if it were formed of a multitude of encysted tumours of various sizes, on account of the carcinomatous matter being contained within, and bounded by, the walls of the cut extremities of the veins. This form of carcinoma of the kidney is easily ascertained by dissection, or by the introduction of a probe from the emulgent vein into its branches.

A similar arrangement is also remarkably conspicuous in carcinoma of the stomach. Not only are the minute veins, which ramify beneath the mucous membrane in the vicinity of the disease, filled with the carcinomatous matter, but also the larger branches seen on the external surface of the stomach, and the coronary veins in which they terminate. The abdominal divi-

sion of the vena portæ furnishes us with a remarkable example of the ramiform arrangement of carcinoma, isolated from any organ affected with the disease.

There is another variety of form of the carcinomatous matter which may be noticed in this place, as it may be regarded as a modification of the preceding. It is that which is observed when this matter is contained in the lymphatics and lacteals, and which is derived from the particular form of these vessels. The lacteals, more frequently perhaps than the lymphatics, contain this matter, and are sometimes seen in great numbers quite filled with it on the surface of the stomach and intestines, and between the folds of the mesentery, in carcinoma of these organs.

Such are the principal forms of carcinoma, whether we consider the disease in a general or special point of view. They are certainly not equally prevalent, nor precisely the same in both species, viz. in scirrhoma and cephaloma, nor in the several varieties of each; but they are found to occur in all of them; and as the modifications which they present in this respect are very unimportant, it is not necessary to allude to them more particularly.

Bulk.—The quantity of the carcinomatous matter deposited in the molecular structure or on the free surface of organs is extremely various, but it is perhaps never so great in the former as in the latter. In the liver it may vary from the size of a pin's head to that of an orange. In softer or more yielding organs, as the lungs, testes, and even the mamma, it may equal in bulk the head of an infant or of an adult; and in the intermuscular and subcutaneous cellular tissue its bulk is sometimes still more considerable. We now speak of individual tumours, and not of those masses formed by the aggregation of tumours, during their progressive developement, as occurs in the liver, lungs, &c. nor of those produced in a similar manner in the abdominal cavity, posterior to the peritoneum, in carcinoma of the mesenteric glands.

The influence of pressure in favouring or retarding the developement of carcinomatous tumours, and consequently in modifying their bulk, is most conspicuously seen when they are situated near the external surface of the body. So long as their progress outwards is obstructed by an unyielding fibrous membrane, they often remain for a considerable time nearly stationary; but so soon as this obstacle is removed, they acquire a rapid increase of bulk. This rapid increase of bulk on the removal of all pressure is still more remarkable when these tumours project through the ulcerated integuments in the frightful form of bleeding fungi. But the best illustration of the influence of pressure on the developement of these tumours is met with in carcinoma of the eye. A tumour which may have required several months before it reached the external surface of this organ, will, after it has been removed, together with the whole contents of the orbit, reappear, and in the course of one or two weeks acquire a much greater bulk than before the operation.

Independently, however, of this physical circumstance, which modifies so conspicuously the bulk of these tumours, there is another of an opposite nature which requires to be particularly noticed on account of its constituting the distinctive character of the second species of carcinoma. We allude to the physiological properties of the cephalomatous tumours, by means of which they possess within themselves the power of increasing their developement to an almost unlimited extent. It is to the vascular organization, which we shall afterwards describe, of the tumours of this species that the rapidity of their growth and the great bulk which they attain are to be attributed, and which renders them less subject to the influence of pressure than those of the species scirrhoma. However, unless we were aware of the modifying influence of pressure, we should often be unable to explain why tumours possessing the same characters are subject to differences both as regards the rapidity of their developement and the bulk which they acquire.

Colour.—The colour of carcinoma differs greatly from that of any of the other adventitious formations. It is, therefore, a character of considerable importance, inasmuch as it frequently enables us to distinguish this disease from others of the same class; and we have already seen that it is chiefly by the same means that we are led to a knowledge of the seat and forms of carcinoma in the early stages of its formation. It is most frequently white, with a shade of grey or blue; sometimes it inclines to yellow, brown, or red, in consequence of the colour of the organs affected with the disease, of the presence of blood, bile, pus, or other fluids in various proportions, or of some other accidental circumstance. But the principal modifications of colour of carcinoma are seen in the several varieties of both species of the disease, these varieties, as we have already stated, resembling more or less in colour that of the organ or tissue whence have been derived their respective appellations; as that of cartilage, of the pancreas, of fresh boiled pork, of coagulated albumen or fibrine, of the mammary gland, of the substance of the brain, or a mixture of the latter and blood.

Consistence.—To none of the physical characters of carcinoma has so much importance been attached as to that of consistence, but more especially to an increased degree of this property when considered in relation either to the disease itself or the tissues of the affected organ. Hence the term *scirrhus*, which implies a state of induration, in consequence of its being frequently not only one of the first, but likewise one of the most marked changes which we are capable of perceiving in the affected organ, has been employed to characterize the early or occult stage of carcinoma. The opposite condition of carcinoma, that in which this disease presents a degree of consistence less than that of the organ which it affects, has been considered as a change succeeding to the state of induration or scirrhus, and the result of a process of softening; consequently, as indicating a more advanced period of the disease,

But the degree of consistence of the carcinomatous formations is not an invariable character of a particular stage of their development, for these formations may, when first perceivable, be as hard as cartilage, soft as brain, or fluid as cream; or they may become soft or fluid after having remained for a greater or less length of time in a state of hardness. This variety in the consistence of the carcinomatous formations depends on the following circumstances:—1st. the nature of the organ in which the carcinomatous deposit is contained; 2d. the elementary composition of the deposit; 3d. the subsequent changes occurring either in the deposit itself, or in the tissues with which it is in contact.

1st. The structure, situation, connexion, and greater or less density of organs and tissues, greatly modify the consistence of the carcinomatous deposit, either in consequence of a difference between the quantity of this substance relative to that of the tissues in which it is contained, or of a difference in the degree of resistance opposed by the latter to its accumulation or developement. Thus it is more consistent in the liver than in the lungs or brain; in the skin than in the cellular tissue or a mucous membrane; in a tumour situated beneath a dense covering than on a free surface.

2d. Modifications in the composition of the carcinomatous deposit exercise a considerable influence over the degree of consistence which it presents, for we often meet with it possessing various degrees of consistence, when examined at the same stage of its developement, and in the same or in different organs. Examples of this kind, although common in almost every organ of the body, are best seen where the deposit is collected into isolated masses containing little or none of the natural tissues, and where consequently its consistence must depend on the nature of the elements of which it is composed. It is found in this state in cellular tissue and in serous membranes, and more especially on accidental surfaces, such as those of sores formed by the destruction of the protruded portion of tumours, or after the removal of an external organ affected with carcinoma. In these situations this substance may, at the same stage of its formation, present the opposite extremes of consistence, being in one case as hard as cartilage and more or less transparent, and in another as soft as brain, or quite fluid and opaque. But these opposite extremes of consistence are most strikingly manifested in those fungiform tumours which arise from the bottom of the orbit after the extirpation of the eye, or from the cicatrix of the integuments after the removal of the breast in consequence of carcinoma. In these two instances it is obvious that the stage of developement of the tumours is the same in both; and that the difference of consistence which they present is no evidence of their being different in their nature is equally obvious, inasmuch as the hardest of them often assume, after a certain length of time, the consistence of the softest, a part or the whole of the dense transparent substance of which they are composed being gradually transformed into a soft, brain-like, pulpy mass. This process of transformation is also most conspicuous in those tumours which constitute the *vascular* or *organized* sarcoma of Mr. Abernethy. They are at first more or less transparent, presenting the appearance of a solid mass of albumen, coagulable lymph, or fibrine, but become gradually opaque, soft, and pulpy, resembling fœtal brain, and are then not to be distinguished from those carcinomatous tumours which, from their commencement, possess the cerebriform character. These examples will suffice to shew that the carcinomatous deposit, besides being modified in its consistence by the tissues in which it is contained, is equally so in consequence of a difference in its composition; that its consistence may or may not be the same when first formed; that it may be either hard or soft at this period; and, consequently, that the latter state is not necessarily preceded by the former, as was maintained by Laennec and the greater number of pathologists who have published on this subject since his time.

3d. The last modification of consistence of the carcinomatous formations is that to which the attention of pathologists has almost exclusively been directed. It depends on a series of changes taking place either in the carcinomatous matter itself, the tissues with which it is in contact, or in both at the same time. But in order that these changes may be more fully understood, we shall first describe the chemical and anatomical characters of carcinoma.

Chemical characters of carcinoma.—In order to ascertain the chemical composition of the several varieties of scirrhoma and cephaloma, it would be necessary to procure a sufficient quantity of the carcinomatous matter isolated from the tissues with which it is so frequently more or less intimately united or combined. The difficulty, and in many cases the impossibility of obtaining it in several of these varieties in a separate state, has prevented the pathologist from determining accurately its chemical composition. Indeed, the results of the analyses that have been published may be regarded as indicating the chemical composition of particular organs and tissues affected with carcinoma, rather than of the carcinomatous matter itself. The most recent analysis of carcinoma in the scirrhomatous and cephalomatous states, is that published by Lobstein in his "Traité d'Anatomie Pathologique." Seventy-two grains of scirrhous breast were found to contain—

Albumen	2 grains.
Gelatine	20
Fibrine	20
Fluid fatty matter	10
Water	20
	72

Seventy grains of the uterus in a state of scirrhus contained:—

Gelatine	15 grains.
Fibrine	10
Fatty matter	10
Water	35
	70

According to the same author, it would appear that the chemical composition of cephaloma is not the same at different periods of its developement. Thus in the first stage of the disease, or that of *crudity*, it was found to contain a greater proportion of gelatine than of albumen; and in the second stage, or that of softening, that is to say, when the carcinomatous matter is of the consistence of soft brain, the albumen is in much greater quantity than the gelatine.

For the reasons already stated, it must be obvious that no great importance can be attached to these results of the chemical analysis of the carcinomatous matter, and, independent of the difference of composition which it must present from its admixture, in various proportions, with the same or different tissues, it is highly probable that it is likewise modified, in this respect, by the physiological influence of the organ in which it is formed, and the constitution of the individual in whom it exists.

Anatomical characters of carcinoma.—We have already pointed out the most important circumstances illustrative of the anatomical characters of carcinoma, when treating of the specific divisions of the disease, its varieties of form, bulk, and consistence; its seat and mode of formation. We shall, therefore, now examine more especially the structure or anatomical arrangement of the carcinomatous matter itself.

We formerly stated that the carcinomatous matter may exist in two states; that in the first state it has little or no tendency to become organized, its form and arrangement being determined chiefly by external circumstances; and that in the second it exhibits a greater or less tendency to become organized, possessing in itself properties by means of which its form, arrangement, and developement are effected. The carcinomatous matter may, as we have seen, exist in three situations, viz. in the molecular structure of organs, on free surfaces, and in the blood. It is, perhaps, only in the two latter situations that we can submit it to minute anatomical investigation. When, therefore, we examine anatomically a mass of carcinomatous matter contained in a large vein, or situated on the surface of a serous membrane, in loose cellular tissue, on the surface of a sore or cicatrix after the removal of an organ affected with carcinoma, we find it composed of the following elements in various proportions, viz. carcinomatous matter; cellular, fibrous, and serous tissues; and bloodvessels.

The *carcinomatous matter*, whatever may be its consistence, almost always forms by far the greater bulk of the disease. If, however, its consistence be considerable, it generally presents a uniform, granular, or radiated, and, when soft, a lobulated arrangement. These three varieties are sometimes met with in the same tumour, and indicate the progressive developement of the disease, the radiated arrangement being seen at the basis, the uniform and the lobulated towards the circumference.

The *cellular tissue* is often small in quantity, and sometimes so fine and loose, as not to be perceptible till after the carcinomatous matter has been separated from it by pressure and maceration. It encloses that matter, separates it into granules, bundles, or lobules, intersects these in various directions, and serves to conduct the vessels which administer to the nutrition and growth of the disease.

The *fibrous tissue* is not often met with as an anatomical element of carcinoma in the situations in which we are now considering this disease. The *serous tissue*, on the contrary, is frequently present, and may form either a capsule to the carcinomatous substance, which is then said to be *encysted*, or give rise to the formation of cysts of various sizes, containing gelatinous, albuminous, or other fluids.

When the carcinomatous matter is deposited in the molecular structure instead of on the surface of organs, as we have just been considering it, the quantity of the cellular and fibrous tissues which intersect it in various directions is sometimes very considerable. In carcinoma of dense organs, such as the breast, uterus, ovaries, liver, walls of the stomach, &c., these tissues are also often very abundant. Indeed, in the early stage of carcinoma of these organs, a firm, pale, compact, cellulo-fibrous-looking tissue is not unfrequently the only anatomical element discoverable, and which on this account, and from the increase of bulk with which it is accompanied, has been described by Andral as *hypertrophy* of the cellular tissue, an appellation which does not appear to us to be warranted by analogy or by the changes which this tissue subsequently undergoes. For, hypertrophiated cellular tissue, such as we find in *elephantiasis Arabum* or *Barbadoes leg*, has no tendency to terminate in carcinoma; nor does hypertrophy of the heart from disease, or of the muscles of voluntary motion from frequent exercise, ever present any other change than that implied by this term, except a certain increase of consistence, generally in proportion to the increase of bulk which has taken place. Besides, admitting that a certain degree of hypertrophy may precede the presence of carcinoma, the facts which we have already brought forward in illustration of the mode of formation of the disease, its seat and origin, clearly show that no such change is necessary, inasmuch as all the varieties of carcinoma may form in situations in which the cellular tissue is either extremely small in quantity or does not at all exist. What, therefore, appears to be hypertrophiated cellular tissue must be regarded a tissue *sui generis*, produced by the uniform distribution and molecular deposition of the carcinomatous matter, either in the cellular tissue of an organ, or in an accidental tissue of a similar kind, formed at the same time, and deposited along with the carcinomatous matter. Such is, in fact, the manner in which the cellular and fibrous tissues which enter into the composition of the carcinomatous matter are generally formed. These tissues are most conspicuous in the early stage of the disease,

becoming gradually less apparent as it advances, and ultimately disappearing in consequence of their undergoing the carcinomatous transformation, or other changes which we shall afterwards describe.

The *bloodvessels* which enter into the composition of the carcinomatous matter vary greatly in number, and sometimes also in bulk. They are rarely perceptible in any of the varieties of scirrhoma; are generally few in number in the first and second varieties of cephaloma, or in the organized and mammary sarcoma of Abernethy; but in the last variety, or medullary sarcoma, they are often so numerous as to form the greater portion of the brain-like tumour in which they ramify. When these vessels are examined in cephaloma, they are found to vary in diameter from the breadth of a hair to a line, and present that peculiarity of distribution always more or less conspicuous in newly formed bloodvessels; that is to say, the ramifications of which they are composed communicate with a common trunk at its opposite extremities in the same manner as the hepatic and abdominal divisions of the vena portæ do with this vessel. They are frequently varicose, their walls are remarkably delicate, and they have altogether much more a venous than arterial character. They appear to be formed apart from the vascular system of the surrounding tissues, as they can be seen forming from small specks of blood situated at the centre or at the circumference of the carcinomatous mass, in the form of striæ, or slender streaks of blood, and gradually assuming a cylindrical arrangement and ramiform distribution, and thereby constituting what may be called the *proper circulation* of cephaloma. The communication which exists between these vessels and those of the organ in which the carcinomatous substance is contained, is frequently very imperfect,—a circumstance which, together with the delicacy of their structure, renders them extremely liable to congestion and rupture. The most minute divisions of these vessels terminate by penicillated extremities in the carcinomatous matter, where they communicate with veins and arteries belonging to the affected organ. The latter vessels, which may be said to form the *collateral circulation* of cephaloma, are seldom so numerous as the former, but there are cases in which they appear to constitute the greater part of the vascular structure of the disease. They proceed in a radiating direction, from the pedunculated attachment of a tumour for example, or arise along its circumference in the cellular tissue which separates it from the neighbouring parts. It is by means of these vessels that the materials required for the nutrition and growth of such tumours are supplied; and, as we shall afterwards see, the partial or even complete destruction of these and other tumours similarly situated, is occasioned by causes which interrupt this their collateral circulation.

The bloodvessels which are seen in scirrhoma appear to be no other than branches of those which belong to the neighbouring tissues, and which have become inclosed within the substance of which its several varieties are composed.

Physiological characters of carcinoma.—The anatomical characters just described are the most unequivocal circumstances by means of which we are enabled to perceive the existence and estimate the degree of those properties termed vital or physiological which manifest themselves during the developement of carcinoma. But it is more especially the formation of cellular tissue and bloodvessels in the carcinomatous matter which shows it to be in possession of these properties. We have already seen that the functions of circulation and nutrition are actively carried on in the carcinomatous matter. Of these functions that of circulation is far the most important, inasmuch as many of the more remarkable phenomena which present themselves during the progress of carcinomatous formations depend on changes which take place either in the proper or collateral circulation which we have described. Thus, the quantity of blood contained in a carcinomatous tumour, and consequently various shades of colour of the substance of which it is composed, will depend much on the degree of facility with which the circulation is performed in either or both systems of vessels. An imperfect communication between these vessels, owing to the manner in which they are connected, or the presence of a mechanical obstacle in the situation of the collateral veins preventing the return of the venous blood, frequently gives rise to congestion of the whole or a portion of a carcinomatous tumour, the colour of which becomes more or less red, purple, brown, or black. The congestion thus produced may be such as to give rise to rupture of the vessels, and internal or external hemorrhage. In the former case the carcinomatous substance, when situated externally in the form of a tumour, is seen to acquire a rapid increase of bulk, proportioned to the extent of the effusion, and, when examined afterwards, is found to be infiltrated with blood, or broken down and mixed with clots of this fluid, and irregular masses or layers of fibrine, thereby producing, when the tumour possesses the cerebriform character, appearances very similar to those observed in cerebral apoplexy from sanguineous effusion. If the obstacle interrupt entirely the circulation in the tumour, nutrition ceases, and death ensues in all those parts of it from which the obstructed vessels proceeded. The termination of carcinoma in mortification from obliteration of veins is far from being a rare occurrence. It sometimes occurs in whole tumours, but is most frequently observed in portions of them, or in some of the small tumours of which larger ones are frequently composed, that are attached by narrow pedunculated extremities. The unequal developement of one of these small tumours may give rise to compression of a neighbouring one; or the tissue to which they are attached may, from its unyielding nature, act as a ligature on their pedunculated extremities, and intercept the return of the venous blood through them. The same thing

sometimes happens to tumours that have perforated fasciæ or even the skin. The protruding portion, now relieved from the pressure to which it was before subjected, increases rapidly in bulk; but the dimensions of the opening remaining the same, very soon exercise a degree of constriction which arrests the circulation through the vessels of the neck of the tumour, and it dies and sloughs.

Changes of a similar kind result likewise from the presence of the carcinomatous matter acting as a stimulus, and exciting various degrees of congestion. In consequence of the congestion thus produced, and the modification of nutrition which necessarily follows, softening takes place, not only of the carcinomatous substance, but likewise of the tissues which enter into its composition. Softening of this kind is sometimes effected with great rapidity, and tumours which before felt firm or even hard, acquire a soft, pulpy feel, and, when laid open, are found to contain a fluid of the consistence of cream intermixed with shreds of cellular tissue, detached bloodvessels, blood, and sometimes pus. This process of softening is frequently seen taking place in carcinomatous tumours that have perforated the skin, and, when considered in connexion with the state of the circulation which has given rise to it, enables us to explain the peculiar appearance of those frightful solutions of continuity by which it is followed, such as their projecting everted edges, and rugged central excavation. It is well known that it is the most projecting part of a tumour situated beneath the skin in which a solution of continuity commences, and the reason of this is, that it is here the circulation is first arrested from the greater degree of compression to which the bloodvessels are subjected, together with the increased influx of blood caused by a greater degree of excitement. The most elevated portion of the skin becomes atrophiated during the first stage of compression and irritation, that is, when the circulation of the blood through it is only impeded; but so soon as this all-important function has ceased, which is announced by a change of colour from bright to dark-red, purple or black, and a diminution of sensibility and temperature, it begins to soften, soon sloughs, and exposes the subjacent portion of the tumour whose circulation had been similarly modified, softened, and deprived of its vitality to a greater or less depth. The edges of the solution of continuity of the skin when first formed are sharp and irregular; they are not *everted;* they are, on the contrary, sometimes *inverted;* and their thickness is in proportion to the depth of the slough. The peculiarity of form assigned to them is produced by the subsequent development of the carcinomatous substance situated beneath them, which, being entirely freed from pressure all round their internal margin, necessarily projects forward, as it grows, towards the centre of the tumour hollowed out by the softening and sloughing process, and, consequently, carries them gradually upwards and backwards. They acquire at the same time a great accession of bulk, and form a rounded undulating border beneath which the skin is found doubled upon itself, encircling the carcinomatous excavation.

All these changes, viz. congestion, hemorrhage, softening and sloughing, which we have described, take place in both species of carcinoma. In scirrhoma, however, they originate in the vascular system of the tissues included within the carcinomatous substance, but are not on that account less frequent and destructive than those which arise in the proper and collateral circulation in cephaloma. In general the softening is less complete, the hemorrhage not so considerable, and the sloughing more extensive in the former than in the latter.

Softening may take place in any portion of a carcinomatous tumour, although it has been maintained that the central portion is the primary seat of this change. Instead of being softer, the centre of the tumour is often much harder than any other portion of it. In such cases it consists of a nucleus of firm, grey, semitransparent substance and obliterated bloodvessels, forming a central depression, around which the rest of the tumour presents a radiating structure. The depression is not observed unless when the tumour is divided, or is situated on the surface of an organ, as the liver, where tumours of this kind are generally met with. In the former case the depression arises in consequence of the softer substance, after the division of the tumour, raising itself by its elasticity above the unyielding nucleus; in the latter it is produced by the peritoneum adhering to the surface of the tumour when small, and preventing its developement in that direction. If the tumour does not come in contact with the peritoneum until it has acquired a considerable size, it presents no such depression, or only a very small one. Hence the reason why, in carcinoma of the liver, we meet with some tumours having a smooth globular surface, and others with a central depression of greater or less extent.

Nerves have never been detected in any of the varieties of carcinoma as a *new formation.* They are sometimes included within agglomerated tumours, or even in a single tumour that has happened to form in a situation through which they pass. It is on this account that some pathologists have supposed the carcinomatous matter to be supplied with nerves; and M. Maunoir of Geneva* hazarded the opinion that cephaloma, no doubt from its frequently resembling the substance of the brain, is in reality this substance effused by the nerves when under the influence of some peculiar morbid state; an opinion to the accuracy of which the facts related in the preceding pages do not leave even the semblance of probability.

The last circumstance connected with the pathological anatomy of carcinoma to which we shall allude, is the developement of the subcutaneous venous system sometimes so

* Loc. cit.

conspicuous when the disease affects the breast in the form of a tumour, or any other external part where the skin is capable of considerable extension. The dilated and varicose state of these veins is simply the consequence of the mechanical obstacle occasioned by the tumour to the venous circulation in its vicinity, and not the result of any special influence exercised by the disease. It is produced by tumours of every description, similarly situated,—fatty tumours and even cysts, and cannot therefore be considered as furnishing any evidence of the existence of carcinoma in particular.

The great difficulty generally experienced by physicians in distinguishing carcinoma under the various forms which it presents in the different stages of its developement, and in different organs of the body, will, we trust, furnish a sufficient excuse for our having given such a lengthened description of what strictly relates to the anatomy of the disease. If we have not succeeded in conveying a clear impression of this part of our subject, much assistance may be derived by consulting the coloured plates of the second and third fasciculi of the author's work on the Elementary Forms of Disease.

Local and other relations of carcinoma.—There are *no organs*, and *few tissues*, which may not become affected with carcinoma. Among the former, the stomach, liver, uterus, breast, and testes, are *much more frequently* the seat of the disease than any of the other organs of the body. It is also worthy of remark that it is met with more frequently in certain portions of organs and systems than in others. Thus, when it affects the uterus, it is almost always the os tincæ in which it commences; in the stomach it is much more frequently the pyloric than the cardiac orifice; it much more often affects the stomach than the œsophagus or intestines; the large than the small intestines. In the latter it is rarely met with, and perhaps only in the duodenum and commencement of the jejunum; and in the former it is exclusively confined to the rectum, sigmoid flexure of the colon and ileo-cœcal valve, unless when propagated from a neighbouring organ by contiguity of tissue.

If we pass in review the several tissues subject to carcinoma, we find that the cellular is infinitely more so than any of the other tissues in which the disease occurs, although we have proved that it is far from being so frequently the primary seat of the disease as was, and still is, generally believed. The mucous and cutaneous tissues are the next in the order of frequency, and lastly the osseous, venous, and arterial. We have never observed the disease in cartilage, tendon, or ligament; but we have shown, when treating of the mode of its formation in the stomach, that, contrary to the general opinion, the muscular tissue of this organ is frequently the seat of it.

The number of organs that may become affected with carcinoma in the same individual varies considerably. In some cases there may be only one organ or tissue affected with the disease, as the stomach, intestines, œsophagus, liver, lungs, kidney, uterus, testis, breast, brain, eye, tongue, chin, cellular tissue, lymphatic glands, bone, capillaries, and veins. In other cases it may be found in a great many organs and tissues in various stages of its progress. It is seldom that double organs, such as both eyes, the mammæ, testes, or kidneys, are affected at the same time. We have never met with carcinoma of the pancreas, muscular, venous, and arterial tissues, serous, mucous, and fibrous membranes, without the disease being present in a neighbouring organ or tissue, and from which it was communicated to the former.

The greater liability of some organs and tissues than others to become affected with carcinoma is a circumstance of considerable practical importance. So, likewise, is its occurrence as a primary and secondary affection. In this latter respect the disease may be *secondary* only as regards the *order of its appearance*, the same morbid condition of the economy which gave rise to it in one organ giving rise to it in the others, which become successively affected; or it may be secondary in one organ in consequence of the *intimate physiological connexion* existing between it and another previously affected; and, lastly, it may be secondary from *mere contiguity* of tissue.

In the first case the secondary appearance of the disease is recognised partly by the extent which it occupies, and partly by the physical and anatomical characters which it presents in the different organs in which it is present. By the same means, and more especially in consequence of two or more organs being found to be much more frequently than others affected with the disease, we infer that its propagation in the former is influenced by the intimate physiological connexion which is known to exist between them, as is exemplified in carcinoma of the uterus and mammæ, and of the liver and stomach succeeding to each other. The secondary production of carcinoma from contiguity of tissue, whether of a similar or dissimilar kind, is frequently observed; such as the gradual extension of the disease from the walls of the stomach to those of the intestines, and from the latter to the parietes of the abdomen; from the stomach to the liver; from the uterus to the bladder or rectum, and *vice versâ*. But in all these cases the contiguous tissues and organs become united or continuous before the disease passes from the one to the other, which is then propagated by the gradual molecular deposition of the carcinomatous matter, in the same manner as we see it accomplished in the skin during the ulcerative stage of the disease.

An opinion very different from that we have now given respecting the secondary production of carcinoma has long been entertained, chiefly by surgeons. Finding, as they frequently must have done, cancer in an internal organ which had given no signs of its presence until after it had existed for a greater or less length of time in some external part, they considered the production of the disease in the former situation to be subsequent to that in the latter,

and to arise in consequence of the absorption of a specific virus from the supposed primary disease, and its transmission into the system. This opinion was strengthened by the fact that symptoms of cancer of an internal organ frequently make their appearance soon after the breast, testicle, or other external part has been removed by a surgical operation, and was considered as fully confirmed by another fact, viz. that the lymphatic glands situated in the vicinity of a cancerous tumour or ulcer are seen to become affected during the progress of the primary disease. We shall only remark with regard to this view of the secondary production of carcinoma, that the facts adduced are far from justifying the application which has been made of them; for they furnish no proof that the occurrence of the disease internally, at any period subsequent to its existence externally, may not depend on the same morbid condition of the economy producing its effects successively or simultaneously, in a greater or less number of organs, inasmuch as we know that carcinomatous tumours may exist for a considerable period, even in the most important of the internal organs, without giving rise to any appreciable modification of function calculated to lead to their detection. Hence, under whatever circumstances the signs of carcinoma may present themselves for the first time in an internal organ, we cannot determine either the length of time it may have existed, or the relative order of its succession. Besides, the extension, as it is called, of carcinoma from the breast or testis, for example, to the neighbouring lymphatic glands, affords no proof that it takes place through the medium of absorption; for we have found these glands in the axilla, and in the lumbar region, extensively diseased in carcinoma of the breast and testis, without any of the carcinomatous matter of which all these were composed being visible in the lymphatic vessels passing from the one to the other. The more natural explanation of the occurrence of the disease in these glands in such cases is, that, being subjected to the irritation which accompanies the latter stage of the disease, (the period at which the lymphatic glands are generally observed to become affected,) they become the seat of congestion, and, as we have already endeavoured to shew, the material element of carcinoma being contained in the blood, it is separated from this fluid and deposited in their substance.

We are, however, well aware that there are cases in which this matter is absorbed and accumulates in the lymphatic glands; but from the circumstance just stated, and from the fact already noticed that these glands may be the only organs in the body in which, after the most careful examination, the disease is found to exist, we are surely not entitled to say that they are always secondarily affected, whatever signification we may attach to this term. We have seen several instances of cephalomatous tumours formed exclusively in the mesenteric glands and abdominal lymphatic glands; and in one case the latter glands of the principal regions of the body, on both sides of the neck and under the jaws, in the axillæ and groins, in the chest and abdomen, were extensively affected with the disease, and forming tumours varying from the size of a cherry to that of an egg. The spleen was the only other organ which presented any trace of the disease.

Carcinoma is a disease which is far from being equally frequent at the *different periods of life*. It is observed to make its appearance most frequently in the male from between thirty to forty or fifty years of age, and in the female after the cessation of the menstrual discharge, than at any other period of life. It is also on account of the more complicated nature of the organs of reproduction in females that they are more subject to the disease, generally considered, than males; for the uterus and mammæ are the organs which, in the former, are most frequently the seat of the disease. In the latter it rarely makes its appearance in the breast, and not so frequently in the testes as in the uterus. The stomach and liver are, according to our own observations, the most frequent seat of the disease in males, although these organs are, perhaps, equally so in females. The tongue, and especially the lips, are often affected in the former and rarely in the latter. It is also worthy of remark that from childhood up to the age of puberty, and even to twenty or twenty-five years of age, we seldom meet carcinoma unless in particular organs or regions of the body. Thus it is chiefly the lymphatic and mesenteric glands, the great joints, as the elbow and knee joints, the brain, and cellular tissue, where it is considerable in quantity; whereas the stomach, intestines, uterus, and mammæ are almost exempt from the disease till a later period of life. And it is interesting to observe that the exceptions to its non-occurrence in these latter organs within the period alluded to are met with in such of them only the exercise of whose functions are susceptible of being prematurely and preternaturally excited, particularly the testes and ovaries.

These remarks on the relative frequency of carcinoma under the circumstances of age and sex apply to the disease generally, and not to both species and their varieties; for while scirrhoma is rarely met with within the period which we have specified, cephaloma is of frequent occurrence, and seldom proceeds to such an extent or with such rapidity in advanced as in early life; a circumstance which may probably depend on the greater activity of nutrition and the more plastic quality of the blood in the latter than in the former condition of life; and thus also a corresponding character may be given to the morbid products which manifest themselves in each.

The frequency of carcinoma is said to be considerably influenced by *temperament*. Thus out of forty-four cases of the disease in which the original temperament was sufficiently characterised, Breschet and Ferrus found the lymphatic to prevail twenty times, the sanguineous twelve, the bilious eight, and the nervous two; and in almost all the patients submitted to their observations, the lymphatic temperament had

acquired a marked predominance during the progress of the disease.*

The observation of carcinoma in individuals of different *habits* and *modes* of life submitted to the influence of various external agents arising out of locality, profession, or climate; in the married and unmarried; in women who have or who have not had children; in the poor and wealthy; in the temperate and debauched, &c. &c. has not led to very satisfactory results regarding the relative frequency of the disease. It is, however, said that it is as rare in peasants and country-people in general, as it is common among the inhabitants of large cities; and that it is more frequent in the lower and higher than in the middle classes of society.

Causes and nature of carcinoma.—The observations which we have made on the relative frequency of carcinoma as to age, sex, temperament, and condition of life, contain the greatest part of what we have to say on the *predisposing* causes of the disease. Among these have long been enumerated the frequent and direct operation of irritating substances; external injuries, especially blows; the abuse of stimulating potions; immoderate indulgence in venery; the depressing influence of moral afflictions; bad food, conjoined with the debilitating effects of cold and otherwise unhealthy habitations; the injurious influence of one or more of these predisposing causes on particular organs being determined or modified by the individual or accidental circumstances of the case. The frequent occurrence, however, of carcinoma in individuals in whom none of these predisposing causes seem to have co-operated in the production of the disease, as well as its non-occurrence in many who have been subjected to the influence of these causes, has led many pathologists to consider it as having an hereditary origin. They believe that the *germ* of the malady, or *cancerous virus*, is transmitted from the parent to his offspring, and cite, in favour of their opinion, the occurrence of the disease in several members of the same family. This opinion, however, has few advocates, particularly since Alibert,† Biett, and Dupuytren‡ have shown that the carcinomatous matter may be introduced in the form of inoculation into the digestive organs, the serous cavities or veins, without giving rise to the disease; experiments, it may be remarked *en passant*, to which no more importance can be attached than to the fact that the disease may occur in several individuals of the same family. A more generally received opinion, and one much more in accordance with the results of accurate observation, is, that the manifestation of the disease is at all times, and under all circumstances, dependent on the previous existence of a peculiar state of the constitution, either congenital or acquired, termed *diathesis*. The evidence on which this opinion rests we have in great part already exposed when treating of the seat, local origin, and mode of formation of carcinoma. We have shown that the material element of the disease—without which it can have no existence—is contained in the blood, is separated from this fluid after the manner of nutrition or secretion, either in the molecular structure, or on the free surface, of organs; and that, while the formation of the disease is thus going on, there may be no appreciable, physical, or physiological modification of the part in which it is observed. It is thus that we meet with carcinomatous tumours in the brain, which, from their bulk and other characters, must have existed long before the functional disturbance of the organ gave signs of their presence; and we have an equally striking example of the silent developement of these tumours in the eye, until, acting simply as a foreign body, they obstruct the rays of light, and render vision more or less imperfect. In persons, too, apparently in the enjoyment of the most perfect health, we often see the disease making its appearance in the form of a small pimple, proceeding more or less rapidly in its course, extending in breadth and in depth, and terminating ultimately in death, in spite of all the means which art has devised. In others, a similar pimple arises under similar, or even unfavourable, circumstances, proceeds like the former to ulceration; and although it may have been neglected, irritated, and excited from time to time, and maltreated in every possible way, disappears, and leaves the patient in perfect health. There is, indeed, no form of inflammation which may not exist for any definite length of time, and in every organ of the body, without being followed by carcinoma. Of the truth of this position every candid inquirer must be fully aware, although it is still attempted to support the unphilosophical theory which maintains that this disease is always preceded by chronic inflammation. It would, however, be a great practical error were we to overlook the influence of this pathological state on a constitution predisposed to carcinoma; for this disease does make its appearance in organs which we have every reason to believe would not have become affected with it, had they not been previously modified by the former. We must, therefore, conclude that, if carcinoma makes its appearance in individuals however they may have been placed in regard to the operation of what are called predisposing and exciting causes, there must be present in such individuals a peculiar condition or disposition of body, previous to the manifestation of the disease. In what this disposition consists, we are entirely ignorant. Its very existence is made known to us only by means of the peculiar characters of the products to which it gives rise. We have certainly seen that the great function of nutrition is that which is more especially affected, and that, as the material element of carcinoma is contained in the blood, it is highly probable that a modification of this fluid constitutes the primary if not the essential condition of the formation of the disease. But, unacquainted

* Dict. de Méd. t. iv. art. *Cancer.*
† Description des Maladies de la Peau, p. 118.
‡ Dict. des Sciences Médicales, t. iii. p. 677.

as we are with the nature of nutrition as a physiological function, we can offer no explanation of the nature of the change effected in the blood, nor, consequently, of the nature of carcinoma. It is, however, an interesting fact,—the result of our anatomical researches in particular,—that, as carcinomatous formations derive the materials of which they are composed from the blood, instead of their being local *transformations* or *degenerations* of pre-existing tissues, they do not, in this point of view, form an exception to the law, viz. that the natural and healthy solids, as well as the fluids of secretion, derive also their respective materials from the same source; and, therefore, we are led to hope that a more intimate knowledge of the manner in which these two functions are performed will enable us, at some future period, to determine the nature of a disease which hitherto has only been rendered more obscure by the attempts which have been made to explain it.

Symptoms of carcinoma.—Considered in a general point of view, the symptoms of carcinoma refer to changes taking place during the progress of the disease, as they occur in the carcinomatous substance itself, in the organs in which it is contained, and in remote organs or the constitution generally. The symptoms are therefore local or general. The former are referable to changes in the bulk, consistence, form, colour, temperature, sensibility, circulation, nutrition, and special functions of the organ affected; the latter to changes in the functions of circulation, nutrition, and innervation in general. Both series of phenomena are greatly modified by the seat, stage, or period of the disease. They present also marked differences in the two species of carcinoma, those observed in the first species being often absent in the second; or, being present in the former from the commencement, either do not occur in the latter at all, or only towards its termination. We shall pass in review the *local* and *general* phenomena which accompany the presence of carcinoma in those organs the diseases of which belong more especially to the province of medicine.

Local symptoms.—Few of the changes to which we have referred the *local* symptoms of carcinoma are discoverable in internal organs, and all of them may be absent in the early stage of the disease. Changes in the *colour*, *temperature*, *circulation*, and *nutrition* of the affected organ, cannot be detected by direct observation; and those of *bulk*, *consistence*, and *form*, can be determined only in certain organs, and at a more or less advanced period of the disease, such as the stomach and intestines, liver, spleen, kidneys, ovaries and uterus, lungs, and mesenteric glands; in all of which organs these changes may be recognized either by the touch, percussion, or auscultation. But it is more particularly the change of bulk which is detected by these means, and which, as a local symptom of the presence of carcinoma, is that to which the greatest importance is to be attached. The increase of bulk which accompanies the presence of carcinoma is not perceptible till the disease has made some progress. It is most considerable in solid organs, such as the liver, kidney, ovary, &c., and is seldom very marked in hollow organs, such as the stomach or intestines. Considerable increase of bulk may, however, have taken place in the walls of the stomach and intestines, without our being able to detect its presence, which happens when the carcinomatous matter accumulates in the direction of the internal surface of these organs. In such cases an increase of bulk of a different kind is produced, viz. dilatation, in consequence of the obstacle presented by the carcinomatous matter to the passage of the food or fæces. When dilatation of the stomach is thus produced, the obstacle is situated at the pylorus; when of the small intestines, it is, in the great majority of cases, situated at the termination of the duodenum or commencement of the jejunum, and caput cœcum coli; and at the sigmoid flexure of the colon and rectum, when the dilatation occupies the large intestines. The increase of bulk which the stomach and intestines acquire in consequence of an obstacle of this kind is sometimes very great. In some cases of scirrhous pylorus, the stomach has been found to occupy the greater part of the abdominal cavity, stretching down to the symphysis of the pubis, and from one lumbar region to the other; and the large intestines sometimes measure from four to six inches in diameter, when similarly affected. We have seen the small intestines equal in size to the ordinary dimensions of the stomach. It is important to know that the extent of the dilatation is not to be taken as the measure of the extent of the disease. The greater the dilatation the greater we may infer is the obstacle by which it is occasioned; but this obstacle may consist in a slight scirrhous enlargement, which prevents the passage of the food or fæces as effectually as when it is occasioned by one or more tumours of considerable size or great thickening occupying several inches in length of the whole circumference of the walls of the stomach and intestines.

There are two circumstances connected with the dilatation of these organs from carcinoma which merit particular notice. The first is the *disappearance* of the dilatation at a particular period of the disease. This may happen a considerable time after the dilatation was first perceived, and is the consequence of the destruction of the carcinomatous substance from softening, ulceration, or sloughing. The obstacle being thus removed, a free passage is opened to the accumulated contents of the stomach and intestines, and the dilated walls of these organs are allowed to contract, and in some instances regain their natural dimensions. The second circumstance is the *reoccurrence* of the dilatation, which we have observed to take place only in the intestines. It does not occur, unless the mucous and muscular coats have been destroyed by ulceration, after the destruction of the carcinomatous substance, and not until cicatrization has commenced. The cicatrix being formed of

cellulo-fibrous tissue, contracts and produces stricture of the intestine. The passage of the fæces is again obstructed, and the intestine acquires an increase of bulk much greater than before the destruction and removal of the carcinomatous substance. We shall again allude to these changes in bulk when speaking of the modifications of function, and the diagnosis of carcinoma in the digestive organs.

The increase of bulk which accompanies carcinoma of the liver is often very considerable. Cases have been met with in which the left lobe of the liver extended into the left hypochondrium, and the right down to the iliac fossa on the same side. It is always produced in this organ by the accumulation of the carcinomatous matter in the form of tumours, which may often be felt projecting above its surface. It is chiefly from this latter circumstance that we are enabled to detect carcinoma of the liver. It is, however, necessary that the tumours should occupy the convex surface of the liver, and that this organ should project beyond the false ribs.

In one instance only have we found the spleen, when affected with carcinoma, much increased in size; it was nearly six times larger than natural. We have also found the kidney enlarged to the same extent in a young person, but it is seldom more than twice its natural size in this disease. Carcinoma of the uterus is not accompanied by any perceptible increase of bulk, unless examined *per vaginam*, when, in the early stage of the disease, the os uteri is found enlarged and projecting into the vagina. The ovaries acquire the size of the fist or even of the head of a child, but never become so large as when they are the seat of dropsy, or contain fibrous tumours. We have never seen the bulk of the lungs so increased by the presence of the carcinomatous deposit as to give rise to dilatation of the walls of the chest. We have already noticed the great increase of bulk which accompanies carcinoma of the mesenteric and lymphatic glands.

The only modification of the *sensibility* which, as a local symptom, accompanies carcinoma, is that of pain. There is, however, no symptom of carcinoma more deceptive than pain. The importance attached to it, more particularly when it possesses a *lancinating* character, must have originated in the study of the disease in external parts of the body, as the face, breast, or the skin and subjacent tissues in general; for there are several organs in which the pain is either very slight or seldom acquires the lancinating character ascribed to it: such is the case in carcinoma of the liver, spleen, kidneys, ovaries, stomach and intestines, (with the exception of the rectum,) the mesenteric glands, and even the brain. It is also to be remembered that pains, described by patients as lancinating, may occur without any trace of carcinoma being found in the organs to which they are referred.

Of all the varieties of carcinoma, it is that of scirrhus which is most frequently accompanied with pain; and it is also in this variety that the pain is most severe, acute, and lancinating. In medullary sarcoma this symptom is less frequent and severe than in any of the other varieties. But it is not according to the several varieties of carcinoma that we are to form an estimate either of the frequency or severity of the pain. For this symptom may, in both these respects, be said to vary with the degree of induration of the carcinomatous substance; of the distension or compression, and of irritation to which this substance gives rise in the neighbouring tissues. Under the influence of the two former of these conditions, pain would seem to result from compression of the nerves which happen to be included within the dense carcinomatous substance, or that are distributed in its immediate vicinity. Pain from irritation may also be produced under similar circumstances, but it is much more frequently when softening and sloughing of the carcinomatous substance, and ulceration of the neighbouring tissues, have taken place, that pain from this cause makes its appearance, and acquires a degree of severity which gives rise to the most intolerable suffering. It is in this stage of the disease that pain occurs in internal organs, in consequence of the extension of the irritation to the nerves of sensation.

The pain may be intermittent, remittent, and continued, whatever may be the organ affected with carcinoma. The intermittent character is most frequently observed during the early stage of the disease; and the remittent and continued during the progress of softening, sloughing, and ulceration. Numerous circumstances concur to produce these varieties in the duration of the pain in carcinoma; but in the great majority of cases they appear to depend on varying and opposite states of the sensibility and circulation of the affected organs. For we know that the direct application of those means which increase the sensibility and circulation excite, in an organ affected with carcinoma, pain when absent, and increase it when present; whilst those remedies which are known to diminish the sensibility and the action of the vascular system, effect also a diminution or an entire cessation of the pain in this disease.

The symptoms which depend on the *modifications of the functions of organs* affected with carcinoma, are far from being so conspicuous as the fatal character of the disease would lead us to suppose. We allude to the *special* modifications of function observed in carcinoma of internal organs. Before taking a general view of these modifications of function, we may remark that there is not one of them which may not be found to accompany other diseases than carcinoma. They nevertheless require to be studied with great care, because of the effects to which they give rise being sometimes more intolerable than the disease itself, and requiring a separate mode of treatment.

The modifications which are observed to occur in the special functions of organs, present great variety not only in different organs, but also in the same organ, according to the stage, extent, and situation of the disease. Thus the function of digestion is not so frequently

disturbed in the early as in a more advanced stage of the disease, nor is the disturbance so great in the former as in the latter case. This difference in the effects of carcinoma on the function of digestion may be explained on the following principles, viz. that the carcinomatous substance, when first deposited, acts merely mechanically, and therefore does not interfere with the function of digestion, unless it occupies a great extent of the walls of the stomach, or prevents the egress of the digested food; whereas during its subsequent developement, this substance undergoes those changes which we have already described, viz. softening, sloughing, and ulceration. The absence of irritation in the former case, and its presence in the latter, furnishes an obvious reason why digestion is seldom disturbed in the one case, and more frequently and to a greater degree in the other. The influence of carcinoma as to extent and situation, over the function of digestion, is very great. A carcinomatous tumour of from three to four inches in diameter, and projecting from one to two inches above the mucous membrane of the stomach, if situated at the small or large curvature, may be unaccompanied by but a very slight derangement of the function of digestion; whereas a tumour not larger than a filbert situated at the pyloric orifice, may disturb this function to an extreme degree. It is, indeed, very often in consequence of the mechanical operation of carcinoma preventing the egress of the food or chyme, that we are first led to detect disorder of the function of digestion, and to suspect the nature of the disease on which it depends. In such cases more or less of the digested food is retained; the succeeding meal is partially or imperfectly digested; the stomach becomes distended, and being irritated by the continual contact of its contents, rendered more stimulating by decomposition or fermentation, contracts forcibly, and they are rejected by vomiting. Vomiting is an invariable consequence of carcinoma of the pylorus, accompanied with a diminution of bulk of the orifice of this part sufficient to interrupt or impede the exit of the chyme or indigested food. Perhaps the most frequent cause of vomiting is the mechanical obstacle occasioned by the carcinomatous substance in the pyloric portion of the stomach. This modification of the function of the stomach as a mechanical effect, we have never observed in carcinoma of any other portion of this organ. Vomiting, however, frequently occurs, whatever may be the situation of the disease, in consequence of the irritation which accompanies the softening process, and the ulceration by which it is followed. Vomiting from irritation may, in general, be distinguished from that occasioned by a mechanical obstacle situated at the pylorus. The former takes place however small the quantity of fluid taken into the stomach; the latter, only when the quantity is considerable. Vomiting from irritation is sudden, and accompanied by a disagreeable or painful effort; that from a mechanical obstacle gradual, and instead of being accompanied by pain, frequently affords relief from this state or a considerable degree of uneasiness. It is in this case a kind of passive act, the consequence of the great dilatation of the stomach, and sometimes of the inferior portion of the œsophagus also. The presence of dilatation of the stomach, which is easily detected by percussion, will enable us to distinguish vomiting from a mechanical obstacle from that occasioned by irritation.

The periodical character of vomiting is, in the great majority of cases of carcinoma of the stomach, to be attributed to the presence of a mechanical obstacle at the pylorus. The vomiting occurs at certain intervals, which vary with the extent of the obstacle, the quantity and kind of food taken, and other necessary and accidental circumstances, as the susceptibility of the patient and the state of those organs which exercise a sympathetic influence on the function of digestion. In some cases of this kind, the vomiting, after having continued for several weeks or months, disappears for a considerable time before it recommences, and in other cases ceases entirely. We have met with examples of both cases, referable to opposite physical conditions of the pyloric orifice. In both cases the vomiting depended on the pyloric orifice being obstructed by thickening of its walls, or the presence of projecting or pendulous tumours; and the partial or permanent cessation of this symptom, to the patency of this orifice being restored, in consequence of the destruction of the carcinomatous substance. The return of the vomiting in the former case was owing to the return of the disease in such a form as to obstruct anew the exit of the contents of the stomach; and in the latter, the entire cessation of this symptom was to be attributed to the progressive extension of the ulcerative and sloughing processes, and, consequently, the complete removal of the obstructing cause.

The *quantity* and *quality* of the matters vomited are variable. Both will be modified by the quantity and quality of the food and drink; the former by the capacity of the stomach, and the absence or presence of irritation; the latter by the nature of the ingesta, the state of digestion, and the stage and variety of the disease. It is only at the early stage of carcinoma, or at least before softening and ulceration have taken place, that the vomiting consists of a watery or mucous secretion. At a more advanced stage, the rejected food is less altered by the digestive process than before, and is often accompanied by a quantity of gas of a disagreeable odour. In the great majority of cases, and always towards the termination of the disease, the contents of the stomach rejected by vomiting contain a substance resembling the lees of wine, a mixture of chocolate, or soot and water. This substance may appear in the form of little particles, patches, or streaks, among the other matters vomited, or it may be in such quantity as to give to the whole contents of the stomach a deep brown or black colour. Its appearance always indicates the effusion of blood into the cavity of the stomach from hemorrhage, either in consequence of the softening of the carcino-

matous substance, or the sloughing of this substance and of the contiguous parts. It is on this account regarded as a fatal symptom, and as indicating the speedy termination of the disease. (The cause of the black colour of the effused blood we have already explained in the articles MORTIFICATION and PERFORATION. It is also at this period that the odour of the breath and the rejected matter is most offensive; and that the appetite, if not previously much affected, is entirely lost, perverted, or replaced by a morbid craving for peculiar kinds of food. There is only one other circumstance connected with vomiting to which we shall allude, viz. the rejection of the food taken the previous day or even at a later period, whilst the last meal is retained. This kind of choice, as it would seem, of the stomach between fresh and digested food, is not frequently observed. We do not recollect to have observed it except in cases of carcinoma of the pyloric portion of the stomach.

The modifications of the special functions of the intestines produced by carcinoma are in many respects very similar to those which we have described as occurring in the stomach. We have already noticed the mechanical influence of the disease in preventing the passage of the food and faeces, the accumulation of the latter, and the subsequent dilatation of the intestine. In no other respect does carcinoma interfere with the functions of the intestines, except when it gives rise to great irritation or inflammation of the mucous membrane and subjacent tissues, or when it terminates in sloughing and ulceration. Diarrhœa is the consequence of the former, and hemorrhage a frequent attendant on the latter of these morbid conditions. The rejection of faecal matter by vomiting is not often observed in carcinoma of the intestines. The stools sometimes present the same melanotic character as the matters rejected by vomiting in the last stage of carcinoma of the stomach. They also indicate the last stage of the disease in the intestines, coincide with the appearance of the hemorrhage, and depend on the subsequent discolouration of the effused blood.

Carcinoma of the liver may occur without any appreciable derangement of the special function of the organ being observed. We are disposed to believe that a suspension of the secretion of the bile very seldom occurs in the disease. In the great majority of the cases of jaundice which we have seen to accompany carcinoma of the liver, we have found the ductus communis choledochus, the hepatic duct or its principal branches, much compressed or obliterated by the carcinomatous substance in the form of large tumours. The same mechanical operation of these tumours on the trunk of the vena portæ or its larger divisions in the liver, prevents the return of the blood of the chylopoietic viscera to this organ: hence that form of ascites which always accompanies this state of the portal vessels.

There is often no apparent alteration in the quantity or quality of the bile, even in the most extensive forms of carcinoma of the liver. This fact is determined not only by the colour of the faeces during life, but by the examination of the organ after death; the substance of the liver presenting no unusual colour, and the gall-bladder being filled with bile of the natural consistence and colour.

There is no apparent modification of the secretion of the urine in carcinoma of one of the kidneys, although the disease may be so extensive as to leave no trace of the natural structure of the organ. We have never found both kidneys affected. On the contrary, the sound one is generally larger than natural, and appears to supply by its increase of bulk or energy the place of the other, as the quantity of urine voided in a given time is not sensibly diminished.

The much more frequent occurrence of carcinoma after than before the cessation of the menstrual discharge, prevents us from estimating accurately the influence which this disease exercises on the special function of the uterus and ovaries. Impregnation, however, has been known to take place in carcinoma of the os uteri, and of one of the ovaries. For farther information on carcinoma of the female organs of generation, see UTERUS, DISEASES OF.

Only a few remarks are necessary on the modifications of function which accompany carcinoma of the spleen, pancreas, mesenteric and lymphatic glands, epiploon, and serous membranes in general. With regard to the spleen, we have only to remark that its cellular organization may be completely effaced by the presence of the carcinomatous matter, and consequently it is rendered incapable of receiving more blood than is necessary for the nutrition of its solid parts, and the growth of the disease. Carcinoma of the duodenal extremity of the pancreas, in consequence of the compression of the duct which passes in this direction, gives rise to an accumulation of the secretion of this organ, and great dilatation of the duct throughout its whole extent. It is in consequence of the increase of bulk of the pancreas which accompanies such cases, that we are sometimes led to suspect retention of the secretion of this organ. Diminished or suspended absorption are the occasional consequences of carcinoma of the mesenteric and lymphatic glands. Emaciation, when attributable to no other cause, may be regarded as indicating the modifications of function alluded to, of the former glands, and œdema of some external part, of the latter, both of which are rare occurrences, particularly œdema. An accumulation of the secretion of serous membranes, and a greater or less degree of obstruction to the motions of the contained organs, are the functional derangements which accompany carcinoma of these membranes, and of the epiploon. The latter, when affected with carcinoma, is generally drawn up in the form of a thick irregular mass, and fixed to the stomach along its great curvature; or it is sometimes split into several portions attached above to the stomach, and below to the uterus, ovaries, or walls of the abdomen, forming so many thick bridles, which not only interrupt

the motions of the intestines, but sometimes pull the stomach downwards, giving rise to an uneasy dragging sensation in the latter organ, and a sense of tightness or constriction in the former.

The function of respiration may be interrupted to such a degree by the mechanical presence of the carcinomatous substance, as to terminate in fatal asphyxia. We remember one case in particular of this kind. It occurred in a young man about twenty-five years of age, who, six weeks previous to his admission into hospital, performed the active duties of a soldier. He complained only of difficulty of breathing; he had a slight cough, followed occasionally by the expectoration of a small quantity of mucus. The difficulty of the respiration rapidly increased, and terminated in asphyxia, without the occurrence of fever or emaciation. Both lungs were nearly filled with large masses of the medullary sarcoma. The remaining pulmonary tissue was compressed, but not otherwise altered. This case affords a striking example of the mechanical effects of carcinoma, and the rapid and extensive developement of the medullary variety of the disease. Carcinoma of the heart has been seldom met with to any great extent, and so far as we know, no particular modification of function has been observed to accompany its presence. We have already minutely detailed the changes effected by this disease in the capillary and venous circulation.

The functional lesions which accompany carcinoma of the brain, cerebellum, and spinal cord, vary considerably with the seat of the disease relative to these organs individually, as well as to particular portions of them. But in neither of these respects does it give rise to any symptom which can be regarded as pathognomonic of its presence. As a foreign body, it gives rise sometimes to a degree of compression sufficient to produce partial or complete paralysis; loss of memory, or difficulty of speech; and derangement of the intellectual faculties. But these latter changes depend principally on the irritation and softening of the substance of the brain in contact with the carcinomatous mass. Even paralysis is more frequently produced by these subsequent changes than by compression. We have met with two cases of medullary sarcoma of the cerebellum, characterized by a remarkable developement of the function ascribed to this organ by Gall. Both patients, young men, were between 18 and 19 years of age. The left lobe of the cerebellum in one of them contained a carcinomatous tumour, of the variety mentioned above, as large as a hen's egg; in the other the tumour was less, and projected from the centre of the cerebellum into the fourth ventricle. We could not ascertain how long they had practised the act of pollution, but both were emaciated and weak when admitted into hospital. One of these patients was left to himself, and died about two months after his admission, in a state of extreme debility. The other lived nearly three weeks. When warned of the fatal consequences which must soon follow the practice which had already reduced him to a state of great misery, he declared that although he was conscious of the nature of his situation, it was not in his power to resist the influence under which he felt himself compelled to act. His hands were secured, but without the desired effect. As a last resource, the whole of the prepuce was removed, yet in this mutilated state he attempted to gratify the fatal propensity. He died a few days afterward, having had several severe convulsive attacks.

Paralysis of the superior and inferior extremities, of the muscles of respiration, of the bladder and rectum, have been observed in carcinoma of the spinal cord. It is hardly necessary to observe that the seat and extent of the paralysis depends on the portion of the spinal cord occupied by the disease.

General symptoms.—The general symptoms of carcinoma do not make their appearance before the last stage of the disease. Their severity depends much on the nature of the organ and the extent to which it is affected; but it is principally the irritation produced by the presence of the carcinomatous substance during the period of softening, sloughing, and ulceration, that determines the gravity of these symptoms. It is in this, the last stage of the disease, that the circulation and innervation become deranged, and that fever and a diminution of the nutritive function are first observed. It is likewise at this period, but more frequently a few days or weeks before death, that the skin assumes a pale earthy, or dull ochry tint; that debility and emaciation make rapid progress; and all the functions of the economy become implicated in the deteriorating influence of the disease. It is this group of the general symptoms which constitutes what is called the *cancerous cachexia*. The febrile symptoms, as well as the diminution of nutrition, in general are greatest when the seat of carcinoma is the uterus or stomach; and least in those organs, as the brain and lungs, in the former of which softening, and in the latter compression, may terminate in death, before either of these symptoms have become conspicuous. General dropsy does not often occur, and is never great. Ascites frequently accompanies carcinoma of the liver, for the reasons which we have already stated. Dropsy of the inferior extremities occurs more frequently in carcinoma of the ovaries and uterus than of any other organ. It is the consequence of compression of the iliac veins, but it may also be occasioned by the extension of the inflammation which accompanies the ulcerative stage of the disease to these vessels. Compression of the vena cava by tumours in the liver, or by the enlarged mesenteric glands, may also give rise to the same state of the inferior extremities.

Diagnosis.—It is not until carcinoma has made considerable progress, that we are sometimes able to recognise its presence in internal organs by means of a careful consideration of the local and general symptoms which we have enumerated. We have had frequent occasion to remark how little importance is in general to be attached to any one of these symptoms taken individually. But when the local signs, viz.

the changes in the bulk, form, and situation of organs, occasioned by the disease; its relative frequency in different organs and in particular portions of the same organ, are taken in connexion with the special and general modifications of function which may be present in individual cases, the greatest possible assistance is afforded us in establishing the diagnosis. The degree of facility with which this important object may be accomplished will depend on the number of the signs and symptoms present, and the possibility of detecting them by the means of investigation in our possession. Thus it is more easy to detect carcinoma of the stomach than of the lungs, of the latter than of the brain; because of our being able to ascertain the presence of the greater number of the local signs of the disease in the first case, only a few of them in the second, and none at all in the third. And when the sense of sight can be applied with that of touch and hearing, the diagnosis seldom presents much difficulty, as in the case of carcinoma of the os uteri and rectum.

It is necessary to observe that too much reliance is not to be placed on the presence of those general symptoms which constitute the cancerous cachexia; for there are morbid conditions of the stomach and duodenum, associated with derangement of the biliary secretion, which give rise to a state of debility and emaciation, accompanied with discoloration of the skin, which so closely resembles the cancerous cachexia, that the one is not to be distinguished from the other. The difficulty of establishing the diagnosis in such cases is likewise increased by the circumstance that the same chronic character prevails in both. There is, therefore, no possibility of distinguishing between carcinoma of the stomach and such morbid conditions of the same organ, unless the local phenomena of the former be very conspicuous.

It is hardly necessary to remark that the presence of carcinoma in an external part of the body is to be regarded as a diagnostic sign of great importance, in all cases of a doubtful character in which functional derangement of an internal organ has existed for some time. In such a case we should regard the frequent occurrence of vomiting after meals as indicating the existence of carcinoma of the pylorus, even should no tumour be felt in this situation, or dilatation of the stomach. If the presence of a tumour were detected in any part of the abdominal cavity, we should not hesitate to say that it was of the same nature as the external affection; and the occurrence of paralysis, under the same circumstances, would justify us in attributing it to carcinoma of the brain or spinal cord.

We shall not, in this general article, attempt to determine how far it may be possible to distinguish carcinoma from other diseases to which internal organs, considered individually, are subject. Besides, in the description which we have given of the signs and symptoms of carcinoma, we have already endeavoured to point out those which more especially characterize the presence of this disease in individual organs.

Prognosis.—In no disease is a fatal termination so universally admitted as in carcinoma. The possibility of the cure of carcinoma of internal organs has never been supported by substantial evidence; and the examples are few indeed in which we are disposed to believe that the disease has been removed from an external part by surgical or other means, without its recurrence in the same or some other part of the body at some future period.

Treatment.—A host of remedies have been proposed for the cure of carcinoma; the greater number of them have been tried in almost every form of the disease, but they have nearly all failed to justify the high praises formerly bestowed on their curative virtues. Some of them, however, have been found to retard, if not to arrest the progress of the disease; and, what is of great importance, to alleviate the sufferings and prolong the life of the patient. We shall notice those remedies only the successful administration of which has been rendered evident in carcinoma of external organs, as under such circumstances the nature of the disease is less likely to have been mistaken. We shall speak first of those remedies which effect a salutary change in the nutritive function of the affected organ, and thereby retard or arrest the progress of the disease; secondly, of those best calculated to prevent, remove, or mitigate the local and general effects to which it gives rise.

I. The remedies which retard or arrest the progress of carcinoma consist of those which exercise a direct or indirect influence on the nutritive function of the affected organ. Among the former, or those which operate directly, the local abstraction of blood by means of leeches, and compression, hold the first rank. The first of these means should be employed for a considerable length of time, at intervals of one, two, or three days, and the quantity of blood taken should be regulated chiefly by the strength of the patient. The diminution of bulk of the original tumour which follows this mode of treatment, is sometimes very considerable. In the great majority of cases the tumour is not entirely removed. It may be reduced from the size of a hen's egg to that of a nut, and in this state remain stationary for years without giving rise to pain or any inconvenience whatever. The alternate use of local bleeding and compression effect more rapidly the reduction of bulk just noticed than when either is employed separately; but the former should, as a general rule, be always employed so as to produce a certain degree of indolency in the tumour, before the latter is had recourse to.

The beneficial effect of pressure, first employed by Mr. Young,* has been satisfactorily determined by M. Recamier, one of the physicians of the Hôtel Dieu of Paris. The following are the general results obtained by this physician:—

1st. Of one hundred patients treated by M. Recamier for carcinomatous affections, sixteen appeared to be incurable, and underwent

* Cases of Cancer, &c. London, 1816.

only a palliative treatment. Thirty were completely cured by compression alone; and twenty-one, submitted to the same means, derived considerable benefit from it. Fifteen got rid of the affection radically, by means of ablation alone, or chiefly by ablation combined with pressure; and six by means of compression and cauterization. In the twelve remaining patients the disease resisted all the means employed.

2d. Tumours similar, or at least analogous to those which degenerate into incurable cancer, are cured by methodical compression, and some other internal and external remedies.

3d. When a tendency towards resolution of a swelling of the mammary gland, which has not yet degenerated, has been produced for a considerable length of time by means of compression, the resolution of the swelling continues even after the compression is no longer employed; but if the swelling has degenerated, and, after having obtained a great diminution of its bulk, compression be laid aside, the swelling may resume its former bulk, and its degeneration proceed with greater rapidity than before.

4th. Compression may assist in preventing the return of cancer after ablation.

5th. The resolution of chronic inflammation is greatly favoured by compression alone, or combined with local bleeding, &c.

6th. Various tumefactions of the neck of the uterus are resolved by compressing this part by means of a pessary in the form of a hollow cone terminating in an open olive-shaped extremity.

7th. It is reasonable to hope, that if compression were employed at an early period, that is to say, before the degeneration of those tumours susceptible of this mode of treatment, the resolution of a greater number of them would be obtained, and the necessity of the ablation of cancer of the breast, so frequently followed by a return of the disease, when not encysted, be greatly diminished.*

Although compression and local bleeding cannot be employed in the treatment of carcinoma of internal organs, properly so called, we have thought it proper to notice the results which M. Recamier states he has obtained by their external application, as encouraging to the physician, and as affording a strong presumption that the cure of this disease, even in internal organs, is not altogether beyond the resources of his art.

It is also in consequence of a modification of nutrition in general, and consequently of that of the affected organ, that the beneficial effects of some general remedies, in carcinoma of external organs, are chiefly to be attributed. Some of these remedies appear to modify nutrition by effecting some unknown change in the composition of the blood, as aconitum, conium, and arsenic; others, by acting on the capillary circulation and absorption, as mercury in alterative doses, and various preparations of iodine.

* Recherches sur le Traitement de Cancer, par M. Recamier, t. i. p. 474.

The beneficial effects of tonics, as preparations of iron, the fixed and volatile alkalies, mineral waters, such as those of Plombières, Barèges, and Vichy, and all other remedies which increase the vital energies, invigorate digestion, and promote absorption and secretion, may also be referred to a favorable change induced in the nutritive function of the affected organ, by the introduction of these remedies into the circulating system.

The salutary operation of these local and general remedies is much increased by a judicious combination of both, regulated according to the circumstances of individual cases. But while employing any of these remedies, it is of the utmost importance to regulate the diet and regimen of the patient in such a manner that neither of them may interfere with the operation of the remedy employed. M. Recamier, in the work already referred to, has shewn that the curative virtues of conium, for example, depend greatly on the quantity of food consumed by the patient; that is to say, the operation of this remedy was more or less powerful when only a small quantity of food was allowed, and hardly perceptible when the quantity was considerable. While using the conium, he therefore restricts the patient to a severe diet; and in this way he says he has succeeded in curing several cases of carcinoma of the uterus, liver, spleen, mammæ, testes, and of the extremities. The following are the principles of the treatment:—

1st. The patient takes a dose of the extract of conium, evening and morning, two hours before the first and two hours before the last meal. The amount of the first dose is half a grain, which is gradually increased to six grains each time. This dose is continued for a fortnight in order that the organs may become habituated to its operation, and is afterwards increased to twelve grains each time, beyond which it is not necessary to carry the remedy, because of its influence being sufficient. The twelve-grain dose is continued for from two to three or four weeks.

2d. After each dose of the conium, as well as at meals, the patient uses a decoction of sarsaparilla, (composed of two ounces of the root to two pounds of water,) instead of water.

3d. Only the third of the ordinary quantity of food is allowed, which ought to be very simple, and divided into three small meals.

4th. If the conium disagree in one form, it should be given in another, or the aconitum may be used instead, but in lesser quantity than the conium. Towards the end of the treatment the dose of the conium is gradually diminished, and the diet gradually increased.

M. Recamier ascribes the success he has obtained in the use of the conium, not only to the strict observance of these dietetic rules, but also to the method he has employed in the preparation of the extract. The plant is submitted to the action of the vapour of vinegar or alcohol, before the juice is expressed from it; the juice is afterwards exposed to the heat of a sand-bath, and evaporated to the consistence of an extract. The extract thus obtained has not

the nauseous odour of that usually employed, whilst it possesses all the deobstruent virtues, and sits better on the stomach than the latter.

11. The remedies best calculated to prevent, remove, or mitigate the local and general effects of carcinoma of internal organs, vary with the nature of these effects and the seat of the disease. The state of irritation and fever, and pain, at whatever period of the disease they may occur, may be greatly moderated by the use of the conium, aconitum, opium, hyoscyamus, the acetate or muriate of morphia; whilst at the same time the use of all kinds of stimuli is to be avoided, particularly if the digestive organs be the seat of the disease; and the patient himself kept as much as possible in a state of quiet of body and mind. If the os uteri be the seat of the disease, additional benefit may be derived from the use of leeches applied to this part, and also sedative injections. It is only in this latter situation that sloughing and ulceration can be detected, and local remedies applied to remove some of the disagreeable effects of the one, or retard the progress of the other. The chlorurets of lime and soda are, perhaps, the best remedies we can employ in this case, as they not only destroy the disgusting odour which accompanies this stage of the disease, but remove the putrid and irritating fluids which are then discharged. The retention of the contents of hollow organs, from compression or obstruction, is an occurrence which ought to be guarded against by regulating the quantity and quality of the food, for negligence in this respect may be followed by fatal consequences, if the obstacle be situated in the intestines.

It is not in our power to prevent the occurrence of ascites from compression of the vena portæ, nor of œdema of the inferior extremities from compression of the cava in carcinoma of the mesenteric glands, or of the iliac veins when the ovaries or uterus are affected with this disease. But the quantity of the effused fluid may be prevented from becoming so great as to affect the respiration, or give rise to painful distention of the integuments, by the use of those remedies usually employed in dropsy from obstruction to the return of the venous blood. (See Dropsy.)

When carcinoma has arrived at that period when the cancerous cachexia announces the extension and fatal termination of the disease, the efforts of the physician must be directed solely to the mitigation of the sufferings of the patient. It would indeed be a valuable discovery—a remedy capable of removing pain without producing any injurious effects on the economy; for if this symptom were removed, there are many cases in which carcinoma would run a much longer course, and give rise to comparatively little functional derangement.

We have not in the course of this article alluded to the perforation of hollow organs from carcinoma. With regard to this termination of carcinoma, we shall only remark that it most frequently takes place in the uterus and stomach, the rectum and urinary bladder, the transverse arch of the colon and jejunum, and the peritoneum. The perforation of the rectum, bladder, and peritoneum, is the consequence of the extension of the disease from the uterus; that of the transverse arch of the colon, the consequence of its extension from the stomach. (See Perforation, Peritonitis, Stomach and Uterus, diseases of.)

(Robert Carswell.)

SCORBUTUS.—This is the general appellation of nosologists for the disease long known in our own country by the name of *scurvy*. The latter term, however, in professional as well as in popular use, has had an extended and very vague signification, embracing various morbid conditions of the skin which differ often essentially from each other, and are unallied to the subject of the present article. Illustrations of this remark might be adduced from various sources. As an instance, in the English translation of the Pentateuch the word scurvy is twice used synonymously with scabies in the Latin.* This and similar applications of it we think may be traced to its early use in an adjective sense; the substantive scurf having its literal prototype in the Saxon language, and referring, as is well known, to exfoliations of small particles of the cuticle; an occurrence not uncommon in the disease now called scurvy, but which has no title to a characteristic symptom.

The word *scorbutus*, as Good observes, is neither Greek nor Latin, nor belongs to any language whatever, but is an intolerable barbarism, deduced probably from the Sclavonic word 'scorb,' the identical disease of which we have to treat having been frequently endemic in Russia and other northern countries: it has gratuitously received a sort of Latin termination. It has also been referred to 'schorbert' in the Danish language, and 'scorbeck,' *i. e.* sore mouth or 'scheurbuych' in the Dutch. Most authors, says Lind, have traced it to 'schorbock,' a griping or teazing of the belly, by no means a usual symptom, but so stated by a mistake in the etymology of the word. Scorbutus has also been called gingibrachium and gingipedum, from its affecting the gums, arms, and legs. It is probable also that the word 'stomacace,' (from στοματις and κακος, disease of the mouth) and 'sceletyrbe' (from σκελος, the leg, and τυρβη, disorder) have by the ancient writers been employed to designate this affection. It may be well also to mention here that 'scorbutus' has two derivatives, which have had the same extensive and corresponding misapplication as the original, viz. the terms scorbutic and antiscorbutic, the former referring to a peculiar virus supposed to be the common root of a large class of diseases, the latter to the substances employed for their removal, constituting a very formidable and extraordinary catalogue.

To prevent misconception, it seems necessary for us to premise that the following discussion relates to a peculiar disease, distinct, so far as we know, from the papular, pustular,

* Lev. xxi. 20, xxii. 22.

squamous, and other diseases of the skin which have been unfortunately confounded with it; a confusion which has given rise to evils of the greatest magnitude, as exemplified not only in the errors of the careless and illiterate, but in their endless dissemination with all the force of authority from the written doctrines of the respected and erudite. It may not be without its use to mention that from the confusion of terms above adverted to, the best medicine for the prevention and cure of scorbutus was for a very long period overlooked and neglected, to the immense sacrifice of human life; and from the same cause it is stated that on the recommendation of Boerhaave, mercury was employed by the medical officers of the imperial army of Hungary in 1720, in the treatment of four hundred soldiers suffering from real scorbutus; every one of whom having been subjected to a course of this medicine died in consequence.*

Scorbutus, or true scurvy, is a disease which pervades the whole of the human frame, and is characterized by general debility, fœtor of the breath, sponginess and turgidity of the gums, livid subcutaneous spots, particularly at the roots of the hairs, ecchymoses, spontaneous hemorrhages, and frequently contraction of the limbs. Cullen has placed it in the class *Cachexiæ* and order *Impetigines*, and has thus defined it: "In regione frigida post victum putrescentem, salitum, ex animalibus confectum, deficiente simul materia vegetabili; asthenia, stomacace, in cute maculæ diversi coloris, plerumque livescentes, præsertim ad pilorum radices." Mason Good has arranged it in his class *Hæmatica* and order *Dysthetica*, as one of three species under the generic name *Porphyra;* including under it every variety of petechial eruption not depending on fever. The first species, viz. "P. simplex—petechial scurvy," he has defined "spots numerous but small and flea-bite shaped, chiefly in the breast, arms, and legs, paleness of visage." The second "P. hæmorrhagica—land scurvy," in which the spots are circular, of different sizes, often in stripes or patches irregularly scattered over the thighs, arms, and trunk; occasional hemorrhage from the mouth, nostrils, or viscera; great debility and depression of spirits. In the third species, viz.: "P. nautica—sea scurvy," the spots are of different hues intermixed with some which are livid, principally at the roots of the hairs, teeth loose, gums spongy, and bleeding, breath fetid, debility universal and extreme. The first and second species having been particularly discussed in the article Purpura, in conformity with the usage of modern writers, require no further comment in this place than that they have been so distinguished from the circumstance of their having frequently occurred in young persons living in the interior of the country, and previously enjoying good health with all the necessaries and comforts of life, but who, nevertheless, having failed to derive benefit from the diet and regimen usually found adequate to the cure of sea-scurvy, have not unfrequently been recovered by opposite means; circumstances which appear to indicate some essential differences in the pathological conditions under which they occur. This opinion has been further strengthened by the blood drawn from the veins being also dissimilar; under the former circumstances being livid and very loosely coagulable, and under the latter having the usual appearances characteristic of an inflammatory disease. It is to be remarked, however, that the scurvy as it is developed at sea is a form of disease in its characters precisely similar to that which was commonly termed land-scurvy long prior to the distinction of Mason Good above adverted to; the only difference being that of the situation of its occurrence and the class of persons (mariners) who have been most frequently its victims. In our own country, though now happily a rare disease, it was formerly, even in the inland parts, of great frequency; and in other northern states, particularly on the shores of the Baltic, where the products of vegetation, at least in their fresh state, have formed a very insignificant portion in the diet of its inhabitants, it is now even occasionally endemic. Its former frequent occurrence in besieged towns and garrisons, under the combined circumstances of defect in the quantity and quality of food, fatigue, anxiety, disappointment, and exposure to the united influence of a cold and damp atmosphere, further prove that any particular influence from the sea is not essential to its generation. A memorable instance in point presents itself in the account of the siege of Thorn; where we find that between five and six thousand of the garrison, besides a great number of the inhabitants of the town, were cut off by the disease, when the Swedes, who were the besiegers, were altogether exempted from it; and it is further remarkable that no sooner were fresh vegetables admitted to their use than the mortality subsided, and the disease disappeared.*

Considerable discrepancy of opinion has prevailed as to the origin of scorbutus; whether it be of recent date, or referred to in the earliest productions of medical literature. It has been contended, chiefly by the continental writers, though some of high estimation in our own country have coincided in the opinion, that the ancient physicians were acquainted with it, although it has not been accurately described by them. On the other hand, there are authors of great celebrity, amongst whom are to be found Friend, Lind, and Trotter, who have maintained that the Greeks, Romans, and Arabians never could have witnessed it; considering it indigenous to the colder regions of the globe, and chiefly incidental to the privations consequent to long voyages, which, from their ignorance of the compass and the science of navigation generally, they never undertook. Sieges, however, and seasons of dearth have been common to every period and country, the former of much longer duration in ancient than in recent times; and though experience has

* Elements of Medical Logic, by Sir Gilbert Blane, M.D. p. 217.

* Lind on Scurvy, Part III. ch. ii. p. 395.

determined that the climates, or at least the vegetable productions of tropical latitudes, and their consequent use in the diet of the inhabitants, would in general insure its prevention, we have abundant proof that its existence is not incompatible with high temperatures. The ancient physicians, too, it is contended, have left us details more closely corresponding to the symptoms of scorbutus in our present acceptation of the word than any other disease with which we are acquainted. Thus Hippocrates, in his description of disorders of the spleen, has noted the occurrence of the following assemblage of symptoms. "The abdomen is distended, and subsequently the spleen is enlarged, becomes hard, and the seat of acute pain; the complexion is changed and has a dusky (μελας) pallid appearance, like the colour of a pomegranate; a disagreeable odour is exhaled from the ears and gums; the latter recede from the teeth, and ulcers break out on the tibiæ like nocturnal pustules or blotches (οκοια περ επινυκτιδες;) the limbs are attenuated and the bowels costive." Again, in his second book of Prognostics, he observes that in those who have tumid spleens, the gums are diseased and the mouth emits a fetid odour, but those whose spleens are enlarged without any consequent hemorrhages are attacked with ill-conditioned ulcers in the legs and black scars. His description of the convolvulus sanguineus* more nearly represents the scurvy than that of the σπλην μεγας. "A bad odour is emitted from the mouth, the gums recede from the teeth, and blood is effused from the nostrils; but sometimes ulcers break out on the legs, and while some are healing others break out afresh, the skin about them is of a dark colour, thin and tender, and the patient is not disposed to walk or use any exertion." In the original the affirmative is asserted, that the patient is disposed to exertion, a circumstance so inconsistent with ulcerations of the legs, hemorrhages, and other symptoms, that commentators agree that the negative particle (ου) must have been omitted: this derives further confirmation from some additional remarks of the same writer, referring to a former description of another kind of convolvulus for the remaining symptoms, in which it is said that the patient's legs are wearied, and if he walk they tremble, and if he should ascend an acclivity that he breathes with difficulty, the elbows being raised as if they were suspended, &c.; the causes of which, he states, are heating food taken by persons using little or no exercise, and who, thus weakened, were suddenly forced to take long and fatiguing journeys in very cold weather; the ειλεος, it must be remembered, being a term not confined by the ancients to express affections of the smaller intestines, but applied to denote also pains in the other parts of the abdomen.† Celsus has given a similar character of the ulcerations attending scurvy to that of Hippocrates: "Ulcera autem omnino non sanescunt, aut certe cicatricem vix recipiunt;" and in another part seems to have translated the observations of Hippocrates: "At quibus magni lienes sunt, his, gingivæ malæ sunt, et os olet, aut sanguis aliqua parte prorumpit; quorum si nihil evenit, necesse est in cruribus mala ulcera et ex his nigræ cicatrices fiant:"* and in another passage, on tumefactions of the spleen, he has almost confirmed the conjuncture above mentioned, expressly observing, "in intenta ambulatione cursuque dolor et quædam difficultas est;" and he thus proceeds: "hoc vitium quies auget, itaque exertione et labore opus est, habitâ tamen ratione, ne febrem ista, si nimium processerint, excitent."† Aretæus, (lib. i. c. 14,) Paul of Ægina, (lib. iii. c. 49,) and Avicenna, (lib. iii. c. 2,) as well as other Greek and Arabian physicians, have described the same chain of symptoms.

It seems highly probable also that the true scurvy has been referred to both by Strabo and Pliny; by the former of whom we are told that the Roman army, sent into Arabia under Ælius Gallas in the reign of Augustus, underwent great hardships and fatigue from difficult marches, sometimes in a marshy unhealthy country, and at others from long and troublesome navigations, which Syllæus purposely protracted. "Proinde," says he, "ad Album Pagum pervenit, jam exercitu oris et crurum vitiis (qui morbi sunt ei regioni peculiares) tacto stomacacen et sceletyrben dicunt; quorum illa circa os, et circa crura resolutio quædam est ex aquis et herbis proveniens."‡ Pliny has left an observation which seems to bear on the same point. He states that the Roman army, under the command of Cæsar Germanicus, having encamped in Germany beyond the Rhine, near the sea-coast, met with a fountain of sweet water, by the drinking of which in the space of two years the teeth dropt out, and the joints of the knees became paralytic (compages genubus solverentur). The physicians, he adds, called the disease stomacace and sceletyrbe, and discovered a remedy for it, viz. herba Brittanica, "a salutary medicine not only in disorders of the mouth and nerves, but for the quinsey, bite of serpents," &c.§

It has been denied, however, that the sceletyrbe was an indication of scurvy, because Galen has spoken of it as a kind of paralysis,‖ by which the patient is disabled from walking straight; but such an effect does not seem at all inconsistent with the detail of the symptoms. It has been argued, also, that the stomacace may have stood for aphthous and similar disorders of the mouth; and that other concomitant symptoms equally constant and remarkable, particularly the petechiæ and ecchymoses, could not have failed to elicit the notice of the early writers if the disease they described had been

* Ειλεος αιματιτης.

† Enquiry on Scurvy by Francis Milman, M.D. Lond. 1782, p. 179.

* Lib. ii. c. vii.

† Lib. iv. c. ix.

‡ Strabonis Geograph. lib. xvi.

§ Plinii Histor. Naturalis, Lib. xxv. c. iii.

‖ Mason Good imagines that Galen referred to chorea, under the name sceletyrbe.—Study of Med. vol. iii. p. 432. First edition.

scurvy. On the other hand, from the comparative rarity of the occurrence of scurvy in the southern climates, it is not to be presumed that the attention of the ancient physicians should have been very particularly directed to it. There is, besides, a peculiarity in the combination of the symptoms, a difficulty in referring them to any other known disease, and an apparent identity of circumstances under which they have been induced. It is likewise an established fact that in many instances the presence of scurvy has been acknowledged, and it has been expressly noticed, without the appearances which have been supposed to constitute the deficiency in the description of the ancient writers. Thus Sennertus observes, "In aliquibus nullæ erumpunt maculæ; aliis tota crura violaceo pinguntur ut tibialia ejus coloris superindueta jurares." To cite another authority, Nitzch, who had very extensive experience of the disease as physician in the imperial Russian armies, and published an elaborate account of it in the year 1747, has noticed the occasional appearance of the other symptoms of scorbutus without the petechiæ which usually accompany it.*

From a consideration of all the circumstances of the question at issue, it appears a reasonable conclusion that the conjecture of the antiquity of the disease is well founded, and that the slight diversity of the effects, if any, by which it has been manifested at different periods, is to be accounted for by the infinity of varying circumstances which exert their modifying influences on disease, rather than by any essential differences in the actual morbid condition under which it has been induced. It will be sufficient to mention the diversity of periods, of seasons, of climates, of localities, of occupations, of diet, besides numberless others of a moral nature. It is further corroborative of the antiquity of scorbutus, though we mention it in continuation of its history rather than with the view of dwelling on incidents from which no deductions of practical value are to be drawn, that with the revival of literature after the siege of Constantinople, we find an undoubted record of its occurrence. It is characterized in the most particular manner by the Sieur Joinville, from the appearances it presented in the Christian army under St. Louis IX. in Egypt, about the year 1260. They had only one sort of fish, viz. the bombette, and their religion would not suffer them to eat meat during Lent; circumstances which, together with bad air and great scarcity of water, were supposed to have induced the disease.† In the year 1486, it is stated by Fabricius in his account of the antiquities of his own country, (Misnia,) to have been a new and unheard-of disease, spreading as supposed by contagion, and proving extremely dangerous.‡ In 1497 it was the acknowledged occasion of dreadful havoc in the crew of Vasco de Gama in his passage of discovery by the Cape of Good Hope;* and its destructive ravages have since been awfully pourtrayed in the narratives of the early English navigators, particularly in those of Cartier, Sir Francis Drake, Davis, Cavendish, and Dampier. Sir Richard Hawkins mentions that within his naval experience he had known of 10,000 men having perished by the scurvy;† and from the same cause Commodore Anson, in the course of his voyage round the world, lost more than four-fifths of his men.

Until the year 1796, scorbutus may be said to have been the universal scourge of our maritime connections; and it is supposed to have destroyed more sailors than the various accidents incidental to a sea life, united with the terrific consequences of naval warfare. Happily, however, since the above-mentioned period it has been of very rare occurrence in our ships of war and naval hospitals; so rarely, that on the high authority of Sir Gilbert Blane, the year adverted to may be regarded as the era of its extermination. The accomplishment of this he attributes in an unqualified manner to the curative as well as preventive use of citric acid; no instance of the disease having occurred in his extensive experience which resisted its influence. To such testimony, perhaps it behoves us to yield our implicit assent; but, satisfied as we are with the immense mass of evidence adduced in favour of the wonderful efficacy of the remedy referred to, we cannot but take into the account the co-operative influence of the great improvements in naval economy, successfully commenced with a view to the prevention of scorbutus by the justly esteemed navigator Captain Cook, and brought to comparative perfection under the happy auspices of the enlightened and venerable director of the medical department of the navy, Sir Gilbert Blane himself. The records of medicine abundantly prove the prevalence, and even the great fatality of scorbutus on our own shores at a former period, although its appearance at the present day is most rare, as is well known to every practitioner of medicine. This salutary change is fully accounted for by the drainage of the country; by the introduction of fresh vegetables as a considerable proportion of the habitual diet of the people; and those improvements in our national economy by which the use of fresh meats has been rendered available at all seasons of the year, and substituted for the dried and salted provisions formerly a principal article of subsistence throughout the winter. The want of fresh vegetables at former periods is plainly evinced by the historical fact, that as late as the commencement of the sixteenth century the art of gardening was so little understood in our country, that Katharine of Arragon, queen of Henry VIII., to procure a salad, was obliged to despatch a messenger to the Netherlands for it;

* See Lind on Scurvy, p. 423.

† Histoire de Louis IX. par le Sieur Joinville.—Milman on Scurvy. Lond. 1782, p. 184.

‡ Op. supra cit. p. 186.

* Hakluyt's Collection of Voyages, vol. iii. p. 225.

† The Observations of Sir Richard Hawkins, knt. in his Voyage to the South Sea, A.D. 1593.—Purchas's Pilgrim, part iv. p. 1374.

and it was near the close of Henry's reign before the necessary vegetables for the purpose, as well as cabbages, turnips, carrots, and some other edible roots, were produced; the small quantity of this kind of food previously used having been imported from Holland and Flanders.*

But to return to the general history of scorbutus. Krantz, the historian of Saxony, is supposed to be the first writer whose works are extant who calls it scurvy; and the next, Euritius Cordus, in his Botonologicon, published in 1534, wherein the chelidonium minus, called by the Saxons schorbock root, is extolled as a remedy. It is mentioned, also, in the same manner in the Medicina Herbaria of J. Agricola, published in the year 1539. But in an intermediate period, in 1535, we find that the most decisive and deplorable effects of it were evinced in the crew of James Cartier in his second voyage to Newfoundland, when we are informed of the providential discovery of a remedy (in previous use amongst the people of Stadacona,) viz. the decoction of the bark and leaves of the ameda or hameda, afterwards gratefully designated by them "the tree of life."† In 1555, the History of Northern Nations, by Olaus Magnus, contained, amongst the diseases peculiar to them, a long description of scorbutus. Soon afterward we find three cotemporary physicians of eminence treating expressly of it, viz. Rousseus, Wiems, and Ecthius. The works of the two former, in the opinion of the learned Astruc, were not published until the year 1580, and the epitome of Ecthius, which, according to Forrestus, was the transcript of a letter dated 1541, not until 1583. In 1604 appeared a work on the subject by Engelanus, which for many years was regarded as the standard of public opinion. This was succeeded in 1624 by that of Sennertus, and in 1627 by the description of Vander Nege, drawn from personal observation of its extensive prevalence at the siege of Breda. In 1667 Willis published a systematic treatise on the disease, which, like that of Engelanus, continued for some time to be the prevailing authority. In 1708, however, it gave place to the observations of Boerhaave, and to him succeeds a long list of writers; but, as of those who preceded him, we shall mention such only as have been held in estimation, attaching the dates of their several publications.‡ Mead, in 1749; Russell and Huxham, in 1750; Addington, in 1753; Bisset, in 1755; Lind, in 1757; Macbride, in 1767; Hulme, in 1768; Milman, in 1782; Trotter, in 1797; and Blane, first in his work on the Diseases of Seamen, published in 1785, and subsequently in a paper on the health of the navy, inserted in the sixth volume of the Medico-Chirurgical Transactions of London, in 1815, and transcribed in a pamphlet of the same title printed for private circulation in 1830. Besides the above mentioned, there are doubtless others which merit attention; and much valuable information on the subject is to be found in the periodical miscellanies, chiefly of a remote date.

Symptoms.—The symptoms which constitute scorbutus having rarely if ever appeared except when there has been an obvious exposure of the subject of them to the concurring influence of several of those termed its predisposing causes, other indications of the approach of the disease will be confirmed, or the suspicion of it diminished, in proportion as such a connection of circumstances can or cannot be ascertained. Of the predisposing causes the most uniformly present has been the combination of cold with humidity of atmosphere, either general or partial; whilst at the same time the diet has consisted of food defective in its nutritious qualities, and particularly of provisions rendered dry and hard by the process of salting as usually adopted to preserve them for sea use, together with a total privation, or the use of a comparatively insignificant quantity of succulent vegetables in their fresh state. Under this privation, as it has frequently occurred at sea, a craving desire for them, particularly for such as are of an acid taste, and also for pure water when the supply of that article has been scanty, has been so often observed to precede the disease, that practical authorities have considered such desires as premonitory symptoms. Their operation has been feelingly portrayed in the narrative of Lord Anson's voyage, on the occasion of the approach of his ships to the island of Juan Fernandez; the scenery of which having been depicted, the writer observes, "Such a scene, so beautifully diversified, must have been delightful to an indifferent spectator; but in the distressed condition of the Centurion's men, who were in a manner languishing for the land and its vegetable productions, a situation of mind which always attends the scurvy, it is not to be conceived with what transport and eagerness they viewed the shore, and how impatiently they longed for the greens, the fresh water, and the other refreshments then in sight." And it is further observed, "that those only who have endured a long series of thirst, and can readily recal the desire and agitation which the ideas alone of springs and brooks have at that time raised in them, can judge of the emotion with which they eyed a large cascade of the most transparent water, which poured itself from a rock near one hundred feet high into the sea at a small distance from the ship." "Those who had been long confined to their hammocks now exerted all the strength they had left in crawling up to the deck to feast their eyes with the reviving prospect. Thus they coasted along the shore, contemplating the enchanting landscape, which improved as they advanced; but the night closed upon them before they had discovered a proper bay. At four the next morning the third lieutenant was despatched with the cutter

* Hume's History of England, ch. xxxiii.

† "I am inclined to believe, from the description given by Cartier of the ameda tree, that it was the large swampy American spruce. Some have supposed it to be the sassafras, others the white-thorn; but in his third voyage he mentions the white-thorn, and makes the ameda to be three feet in circumference."—Lind on Scurvy, p. 178.

‡ Lind's Treatise on Scurvy. Lond. 1757.

to discover the bay they sought for, and at noon he returned with the boat laden with seals and grass; for the boat's crew did not stay to search for better vegetables, as they well knew that even *grass* would prove a dainty, and indeed it was soon eagerly devoured."*

Another indication of the scorbutic diathesis, unnoticed by preceding writers, says Sir Gilbert Blane, is a soft indolent tumour, which arises under the skin on a part which has received a slight blow or contusion, so slight as not to break the skin. It most commonly appears about the elbow or forearm, and generally disappears without inconvenience, its contents being absorbed.† Scratches and wounds which under other circumstances would scarcely elicit attention, are apt to proceed to troublesome ulcerations, and betray their real character with the further developement of the disease.

Amongst the more obvious symptoms, the earliest is usually a change of colour in the face, which, as well as the rest of the skin, becomes pale, and has a bloated appearance. When narrowly examined, it is seen that the lips and caruncles of the eye, where the bloodvessels lie most exposed, are of a greenish hue. The countenance denotes the state of the mind, which is depressed. The patient complains of lassitude, and is averse to all kinds of bodily exercise; the inability to use it is soon manifested by stiffness and feebleness of the knees, and excessive fatigue and breathlessness or panting are the consequences. The gums soon become itchy, swelled, and are apt to bleed upon the gentlest friction. On inspection they present a livid red appearance, are soft and spongy, and become extremely putrid and fungous. The odour of the breath is, as may be supposed, excessively offensive, and hemorrhages are apt to occur from the gums, as also from other parts of the body.

The skin at this time feels dry, and continues so through the whole course of the disease. If the patient be feverish, it is extremely rough, sometimes resembling that which is vulgarly called goose-skin. But most frequently it is smooth and shining, with suffusions of reddish, bluish, or rather black and livid spots. These are of different sizes, occupying spaces from the smallest possible to that of a handbreadth or more, increasing generally with the progress of the disease. They are to be seen chiefly on the legs and thighs, often on the arms and trunk, but more rarely on the head and face. The legs are apt to be œdematous, the swelling at first being confined to the ankles, and conspicuous only in the evening, but gradually extending to the whole limb, and becoming less and less transient.

Such are the most constant and essential symptoms of the disease in its first stage; but a diversity is sometimes observed in the order of their appearance. Thus, when there has been great debility from previous illness, the gums for the most part are first affected; whereas, when the individual has been deprived of exercise in consequence of a fractured bone or other injury, the parts so affected become first scorbutic. As for example, if a patient is suffering from a strain of the ankle, the first indication of scorbutus will be pain, swelling, and œdema of the leg, with the purple subcutaneous spots and ecchymoses which more especially characterize the disease. It is remarkable, also, that if there have been previous disease, particularly rheumatism, chronic pains from bruises, and other effects of local injuries, these are apt to be renewed, and the disease on which scorbutus may have supervened to appear in a more aggravated form.* A striking instance in confirmation of the preceding remark is mentioned in the account of Lord Anson's voyage. The individual spoken of had been wounded, about fifty years before, at the battle of the Boyne, but had speedily recovered, and had continued well for a great number of years preceding an accession of scorbutus; but upon this, and during its progress, the same wounds broke out afresh, and appeared as if they never had been healed; nay, what is still more astonishing, the callus of a broken bone, which had been completely formed for a long time, was found to be destroyed, and the fractured part as if no consolidation had ever taken place.

The subjects of scorbutus frequently suffer from shifting pains: some complain of them, according to a common expression, throughout their bones, being particularly severe in their limbs and lumbar region, and in the joints and legs when they are swelled. But the most frequent seat of pain is the thorax; a sense of constriction in it with stitches on coughing being usual symptoms. "I believe indeed," says Lind, "it will universally be affected unless the bowels are very open. The pain shifts from one part of it to another, often to opposite sides, and is at first perceived upon coughing only; but in a more advanced stage it commonly fixes in a particular part—most frequently in the side, where it becomes extremely severe and pungent, so as to affect the breathing—a dangerous symptom." As scorbutic pains often change their position, so they are always exasperated by motion of the body, especially the pain of the back, which on such occasions proves very troublesome.

The next thing observable is, that if any epidemic should prevail at the same time with scorbutus, the subjects of the latter are in consequence predisposed to be attacked by it, even if there should appear to be no correspondence between the two diseases. Such a concurrence, however, Lind considers much more fortunate than when the new disease may be, as he terms it, of a putrid nature, as small-pox, measles, dysenteric fever, &c; "it is then," he adds, "that co-operating with the scorbutic acrimony, they produce most fatal and malignant symptoms." The head is seldom or never affected with pain, unless when fever is present, which may be considered altogether an adventitious circumstance. When

* Anson's Voyage round the World, 1740-4, ch. iii.
† Observations on Dis. of Seamen, 1785, p. 465.

* See Lind on Scurvy, chap. ii.

fevers supervene on scorbutus, they usually prove fatal; but that species which at a former period was most destructive, more so even than the plague, was the petechial or goal fever, of which we read in works of the last century, contracted in large, crowded, and sickly ships or prisons. According to the habit and constitution of the patient there will be some diversity in the performance of the alvine function. In some patients it is natural, in others there is extreme constipation; but generally the bowels are in a relaxed state, and the dejections are extremely fetid. The appearance of the urine is very variable at different times, even in the same patient, except that it is generally high-coloured, and soon becomes rank and fetid. It is said, also, to turn blue vegetable infusions to a green colour. The pulse varies according to the habit of the patient and stage of the disease, being in general slower and more feeble than in health. After a time the patient is commonly deprived of the use of his inferior extremities, the flexor tendons of the ham being contracted and the joints swelled; livid spots and ecchymoses are to observed, particularly on the legs, and frequently hard and very painful swellings in different parts. "In some," says Lind, "I have seen, without any swelling, the calf of the leg quite indurated." There is great proneness to syncope upon exertion, and not unfrequently upon occasions of this kind, or any sudden exposure to a fresh atmosphere, scorbutic patients have instantly died. The tendency to profuse hemorrhages increases with the progress of the disease, and these are apt to take place from the nose, gums, lungs, intestines, &c., as well as from any ulcers which may be present.

Besides the morbid appearances of the gums already mentioned, they are liable to be affected with deep ulcerations, the teeth most commonly are loosened and often fall out; but caries of the jaw rarely ensues, nor is this affection of any of the bones a usual consequence, but has probably been considered so from the occasional complication of scorbutus with syphilis; as ptyalism has also from its synchronous occurrence when mercury has been exhibited for the cure of the latter disease.

When scorbutus approaches its fatal termination, the painful and livid swellings above referred to often break, and assume the fungous appearance characteristic of scorbutic ulcers. The hemorrhages become more profuse and general; the increasing dyspnœa is accompanied in some cases with pain under the sternum, but most frequently in one of the sides. In others, however, without any complaint of pain, the respiration becomes suddenly quick and laborious, and death unexpectedly puts a period to the disease. The mind throughout is depressed and anxious, but at last there is generally a total indifference and apparent torpor of every faculty. The appetite for food is rarely impaired, and death has even seized the sufferer in the act of eating. Nyctalopia is an occasional occurrence in the progress of scorbutus, though rarely noticed in the descriptions of it. Dr. Hulme recorded its appearance in his inaugural dissertation printed in 1765; and Sir Gilbert Blane states that it had been reported to him by Mr. Telford. It was also a common occurrence amongst the scorbutic patients in the garrison of Gibraltar, during the siege of that place. (See NYCTALOPIA.)

To the complications of scorbutus with other diseases is to be attributed the Protean character which has frequently been ascribed to it, and which, from a comparison of descriptions, it would seem to have manifested. The conjoined diseases have been most frequently such as are incidental to the same predisposing causes, namely, fevers, continued, intermittent, and remittent; rheumatism, diarrhœa, and dysentery. It has often also been complicated with syphilis, and occasionally with catarrh and ophthalmia. Besides these, numerous other diseases are mentioned by writers as having preceded its occurrence; but scorbutus always exerts the predominating influence, and sometimes even has simulated the worst form of idiopathic disease, as phthisis pulmonalis,* the symptoms of which have subsided on the treatment appropriate to the removal of the former.

Scorbutic ulcers are to be recognized by the following characteristics: instead of pus they excrete a thin, fetid, sanious fluid, mixed with blood; their edges generally are of a livid colour, and as it were puffed up; a coagulum is soon formed on their surface, which can with great difficulty be wiped away or separated from its subjacent parts. These are soft, spongy, and putrid. When, however, the removal of this coagulum has been effected, the same appearance presents itself again after the lapse only of a few hours, and soon constitutes a soft bloody fungus of considerable size, formerly familiar to sailors, and commonly called by them *bullock's liver*, which in its boiled state the former resembles both in colour and consistence. "It often rises," says Lind, "in a night's time to a monstrous size, and although destroyed by cauteries actual or potential, or cut smooth with a bistory, in which case a plentiful hemorrhage generally ensues, at the next dressing it is as large as ever."

Pathological anatomy.—Although scorbutus, as we have already stated, was until the latter end of the last century a very fatal disease, and has been the subject of numerous dissertations, few accounts have recorded the *post-mortem* examinations of individuals who have died of it. On this part of the subject the essay of M. Poupart, from observations made at the hospital of St. Louis in Paris,† is the most minute and explicit we possess. Added to the external appearances of the body as described in the living subject of the disease, extravasations

* Medico-Chir. Review, for June, 1824. On scurvy in his Majesty's ship Leander, on a voyage from Trincomalee to the Cape of Good Hope.

† Mémoires de l'Academie des Sciences, 1699, p. 237.—Also Lind on Scurvy, p. 255.

of dark-coloured blood have been found very generally under the integuments, in the muscles so as to render them hard and rigid, and in some of the glandular parts of the body, particularly the spleen. The brain was always in its natural state. Serous fluid was frequently found in the thorax, stated to have been of various colours, and so corrosive as to excoriate the hands which had been wetted with it. In some who had suffered from dyspnœa, and had died suddenly, the cavity of the chest and also the lungs were void of *serum;* but there were adhesions of the pericardium to the latter, and of the lungs to the pleura costalis and diaphragm. In some who died suddenly without any obvious cause, the auricles of the heart, it is stated, were as large as a man's fist, and full of coagulated blood. The glands of the mesentery were generally obstructed and swelled. Some of these were found partly corrupted and imposthumated. In the liver of some few, the extravasations were hardened. The spleen was three times bigger than natural, and fell to pieces as if composed of coagulated blood. Sometimes the kidneys and lungs were studded with imposthumes. The ligaments of the joints were corroded and loose, and instead of the synovial fluid there was only a greenish liquor, to the causticity of which the corrosion of the ligaments was attributed. The epiphyses were found entirely separated from the shafts of the bones, the cause in the living subject of a crepitating noise on motion, which was sometimes distinctly audible. In some, the cartilaginous portions of the ribs were separated from the bone, and the bony part, at the point of separation from the cartilage, was carious to the breadth of four fingers. In some subjects, on squeezing the sternal extremities of the ribs the spongy portion was separated in a corrupted state, leaving only the external and internal bony plates. In some were found abscesses of the glands of the groin and axilla. Dr. Mead tells us, that upon opening the abdomen of a scorbutic patient he was struck with amazement at the monstrous size of the spleen, which weighed five pounds and a quarter, whereas the liver weighed but four pounds and a quarter; but its bulk seemed to be its only defect; for it retained its natural shape and colour, and had not the least scirrhosity or other hardness. Its interior parts were as usual of a dark livid hue, with lax fibres and deep-coloured blood.*

In the beginning of the disease, according to the observations made by the surgeons of Lord Anson's expedition, (Mr. Ettrick and Mr. Allen,) the blood as it flowed out of the orifice of the wound might be seen to run in different shades of light and dark streaks. As the disease advanced, it ran thin and seemingly very black, and after standing some time turned thick and of a dark muddy colour; the surface in many places of a greenish hue, without any regular separation of its parts. In the third degree of the disease it came out as black as ink, and though kept stirring in the vessel many hours, its fibrous parts had only the appearance of a quantity of wool or hair floating in a muddy substance; and when it issued from the body, as in hemorrhages, the appearances of this fluid were the same as to colour and consistence, whether it was discharged from the mouth, nose, stomach, intestines, or any other part. In dissected bodies, the blood in the veins was so entirely broken that by cutting any considerable branch, the part to which it belonged could be emptied of its black and yellow liquor. The extravasated blood was also precisely of the same kind.

Diagnosis.—The symptoms already detailed as characteristic of scorbutus, considered in connection with the circumstances under which they are stated to occur, or in other words its immediate causes, are sufficient data to render it distinguishable from every other disease; but in the present state of our knowledge a consideration of the latter is necessary to prevent it from being confounded with certain forms of purpura, viz. purpura simplex and purpura hemorrhagica; both of which until a recent period were regarded as manifestations of the disease under discussion. Good, as already stated, has classed the three together as species of the same genus, under the name Porphyra, Scurvy,—an arrangement which was sanctioned by the opinion of Willan, who viewed them as allied. A comparison of the symptoms alone would seem to warrant the conclusion that they are constituted by diversities of degree only of the same morbid condition. But that this uniformity does not exist, particularly as regards purpura hemorrhagica and scorbutus, has been inferred from the successful issue of the treatment of the former by the pursuance of the antiphlogistic system, especially by the exhibition of purgatives, and in some instances even by bloodletting, when the occasional causes of the latter have not been found to exist, and the remedial measures appropriate to its removal had been resorted to in vain. In many instances a plethoric state of the system and a febrile disposition have pointed out the divergence from the line of symptoms which characterize scorbutus, and the peculiarity has been further marked by the nature of the diet and the previous condition of the patient. But it must be acknowledged that it is often impossible to recognize the distinction between purpura and scorbutus, or appreciate any difference in their occasional causes, except that amongst those of the latter the influence of a cold and humid atmosphere appears almost, if not always, essential to its production. When the state of the pulse and the condition of the patient has suggested the advantage of bloodletting in purpura hemorrhagica, the appearance of that fluid on being allowed to stand has been that of blood drawn in inflammatory diseases, presenting on its surface a thick and tenacious coat of coagulated lymph. The cruor has also been firm and cohesive, and difficult of diffusion when shaken in the serum, and altogether different, (as will be seen

* Medical Works of Richard Mead, M.D. Dublin, 1767, p. 421.

by comparison with the description already given,) from blood drawn in scorbutus.

Prognosis.—Although scorbutus has "slain its tens of thousands" on land as well as at sea, and from its former fatality was not inaptly classed amongst pestilential diseases, the means of treating it have been so well ascertained and established, that for the most part, having citric acid at command, and still more certainly an abundant supply of fresh and succulent vegetables, with the power of protecting the patient from a continuance of the operation of its occasional causes, its cure may be much more certainly anticipated than that of any other disease in which the visible effects are as general and as threatening to the extinction of life. When deprived of the means above specified, as formerly often happened at sea, and as is even now frequently the case as regards fresh vegetables, citric acid may in general be depended on as a very efficient antidote; but without it the probabilities of arresting the progress of the disease will be infinitely diminished, and the recovery of severe cases rendered hopeless.

The first favourable symptom in the advanced stages of the disease, when fresh fruits and vegetables have been obtained, is a change from a constipated to a lax state of the bowels; the skin becomes moist and soft; some increase of bodily power follows; a tranquil pulse together with an improvement in the appearance of any ulcers which may be present; and a change in the aspect of the petechiæ and ecchymoses, their livid colour gradually assuming a yellow hue from the centre to the circumference, the skin at the same time resuming its natural colour, is then observed.

The most unfavourable symptoms are dyspnœa, stitches in the side, frequent faintings, a weak and quick pulse, involuntary evacuations, and excessive hemorrhages. An unexpected and fatal termination of scorbutus has occasionally, we have said, taken place upon any unusual exertion, or on sudden exposure to a fresh atmosphere. When complicated with other diseases, as dysentery or diarrhœa, the unfavourable aspect of scorbutus is rendered still more so, in proportion to their severity and the difficulties there may be to encounter in checking their progress. Diseases, also, of an incurable nature, the tendencies to which have been previously established, may be developed by the presence of scorbutus, such as phthisis, and other organic lesions productive of hydrothorax, ascites, &c. But at the same time, in forming a prognosis, it must be borne in mind that phthisis itself and other organic lesions have been simulated by this disease, and that their symptoms have subsided when the peculiar affection which constitutes scorbutus has been subjected to its appropriate treatment; and that the most unfavourable sequelæ will sometimes disappear when solely consequent upon the disease under discussion.

Causes.—The predisposing causes, or those which induce an aptitude in the body to be attacked by scorbutus when exposed to its usual excitants, are numerous, and vary in their nature, but concur to occasion debility whatever they may have been. Thus we find that preceding diseases, whether acute or chronic, have been very common precursors, and that persons recovering from fevers, or who have been previously weakened by frequent relapses, have been often subjects of it. Indolence and inactivity appear also to have contributed to produce the susceptibility. The persons in a ship's crew termed *skulkers* or sluggards have been usually the first attacked; and it has been observed that those whose condition on board-ship exempts them from much exercise, have also been early amongst the number affected. We are told that in one of Lord Anson's ships, the Centurion, out of fifty cases of scorbutus four only survived, and of the whole number of marines attached to the squadron (seventy), all but eleven died of it. It has been observed also in the Dutch service, that if there were seven on board that had the scurvy, four of these were marines, though the number of the latter was, of course, proportionately much less than that of the sailors. Corpulent persons have appeared to be peculiarly prone to it, and on shore it has been observed to affect individuals of sedentary occupations more frequently than those engaged in the active duties of life; and where it has been endemic, very frequently to attack the sedentary mechanics whilst the rural population have entirely escaped. On the other hand, however, excessive fatigue, overexertion, and want of necessary rest, induce the same predisposing condition. Thus, it has not unfrequently occurred after long and harassing marches, and at sea succeeded occasions of much laborious duty; numerous instances of which might be adduced if space were allowed us for the detail.

But of all the predisposing causes, none has been observed to have more frequently, if not invariably, exerted its influence than cold combined with moisture, either from the atmosphere generally, or from the equivalent influence of a humid apartment or damp clothes. When scorbutus made such havoc in Lord Anson's squadron on doubling Cape Horn, the weather had been very tempestuous, the wind cold and cutting, accompanied with snow and sleet. At the siege of Azof, when the Russian army suffered from it severely, the same circumstances existed. In the account of his voyage round the world, La Perouse states that he was very fortunate in preserving his crew from scorbutus, an effect which he attributed entirely to maintaining a dry state of the atmosphere between the decks. Captain Cook's success in this respect seems to have depended considerably on similar precautions. In Captain Parry's first voyage for the discovery of a North-West passage, the influence of humidity in this particular was very conspicuous. "Mr. Scallon," he states, "had been complaining for some days of pains in his legs,—first considered by the surgeon as rheumatic, but which he was soon convinced by the appearance of the gums depended on scorbutus. This occurrence, so uncommon

amongst the officers of a ship, led to a particular enquiry as to its cause, and it was discovered that Mr. Scallon's bedding was in so damp a state in consequence of the deposit of moisture in his bed-place, as to render it no longer questionable." In Captain King's expedition in 1826, the crews of the two ships which he commanded, viz. the Adventure and the Beagle, continued healthy until May 1828, when scorbutus began to shew itself whilst in the straits of Magellanes, notwithstanding they were plentifully supplied with lemon-juice, sugar, preserved meats, pickles, cranberries, fish, wild fowl and wild celery. There was, however, excessive moisture of the atmosphere, and great mental depression prevailed in the crews from want of occupation, which in this instance would seem to have been excitants of the disease.

Mental depression, indeed, appears on most occasions to have had a powerful influence in predisposing persons to scorbutus. During its endemic prevalence, the timid, the discontented, and the inactive, have been frequently the first attacked. From this cause probably it is that newly impressed seamen have been particularly liable to it, and that it has often shewn itself among the inhabitants of besieged towns. Hypochondriacs and persons of a melancholic temperament have been so commonly its subjects, that the hypochondriacal disorder, the atrabilious habit, and scorbutus, have by many of the old writers been considered as different degrees of the same disease.* Amongst a variety of other debilitating circumstances conducive to scorbutus, exposure to the impure air of crowded apartments and the free use of ardent spirits have been so commonly its precursors, that they require to be especially particularized. It has also been observed that individuals of uncleanly habits, both with regard to their persons and clothing, have been more liable than others to the disease.

Various opinions have been entertained as to the immediate or exciting causes of scorbutus, and, as frequently has occurred in reference to epidemic or endemic diseases, its propagation has been attributed to contagion. Sennertus, Boerhaave, and Hoffmann, are of the number of those who have advocated this opinion; and in Sir Gilbert Blane's work, published in 1785, we find that it was not discountenanced by him. It has been so completely subverted, however, by subsequent experience that it would be needless to discuss the question. Its hereditary transmission has also been asserted, but of this there is no satisfactory proof or even plausible argument.

At all times it has been an accredited opinion that its origin has been referable, with the concurrence of the predisposing circumstances already mentioned, to an insufficiency of nutriment, or to some noxious qualities of the ingesta, and these for the most part included in the following particulars—in certain impurities in the water or other liquids used for drink; in a preponderating proportion of farinaceous substances ill-fermented, or which have not undergone that process, or otherwise in a faulty state; in the use of animal food in a state of putrefaction, decomposition, or hardened and changed in its nature by the process of salting, as for sea use; simultaneously with privation or an insufficient supply of fresh vegetables, or a scanty allowance of such dietetic drinks as contain their elementary principles.

The connection of scorbutus with the use of such diet has to a certain degree been rendered obvious by the successful issue of changes in the dietary of our own navy, determined on in consequence of the numerous facts corroborative of the supposed influence of the former system on the generation of this particular disease. The necessary concurrence of so many circumstances apparently essential to its production renders it impossible to estimate their individual operation, and this knowledge can be obtained only (if the opportunity should ever occur) by a more full and exact inquiry into the co-existent condition of the blood and other fluids of the body than has ever yet been made. From its former prevalence principally amongst seafaring people, an idea has been entertained that the large quantity of salt used in their food was exclusively an excitant of scorbutus; but Dr. Lind has shewn that the daily use of considerable quantities of sea-water has in no degree aggravated it, and that an entire abstinence from salt or salted meat has had no mitigating effect on its symptoms.* It is certain also that scorbutus has prevailed where the operation of this article could not even have been suspected; as, for instance, on the occasion of Lord Anson's ships leaving the coast of Mexico, when they were plentifully supplied with fresh meat. The soldiers in the Russian armies, who suffered from scorbutus at the siege of Azof, had no salt provisions. During a scarcity of corn it raged amongst the poor inhabitants of the colder districts of Italy near the Alps, who subsisted chiefly on the decoction of roots, and often passed whole days without any food at all. In the Transactions of the College of Physicians, Dr. Milman has related two cases of the disease appearing in a very severe form in individuals who had lived for three months on tea, without milk or sugar, or any other article of diet except bread.† From its occurrence also in prisons, and so lately as the year 1819 in the Milbank Penitentiary, under a dietary of fresh animal and vegetable food combined, it may be inferred that the prejudicial effect of salted meat depends either on its being deprived of its nutritious qualities, or upon its being otherwise rendered indigestible. It is also somewhat corroborative of this view, that the

* Enquiry into the source of Scurvy, by Francis Milman, M. D. 1782.

* Page 52.

† Milman on Scurvy, ch. ii.

direct effect of the addition of salt to blood out of the body is a change of its colour from black to red, the reverse of which is the consequence of scorbutus in the blood of the living body. With regard to diet, however, the most constant peculiarity which has apparently caused the occurrence of scorbutus, has been a deficiency in the proportion or an entire privation of *fresh* vegetables, or rather, it should be said, of those which are of a succulent nature,—as an instance in point, may be mentioned the occurrence of scorbutus in Porchester Castle and at Norman Cross, about the beginning of the late revolutionary war, before those arrangements were put into practice which afterwards so effectually secured the health of the prisoners. Under similar circumstances it appeared in a prison-ship near Porchester Castle.* In these situations, however, it is to be remembered that there was a cooperation of several circumstances conducive to the disease, viz. deteriorated air, a dull uniformity of life, depression of spirits, want of exercise, &c. &c. It is scarcely necessary to observe that the saline effluvia in sea-air has been alledged as the cause of scorbutus. It is obvious that a circumstance so constantly prevailing at sea and on its shores could never have had so partial a consequence, and that the disease has almost entirely disappeared, though the cause alleged remains the same. It has been moreover remarked that there are few artificers so healthy as those who prepare salt from sea-water, and are thus continually exposed to the impregnated vapour which rises in the processes of drying and purifying this article.†

The hypotheses which have been promulgated in explanation of the physical condition on which scorbutus, or, in technical language, its proximate cause, depends, have accorded with the revolving doctrines of general pathology, but have been chiefly founded on those principles which refer disease to morbid changes in the fluids, or else to a corresponding condition of the properties of the living solids. For the most part, and up to the present day, scorbutus has been attributed to the former, even by those who have ably advocated the opposite opinions with regard to disease in general. Much further investigation, however, into the elementary components both of the solids and fluids of the body in their healthy and morbid state, and into the influences of external agents upon them, than has hitherto been made, is requisite to clear up the difficulties of this intricate question. The peculiar opinions on the subject which from time to time have elicited attention require to be noticed in this place, but it must be premised that the principles of treating the disease founded upon them have been very inadequate to the end in view, which has been achieved most completely by observation alone, or, in other words, by that enlightened empiricism which suggests the right application of established facts in the art of therapeutics, although much knowledge may be wanting to elucidate the nature of the changes produced in the body by which the object is effected.

The early writers on scorbutus have applied the general doctrines of the humoral pathology to the explanation of its various phenomena; more especially ascribing them to a putrid state of the blood, occasioned, as it was supposed, by defect in the function of the spleen, this organ at the period having been considered essential to the process of sanguification. Willis,* consistently with his pathological speculations in general, referred scorbutus to a state of *dyscrasy* of the blood, which he fancifully described as of two kinds, under the terms of the sulphureo-saline and the salino-sulphureous; the former to represent a supposed superabundance of sulphur, for the correction of which he taught that the depleting system was requisite, and above all things the avoidance of the hot and acrid antiscorbutics; whilst, on the contrary, in the *salino-sulphureous*, when the salts of the blood were supposed to predominate, he considered the warmer medicines were proper, and such as contained a volatile salt, together with preparations of steel and other tonics. The dyscrasy of the blood, he further presumed, was the occasion of a corresponding state of the nerves, or, according to his system, of the *liquor nervosus;* which thus secondarily, he imagined, conduced to the manifestation of some of the symptoms. The opinions of Boerhaave† on this subject appear to have been equally hypothetical: he contended that scorbutus was occasioned by that part of the blood which constitutes the crassamentum being inordinately thick and viscid, and the serous portion too thin, salt, and acrid. The acrimony of this fluid he imagined was either acid or alkaline, according to the nature of the food by the use of which the disease appeared to be induced: if, as at sea, it had consisted of salted meats, or of such as yielded little nutriment, as a consequence that there would be an acid, or, to use his own phrase, a muriatic acrimony; but if the food had been in a putrid state, that the acrimonious principle would be alkaline.

Although Hoffmann exposed the fallacy of the humoral pathology in general, his views of the nature of scorbutus coincided for the most part with those of Boerhaave; and Cullen, who first and most successfully controverted the same system of pathology, admitted its influence in giving rise to this disease. Presuming from the appearance of the blood, from that of the secretions and excretions, and from the fetor of the breath, that a morbid condition of the blood does give rise to it, he contends that a putrefaction or a nearer

* See a paper on the health of the Navy, by Sir Gilbert Blane, in the London Med.-Chir. Trans. vol. vi. p. 502. 1815.

† *Lind*, ch. i. p. 53. Stevens on the Blood, p. 311. Lond. 1832.

* Tract. sec. de Scorbuto.

† Opera, cap. De Scorbuto.

approach to it than is consistent with health, is a necessary consequence of living entirely upon animal food, without a frequent supply of vegetable aliment, and thereby of producing and evolving a larger proportion of saline matter. In confirmation of this, he observes that every interruption of perspiration, that is, the retention of the saline matter, contributes to the production of scurvy, whether produced by the direct application of cold, or by any other circumstance which might weaken the force of the circulation, such as the neglect or want of exercise, fatigue, and despondency of mind. It will be sufficiently obvious, he adds, that if the preternaturally saline state of the blood in scorbutus be admitted, the throwing into the body along with the aliment an unusual quantity of salt may have a great share in producing the disease. Even (he proceeds) supposing such salt to suffer no change in the animal body, the effect of it may be considerable; and this will be rendered still more probable, if it may be presumed that all neutral salts consisting of a fixed alkali are changed in the animal body into an ammoniacal salt, which he apprehends to be that especially prevailing in scurvy.* Sir John Pringle supported a similar doctrine, that scurvy was the result of "a gradually accumulating putrefaction" in the blood, from the putrescency of salted food, which he deemed the chief cause of the disease.†

The theory of fixed air, which was considered the principle of cement or bond of union on which the firmness, soundness, and cohesion of bodies depends, was advanced by Macbride in support of the opinions which referred scorbutus to a putrescent tendency in the blood; the loss of that principle appearing to him to account for the altered state of this fluid, and the method of cure depending on its restoration, which he proposed to effect by conveying it to the body by the free use of the infusion of malt and essence of wort. Dr. Trotter differed from his predecessors in his application of the pneumatic doctrines of pathology to this disease, the remote causes of which, in his view, tended to deprive the blood of oxygen; and to the restoration of this principle through the medium of the acid fruits he attributed their antiscorbutic efficacy. "We are of opinion," he remarks, "that the citric acid is decomposed by the organs of digestion and assimilation, after which the oxygenous principle is blended with the circulating mass." This supposition Dr. Trotter considers as further confirmed by the blackness of the blood discharged, and by the speedy change to a florid hue which the fungous ulcerations assume within a few hours after the acids have been administered.‡ Dr. Beddoes adopted the same hypothesis, but extended it to the abstraction of oxygen from the whole system, in explanation of the phenomena of the disease.

* First Lines of the Practice of Physic, by William Cullen, M. D.

† Obs. on Diseases of the Army. Appendix, p. xci.

‡ On Scurvy, p. 141.

Lind disputed the idea of putridity of the blood in scorbutus, and referred the primary changes to a relaxation of the tone of the animal fibres, a weakening of the powers of digestion, together with a stoppage of perspiration, the tendency of which, he admits, was to produce *spontaneous putrefaction*, the process of nutrition being suspended.* This view of the subject was followed up and most ably advocated by Dr. Milman, in an essay remarkable also for the elegance of its composition, published in 1782. "Whether," says he, "I consider the nature of the causes producing scorbutus, or the actual state of the blood in the disease, or the secretions which occur in its progress, they all concur to make me believe that it does not consist in a putridity of the blood. Nor does there appear to be any quality which can be discerned or defined in the blood of scorbutic persons by which the nature of their disease can be characterised." The theory which Dr. Milman has substituted it would exceed our limits to enter into in detail, but it consists of the following propositions:—that scorbutus is not a disease of the fluids, but of the solids; that its seat is in the muscular fibre; that its proximate cause consists of a gradual diminution of the vital power; and that the subsequent diminished cohesion between the particles of the muscular fibres, and the tendency of these to putrefaction, are links of the chain. In reference to the action of salt provisions, he considers, with Lind, that they tend to excite scorbutus not by their saline, but by their indigestible nature, and through defect of nutriment occasion an enfeebling of the vital principle productive of languor in all the functions of the body, and ulteriorly of a general disposition to putridity.† This view of the proximate cause of scorbutus is supported by the argument that all its predisposing causes are of a debilitating nature, and by the extraordinary influence of mental impressions in favouring its occurrence as well as its prevention and cure, such impressions being considered inadequate to the occasion of a sudden change in the chemical condition of the fluids. The agency of such impressions, however, through the medium of the nervous system, is supported by numerous illustrations in the phenomena of health and disease. On the other hand, it must be acknowledged that those means which appear to contribute in general to the strength and activity of the solids, such as fresh animal food, soups, wine, bark, and a variety of other tonics and stimulants, have been found to exert very inferior powers over the disease in comparison with the vegetable acids; which, nevertheless, are well known to produce an attenuating effect on the body, and this not unfrequently whilst they are accomplishing its cure.

Broussais contends that in scorbutus, whatever may be its cause, there is first an irritation of the internal membrane of the digestive canal; 2dly, an imperfect assimilation of the elements, especially of fibrin and gelatin, either in the

* Lind on Scurvy, p. 234.

† Milman on Scurvy, chap. vi.

tissues formed out of them, or in the blood which directs them to different parts of the body; 3dly, that in consequence of defect of nutrition a diminished cohesion of fibre ensues, which accounts, in his view, for the imperfect contractility and fragility of the muscular fibre, for the rupture of vessels and the escape of their fluids, and, finally, for the easy disorganization of the tissues on the occurrence of scorbutus.*

We shall conclude this part of the subject by noticing some observations of Andral, which appear to us to be most consistent with all the facts on which an opinion of the nature of scorbutus can be established. In the threefold respect of the vital phenomena, intimate structure, and chemical composition, no line of demarcation can be drawn with strictness and precision between the blood and the solids. Physiologically speaking, it is impossible to conceive that one of these two parts of the same whole could be modified without the other being so likewise. On the one hand, inasmuch as the blood nourishes the solids, and as without its presence they cannot support life, the state of the solids cannot but be influenced by the state of the blood. The chemist might as well say that the nature of a body does not depend on the nature of the elements that compose it. On the other hand, the solids, considered with respect to their relations to the blood, form but two classes, the one contributing *to make* the blood, such as those concerned in the processes of absorption, digestion, arterial circulation, and respiration; the other contributing to *unmake* it, those, namely, concerned in the processes of venous circulation, secretion, and nutrition. No one solid, therefore, can undergo the slightest modification without producing some derangement in the nature or quantity of the materials destined to form the blood or to be separated from it. Physiology, then, leads us to the conclusion that every alteration of the blood must be succeeded by a modification of the solids. Viewed in this light, there is no longer any meaning in the disputes between the solidists and the humorists; and the system appears to constitute but one great whole, indivisible in the state of health as well as in that of disease. With regard to scorbutus in particular, he observes that the causes under which it is developed epidemically, the symptoms that characterize it, the remarkable state of the blood itself, and the nature of the lesions discovered on examining the bodies, all combine to prove that this disease depends on a primary alteration of the blood.†

Prevention of scorbutus.—The prevention of scorbutus in this and in some other countries in which it formerly prevailed having been completely effected, or rather the disease having disappeared in consequence of the dietetic consumption by all classes of persons of fresh vegetable food at every season of the year, of drinks which contain their elementary principles, of water in a pure state, of milk, of fresh animal food, and the disuse, as an article of daily subsistence, of dried and salted meats, together with the general drainage of the country, the greater security, dryness, and warmth in the dwellings, the improvements in clothing, and greater attention to cleanliness, it would be superfluous to enter into a formal detail of measures for its prevention on land; more especially as the process of civilization advances us so much the farther from the sources of this and other epidemic diseases. But, although improvements comparatively as great have been effected in our naval economy, and have been sufficient to lead to the general extermination of scorbutus, yet under particular circumstances the greatest vigilance has been frustrated by the superior power of its occasional causes, and their unceasing operation at sea renders unremitting attention to certain prophylactic measures necessary to ensure security against its occurrence. These consist of the removal, if possible, or, at least, of the counteraction of the predisposing and occasional causes of the disease; and in the daily use of a certain quantity of lemon-juice, the preventive efficacy of which is well established although its operation has not been satisfactorily explained. The application of such preventive measures has for the most part been happily illustrated in the narrative of the memorable voyage of Captain Cook. To his sagacity we are indebted for the first impulse to those regulations by which scorbutus is so successfully prevented in our navy. It will be remembered that the crew of his predecessor Lord Anson, in a similar voyage of discovery, had experienced the most dreadful havoc from this disease, and the prevention of it seemed to present as great difficulty to himself as any circumstance of his projected voyage. The maintenance of the general health of his men he discerned was the main point of security, and to command this he was especially careful that they should not be subjected to excessive or unnecessary fatigue, and as much as possible that they should be protected from the noxious influence of a cold and damp atmosphere. In the first place he instituted three instead of two watches,* by which eight hours of uninterrupted rest were allowed to his men for four of duty; their strength was consequently more recruited, and they were also less exposed to the weather than if they had been at watch and watch, and if necessary they had dry clothes to change. The hammocks and bedding every fine and dry day were not only ordered upon deck, but each bundle was unlashed and so spread out that every part was exposed to the air. Besides

* Treatise on Physiology applied to Pathology, Transl. Philadelphia, 1832.

† Andral's Pathol. Anat. translated by Townsend and West, vol. i. p. 641 and 678.

* Dr. Trotter disputes the advantage of this arrangement. "We," he observes, "who see things on the spot, and daily accustomed to reason on the discipline of ships, are clearly decided in favour of two watches; our most accomplished and intelligent officers have also from experience put it beyond dispute."—Medical and Chemical Essays, By Thomas Trotter, M.D. p. 25. We believe, however, that *three watches* are now the more general custom in our navy, at least in large ships.

the ordinary methods of whitewashing and scraping the decks, stoves were kindled and carried successively through them, which not only served to dry the ship, but, by heating the impure air below and rendering it specifically lighter than the common air, to make it rise and pass through the hatchways. In the torrid zone he shaded his people from the scorching sun by an awning over the deck, whilst in his course within the Antaretic circle they were provided with coats of woollen stuff, furnished with hoods to cover their heads. He attended also particularly to their diet, taking care that there should be always a plentiful supply of water both for this purpose and for the promotion of cleanliness. He prohibited the custom of using the fat which was boiled out of the salted meats in lieu of other food; having observed that symptoms of indigestion were the common consequence, and the latter not unfrequently a preliminary of scorbutus.* Captain Cook begins his list of preservative stores with malt. "Of this," he says, "was made sweet wort,† and given not only to those men who had manifest symptoms of the scurvy, but to such also as were considered most liable to it." This article, although he did not consider it adequate to the cure of scurvy, he praised as one of the best anti-scorbutic medicines known in his day. Sooins or sowens,‡ an article of diet well known in Scotland, was also considered by him of great anti-scorbutic efficacy, and was dealt out to his men in messes sweetened with sugar and flavoured with some French prize wine, which, though sour, was thought to improve the flavour. Captain Cook was provided with lemon-juice prepared for sea use, but the necessary quantity not being understood, it was neglected and erroneously underrated. But the article of most extensive use for the same purpose was sour kroute (sour cabbage), well known in German diet. Sour kroute or croute (*Saures Kraut*, German; literally sour herb or pickled cabbage,) is prepared by slicing the soundest and most solid cabbages in the way cucumbers are used in this country. In this state they are put into a barrel in layers, hand high, and over each is strewed a handful of salt and carraway seeds; in this manner it is rammed down, stratum super stratum, till the barrel is full, when a cover is put over it, and it is pressed down with a heavy weight. After standing for some time in this state, it begins to ferment, and it is not till the fermentation has entirely subsided that the head is fitted to it, and the barrel is finally shut up and prepared for use. Vinegar, as some have supposed, is not employed in its preparation. It was recommended to the use of the British navy by Dr. Lind, the great freedom of the Dutch from scorbutus having been attributed to the free use of it. The quantity allowed was two pounds weight to each man per week, besides a pound and a half to two pounds with every gallon of pease, for making soup. He was supplied also with portable soups, which, as far as possible, he made the vehicle of vegetable aliment; and by such means, and by diminishing the quantity of salted provision, to his honour be it said, he preserved his crew from scorbutus, although the period of his voyage had extended to three years and eighteen days, passed in all latitudes from 52° N. to 71° S. It is still more remarkable that of a company of 118 men he lost but one, who there is reason to suppose was labouring under phthisis previous to his departure from England.

The comparative exemption of our own navy from scorbutus during the last thirty-five years, is, we conceive, to be attributed in no small degree to the regulations enforced for the maintenance of the general health of the sailors, together with the improvements by which this object has been advanced. A frequent inspection of the men's clothing is made, to ascertain whether there is a sufficiency for the purposes of personal cleanliness and of protection from the effects of the weather, both as regards their bedding and wearing apparel. The strictest attention is given to the ventilation, cleanliness, and dryness of ships. For what are called windsails (which were found to be imperfect and inconvenient ventilators, from their use being inadmissible with hatches closed in bad weather when they are most wanted, and when the men were asleep, on account of the large volumes of cold air which they admitted) has been substituted a contrivance free from those objections, borrowed from a French frigate: this consists of square wooden trunks (for which brass tubes have since been used) running from the hold or lower deck and terminating in the open air. A contrivance which has still more recently been preferred, is a funnel placed vertically near the middle line of the ship, before the foremast, leading through the forecastle-deck where there is neither hatchway nor ladder, and under which are the sleeping-places. The removal of all offensive substances by sweeping and scraping has been much more particularly attended to than formerly; but instead of washing the decks, particularly in cold or damp weather, the preservation of dryness, so essential to comfort and health, as well as to the prevention of scorbutus, has been carefully studied, and rubbing

* *Milman*, p. 33.

† Infusion of malt, proposed as a preventive as well as a remedy for scorbutus, was recommended by Dr. Macbride on the supposition that it would ferment after being taken into the stomach, and give out carbonic acid gas—its alleged remedial principle. Laying aside all regard to the theory on which it was suggested, experience seems to have determined that it is a nutritious beverage, and that it has been productive of considerable advantage in the objects for which it was proposed. It has been used rather as an article of diet than medicine, and has been generally directed in the quantity of from one to four pints daily.

‡ This food is prepared by putting some oatmeal into a wooden vessel, pouring hot water upon it, and continuing the infusion till the liquor begins to taste sourish, i.e. till a fermentation comes on, which, in a place moderately warm, may be in the space of two days. The water is then poured off from the grounds, and boiled down to the consistence of a jelly.

with hot sand, scraping, and portable fires, have been generally substituted. By these precautions, also, the deteriorated agency of moisture on the ship's provisions, as well as on other articles in common use, has been prevented, and thereby a source cut off, which otherwise might have been largely conducive to the generation of this disease. This important point has been further promoted by having portable fires in iron stoves carried all over the ship. Formerly a prolific source of foul air and bad smells in ships were the putrescent matters absorbed and retained by gravel, sand, and other earthy substances used for ballast, for which are now substituted small masses or pigs of iron; and iron tanks, instead of the lower tier of water-casks, are placed over the iron ballast. The tanks adverted to are cubes of four feet in dimensions, each capable of containing about two tons of water: as they are not corruptible, like wood, they impart no bad quality to it, and by their durability insure an ample supply; whereas the decay of casks in long voyages and in remote parts of the world where they cannot be replaced, has occasioned the utmost distress.

The improvement suggested by Sir Robert Seppings, Surveyor of the Navy, and explained by him in the "Philosophical Transactions" for 1814, the object of which was to add to the strength, solidity, and durability of ships, has been highly conducive to the purity of the air in them; first, by the obliteration of those cavities under the floor of the hold which used to be the receptacle of filth and vermin, and the perpetual sources of offensive and noxious exhalations; secondly, from commanding at all times the most perfect ventilation, the timbers of the frame which run up the side of the ship maintaining a constant communication with the open air, with the hold and spaces between the decks; thirdly, by virtue of this new construction, a ship being less liable to leakage, together with the new method of ballasting, all the unwholesomeness and offensiveness belonging to bilge-water is done away.

The promotion of the general health of seamen, and consequently the prevention of scorbutus, is further effected by the superior quality of all the articles of victualling; by the plentiful supply, when in port or within reach of it, of fresh meat, succulent vegetables and fruits; and when at sea, by the daily use of cocoa for breakfast, or of tea, coffee, sugar, &c. and a less proportion of ardent spirits. To these are to be added the more liberal allowance as to quantity of the diet at sea; and, under circumstances particularly conducive to the generation of the disease, an increased allowance of farinaceous articles in lieu of the necessary diminution in the rations of salted meats. The former consist for the most part of biscuit, wheat-flour, oatmeal, peas, and pearl barley, and, as substitutes for fresh vegetables, though of infinitely inferior anti-scorbutic efficacy, dried raisins, currants, prunes, preserved fruits, spices, pickles of various kinds, vinegar, molasses, and as much wine for each man as is equivalent to one-half of the allowance of spirits, the latter being suspended.*

But to the general supply of lemon-juice, judiciously dispensed to ships of war since the year 1795, Sir Gilbert Blane ascribes the complete eradication or rather the prevention of scorbutus. Usually, after ships have been a fortnight at sea, to every individual in them a fluid ounce of lemon-juice mixed with an ounce and a half of sugar is served out daily, which, with the addition of water and of wine or spirits, affords a grateful beverage, the use of which is enforced when the neglect of it is suspected, or under particular apprehension of the invasion of the disease. It is in consequence of this prophylactic, Sir Gilbert Blane infers, that there are now many surgeons in the navy of long standing who have never seen a case of the disease; and, as appears from the inspection of a great number of journals, that it has either not appeared at all, or else in so slight a degree that it was speedily checked by an increase of the quantity of the antidote. No other remedy yet known can ward off, he observes, this dreadful scourge of mariners under the use of salt provisions for an indefinite length of time; nor does it produce, he adds, any bad effects on the constitution like some specifics in other diseases. The decisive superiority of lemon-juice has led to the disuse of a variety of articles formerly in repute for the prevention of scorbutus, such as sour kroute, infusion of malt, essence of spruce, elixir of vitriol, &c. Of the sour kroute we have already spoken; and we have alluded to the use of the infusion of malt. "Although," says Dr. Trotter, "I have no idea of impeaching the veracity of those who established the credit of the malt preparation, yet I must beg leave to observe that in my own practice I have not seen it attended with any good effects. Lind speaks of it only as a very nourishing liquor, well adapted for scorbutic patients." The essence of spruce,† or rather spruce-beer, the form in which it has been commonly used, seems to possess, says Sir Gilbert Blane, similar and equal anti-scorbutic virtues with fermented malt liquor, as beer or porter; and it has this advantage, that the materials for preparing it can be readily carried about and used as occasion may demand.‡ The use of elixir of vitriol in the cure of scorbutus was of very early date, and, on the principle that what will cure will prevent, it was recommended to the use of the navy by Dr. Huxham, who states that it had been found "greatly serviceable." The assertion, however, is not corroborated by general experience, and the converse of the proposition seems more applicable to the circumstance in

* See Paper by Sir Gilbert Blane on the Health of the Navy.—Med.-Chir. Tr. vol. vi.

† Captain Ball states that the essence of spruce a little diluted did wonders at St. Domingo, both in prevention and cure. It acted as a purgative, and was therefore carefully administered; it sat on the stomach when every thing else was rejected.—Med. Naut. by T. Trotter, vol. i. p. 349.

‡ Observations on Diseases of Seamen, p. 302.

question; at most, probably, it has been useful in correcting the unwholesome qualities of impure water, for which purpose it has been occasionally added to it in very minute proportion.

We have yet to mention the necessity, in a prophylactic point of view, of regular exercise. Although often called upon for extraordinary exertion, it occasionally happens with seamen that there are long intervals in which systematic attention to this branch of hygiene is especially requisite. Independently of its direct influence on the maintenance of the general health, it may be made subservient to an equally important object in the prevention of scorbutus, viz. to occupation of mind, and in sailors, its diversion from those gloomy views to which, under suspension of duties, they are peculiarly prone; a fact which, however astounding it may at first appear, reflection will assent to be consistent with his condition. To separate, as his duties require him, under perilous circumstances from those to whom he is linked by the bonds of affection; to be peculiarly subjected to disappointment, and to unexpected delay in schemes to which the brightest hopes are attached; to have been taught by reason and experience that the perils which he has no fear to encounter are frequent and more than ordinarily liable to frustrate them; and in many instances the necessary system of moral discipline being wholly inconsistent with the physical condition, are circumstances sufficient to account for the state of mind above mentioned. The despotic system, formerly in force, of impressing seamen, doubtless had a powerful influence in predisposing them to disease. Their country, says Dr. Trotter, has taken advantage of their situation, and their service is indispensable to the safety of its commerce and territory. It is only therefore mild treatment that can reconcile an impressed sailor to his fate, and if he be so unfortunate as not to overcome it, some fatal disease, as scurvy, will be the consequence: among people of this description it first makes its appearance. An officer, therefore, cannot too minutely study the genius and the temper of those he is to command; but the good effects of it and the satisfaction he will experience, will more than repay his assiduity.

In the narrative of Captain Parry's voyage already referred to, it appears that that able officer was fully impressed with the expediency of amusement as well as of exercise for the preservation of the health of his men, and was particularly aware of the anti-scorbutic efficacy of occupations being afforded to them. The mode of their pursuance must depend on the circumstances which are present, and much of the advantage must arise from the ingenuity and address with which the means are devised. The narrative of Captain Parry's expedition to the Polar seas affords a happy illustration in point, many circumstances of it having been congenial to the production of scorbutus, but which, nevertheless, by salutary precautions was most successfully opposed. Although some of these have been already discussed, their practical application with that of others is so advantageously set forth in the following passage, that no apology, we conceive, is necessary for transcribing it. "The commander finding himself shut in for a long and dreary winter, devoted his attention, with judicious activity and a mixture of firmness and kindness, to mitigate those evils which even in lower latitudes had often rendered an arctic winter so fatal. His provisions being very ample, he allowed the sailors weekly a pound of Donkin's preserved meat and a pint of concentrated soup, instead of a pound of salt beef; beer and wine were served instead of spirits; and a certain allowance was made of sour krout, pickles, and vinegar. The sailors were also called together daily and made to swallow a quantity of lime-juice and sugar in presence of the officers; their improvidence being such as to afford otherwise no hope of their spontaneously imbibing this salutary draught. Their gums and skins were also regularly examined, in order to detect scurvy in its earliest symptoms. It was necessary to be very economical of fuel, the small quantity of moss and turf which could be collected being too wet to be of any use. By placing the apparatus for baking in a central position, and by several other arrangements, the cabin was maintained in a very comfortable temperature; but still, around its extremities and in the bed-places, steam, vapour, and even the breath settled, first as moisture and then as ice; to dry and remove these annoyances became therefore a part of their daily employment."

Exercise, it is stated, was enforced on the men when they were prevented from leaving the vessel, by obliging them to run round the deck to the tune of an organ; this they did not at first entirely relish, but no plea against it being admitted, they converted it at last into matter of frolic.

To keep their minds agreeably occupied, schools, masquerades, and plays, were adopted; in reference to the latter it is observed that the very expectation thus raised among the seamen, and the bustle of preparing a room, were extremely salutary, and when the *North Georgian Theatre* opened, with "Miss in her Teens," these hardy tars were convulsed with laughter, not a little excited perhaps by viewing their officers in the singular and novel position of stage performers. At all events the Arctic management was extremely popular. As the small stock of plays contained in one or two chance volumes was soon exhausted, original compositions were produced and afterwards formed into a collection. The officers had another source of amusement in the *North Georgian Gazette*, of which Captain Sabine became editor, and all were invited to contribute to this chronicle of the frozen regions. Even those who hesitated to appear as writers enlivened the circle by severe and good-humoured criticisms.

Treatment.—Recovery from scorbutus, to use an expression of Lind's, presents a re-

markable instance of the quick diminution of the effect from the cessation of the cause; an observation which has been so amply confirmed by experience that it may be regarded as a most important axiom in the therapeutic consideration of the disease. There are remedies, nevertheless, which expedite and even effect its removal under disadvantageous circumstances, and this with a degree of rapidity which, considering its apparent ravages, seems most extraordinary and peculiar to itself, the more so from our knowledge of its nature being very imperfect, and the salutary operation of such remedies by no means obvious. We reject theory, therefore, from our consideration of this part of the subject, in the spirit of the following remark of one who has well appreciated its importance in practical medicine: "Cujus autem rei non est *certa notitia*, ejus opinio certum reperire remedium non potest. Verumque est, ad ipsam curandi rationem nihil plus conferre quam experientiam."*

It has been found an essential step to the relief of a person suffering from scorbutus that he should have the advantage of a dry atmosphere, both as regards the apartment which he inhabits, and the various articles of his bedding and wearing apparel. Next to this, to gratify the cravings of his appetite, an instinctive index, apparently, to the chief corrective of his disease, by a satisfying supply of esculent fruits and fresh vegetables: "be they of any sort," says Lind, and all experience has verified the remark, "they will for the most part prove effectual." At different periods, however, a specific virtue in the cure of scorbutus has been attached to particular articles of the vegetable kingdom, and those which are succulent and possessed of an aromatic quality, especially the alkalescent plants of the class tetradynamia, have been regarded as powerfully anti-scorbutic;† but that their power in this respect does not depend on their alkalescent property is proved by the fact that the vegetables and fruits in which the acid principle abounds have been alike efficacious, and even in a still higher degree. Of the latter, those of the genus Citrus, and of the natural order Hesperidæ, viz. the Citrus medica, lemons—C. aurantium, oranges—C. acida, limes—C. decumana, shaddocks—particularly the three first, have obtained pre-eminent repute, even to the extent of being considered specifics—a denomination to which they appear to be as much entitled as medicines adapted to the cure of any disease. Their efficacy, however, having been gainsayed by a physician whose writings have attracted considerable notice,* and their claim to therapeutic estimation resting entirely on experience of their effects and deference to

* *Celsus*, lib. i.

† Formulæ for the preparation of medicines for the cure of scurvy were formerly inserted in the Pharmacopœias of London, Edinburgh, and Dublin, under the titles of Succi Scorbutici and Succi ad Scorbuticos; these were compounded of the juices of garden scurvy grass (cochlearia officinalis); brookline (veronica beccabunga); water-cresses (nasturtium officinale); and Seville oranges. Besides these, of the infinite number of anti-scorbutics which have been in great popular estimation, and commonly recommended by medical writers until within the last half century, the chief are the horse-radish (cochlearia armoracia); garden purslane (portulaca oleracea); black and white mustard (sinapis alba et nigra); the biting stone crop (sedum acre); celandine (chelidonium minus); marsh trefoil (trifolium palustre); common and Roman wormwood (absinthium latifolium et tenuifolium); fumitory (fumaria purpurea); hemp agrimony (eupatorium cannabinum); the garden radish (raphanus sativus); the garden lettuce (lactuca sativa); the garden endive (cichonium endivia); common juniper (juniperus communis); dandelion (leontodon taraxacum); the common onion (allium cepa); garlick (allium sativum); the leek (allium porrum); squill (scilla maritima); the potato, sliced and raw in vinegar (solanum tuberosum); the fir (pinus abies); sorrel (rumex acetosa); &c. Bishop Berkeley wrote a treatise, in 1744, to insist on the curative efficacy of tar-water in scorbutus; and Alston, (1750,) another on the superiority of lime-water for the same purpose.

* Dr. Stevens: see his Observations on the Healthy and Diseased Properties of the Blood, 8vo. London, 1832. Dr. Stevens's denunciation of the treatment of scorbutus by the administration of vegetable acids, seems to rest on the general effect observed of their admixture with the blood out of the body—viz. that of changing its colour from red to black, and by consequence, on the supposition that in this as well as in some other diseases in which the latter quality has particularly characterized the appearance of that fluid, such means would be found not only to keep up but to aggravate the disease. This morbid appearance Dr. Stevens attributes to its privation of its saline constituents, and hence in scurvy, and in other diseases in which it is in a black and vitiated condition, he asserts that "the natural saline waters, or the active non-purgative alkaline salts, act like a charm," (p. 309)—it being the property of these substances (contrary to that of the vegetable acids) on their addition to black blood out of the body to change its hue to red. On this principle Dr. Stevens explains the good effect attributed to the nitrate of potash in the treatment of scorbutus, and on the same ground would administer the muriate of soda, to the excessive use of which its production (as observed in the text) has been commonly attributed. Dr. Stevens, however, in another place (p. 451), has stated that during a residence of twenty years in the West Indies *only one case of scurvy* had come under his notice, and that case, he asserts, was decidedly brought on by the excessive use of citric acid, which an American gentleman had been recommended to use as a preventive against yellow fever; consistently with his theory too, that on its being laid aside and the carbonate of soda substituted, the patient was completely cured in three weeks. "To those," he observes, "who are disposed to see the contrast betwixt the effects of the neutral salts and the citric acid in the treatment of scurvy, I would recommend the perusal of Mr. Cameron's paper on this disease, which they will find in the Medico-Chirurgical Review, for 1829"—more conveniently, perhaps, for that purpose inserted in our text, and which, if considered with that degree of candour which the cause of therapeutic science demands, would only serve to prove what little credit is due to the following remark of his own, (p. 264.) "With respect to scurvy it would not be difficult to prove, from the writings of Trotter and others, that this disease, which at one period was so distressing in the British navy, was frequent and fatal almost exactly in proportion to the quantity of citric acid which was used as a preservative, and unfortunately also as a *cure* for the disease."

authority confirmatory of it, we conceive it necessary to enter into detail of evidence in support of the treatment of the disease by the remedial agents the efficacy of which has been denied.

The earliest notice we can find in reference to this point is in the third epistle of Rousseus, dated 1564, wherein it appears that some Dutch sailors who were suffering from scurvy, and the cargo of whose ship on their return from Spain consisted of lemons and oranges, accidentally discovered that their use was the means by which they recovered their health. "And if people," observes Lind, (p. 160,) "had been less assiduous in finding out new remedies, and trusted more to the efficacy of these fruits for preventing this fatal pestilence to seamen, the lives of many thousand sailors, and others, especially during the last war, might in all probability have been preserved. But some have been misled to recommend many other things, as of equal, if not superior, anti-scorbutic qualities to these; and have reduced them to a level with other acids, and many falsely supposed anti-scorbutic medicines; from whence the many unhappy disappointments hitherto met with in preventing this disease at sea seem to have arisen."

In 1593, Sir Richard Hawkins experienced the anti-scorbutic efficacy of lemon-juice in his crew, who were attacked by it in its virulent form within three or four degrees of the equinoctial line. In a work of considerable merit, entitled the Surgeon's Mate, or Military and Domestic Medicine, by John Woodall, master in surgery, dated London, 1636, we find an excellent disquisition on scurvy, and the following apposite remarks: "further experience teacheth, which I have oft found true, that where a disease most raigneth, even there God hath appointed the best remedies for the same grief, if it be his will they should be discovered and used; and note, for substance, the lemmons, limes, tamarinds, oranges, and other choice of good helps in the Indies, which you shall find there, do farre exceed any that can be carried thither from England, and yet there is a good quantitie of juice of lemmons sent in each ship out of England by the great care of the merchants, and intended only for the reliefe of every poore man in his neede, which is an admirable comfort to poore men in that disease. Also I finde we have many good things that heale the scurvy well at land, but the sea chirurgeon shall do little good at sea with them, neither will they indure. The use of the juyce of lemmons is a precious medicine, and well tried; being sound and good let it have the chiefe place for it will deserve it, the use whereof is: It is to be taken each morning, two or three spoonfuls, and fast after it two houres, and if you add one spoonful of *aqua vitæ* thereto a cold stomack it is the better. Also if you take a little thereof at night it is good to mixe therewith some sugar, or to take of the syrup thereof is not amisse. Further note, it is good to be put into each purge you give in that disease. Some chirurgeons also give of this juice daily to the men in health as a preservative, which course is good if they have store, otherwise it were best to keep it for need." In want of these he adds, "use the juice of limes, oranges, citrons, or the pulp of tamarinds, and in want of all these use oyle of vitrioll, as many drops, as may make a cup of beere, water, or rather wine if it may be had, onely a very little as it were sower." In another place he writes, "And generally note that bitter and sower medicines prevail most to the cure of this griefe, amongst which you have that are approved goode thereto, those that follow as chiefe, juyce of lemmons, of limes, of citrons, and oranges." In the account of his voyage to the East Indies, published in 1683, Dellou, a French physician, recommends for the prevention of scurvy, that each person on board should provide himself with the juice of citrons, lemons, and dried fruits, especially prunes. The same remedies we find recommended in the treatise of Martin Lister, published in 1694.

It is remarkable, however, that epidemic scurvies were allowed to rage in various parts of the world, and in none more than in the British navy, for more than a century and a half after Woodall had pointed out the usefulness of lemon juice, without its being generally employed. So complete was this neglect, that in 1740, when Lord Anson proceeded on his circumnavigation, no provision of any kind appears to have been made against the disease, and we find Mr. Walter, the chaplain of the expedition, and discriminating historian of it, declaring that "in some instances the prevention and cure of the malady could not be effected by any management or remedies which could be made use of at sea:" (p. 113.) But it is mentioned that on *nearing* the island of Tinian, lat. 15°. 8′. north, and in 114°. 50′. west longitude from Acapulco, it was part of a very grateful account of it they obtained from a Spanish prisoner, that it afforded plenty of lemons, limes, sweet and sour oranges, cocoanuts, and bread-fruit. We are informed also that on making shore their sick amounted to 128, and notwithstanding the extreme debility of the greatest part, twenty-one of them dying on the day of their arrival and the following day, yet during the whole two months in which they staid there, they did not lose above ten more, and that the remainder reaped such benefit from the fruits of the island, and "*in particular those of the acid kind*, that within a week most of them were so recovered as to be able to move about without assistance."

The calamities of this unfortunate expedition, and the sufferings they underwent, created a general interest, not only with medical men, but with the public at large, on the cause and nature of the disease, and the most likely means of controlling its ravages.

The stamp of correct observation founded on most extensive experience, which Dr. Lind's treatise on the subject, published in 1753, has been always acknowledged to bear, renders his testimony of the highest worth. "The result of all my experiments was," says he, "that oranges and lemons were the most effectual

remedies for this distemper at sea. I am apt to think oranges preferable to lemons, though, perhaps, both given together will be found most serviceable." In another case, "I cannot omit upon this occasion observing what caution is at all times necessary in our reasoning on the effects of medicine, even in the way of analogy, which would seem the least liable to error. For some might naturally conclude that these fruits are but so many acids, for which tamarinds, vinegar, *sp. salis. elixir. vitriol.* and others of the same tribe, would prove excellent succedaneums. But upon bringing this to the test of experience we find the contrary. Few ships have ever been in want of vinegar, and for many years before the end of the late war all were supplied sufficiently with el. vitriol. Notwithstanding which the Channel fleet often put on shore a thousand men miserably overrun with this disease, and many hundreds besides died in their cruises. Upon those occasions tar-water, salt-water, vinegar, and el. vitriol. especially, with many other things, have been abundantly tried to no purpose; whereas there is not an instance of a ship's crew being ever afflicted with this disease where the beforementioned fruits were properly, duly, and in sufficient quantity, administered."

Again, says this observer, "in seemingly desperate cases the most quick and sensible relief was obtained from lemon-juice, by which I have relieved many hundred patients labouring under almost intolerable pain and affliction from this disease, when no other remedy seemed to avail." Finding the acid to operate violently upon the stomach and bowels of those who were much weakened, he recommended the addition of wine and sugar, as constituting the best anti-scorbutic, and was in the practice of ordering about four ounces and a half of lemon or lime-juice, and two ounces of sugar, to be put into a pint of Malaga wine, which he thought sufficient for any weak patient to take in twenty-four hours. Dr. Trotter, however, states as the result of his experience that any such preparation was unnecessary, and that the happiest effects were produced by allowing the patients to suck the juices immediately from the fruits themselves.

In another place Dr. Lind says, "summer fruits of all sorts are here in a manner specific, viz., oranges, lemons, citrons, apples, &c.;" he moreover devised a method of preserving the juice of the two first-mentioned, so as to render them available at all times and in all climates, whether in the midst of the ocean or under the artic circle.

The testimonies of Sir Gilbert Blane and Dr. Trotter in favour of the anti-scorbutic efficacy of these fruits are equally strong, and when we consider the extensive opportunities of observing this disease which fell to the lot of these three eminent physicians, their qualifications for forming correct opinions, and the immense mass of evidence adduced by them in support of the remedies in question, the conclusion is irresistible that their adaptation to the removal of this disease is established on as firm a basis as that of any article of the materia medica to any disease whatever. The late venerable and talented director of the medical department of the navy, has in the year 1830 confirmed the opinion he gave to the world of these remedies in 1785, by the triumphant fact that the scurvy has been prevented, subdued, and totally rooted out of the navy by the general use of lemon-juice, supplied for the first time at the public expense in the year 1795, and which operated so speedily that in less than two years afterwards it became extinct and has remained so.* Of all the articles either of medicine or diet he had observed for the cure of scurvy, lemons and oranges are of much the greatest efficacy. They are real specifics, if any thing deserves that name; but upon what principle their superior efficacy depends, and in what manner they produce their effect, he acknowledges that he was wholly at a loss to determine, the only sensible effect being a small increase of some of the secretions. In another place he says that he has never seen the scurvy resist the juice of these fruits, and in the perusal of several hundreds of surgeons' journals that he had met with only two cases which seemed to resist it. "It is sui generis—nil simile nec secundum." "It may be affirmed with truth that it performs not only what no other remedy will perform in this disease, but what no known remedy will effect in any known disease whatever."†

Dr. Trotter, in his account of the health of the fleet in 1795, remarks, "from the middle of March to the 12th of June, upon comparing notes from the reports of surgeons, it appeared that not less than three thousand cases of scorbutus (the subjects of which were unfit for duty) had been cured on board ship by the fruit or preserved juice, and that twice that number with slighter symptoms were relieved by the fruit, the juice, and salads."‡ Mr. Moffat, surgeon to H.M.S. Triumph, 1796, in which scurvy had prevailed to a considerable extent, reported to Dr. Trotter, "that the scorbutic cases as usual yielded to the lemon-juice in every instance. So general," he adds, "was the tendency to it, that almost every case of contusion or ulceration was attacked with the disease, nor could their cure be accomplished without a few doses of the acid."§ In p. 151, vol. i. of the Medicina Nautica we find the following entry:—"Jan. 2, 1796. This day the squadron under Rear-admiral Harvey arrived at Spithead, after an absence of eighteen weeks from England, bringing three thousand soldiers from Isle Dieu. This squadron had been repeatedly supplied with refreshments from Plymouth and Cork. The scurvy appeared nevertheless *in all the ships*, but was quickly cured by lemon-juice." In the report of Mr. Ken-

* Brief Statement of the Improvement of the Health of the Navy. By Sir Gilbert Blane, M.D. London, 1830.

† Medico-Chirurgical Transactions, vol. vi. p. 500. London.

‡ Medicina Nautica, vol. i. p. 134.

§ Ibid. p. 157.

ning, surgeon of the Invincible, dated June 8, 1795,* in which ship there had been in all one hundred and sixteen cases of scorbutus, it is stated that of twenty-eight attacked in the month of April, the worst were supplied with three lemons and one orange daily, the others with two lemons, and that *in every instance* after the third day, and sometimes sooner, they began to recover, and were shortly well. In May fifty-six fresh cases were treated with the same remedies with equal success. In the latter end of the month the fruit was all expended, but there still remained a few gallons of lemon-juice, which lasted until the 2d of June. Patients continued to apply, and two of those that had been recovering before the lemons were expended, got worse in the short interval from the 2d to the 5th day, the day on which a fresh supply of lemons was received. Their complaints were soon checked by the *fresh fruit*, but not so fast by the juice, though it was given in some cases to a pint per day." In Lord Bridport's squadron, which (in 1795) had suffered severely from scorbutus, there was not a case in which lemon-juice was given where it did not produce a cure in the space of a few days.†

Dr. Baird, surgeon of the Hector, a ship in which scorbutus prevailed to a considerable extent, gives the following account: "I began with giving the lemon-juice in the quantity of an ounce and a half daily, and encouraged by the material change I perceived in about four days, I increased it to three or four ounces per day, always taking care to join a sufficient quantity of sugar to prevent it from irritating the bowels; in twelve or fourteen days the worst of them were able to return to duty, every symptom being then removed, except some slight degree of stiffness in the hams, which gradually wore off." "When I consider," he adds, "the alarming progress which the scurvy was making among the Hector's ship's company previous to the administration of lemon-juice as a preventive, the sudden check given to it afterwards and its powerful effect in very bad cases, I think I shall not be accused of presumption when I pronounce it, if properly administered, a most *infallible remedy*, both in the cure and prevention of the disease."‡

Mr. Walker, surgeon of the Hannibal in 1795, writes, "during our late cruize numbers were afflicted with that disease (scurvy); the citric acid to the quantity of three ounces per day cured many, and always stopped its progress. It was given with wine in the following manner:

℞ Vin. rub. ℥ii.
Succi lim. ℥i.
Sacchari, ʒii. *m.* fiat haustus ter die sumendus."§

Dr. Trotter himself remarks that the superior efficacy of the acid fruits in the cure of scurvy is so well ascertained, that it might seem superfluous to add any fresh remark to what is so fully admitted. These articles are certainly more beneficial as they approach to the nature of the citric acid, which is that abounding in the lime, lemon, &c. Our summer fruit in this country, such as the apple and gooseberry, lose their acidity as they come to maturity, so that in their immature state they contain most of that principle valued in the cure of scurvy. "In all cases of scurvy," he adds, "which I have attended, I have remarked the longings and desires of the patient for acids, which also have been mentioned by some of the earliest writers on the disease, and more or less by others since that time. It is one of the strongest instincts in nature we are acquainted with. Having repeatedly observed the scorbutic slaves throw away the ripe guavas, while they devoured the green ones with much earnestness, I resolved to try if there were any difference to be remarked in their effects. For this purpose I selected nine blacks, affected in nearly a similar degree with scurvy. To three of these I gave limes, to three green guavas, and to three ripe guavas. They were kept under the half-deck, and served by myself twice or thrice a day. They lived in this manner for a week, which was about the time we left the coast of Africa, and it is to be remarked that the three negroes restricted to the ripe guavas continued in much the same situation, while the others were almost well."

Whenever the fresh fruit, i.e. oranges and lemons, can be procured, they should be preferred to their juice prepared by evaporation for sea use according to the methods devised by Dr. Lind, and to the crystallized citric acid obtained according to Scheele's formula by combining the fresh vegetable acid with lime, and then precipitating by means of sulphuric acid.* The former by keeping is somewhat liable to spoil, though, as stated by Mr. Moffat, a naval surgeon of experience, he found it fully adequate to the purpose of the fresh juices at the end of fifteen months. The crystallized acid, reduced to the strength of lemon-juice by solution in from sixteen to eighteen parts of water, is, however, an excellent substitute for the fresh juice. This solution should not be prepared long before it is required for use, being apt to undergo decomposition, but in its recent state it has proved equally efficacious, according to the testimony of Dr. Trotter and others, with the fruits themselves.† Although all the esculent fruits and fresh vegetables have been found effective in the cure of scorbutus, and particularly, as we observed before, those in which an acid principle prevails, it seems impossible to estimate their relative powers in this respect. The vegetable acids which have had trial, viz. the acetic and tartaric, appear to have exerted little if any power over the disease, nor

* Med. Nautica, vol. i. p. 411.
† Ibid. vol. i. p. 417.
‡ Ibid. vol. i. p. 426.
§ Ibid. vol. i. p. 407.

* See Pharm. Lond.
† Med. and Physical Journal, vol. iv. p. 154.

have we any proof that the sulphuric, the nitric, and the muriatic acid, though frequently tried, have been at all beneficial.

Mr. Patterson, a surgeon in the navy, published a treatise in 1794, in which he infers that a solution of nitrate of potassa in vinegar is preferable to lemon or lime-juice as an antidote to scorbutus; its good effects he ascribes entirely to the oxygen contained in the former. At first he used a solution of two ounces of nitre in one quart of the ship's vinegar, and gave half an ounce of the solution, to some twice, to others thrice in the day, and as frequently bathed the local affections with it. From the good effect it produced, which was unattended either by nausea, colic, or diarrhœa, he was induced to increase the dose of the above-mentioned solution to an ounce, and to repeat it as before. At length, instead of two, he dissolved four ounces of nitre in a quart of vinegar, and used it in the same quantities and manner as before. He adds, "some patients cannot bear the solution without the addition of water, whilst others without the least inconvenience bear it undiluted. The discharge by stool, or the presence of gripes and nausea, guide me with respect to increasing or diminishing the dose; but, at the same time, it is not a slight degree of nausea, colic, or diarrhœa that renders an alteration in the quantity of the medicine necessary. To a great number of scorbutic patients eight ounces of this strong solution, containing one ounce of nitre, have, in the course of the day, as long as such a quantity was necessary, been administered to each with the greatest success. Also, a circumstance no less curious than pleasing, large and frequently repeated doses of this medicine have been given in cases of scorbutic dysentery, and instead of increasing I have always found it remove the disease. Sometimes, notwithstanding the free use of the nitric vinegar, I have known constipation take place to a considerable degree, in which case I have found intermediate doses of the potassæ supertartras necessary and highly advantageous. This very constipated state generally occurred where the disease was far advanced; but in a few particular cases in delicate habits, and where the disease was not far advanced, I perceived even small doses of the nitric vinegar ruffle the stomach and intestines; to prevent or remove which I have found two, three, or four grains of camphor with each dose of the medicine very effectual."

The beneficial effect of the nitrate of potash in scorbutus has been more recently testified by Mr. Charles Cameron, surgeon in the Royal Navy, in a letter, dated December 10, 1829, to the Commissioners for Victualling. The Fergusson, he states, sailed from Ireland on the 16th of December the preceding year, with two hundred and sixteen male prisoners, amongst whom scorbutus, in several instances combined with dysentery, prevailed to a considerable extent. Before reaching Rio Janeiro their state was such that he had reason to fear he should lose several, and others were fast approaching the same lamentable condition. Having on several occasions experienced the excellent effects of a "solution of nitre," as recommended by Patterson, he was induced to employ it. "From the moment I commenced the use of it," he observes, "many, although almost hopeless cases, began to improve rapidly, and before we accomplished one-third of our voyage, I found the health of the sick improve so fast under the new treatment, that I did not think it necessary to go into any port, and on our arrival at Sydney the general health of the prisoners was much better than when they embarked in Ireland. I am willing," he adds, "to ascribe much of this favourable change to the effect of climate, but I feel assured that a solution of nitre in vinegar or lemon-juice is the best remedy ever proposed in the treatment of scurvy."

Two of the patients who recovered exhibited symptoms of the last stages of phthisis, and expectorated large quantities of purulent matter. With regard to the patients in general, he says, the most distressing symptoms which they complained of in the early stages of the disease were, a sense of oppression and sinking at the pit of the stomach, which a few doses of medicine invariably relieved or totally removed. Mr. Cameron's preparation consisted of eight ounces of nitre dissolved in so much vinegar as made the solution amount to sixty-four ounces. Sometimes equal parts of vinegar and lime-juice were used, a little sugar was generally added to render it more palatable, and about four drops of ol. menth. piperitæ, diffused in a small portion of alcohol, was added to the whole, which rendered it more grateful to the stomach. An ounce of this solution was a dose, and from three to eight doses, according to the stage of the disease and the severity of the symptoms, were given at equal intervals during the day, from six o'clock in the morning till eight at night. Mr. Cameron, at the conclusion of his letter, observes that he had previously tried nitre in several bad cases of scurvy, where neither vinegar nor lemon-juice could be obtained, and, except that sometimes it did not appear to sit so easy on the stomach, with the same beneficial effects.

With the view of restoring the supposed deficiency of oxygen to the scorbutic system, it has been proposed to impart it to the body through the medium of the lungs; but the attempt which was made in cases of the disease as it appeared in the voyage of La Perouse round the world, was wholly unsuccessful.

From the salutary effect in cases of scorbutus produced by vegetable matter in general, peculiar efficacy has been ascribed to particular articles, the use of which accident or analogy from time to time has suggested; it may be that future discoveries will determine their relative title to the estimation in which they may have been held, and the precise principle on which it depends, but the superiority of lemon-juice as an expeditious and certain remedy being well established, other articles of the vegetable kingdom, and the drinks prepared from them, are to be regarded rather as useful auxiliaries, and may be selected from

those in popular repute as the inclination or particular habit of the patient may dictate. It will be no inconsiderable advantage also to introduce them to use according to the dietetic form most grateful to the taste, instead of prescribing the nauseating compounds which until the last half century were supposed to possess especial virtues conducive to the removal of this disease.*

Beer, porter, simple infusion of malt, cyder, perry, spruce beer, various wines made from the subacid fruits, and even pure water, will present useful and agreeable beverages to scorbutic patients. The Lisbon diet drink (decoctum sarsæ compositum) and the compound decoction of guaiacum have also been found serviceable for the recovery of patients from this disease. Of the dietetic vegetable substances, those which have been commonly preferred and considered to be most especially adapted to the removal of scorbutus, have been the various subacid fruits, and the several herbs used in salads, a form in which with their usual additions, vinegar and mustard, they have been considered especially efficacious. Dr. Trotter, in his Medicina Nautica, has adduced numerous instances of their efficacy, and the popular favour they elicited serves to corroborate the opinion entertained of them by professional writers for this particular purpose.

Another agreeable method of supplying the system with vegetable aliment, and which has been advantageously adopted in scorbutus, has been the combination of it with fresh animal matter through the medium of broths and soups, as well as in the ordinary forms in which they are commonly prepared for dinner use. Lind states that milk is useful to scorbutic patients, with whom it generally agrees, but that whey, "by reason of its more diuretic and cleansing quality, is preferable."

"Thus," says the last mentioned writer, "we have numberless instances of people after long voyages, miraculously, as it were, recovered from deplorable scurvies without the assistance of many medicines, for which, indeed, there is no great occasion, provided the green herbage and fresh broths keep the belly lax, and pass freely by urine, sweat, or perspiration."

Since scorbutus has become a very rare disease, the materia medica has been enriched by the addition of some valuable articles the general properties of which suggest their adaptation to the purposes of its treatment; these are the chlorides of lime and soda, and the sulphate of quinine. At sea, the chloride of lime will doubtless be advantageously applied to the preservation of water and to the correction of such as may be putrescent, to the prevention of unwholesome exhalations, and to the general purification of the air. Solutions of it as gargarisms and lotions for ulcers give promise of considerable advantage, and from the little experience already had of its internal use, encouragement is given to its further trial. Dr. Robertson informs us that he has used the chloride of soda in one instance—with the benefit he anticipated.* With some other remarks with which he has been so kind as to favour us on this disease, he observes, "I had occasion, in the year 1831, to see a case resembling scurvy in all its phenomena, (indeed, had it occurred in a seafaring person instead of a person living in a midland county, I should have pronounced it a well-marked case of that complaint,) where the liquor chloridis sodæ, given in doses of half a drachm in conjunction with the decoctum lichenis Islandici, had a strikingly beneficial effect. The patient was speedily brought by it from a state of cachexia threatening death to a very tolerable degree of health and enjoyment. Were it ever my fortune to treat scurvy extensively again," he adds, "I should trust chiefly to quinine or the chloride of soda internally, and to the chloride of lime properly diluted as a topical application; with, of course, a liberal supply of vegetable matter where it could be obtained."

The costive state of the bowels which occasionally prevails to an extreme degree must be counteracted by aperient medicines, or, if need be, by the stronger purgatives. In many instances the advantage derived from the operation on the alvine canal of a single dose has led to their frequent repetition, and the most beneficial results have ensued. Lind was favourable to the combination of medicines of this class with diuretics, or to the use of such as embraced the twofold property. Selections have accordingly been made from the supertartrate, acetate, and sulphate of potash, the tartrate and sulphate of soda, and the sulphate of magnesia, dissolved in the infusion of senna, of tamarinds, or of prunes, with the addition of some aromatic tincture, and further combined if requisite with jalap, rhubarb, aloes, scammony, colocynth, or some of their preparations.

The complication of inflammatory disease with scorbutus in constitutions naturally robust and not much debilitated, will sometimes require venesection and the general adoption of the antiphlogistic treatment, according to the nature and degree of the supervening disease; but diarrhœa, dysentery, pneumonia, and other morbid conditions which have been co-existent with it, have not unfrequently resisted modes of treatment peculiar to them, and have disappeared together with scorbutus when the remedies appropriate to the latter disease have been had recourse to.

In reference to the concurrence of scorbutus and dysentery, Dr. Trotter observed that they frequently disappeared together, and readily yielded to a diet of fresh meat, citric acid, and

* "A vegetable substance called *nopal*, the stalk of the cactus opuntia, which keeps well at sea, has been lately discovered in India to be an extremely salutary article of diet, and to resist scurvy; but the author read in the surgeon's journal of one of the East India Company's ships, that in spite of the use of this and of spruce beer at the same time, sixteen cases of scurvy arose, in one of which it was so severe as to prove fatal."—Paper by Sir Gilbert Blane, on the Health of the Navy; Medico-Chir. Tr. vol. vi. p. 501.

* See Dublin Hospital Reports, vol. v. 1830.

esculent vegetables, without requiring any of those remedies more particularly adapted to the last mentioned disease, as it occurred under other circumstances.* The same remark has been illustrated by Sir James M'Gregor, in his reference to a case of severe ophthalmia, which appeared conjointly with slight symptoms of scorbutus where the latter disease was endemic. It resisted a variety of applications, both external and internal, for five months, when the acid of limes was thought of, which in twelve days effected a cure.†

In some cases of apparent phthisis accompanying scorbutus, we find in the observations of Mr. Cameron already cited, that the disappearance of both forms of disease was evidently effected by the remedies appropriated to the removal of scorbutus alone.

It has been commonly observed, that however promising and speedy recovery from scorbutus may be, to prevent its recurrence it is necessary for a considerable time to persevere in the counteracting regimen, and to avoid as much as possible the predisposing and occasional causes of the disease. When fresh vegetables can be procured, and the object is not to cure, but to guard against a relapse, the use of acids will be advantageously suspended. Practical authorities have expressed opposite opinions as to the general effect on the constitution of their continued use, but on the whole there is good reason to believe that, when long continued, they have produced injurious effects on the digestive organs.

Great care should be taken that scorbutic patients be not too suddenly exposed to an atmosphere differing in its temperature or other qualities (except in point of dryness) from that which they have breathed for some time previously. Any sudden exertion should also be avoided, for numerous instances might be adduced in which inattention to these particulars has been immediately followed by death, in cases in which it was not in the least to be expected. We read in the narrative of Lord Anson's voyage, that in the removal of his crew from the Centurion to the island of Juan Fernandez, twelve of them died on being exposed to the fresh air; and on the first breaking out of the disease many of the people, though confined to their hammocks, were cheerful, talked in a loud strong tone of voice, and eat and drank heartily, but on being only moved in their hammocks from one part of the ship to another immediately expired. Others, trusting to their seeming strength, resolved to get out of their hammocks, but died before they could reach the deck, and it was common to see the men drop down dead upon a violent effort of duty.

The local affections which are manifested in scorbutus are often extremely distressing, but, it must be remembered, are always secondary to the constitutional disorder, increasing in malignancy with its progress, and manifesting a contrary disposition whenever a salutary change has been effected in it: this correspondence, too, takes place with an almost incredible degree of rapidity, and such as is rarely, if ever, exemplified under any other circumstances of disease. The constitutional disorder, therefore, should be the first object of regard in the cure of every local lesion which depends on scorbutus; a contrary procedure only can account for the numerous and complicated formulæ which are to be found in the early treatises upon it, all of which, it may be inferred from accumulated experience, will be nugatory whilst their immediate cause is allowed to continue uncorrected. Local applications, however, with the cotemporaneous use of constitutional remedies, are not unproductive of advantage. To relieve the spongy and rotten state of the gums and of the mucous parietes of the mouth and pharynx, astringent gargles, particularly those containing sulphate of alum, have been found very serviceable. Two drachms of this substance, or more, may be dissolved in half a pint of water or of a decoction of cinchona for the purpose. Lind recommends also the tincture of cinchona, which may be used alone, or mixed with port-wine or camphor mixture. The tinctures and other preparations of myrrh, of kino, of catechu, may likewise be selected from the class of astringents for the same purpose, and will be advantageously diluted with water or with camphor mixture, to be sweetened and inspissated with honey. In the advanced stages, the mineral acids have been found more efficacious; water, barley-water, the infusion of roses or other vegetable substances acidulated with the sulphuric or muriatic acids, and made agreeable with the addition of honey or simple syrup, will form convenient gargles. "The quantity of the acid," says Lind, "must be proportioned to the greater or less degree of putrefaction. The fungus must be often removed, or if needful be cut away; and by frequent gargarizing the mouth kept as clean as possible. Where the ulcers appear deep and spreading, they are to be checked with a touch of *vitriol.* or *sp. salis*, either by itself, or diluted according as the patient bears it." Analogical reasoning leads us to infer that a solution of chloride of lime is peculiarly adapted to the purposes of this disease, whether in the form of gargle for the mouth, or as an immediate application to ulcers in other parts. To the latter the astringent applications already mentioned as useful in the corresponding condition of the mouth and gums have been advantageously employed. "Sulphate of alum, in the proportion of two drachms to a quart of water," says the experienced and talented writer of the Medical Topography of New Orleans,* (Edin. Med. and Surg. Journal, vol. xii. p. 146) in his observations on 'the Sloughing Scorbutic Ulcer' as it appeared extensively in that place, "was upon the whole an admirable local remedy, and seemed to possess wonderful powers in stopping the ravages of sphacelus, and giving a healing tendency to spreading ulcers. In the same cases equal parts of basilicon and oil of turpentine

* Med. Nautica, vol. i. p. 377.

† Edin. Med. and Surg. Journ. vol. i. p. 283. 1805.

* Dr. Robertson, of Northampton.

(melted and applied warm to the ulcer), mixtures of lime juice, or rum and water, charcoal cataplasms, common poultices, bark decoctions, and bark in powder, were employed; but though they kept the sores cleaner, they were often of no avail to arrest the sloughing process." Several of the early writers, and Lind amongst the number, particularize the unguentum *Ægyptiacum** as adapted to the ulcerations of this disease. Mr. Murray, a naval surgeon, in a communication to Dr. Lind, observes, "I have applied a strong tincture of bark lately to scorbutic ulcers, and have found it highly beneficial. The powder of the hydrargyri nitrico-oxydi sprinkled on the fungoid ulcerations, and the ointment of this substance, after the sloughs have been removed and the ulcers cleansed by carrot and other detergent poultices, have also been of some use; but no permanent benefit is to be anticipated from any other treatment than a diet of nutritious food of which fresh vegetables constitute a considerable proportion, the efficacy of which will be materially augmented by including amongst them the acid fruits or their juices, such as lemons, limes, shaddocks, apples, pears, gooseberries, &c. whilst at the same time the patient is secured from the influence of the predisposing and occasional causes of the disease." The latter remarks apply also to the œdematous swellings of the legs and the rigidity of the hamstrings, for which local relief also is often demanded. Frictions with warm flannels, (which for this purpose were formerly medicated with the fumes of benzoin, amber, and warm aromatic gums,) have answered this end, and have been advantageously followed up by gentle compression with bandages. But in extreme cases, warm fomentations, local steam-baths, or, as Lind has recommended, sweating the limb "by burning of spirits," (the local vapour-bath of the present day,) with some of the various other contrivances in common use for the promotion of heat locally, are better calculated to afford relief.

An important part of our duty would be unperformed were we to limit ourselves to the detail of those means by which scorbutus has been successfully treated, for we know not what additional light may be reflected on the obscure parts of this subject by a knowledge of such as have been found unsuccessful. The cost of the experience, too, by which it has been gained forbids its waste, and in practical medicine it must be acknowledged that a beacon is often of not less use than a guide. In the first place, "it is to be observed," says Lind,† "that this disease, especially when advanced, by no means bears bleeding, even although the most acute pains upon the membranes, a high degree of fever, and dangerous hemorrhages would seem to indicate it. The patient generally dies soon after the operation. Nor does it bear strong cathartics, which are often injudiciously administered in its commencement. From blisters there is danger of a gangrene. As to vomits, though I have never had any great experience of their effects, yet by the observation of others squill vomits have been found serviceable. 2dly. Persons in the advanced stages of this disease are not, without great caution and prudence, to be exposed to a sudden change of air. On such an occasion they are to be given a glass of generous wine well acidulated with lemon or orange-juice, which is likewise the best cordial in their fainting fits. The sloth and inactivity belonging to the disease are not to be mistaken for wilful idleness. This," continues Lind, "has proved fatal to many, some of whom, when obliged by their officers to climb up the shrouds, have been seen to expire and fall from the top of the mast. 3dly. After a long abstinence from green vegetables and fruits, scorbutic persons should be treated like those nearly starved to death; that is, not permitted for a few days to eat voraciously, or surfeit themselves; otherwise they are apt to fall into a dysentery, which often proves fatal.

"Lastly, medicines of the fossil or mineral kind, such as steel, antimony, and especially mercury,* do manifest harm. Opiates occasion an unaccountable depression of spirits, with a sense of oppression on the chest, and when absolutely necessary, as in fluxes, should be of the warmest kind," (i. e. we presume combined with aromatics and cordials.)

(W. Kerr.)

SCROFULA.—The term scrofula is derived from the Latin *scrofa*, a hog; and χοιρας, the corresponding word in Greek, plainly acknowledges a similar origin, (χοιρος, a pig:) but whether this etymology has arisen from the filthy condition in which scrofulous children are often found, or from the hog being subject to a similar disease, or from the appearance presented by scrofulous glands lying in clusters under the skin, or from the tumid throat and neck of such subjects, is not so easy to determine, and seems of small importance to inquire. It is sufficiently evident, however, that a strong association existed in the minds of the Greeks and Romans between scrofula and the animal in question. Another term by which this malady has been designated is struma. Celsus very distinctly describes the disease as it affects the absorbent glands, under this name; and adds that it occurs also in the female breast. Among modern nations the French have named the disease *les ecrouelles*,† probably a corruption of *scrophules;* the Germans *der kropf*, from the swelling under the

* Gray, in his Supplement to the Pharmacopœias, gives the following as the formula for this ointment:—Rough verdigrise ppd. ʒv. honey ʒxiv. vinegar ʒvii.; boil to a proper consistence.

† Page 216.

* Sir Gilbert Blane stated to the select committee of the House of Commons appointed to inquire into the state of the Penitentiary at Milbank in 1823, that if he had found, when he was in office as commissioner, a navy surgeon who by his journal had administered a particle of this medicine in the treatment of sea scurvy, he should have felt it his duty to move that such surgeon be struck off the list.—Edin. Med. and Surg. Journ. vol. xxii. p. 142.

† In some parts of Scotland the disease is called by the common people "*the cruels;*" an evident corruption of the French word.

chin; and the English the king's evil. This last term commemorates the imaginary virtues of the royal touch, to which, from the time of Edward the Confessor till the reign of Queen Anne, multitudes of cases of scrofula were submitted, and very many of them were supposed to have been cured. A similar practice existed in France, with equal belief in its success; and miraculous powers for the cure of scrofula were likewise claimed for different Romish saints, for the heads of certain noble families, for the seventh son, and for many consecrated springs in different parts of Christendom.

It may be truly asserted that no original temperament, complexion, or frame of body, confers complete immunity from scrofula; yet a little observation will convince us that individuals possessing certain characteristics are more frequently the subjects of this malady than others. The scrofulous constitution is often indicated by a fair complexion, light silky hair, long shining eye-lashes, large, watery, and often blue eyes, with dilated pupils, and a red patch on either cheek, contrasted with a dazzling whiteness of the skin, which is itself usually thin, smooth, and readily irritated by slight causes. Thus scrofulous individuals are more liable to chilblains, which appear often on their hands; and in such persons the application of a blister is generally followed by an eruption of pustules on the skin around, and the formation of successive crusts. The insertion of a seton, the wounds of leeches, and even simple venesection sometimes produce the same effect: so great, indeed, have we known the irritability of the skin in scrofulous children, that washing with scented soap has caused the immediate appearance of a papular eruption. Scrofulous persons often present the look of florid health and a full habit; but the soft parts are flabby, and easily shrink away under fatigue, privation, or disease; and when the operation of these causes is completely at an end, such individuals are restored with the same rapidity to their former plethoric condition. The scrofulous habit is, in short, characterized by a deficiency of what has been termed *stamina*, and enduring tone. Children who possess this constitution are familiarly known as feverish children; a very slight irregularity of diet or exposure to cold or moisture throwing them immediately into a state of febrile excitement. Their frames possess an undue proportion of irritability, and they are peculiarly prone to attacks of inflammation. The mucous membranes of the scrofulous, like the external integument, are also delicate, and their vessels readily give way and pour out blood: thus bleeding from the nose is a common occurrence in persons of this constitution; and in them hemorrhage is more frequent from the urinary passages and ramifications of the windpipe. The conjunctiva in scrofulous individuals is very liable to inflammation, and the mucous membrane of the intestines is readily irritated and diarrhœa induced. In such subjects the mucous secretions are very abundant and often acrid, and the membranes themselves frequently become thickened: hence arise excoriations of the nostrils and of the upper lip, which becomes in consequence chapped and swollen; and the half open mouth is a common characteristic of scrofulous persons, owing to the partially obstructed state of the nasal passages. Most scrofulous persons are of small stature, and have slender limbs; nor is it very uncommon in such individuals to find some member or organ imperfectly developed, defective in its power, or curtailed of its proportion: yet multitudes of scrofulous persons are met with of a very different description—individuals remarkable, some for their lofty stature and apparent strength, and others for the surpassing symmetry and beauty of their persons.

The moral and intellectual qualities of the above, which is the largest class of scrofulous subjects, correspond with, and in all probability are derived from those of their bodies: the temper is quick and irritable; the desires and passions are ardent; the perception is keen, the imagination is predominant over the judgment; and the mind is characterized by a want of firmness and solidity, and an inability to persevere steadily in the pursuit of any one object. To this observation, however, there are many brilliant exceptions, where the strumous constitution is seen combined with mental qualities of the highest order.

In a second class of persons who are disposed to scrofulous disease, the complexion is dark, the skin harsh, and the habit indolent; the countenance is swollen and pasty, and all the functions of the body are sluggish and imperfect: the nervous energy is feeble, the feelings are obtuse, and the moral and intellectual powers occupy a very low rank. Scrofulous cases of this character are not by any means uncommon in Britain, although far more rare than those first described; but extreme instances are frequent in some districts of Switzerland and France; and in these human nature appears reduced almost to the level of the brute creation, assuming forms which awaken feelings of humiliation and disgust. Scrofula, which is always tedious and difficult of cure, becomes still more obstinate and unmanageable when it makes its appearance in those of a dark complexion and sluggish temperament.

This disease exhibits itself under a great variety of symptoms, according to the part of the body which it happens to affect: hence the difficulty of framing any definition of it which is at once accurate and comprehensive.

The most certain evidence of the existence of scrofulous disorder is afforded by the production of a soft, brittle, unorganized matter resembling curd or new cheese, which is found mixed with the purulent contents of scrofulous abscesses, or deposited in rounded masses of different degrees of firmness, and varying in bulk from the size of a millet-seed to that of a hen's egg: sometimes it is contained within the natural cavities and canals of the body, sometimes it is enclosed in cysts, and occasionally it is diffused, as if by infiltration, through the natural texture of a part. To the

rounded masses of this substance, which, as they enlarge, often acquire the irregular form of a tuberous root, the name of *tubercle* has been assigned, and the substance itself has been named *tuberculous matter*. We venture to assert that the presence of tuberculous matter is a satisfactory proof of the existence of scrofula; but we do not by any means maintain that scrofula cannot exist without the deposition of this substance. The researches of pathological anatomy have satisfactorily shewn that scarcely any living texture of the human body is altogether exempted from tuberculous deposits. This morbid production has been observed on the free unbroken surfaces of mucous membranes, within mucous follicles, and forming the contents of lymphatic vessels the tunics of which were themselves sound :* granules of tuberculous matter, sometimes insulated, sometimes clustered together, have also been detected within the clots of blood contained in the cells of the spleen.† The history of tubercle certainly entitles us to consider it as a morbid secretion; but when it is thus found lying free within a healthy lymphatic vessel, or enveloped in the coagula of the splenic cells, we are led to suspect that in such cases it has probably been formed by some change in the constitution of the lymph or blood, from an alteration in the proportions of their ingredients, or the addition of some coagulative substance, or the withdrawal of something which these fluids usually contain. The cellular tissue has been hitherto considered as of all others the most common seat of tubercle; but Dr. Carswell has stated that it is far more frequently met with in contact with mucous surfaces; and he has certainly adduced very strong arguments in support of this opinion, which he has also illustrated by most beautiful engravings.‡

For a particular history of this substance in its etiological, pathological, and chemical relations, we must refer the reader to the articles Tubercle and Tubercular Phthisis, and content ourselves, in this place, with noticing such circumstances as have more especial reference to the subject of the present article.

According to Dupuy,§ all the domestic animals of France, not excepting the dog, as well as those imported from warmer countries, are subject to tuberculous deposits: his researches further shew that this disease in the inferior animals is much more frequently combined with the presence of vesicular worms than it is in man. He has traced the conversion of the cysts containing these animals into collections of tuberculous matter, and has thus given a degree of support to the opinions of Dr. Baron, who maintains that all tuberculous disease originates from vesicular worms or minute serous cysts. But although we admit that such adventitious cavities often become, at least in the inferior animals, the nests in which the matter of tubercle is deposited, the assertion that all tubercles arise in this manner may well be disputed when we find that such cysts or vesicular worms, or traces of them, are by no means always coexistent with tuberculous disease, and that they often attain a very great magnitude without exhibiting any symptoms even of incipient transformation.

Opinions directly opposed to each other have been held by writers of great eminence as to the immediate cause of tubercles; one party ascribing their origin in every case to inflammation;* another as exclusively asserting that they are in no instance dependent on inflammatory action, and that when inflammation co-exists, it does so as the consequence, and not the cause, of tubercles.† After carefully reviewing the discussions on this question, we have come to the conclusion, that on some occasions tubercles have been found where no symptom of previous inflammation could be recollected, nor any trace of it discovered on inspection after death;‡ while in other instances the deposition of tuberculous substance seems to have been distinctly connected with the developement of inflammatory action. But as inflammation often occurs without the formation of tubercles, it is obvious that this alone is not sufficient for their production, and that the addition of something else is required to that end. Inflammation, therefore, may be viewed as an occasional cause of tubercles, producing this effect only in frames of a scrofulous disposition.

Some organs are more liable to tuberculous deposits than others, and the liability differs at different periods of life: the organs which are most frequently affected with tubercles in children are not those in which they are oftenest met with in adults. In children the disease tends more to implicate several organs at once; and in them it is more common to find the lungs unaffected, although tubercles be discovered in other parts of the body.§ The existence of tubercles in the fœtus is certainly rare, but it has been proved beyond question

* *Andral*, Précis d'Anat. Patholog. tom. i. p. 419, and tom. ii. p. 446.

† *Andral*, op. cit. tom. ii. p. 431. Carswell's Illustrations, &c. Fascic. 1, plate iii.

‡ See Fascic. 1.

§ De l'Affection tuberculeuse.

* *Broussais*, Examen des Doctrines Médicales, tom. i. *Alison*, Edin. Med.-Chir. Trans. vol. i. and iii.

† *G. L. Bayle*, Recherches sur la Phthisie.—*Laennec*, Auscult. Médiate.—*Gendrin*, Hist. Anatom. des Inflammat.—*Lobstein*, Anat. Patholog. tom. i. This able advocate of these opinions admits the production of what he terms miliary granulations on the surfaces of inflamed serous and mucous membranes, but denies their identity with tubercles. In this manner he endeavours to set aside the arguments drawn from such cases as those of Dr. Alison, and also the results of the experiments of Cruveilhier and others, who produced the appearance of myriads of small tubercles by injecting mercury into the bloodvessels and lungs of animals; each minute globule being found enclosed within an effusion of tuberculous-like matter. These experiments we have always considered as any thing but conclusive: for where is the evidence that the effused matter is truly tuberculous?

‡ *Andral*, Précis d'Anat. Pathologique. *Lombard*, Essai sur les Tubercules.

§ *Lombard*, op. cit.

by the dissections of Langstaffe,* Lombard, West, Orfila,† and Chaussier:‡ they continue infrequent from birth till two years, after which they are often met with; and during the fifth year their occurrence appears to be much more common than at any period before puberty. From eighteen till forty tubercles very frequently occur; affecting, however, chiefly the lungs, intestines, and some parts of the lymphatic system.

These results are drawn from the researches of pathological anatomy; but to speak merely from symptoms, independent of the verifications of dissection, scrofula has been observed by us in the form of enlarged axillary glands within the first fortnight after birth: it is not usual, however, for the absorbent glands to be affected till the period of the first dentition; the occurrence is still more frequent during the second. At puberty the disease often disappears spontaneously, and after this age external scrofula is very rarely observed to originate; but instances are not wanting in which persons well advanced in life have been attacked for the first time by scrofula, more especially among those who have been long confined in prisons or workhouses. To shew the various ages at which the disease may develope itself, Lalouette§ states that in a scrofulous family one daughter was affected at fourteen, another at sixteen, a third at twenty-six, and the father at sixty-six. Cases have occurred to the writer where scrofula has appeared in youth, undergone an apparent cure, and again manifested itself in advanced life, when it proved fatal.

In former times it was believed that scrofula was communicable from one individual to another; and the occurrence of the disease in many members of the same family, and its diffusion among the inhabitants of particular districts, seemed, through a loose mode of reasoning, to afford ground for this opinion. Positive experiments have been made by Kortum,‖ Goodlad,¶ Hebreard,** Le Pelletier,†† and others, to propagate the disease by rubbing in scrofulous matter, and by inserting it under the skin of animals, and even of the human subject; while Pinel, Alibert, and Richerand,‡‡ have carefully watched the effects of allowing scrofulous and healthy children to associate together without restraint; but in no instance was there the least reason for believing the malady to be communicable by any of these modes of infection. The observation of British practitioners fully corroborates the opinion of the non-contagious nature of scrofula, although the writers of this country have not directed so much attention to the subject; because a belief in the contagion of scrofula was abandoned by our physicians long before it ceased to be current among those of the continent.

In this respect scrofula differs remarkably from that form of tuberculous disease in animals which has been named glanders; for this last is not only communicable from one animal to another, but also to man.* It would be curious to enquire whether glanders in man is itself communicable to other human beings: that it is so is by no means improbable, for it has been proved by experiment to be capable of being communicated from man to the inferior animals.† It is proper here to state that M. Dupuy has expressed strong doubts of the contagious nature of glanders, and has asserted that he knows of no well-conducted experiment in favour of this doctrine, but some against it. He is disposed, on the contrary, to refer glanders to hereditary transmission, and to various unfavourable circumstances in the rearing of horses, similar or analogous to those which are admitted as predisposing to scrofula, such as cold, damp, and shady pastures, insufficient nourishment, and the debilitating effects of castration.‡

Daily observation must convince us that a scrofulous constitution is often transmitted from parent to child; therefore the disposition to the disease may be truly said to be hereditary; nay, the dissections already referred to prove the actual development of scrofula even before birth, in the progeny of a strumous mother. Like other hereditary gifts, it may miss one generation and reappear in the succeeding; just as some individuals are observed to resemble in external appearance their grandfathers more than their fathers.

A striking example of the hereditary nature of scrofula was lately presented to the writer by a family respecting whom he was consulted. The father was a tall, thin, and sickly man, who suffered much every year from winter cough; the mother a person of full relaxed habit, with a look of florid health, and in fact not often affected with illness. Of nine children to whom she had given birth, two females and six males had died with phthisical or mesenteric symptoms, between the ages of three and fifteen months; the survivor was a boy nearly twelve years old, who enjoyed moderately good health. The last of these little victims of transmitted disease died just as he had completed his third month, after having suffered under symptoms of phthisis. On inspecting the body, the lungs were seen mottled with many yellow spots, and when cut into they exhibited myriads of tubercles, varying from the size of a small mustard-seed to that of a pea: all of them were opaque, and many converted into pus. The glands at the root of the lungs were

* Lloyd on Scrofula.
† *Velpeau*, Thesis ad aggreg. p. 10.
‡ Procès verbal de l'Hospice de la Maternité, 1812, p. 62.
§ Traité des Scrophules. Paris, 1780.
‖ De Vitio Scrofuloso. Lemgov. 1798.
¶ On the Lymphatic System.
** Dissertat. sur les Tumeurs Scrofuleuses.
†† Sur la Maladie Scrofuleuse, p. 16.
‡‡ Nosograph. Chirurg. tom. i. p. 161.

* *Elliotson*, in Lond. Med.-Chir. Trans. vol. xvi. p. 171. *Travers*, On Constitut. Irritat. 2d edit. p. 398. *Schilling and Weiss*, in Rust's Magazin für die gesammte heilkünde, 1821. Also *Remer*, in Hufeland's Journal, March 1822.
† *Coleman*, in Travers on Constitutional Irritation.
‡ De l'Affection Tuberculeuse.

enlarged, indurated, and some of them converted into abscesses, the walls of which were lined with firmly adherent fibrine, and their contents were a thick purulent fluid. The mesenteric glands were enlarged, hardened, and many of them contained softened tuberculous matter. The spleen contained some small granules of a white colour and cheesy consistence. There was a good deal of subcutaneous fat, but none in the omentum. A very few weeks after the death of this child, the father, who had been eager to learn whether his offspring drew their fatal disease from himself or from their mother, declined rapidly in strength, and fell a victim to phthisis.

Scrofula is supposed by most writers to be of more frequent occurrence among females than males; and Le Pelletier* has stated, as the result of a comparison of the cases in the Parisian hospitals, that the proportion of strumous females to males is as five to three. In all enquiries into the relative prevalence of disease in the two sexes, it must be recolleeted that the female population, especially of large towns, considerably exceeds the male; and hence it is to be expected that a greater number of scrofulous females will apply for medical relief. But on reviewing the matter carefully, and referring to an examination of hospital patients made for another purpose, we are convinced that the disease is really more frequent in the female sex. Dr. Cullen was of opinion that scrofula was oftener transmitted from the father than the mother, which he conjectured might arise from the circumstance that more scrofulous men than women enter the married state; but he has nowhere explicitly asserted that males are more liable to the disease than females.†

We proceed now to pass briefly in review the various parts and organs of the human body in which scrofula most commonly appears, and to point out the modifications of this disease induced by the different properties and textures of the parts affected.

The first which presents itself is the common integument; and here several forms of cutaneous disease are distinctly referable to the class of scrofulous affections. The three species of porrigo named favosa, larvalis, and furfurans, together with eczema impetiginodes and rûbrum in their chronic forms, may be fairly enumerated among strumous diseases; at least if we are entitled to draw any inference from the facts that these eruptions are found in combination with the generally admitted symptoms of scrofula, and are as often benefited by anti-strumous remedies as the symptoms just mentioned are usually observed to be. Eruptions of this description, when they affect the scalp, ears, and face, are very apt to occasion swelling of the glands at the back part of the head, on the sides of the neck, and under the jaw; at first from simple irritation, or perhaps the absorption of morbid fluids; afterwards, the swelling becomes permanent, from the deposition of tuberculous matter. Other causes of an irritating or inflammatory kind, as dentition and exposure to cold, are known to produce such glandular tumours, terminating like the others, where the habit is strumous, in the deposition of the same curdy substance. Thus we have a second order of parts more deeply seated than the skin, affected with scrofula, often from the causes stated above, and sometimes, it would seem, spontaneously. The absorbent glands, indeed, are the parts of the body which have long been regarded as the peculiar seats of scrofula, and their enlargement and induration are still considered as affording more unequivocal evidence in the living body of the presence of that disease than any other circumstance except the discharge of tuberculous matter. A lymphatic gland, when first affected with scrofula, is soft and fleshy, and its size is increased; the texture, as proved by inspection, then becomes firmer, and the colour paler than in health: as the disease proceeds, portions of the gland are observed to have altogether lost their flesh-colour, and acquired a degree of semitransparency, and a texture approaching to that of cartilage; at length a deposition of soft white or yellowish curd-like substance is found to have taken place, and the true scrofulous tubercle is now manifest.*

The size to which strumous glandular tumours attain is in some instances enormous. The lower jaw and upper part of the neck are occasionally seen hung round with such voluminous swellings as completely to deform the countenance; and we have seen, in the case of a strumous middle-aged male, both groins occupied by vast glandular tumours, the larger of which equalled in size the half of a child's head at birth. These inguinal swellings were firm, nodulated, and without pain; they had commenced only six months before as clusters of hard kernels, which by degrees enlarged and coalesced into the enormous morbid masses now described. It has been stated by a very able and accurate observer that scrofulous glands always possess a higher temperature than the healthy parts in the vicinity; but the trials which we have made, and they were often repeated, did not detect any greater heat in such swellings, unless when they were actually inflamed.

Scrofulous glands are commonly supposed to be obstructed and impervious to the fluids which are naturally transmitted through them, but it is certain that they are in many instances capable of being injected with mercury from the intrant lymphatic;† and hence we may infer that, though partially changed, some portion of them may still give passage to their proper fluids.

Scrofulous tumours do not uniformly originate from the degeneration of lymphatic glands, but arise in many cases from the deposition of

* Sur la Maladie Scrofuleuse.

† First Lines. *Scrofula.*

* *Abercrombie*, Edinb. Medico-Chir. Trans. vol. i. p. 683.

† *Soëmmering*, De Vasis Absorbentibus, sect. 37, p. 90.

tuberculous substance in the subcutaneous cellular tissue, in different parts of the body, quite independent of any absorbent gland: their resemblance, however, to glandular swellings is such as to deceive the inexperienced; nay, they were named even by Wiseman, the first surgeon of his day, *adventitious glands*. When these scrofulous tumours are cut into, they are found to be composed of cysts varying in size and density, usually lined with a fibrinous exudation, and filled with tuberculous substance, sometimes crude, at others softened, or converted into curdy pus.

Absorbent glands affected with scrofula, and cysts of tuberculous matter in the cellular tissue, may remain for a long time without exciting any irritation; but their tendency is to become soft by the secretion of purulent fluid from the internal surface of the cavity, which is soon followed by inflammation of the integuments. Ulceration succeeds, and the morbid contents are discharged from the body, sometimes by one, at others by many small apertures: but a cure does not follow; either fistulous openings remain, discharging a thin glutinous fluid mixed from time to time with curdy particles, or an indolent ulcer succeeds, or both may result from the expulsion of tuberculous matter. The contents of scrofulous glands and tumours on the surface of the body occasionally undergo the cretaceous transformation: after remaining long indolent, suppuration at last takes place, and masses of earthy substance, sometimes of considerable bulk, are extracted from their cavities. On macerating these calculous concretions in water, we have found them to separate readily into a multitude of gritty particles like dried mortar. In some instances, strumous glands are converted into prominent spongy tumours of a red colour, and covered by a silky cuticle, which frequently breaks, and gives issue to small superficial collections of purulent matter.

Scrofulous ulcers are characterised by their flabby and often pale granulations, and the thin unhealthy integument which usually overlaps their margins. This undermined skin is of a purplish or livid hue; shewing the languor of its capillary circulation, and its proneness to be destroyed by gangrenous erosion. Such ulcers, though usually productive of little uneasiness, sometimes become exceedingly irritable and painful, requiring the employment of powerful narcotics to give relief to the patient. The thin discharge which scrofulous sores yield often concretes upon their edges into straw-coloured crusts, under which the ulcer, if small, sometimes heals. Scrofulous cicatrices possess a peculiar wrinkled and puckered appearance, with small portions of projecting skin, and even complete bridges admitting a probe to pass beneath them; features by which their real origin, long after a cure, may be readily discovered. These appearances of scrofulous scars seem to be produced by the great attenuation and irregular destruction of the integument, and the slow and interrupted mode in which such ulcers heal; and they may always be in a great measure prevented by careful and judicious surgical treatment. When scrofulous cicatrices are cut into and examined after death, the affected glands are found wasted away, no vestige of them being left excepting a few bands of condensed cellular tissue attached to the cicatrised integument. The healing of a scrofulous ulcer is often followed by the advance of other tumours to suppuration, or perhaps the formation of new ones in some adjoining or distant part of the body. Thus one train of evils succeeds another, till the constitution of the patient begins to yield to the debilitating effects of the irritation and discharge, or the disease fastens on some organ of greater importance in the economy, and life is at length destroyed by hectic fever, colliquative perspirations, and diarrhœa.

Another form in which scrofula sometimes attacks the integument is that of lupus, the usual seats of which are the lips and nose; but we have also seen it affecting the genitals. Scrofulous lupus commences by the appearance of small red button-like prominences, which usually remain indolent for some time, then become excoriated and form eroding ulcers, with pale shining spongy granulations and encrusted margins; or, perhaps, the work of destruction goes on under a thick incrustation, which drops off from time to time, to shew the ravages which have been committed. The progress of the disease is sometimes hastened by the formation of sloughs, especially when the parts are cartilaginous; and in this way perforations are made into the nostrils, and sinuses scooped out within the thickness of the lips. In lupus of a well-marked scrofulous character the face usually becomes swollen and raised into pallid flabby prominences, which deform the countenance, and give to it a very sickly and disgusting aspect. See the article Noli me tangere.

Scrofulous individuals are subject to the formation of large chronic abscesses, which sometimes arise with great rapidity, as if from a sudden deposition of fluid rather than as the consequence of regular suppuration. The usual seat of such abscesses is in the cellular tissue connecting the large muscles, or within their sheaths, and under fasciæ; and their contents are at first a serous effusion, afterwards sero-purulent fluid, with curdy flakes; and more rarely a thin pus. In such cases sloughing of the cellular tissue is not uncommon; spongy masses of it, like wet tow, coming away along with the discharge, or plugging up the lancet puncture. These abscesses are named by French writers *abcès froids* and *abcès par congestion*; and their origin is usually the irritation of some diseased joint or bone in their immediate vicinity. It does not appear that abscesses of this description result from the softening of tuberculous matter previously deposited, but that the curdy flakes are thrown out from the internal surface of the abscess during the formation of its more fluid contents.

The lymphatic system has been generally considered as the primary, and by some the only seat of scrofula; and in all treatises on

the diseases of the absorbent vessels this malady occupies a prominent station. In almost every case of advanced scrofulous disease of the mesenteric glands, the lacteals connected with them will be found affected, and more or less filled with tuberculous matter; but the absorbents in other situations have not been very often observed to be the seats of strumous disease. Several well-authenticated cases, however, are recorded, in which tuberculous matter was found deposited within these vessels, and that in such quantity as completely to obstruct them.*

The following instance of scrofulous affection of the lymphatic vessels occurred to the writer. A gentleman, after applying an astringent lotion to a simple excoriation of the cervix glandis, was affected with indurated swelling of the prepuce, and the appearance of hard tortuous cords within the integuments of the penis, which after a few days could be traced all the way to the pubes. A glandular swelling took place in one groin, which after a considerable interval suppurated, burst spontaneously, and at length healed. No perceptible benefit accrued from a slight mercurial and purgative plan of treatment; but amendment commenced under the use of sarsaparilla and iodine, and the disease wholly disappeared after a tour of several weeks' duration, since which the individual has continued to enjoy good health.

The inflammation of the superficial lymphatics in the horse is believed by the best writers on veterinary medicine to constitute the disease named *farcy*;† and M. Dupuy‡ regards the small tumours termed *farcy buds* as tuberculous deposits.

The sublingual and submaxillary glands are often the seat of scrofula; the parotid more rarely, but a chronic swelling of that organ is occasionally seen in scrofulous subjects of a dark complexion. Tumefaction of the tonsils is seldom absent, when the strumous constitution is strongly marked: this exists from an early period of life, and is perhaps in some instances congenital. The tonsils so affected jut out in rounded tumours from between the arches of the fauces; they are peculiarly prone to inflammation, and when it occurs, the swelling is often such as to threaten suffocation, especially when stimulant astringent gargles have been incautiously employed. The inflamed tonsils become speedily spotted with aphthous crusts, which are succeeded by superficial ulcerations, always indolent, and sometimes ending in brown excavated ulcers, which we have known to exist for weeks without any remedy being used, and then to yield rapidly to cinchona.

Scrofula occasionally attacks the tongue,* the disease alternating with strumous eruptions, especially in the face: it sometimes assumes the form of aphthous ulcerations and fissures of the margin; but its most characteristic features are small knots or nodules superficially imbedded in the substance of the organ, varying in size from a grain of small shot to that of a horse-bean. They cause no uneasiness unless when firmly pressed, and then the pain is slight and pricking. The mucous membrane covering them is red and prominent, and soon breaks in the centre, giving rise to an ulcer, which spreads and destroys by sloughy erosion, with much pain, profuse salivation, furred tongue, and fetid breath. The ulcers under proper treatment become clean, contract, and heal; but the hardness remains, fresh nodules form in other parts of the organ, and the same train of suffering is gone through after a longer or shorter interval, according to the state of the patient's health and the regularity of his mode of life, until a decided improvement be produced on the constitution by time, change of climate, or the employment of remedies.

The mucous membranes are frequently affected with scrofulous disease: allusion has just been made to the aphthous exudations and superficial sores which appear on the tongue and tonsils of strumous individuals: in other instances there are small blisters and excoriations on the inside of the lips and cheeks, and on the fauces, and that wholly independent of any syphilitic disease, or the previous exhibition of mercury. The pituitary membrane in scrofulous subjects is easily irritated, and the secretion of mucus is usually copious and often acrid: nay, in some instances the morbid condition of the part proceeds so far as to induce small ulcerations, constituting one form of ozœna. If the progress of this affection be not arrested, the fine long laminæ within the nostrils become in part denuded, and at length necrosed; and it is from the decomposition of dead osseous substance that the horribly offensive odour is produced which renders this malady so peculiarly disgusting. To those around the patient it is always so; but he himself is sometimes unconscious of the odour, in consequence of the diseased condition of the pituitary membrane, and the loss of smell resulting from it. The most frequent cause of ozœna is, without doubt, syphilis; but it occurs chiefly in those syphilitic cases where the habit is strumous, and it is met with also as the effect of scrofula alone. It has not been ascertained whether ozœna ever originates from the deposition of minute tubercles on the pituitary membrane; but that this sometimes occurs is far from improbable. In the glanders of horses, which is an analogous affection, the existence of tubercles in the lining membrane of the nostrils has been satisfactorily shewn by Dupuy to form a leading feature.†

* *Sir A. Cooper*, Medical Records and Researches, vol. i. 1st and 2d Cases.—*Paletta*, Exercitat. Patholog. p. 109, fig. 4.—*Lieutaud*, Hist. Anat. Méd. vol. ii. obs. 770, 771, 771 a.—*Otto*, Seltene Beobachtung. Theil ii. No. 33.—*Andral*, Précis d'Anat. Patholog. t. i. pp. 419-421.

† *Percival*, Lectures on the Veterinary Art, vol. iii.

‡ De la Maladie Tuberculeuse.

* Mr. Russel has alluded to this affection, but without describing it. See Russel on Scrofula.

† De l'Affection Tuberculeuse, pp. 30 & seq.

Scrofulous children are more liable than others to inflammatory affections of the windpipe, and to that fibrinous exudation on its mucous surface which occurs in croup; yet this cannot properly be classed among strumous diseases.

But the ultimate terminations of the respiratory mucous membrane are frequently the seat of scrofula: some eminent pathologists, indeed, are of opinion that the air-vesicles of the lungs are the usual situations in which tuberculous matter is originally deposited in cases of scrofulous phthisis. Dr. Alison informs us that he has repeatedly found tuberculous matter in the air-vesicles, these minute cavities being partly filled with air and partly with this substance;* and the dissections of Dr. Carswell,† which he has so happily perpetuated by his drawings, appear to us to have set this point completely at rest. M. Gendrin, however, asserts that the substance effused into the air-vesicles is nothing more than the product of common inflammation, and not at all tuberculous; but he candidly admits that Laennec expressed a contrary opinion while the subject was before them, and he is ready to acknowledge that inflammation is a powerful occasional cause of the production of tubercle.‡

The digestive mucous membrane is subject through its whole extent to scrofulous disorder of function, and in its intestinal portion at least to extensive scrofulous transformations. A feeble action of the stomach is an almost uniform accompaniment of well-marked strumous disease; and the mucous lining of the alimentary canal is in such cases either torpid or unduly irritable, the food remaining lodged as a source of oppression and disturbance, or being hurried rapidly forward, and expelled before it has had time to afford adequate nourishment to the system. Tubercles are met with in the walls of the intestinal tube in children, and still more frequently in adults: Louis states that in his examination of more than 350 phthisical subjects above the age of fifteen, he found tubercles in the small intestines of one-third, and in the large intestines of one-ninth of the whole.§

The subsidiary organs of digestion and assimilation suffer also from scrofula; but the spleen and the pancreas are more frequently the seats of tubercles than the liver; yet the last of these organs is more or less functionally deranged in almost all strumous cases, which the chalky and various-coloured motions of such patients sufficiently demonstrate. The great irritability of the mucous tunic of the intestines in many scrofulous cases, and the tubercles which so often form within the mucous follicles and walls of the tube, naturally lead to ulceration, and hence arise many cases of disease of the mesenteric glands. At first they become merely swelled, but ultimately tuberculous deposits take place within their substance, constituting what has been named mesenteric consumption, or tabes mesenterica. For a full account of this affection we refer the reader to the article TABES MESENTERICA.

Scrofulous disease of the mucous membrane of the female genital organs is of frequent occurrence, and forms the most obstinate description of leucorrhœa, producing languor and debility, disordering and sometimes putting a total stop to menstruation, and in very many cases preventing conception. The morbid discharge in this disease is interrupted on the appearance of menstruation, and is increased in quantity before and after that occurrence. It varies in character from an opaque white mucus to a greenish yellow or blood-streaked purulence; and the surface which furnishes it is not limited to the vagina, but apparently extends throughout the whole internal lining of the uterus. It does not appear that tubercles have been detected in the vagina, but scrofulous ulcers have been seen there, probably arising from the destruction of tubercles, while the cavity of the uterus itself and the Fallopian tubes were found filled with tuberculous matter.* Tubercles have also been found imbedded in the walls of the uterus, and still more frequently in the ovaria.†

In men, scrofulous disease of the mucous membrane of the urinary channels and cavities is not unfrequent; and it is an affection particularly obstinate and unmanageable. The writer has known it to continue in the urethra for five years, at the end of which time it came under his care. The urethral membrane was then so soft and spongy that the most cautious attempt to introduce an instrument occasioned a profuse hemorrhage: after a lengthened treatment, the discharge at last yielded to tonics, the cold plunge-bath, and astringent injections. Chronic, or mucous cystitis, is often of a scrofulous character, (see CYSTITIS;) and there is ground for believing that the same affection passes up along the ureters, and even extends itself within the chambers of the kidney. Tuberculous deposits have been found within the coats of the bladder,‡ and lining the interior of the ureters;§ very frequently also in the cavities and substance of the kidneys, and sometimes in the renal capsules.‖ The glands of Cowper, the prostate, vesiculæ seminales, and testicles, have all been found the seats of tuberculous deposits. They occur most frequently in the prostate gland and testicles, particularly in the latter; and the symptoms to which they give rise render them objects of considerable importance to the

* Edinb. Medico-Chir. Trans. vol. i. p. 427.

† Illustrations of the Elementary Forms of Disease, Fascic. I.

‡ Hist. Anatom. des Inflammations, tom. ii. pp. 310, 601.

§ Recherches sur la Phthisie.

* *Carswell*, Op. cit. pl. ii.

† *Meckel*, Handbuch der Pathol. Anat. B. ii. Theil. ii. s. 386. *Louis*, Recherches sur la Phthisie. *Lombard*, Essai sur les Tubercules.

‡ *Louis*, Op. cit. *Lombard*, Op. cit. *Delaroche*, Bulletin de la Société de Méd. t. 13, 14.

§ *Laennec*. Auscult. Méd. t. i. p. 556. *Louis*. Also *Carswell*, Op. cit. pl. ii.

‖ *Baillie*, Morbid Anatomy.

practical physician as well as to the surgeon. See PROSTATE GLAND, DISEASES OF.

The changes produced in the testicle by scrofula vary considerably, according to the degree of attending inflammation, and the rapidity with which the disease has formed. We have, most commonly, a hard solid enlargement of the organ, usually affecting first the large head of the epididymis, slow in its growth, and obstinate in resisting the operation of remedies. It may remain indolent for some time, but at length abscess forms, the serotum inflames, adheres, and gives way, discharging a curdy substance mixed with pus. The disease now extends to other parts of the epididymis and to the body of the testicle; sinuses form under different parts of the inflamed integument; and fistulous openings take place, which give issue to a thin ill-conditioned fluid, mixed with curdy particles. At other times a more rapid inflammation occurs, and an abscess forms, which on bursting discharges scrofulous pus; a fistulous opening succeeds, the gland wastes away, and at length nothing remains but a small, shrunk, and hardened mass. On dissecting a strumous testicle, the natural fabric of the organ is found more or less indurated by the deposition of dense organized substance; tuberculous matter is discovered in different spots, in the tubuli seminiferi epididymis, and sometimes even in the vas deferens. Small scrofulous abscesses are also occasionally found disseminated through the substance of the gland.* This disease is much more common after puberty, when the actions of the testicle are awakened, and it has become exposed to numerous causes of irritation and injury; but we have known it occur at a very early age, in the case of a child which exhibited other strong marks of the strumous constitution. In almost every instance only one testicle is attacked at first, but after a time the other is usually affected; and it is not uncommon for both to continue suffering from the disease at the same time. Andral has well remarked the frequency of scrofulous affection of the testicle, and has pointed out the palpable omission of Louis, who has assigned no place either to the testicle or the bones in his enumeration of parts in which scrofulous deposits have been found.

Another organ which is subject to scrofula is the mamma; scrofulous disease of which occurs both before and after puberty, but much more frequently after that period, and often during the excitement of the first lactation. Scrofula of the mamma appears under different shapes, and in its earlier stages is not always easily distinguished from disease of a more formidable character. Sometimes a hard lump forms in the breast, and remains nearly quiescent for several years; at others the whole gland is affected with scrofulous enlargement; but in every case of the disease its tendency is to suppuration, and the purulent matter discharged is more or less mingled with curdy flakes: instances likewise occur in which large masses of tubercular substance come away.* In the progress of such cases the integuments become inflamed, assume a livid colour, and are extensively detached from the parts beneath; new abscesses and apertures form, and the adipose and glandular tissues are traversed by many fistulous passages, while the contiguous parts are condensed and hardened. In strumous disease of the breast, there is always an enlargement of the gland instead of that contraction which occurs in one form of carcinoma: the tumour is tender when squeezed, never possesses the stony hardness which exists in the disease just named, and there is never, we believe, retraction of the nipple.

The mucous membranes of the eye and lachrymal passages are peculiarly liable to scrofulous disease; its influence on the latter is indicated by the long-continued discharge of puriform mucus, varying in its colour and consistence; while strumous inflammation of the conjunctiva constitutes a very large proportion of all the inflammatory affections to which this organ is subject. Beer asserts that in Vienna nine-tenths of all the cases of ophthalmia in children are of a scrofulous character;† and Benedict of Breslau estimates the proportion in that city as high as ninety-five in the hundred.‡ The eruption of the minute vesicles, (phlyctenulæ) or pustules, which occurs in scrofulous inflammation of the conjunctiva, seems to approximate it to other diseases of the same class, when numerous crops of very small tubercles are seen on the investing membranes of various organs; but it does not appear that true tuberculous matter has ever been detected in any part of the eye.§ Scrofula likewise attacks the margins of the palpebræ and Meibomian follicles, causing the appearance of vesicles and ulcerations named ophthalmia tarsi; and it is believed by Mr. Todd to occasion chronic enlargement of the lachrymal gland.‖

The organ of hearing, like that of sight, is the frequent subject of scrofula, which in many instances is productive of early deafness, and, there is reason to believe, is the cause of that imperfection of hearing which is sometimes seen to pervade several members of the same family. The lining membrane of the external auditory passage is in most instances the seat of this disease, which is usually marked by profuse watery, then mucous, and at length purulent discharges, forming what may be named strumous otorrhœa. It is in general unattended with danger, but it rarely exists without producing a greater or less imperfection of hearing. In some instances, however, the disease spreads more deeply; the

* *Sir A. Cooper*, On the Testis. Carswell's Illustrations, pl. ii.

* *Lloyd*, On Scrofula.

† *Jos. Beer*, Lehre, &c. b. i. s. 588.

‡ Handbuch, &c. b. ii. s. 165.

§ Strumous disease of that organ seems to exist also among animals. M. Dupuy considers the specific ophthalmia of horses as one of the consequences of the tuberculous affection.

‖ Dublin Hospital Reports, vol. iii.

membrane of the tympanum becomes inflamed and is perforated, the small bones of the ear are discharged, and irremediable deafness ensues; or perhaps caries of the petrous portion of the temporal bone takes place, and the result is fatal. (See Otalgia and Otitis.) Strumous otorrhœa has been known to alternate with other mucous discharges, such as leucorrhœa and chronic cystitis;* and its disappearance has been followed by enlargement of the cervical glands, swelling of the testicle, and various diseases of the eyes and skin.† Like other scrofulous affections it sometimes resists all remedies, and at length disappears at puberty.

The synovial membranes of joints are undoubtedly much more liable to disease, in scrofulous subjects, than others; inflammation is more readily excited, and effusion of fluid into their cavities is more easily induced. In such persons we frequently observe several joints affected at the same time. In a case of six years' duration, lately placed under the writer's care, the left hip-joint, the right knee, and the joints of the right great toe were all suffering under disease, with displacement of the head of the femur and shaft of the tibia; there were, besides, many ulcers and sinuses around the joints, and indurated cervical glands: this patient had a strongly marked strumous countenance. The secretion of scrofulous pus into synovial cavities is not uncommon, but the existence of tubercle within the substance of the membrane itself appears to be of rare occurrence. Dr. Craigie states his belief that tubercle has been found in the synovial membrane of the hip-joint.‡ There is indeed a remarkable change of structure, which takes place slowly in the synovial membranes, particularly that of the knee-joint, and which, as it occurs most frequently in the scrofulous, some may be inclined to regard as of scrofulous origin. This morbid alteration of texture, which was first accurately described and illustrated by Mr. Brodie,§ consists of the conversion of the synovial membrane, and afterwards of the adjacent soft parts, into a pulpy substance of a light brown colour, intersected by white membranous threads, and traversed by minute red vessels. But there is another affection of the joints, in which the characters of scrofula are unequivocally exhibited; in this the disease originates in the cancellous structure of the bones, which is found to contain deposits of tuberculous matter; and the cartilages and synovial membranes are affected secondarily by the spreading of the inflammation.

In scrofulous persons the bones are more slender throughout; their cortex or outer wall is much thinner, and their interior more soft and vascular than the bones of persons of sound and vigorous constitution: in the inferior animals affected with tuberculous disease, according to Dupuy,* this peculiarity is still more strongly exhibited. Scrofulous children sometimes fracture the thigh or leg merely by falling on the carpet; and in other instances the bone does not snap across, but bends like a piece of tin; and the injury may be remedied by straightening it as we do a rod of that metal. The effects of scrofula on the bones are considerably different, according to the comparative density of their texture; but in all instances the process of disorganization appears to commence by an increase of their vascularity, or a greater or less degree of inflammation. In the dense fabric of the bones of the skull and the shafts of the long bones, scrofula is a frequent cause of necrosis; while in the spongy heads of bones, the small bones of the hand and foot, and the bodies of the vertebræ, this disease manifests itself, first by increased vascularity and softening of the cancellated structure, while the firm exterior remains entire and unchanged; then a deposit takes place of a clear yellow fluid, which is succeeded by or probably converted into a soft cheesy substance or true tubercular matter.† This alteration in the texture of the bones is slow in its progress, and its existence is not indicated by any decided symptoms until it is considerably advanced. A dull and deep-seated pain gives the first warning of the disease, the soft parts then become swelled, the motions of the neighbouring joint are restrained and painful, and abscesses now form around it, containing a scrofulous pus; the investing cartilages and synovial membrane next suffer, effusion takes place into the articular capsule, and perhaps a high degree of inflammation is induced by the escape of tuberculous matter or a portion of necrosed bone into the cavity of the joint. In the progress of the disease the destruction of the head of the bone or edge of the socket, and of the ligaments which preserve the bones in their places, enables the more powerful muscles to draw the lower one from its situation, and produce what is named secondary luxation. The writer has repeatedly observed dislocation of the tibia produced by the separation of the epiphysis from the shaft of the bone; the leg being in this manner completely displaced, although the articular surfaces of the knee-joint were in proper apposition.

Not only the bones but also their investing membrane or periostemn is subject to tubercular deposits,‡ giving rise to swelling, inflammation, suppuration, detachment of the periostenm from the bone, and ultimately to necrosis, or absorption of the osseous tissue, which is replaced by dry tuberculous substance without softening of the bone. To this form of tuberculous disease we would refer some of those cases which have been named osteo-steatoma. This morbid deposition, which we have seen lying in contact with the bone in large

* *Lallemand*, Recherches sur l'Encéphale, lettre quatrième.

† *Itard*, Maladies de l'Oreille.

‡ Elements of Patholog. Anatomy, p. 810.

§ Pathological Observations on the Joints.

* De l'Affection Tuberculeuse.

† *Brodie*, Patholog. Observ. on the Joints.—*Lloyd*, On Scrofula.

‡ Otto has found tubercle within the tissue of the periostenm. See Compend. of Pathol. Anat. translated by South, vol. i. p. 240.

angular masses, bears a striking resemblance to suet or adipocire, but its nature is truly that of coagulated albumen, for it emits, under a strong heat, the odour of burnt cheese or horn, and produces no greasy stain when rubbed on paper.

Scrofula manifests itself by unequivocal proofs both in the bodies of the vertebræ and the fibro-cartilaginous substance which is interposed between them. The former become more vascular, are softened by the partial absorption of their earthy and saline constituents, and afterwards receive a deposit of yellow, cheesy, or true tuberculous matter. These changes naturally lead to caries and destruction of the bone, which yields to the superincumbent weight; and the spine bends at an angle more or less acute according to the number of vertebræ which are diseased. The bend is in general directly forward; but when the sides of the vertebræ have suffered most, the curve is of course lateral.* In the progress of this disease the soft parts around become affected, and collections of purulent matter form, which, passing down in front of the spine and along the course of the psoæ muscles, ultimately make their appearance under Poupart's ligament at the upper part of the thigh, and sometimes on both sides, nearly at the same time. On other occasions the matter points in the loins, or near the anus; and in some rare instances it has burst into the spinal canal, with an immediately fatal result.

When chronic disease has thus been producing such extensive disorganization in the osseous substance of the spinal column and in the soft parts around, it is not to be expected that the membranes of the spinal cord, the medullary substance itself, and the nerves which branch from it, should escape injury; accordingly we find that the first symptoms of caries of the spine are, a feeling of weight and aching in the part, itching and numbness, pains shooting round to the front of the trunk; and, when the disease is farther advanced, pains and twitching of the limbs, succeeded by palsy of all the parts below the affected vertebræ, and of the sphincters of the bladder and rectum. The nervous symptoms are not always limited to the parts below the seat of the disease; in some cases we have pains of the arms, although the disease be situated in the middle dorsal vertebræ.† On inspecting the contents of the spinal canal, where death has occurred during the existence of caries of the bones, effusions of serum or plastic lymph are found between the osseous surface and the dura mater, and sometimes they are found firmly adherent; plastic lymph and pus are also discovered within the arachnoid, or the membranes are found glued together. Tuberculous deposits have been observed within the substance of the spinal dura mater, and between that membrane and the arachnoid; most commonly connected with scrofulous disease of the bones, but sometimes wholly independent of it.* The medullary substance itself has in such cases been found softened or attenuated; sometimes entirely destroyed for a short space, and the vacuity filled up with a sanious pus.

When scrofulous disorganization of the bones has been effectually checked, it is astonishing to mark the effects made by nature to repair the loss and support the fabric by new osseous growths: we have even occasionally seen them formed in the vicinity of the disease, even although its activity was still unabated.

Scrofulous affections of the spine often commence in the intervertebral substance, which becomes soft in the centre, and is then destroyed by ulceration and absorption; the disease afterwards extending to the bodies of the vertebræ. There is no reason to doubt that ulceration of the intervertebral substance is in most cases of a scrofulous nature; yet it must be admitted that tuberculous matter has very rarely been observed in this texture; partly, perhaps, because it has not often been carefully sought for. Andral states that he once met with a mass of tubercles within the substance of the intervertebral cartilages.†

Lateral curvature of the spine has been supposed by some writers to be in almost all cases produced by strumous disease of the bodies of the vertebræ. Certain it is that scrofulous individuals are most liable to lateral curvature of the spine; but this may with more propriety be ascribed to a general debility and relaxation of the frame, and of the muscular and ligamentous systems in particular, than to any positive softening of the osseous texture. Were the bones softened from scrofula in every case of lateral curvature, how is it possible that so many cures should be effected, or that such multitudes of females should be met with in comparatively good health, yet having permanent lateral flexure of the spine? Scrofulous disease of bones in other cases requires powerful counter-irritation to check its progress; but in this form of spinal disease, rest in the horizontal posture, friction, a regulated exercise of the muscles, and attention to the general health, are sufficient, in a great majority of instances, to accomplish a cure. Lateral curvature of the spine not unfrequently precedes angular projection from caries: hence it has been inferred that the latter is but the second stage of the former disease: of this, however, there is no proof; nor is it at all unnatural that a feeble individual, whose spine sinks readily into a serpentine bend, should afterwards become the subject of a more formidable disease, affecting the bones themselves. The vertebræ after death, in cases of serpentine curvature, are most commonly found free from disease,‡ which would seem to shew that scrofulous softening of the bones is rarely the cause of this deformity; for it is highly im-

* *Brodie*, Opus cit. p. 289.
† *Copland*, on Diseases of the Spine.

* *Ollivier*, De la Moelle Epinière, t. ii. pp. 760—764.
† Précis d'Anat. Patholog. tom. i. p 424.
‡ *Shaw*, Diseases of the Spine. We have lately examined a number of preparations with a view to this point, and the result fully corroborates the assertion of Mr. Shaw.

probable that so great a change in the texture and form of the vertebræ should be repaired without leaving behind it some traces of its previous existence.

The serous membranes in different parts of the body often exhibit decided marks of scrofulous disease, myriads of minute tubercles or tuberculous granulations being found adhering to their surfaces or imbedded in their tissue; and sometimes enveloped in the false membranes connecting them, which have formed during inflammation. Thus the pleura, the arachnoid, the pia mater, the peritoneum, are frequently found affected with scrofula; and a few instances are recorded where tubercles have been observed in the pericardium.* When this disease attacks the membranes of the brain, its symptoms are usually the same as those of acute hydrocephalus; and its termination takes place by effusion within the skull or spinal canal, to which sometimes is superadded softening of the medullary substance. The children of scrofulous parents are well known to be more prone than others to cephalic disease; and in this manner the whole offspring of such individuals are sometimes cut off in succession during infancy. When tuberculous disease affects the peritoneum, it seems, whether originally induced by inflammation or not, to produce, after a time, that state: dropsical effusion then follows. As the disease proceeds, the fluid is absorbed, and the opposite surfaces, loaded with tuberculous matter, become glued together, obliterating the cavity of the peritoneum, and fixing the floating viscera in their places. We have seen this disease in a boy of twelve years pervading the whole trunk, gluing the contiguous viscera to each other, to the parietes of the chest and abdomen, and to the diaphragm, filling up the anterior mediastinum, and presenting numerous white cheesy tumours within the substance of the viscera themselves. The heart alone was free from disease. A separation of the lowest part of the sternum, which was much softened, had taken place, and the point of the ensiform cartilage was directed forwards and upwards; a consequence, apparently, of the swelling of the abdomen, and the restraint imposed by the strong adhesions on the motions of the chest in respiration. Such cases are always complicated with scrofulous disease of the mesenteric glands, and usually with ulceration of the coats of the intestines, which have thus been perforated, allowing a free communication through the adherent sides of the contiguous tubes. In some cases it has appeared that the ulceration had commenced in the peritoneal surface;† while in others the mucous lining of the bowel seems to have been the first eroded.‡ The same result will follow from both processes; but certainly the ulceration from within outwards is what we consider most likely to happen, from the greater proneness of mucous membranes to that state.

The frequent occurrence of scrofula within the central organs of the nervous system has been satisfactorily ascertained. Wiseman, whose knowledge on this subject greatly surpassed that of most of his contemporaries, appears to have suspected the fact; but it was reserved for modern pathologists* to shew how frequently tubercles are formed within the encephalon and spinal cord. Before the age of two years they are not common; but from this period onwards till puberty they are of frequent occurrence. Their most usual seat in the brain is the upper part of the hemispheres; and in the spinal cord they occur much oftener in the cervical than in the dorsal or lumbar portions: according to the most accurate observers, they are very often enclosed in cysts.† It is singularly deserving of notice that tubercles have been repeatedly found in the nervous centres where no symptom during life had induced any suspicion of their existence; and the scalpel has as frequently been unable to disclose any deviation from healthy texture in the substance immediately surrounding them.

The thyroid gland was long believed to be peculiarly subject to scrofula; and the chronic enlargement of that organ, named bronchocele, was at one period regarded by the best writers of their day as a distinctly scrofulous disease:‡ nay, it is remarkable that even in recent times the introduction of iodine as a general antistrumous remedy originated in the supposed connexion of bronchocele with scrofula. But on reviewing the history of the two diseases, we shall find so many points of difference as to convince us that they are altogether distinct and independent. (See article Bronchocele.) In support of this opinion it may be sufficient here to state that bronchocele is of rare occurrence in the large manufacturing towns of Britain; while scrofula prevails throughout their population, cutting off thousands in infancy, and scattering among the survivors the germs of debility and protracted disease. The thyroid body, though rarely the seat of true scrofula, is not wholly exempt from it, more than one instance of its occurrence having come under our observation. The disease commences with a moderate degree of swelling, which is followed by the formation of a small indolent abscess: this after a time bursts spontaneously, discharging a thin pus mixed with curdy flakes; the apertures remain fistulous for a considerable time, while the tumefaction of the gland subsides.

The lungs have long been known to be particularly liable to scrofulous deposits; and so rare is it to find tubercle in any other situation without also finding it in the lungs, that Louis states he never met with an instance in all

* *Baillie*, Morbid Anatomy, p. 9.

† *Gregory*, Lond. Med.-Chir. Trans. vol. ii. p. 269.

‡ *Howship*, Practical Observations in Surgery and Morbid Anatomy, p. 269.

* *Lecellé*, Recherches sur les Tubercules du Cerveau, 1824, *a thesis*.—*Gendrin*, Sur les Tubercules du cerveau et de la Moelle épinière, 8vo.—*Ollivier*, Sur la Moelle épinière.

† *Andral*, Précis d'Anat. Pathol. tom. ii. p. 841.

‡ *Semmertus*, Medicina Practica. — *Laurentius*, Hist. Anat. corporis humani.

his numerous dissections excepting once, in the case of a man who had died of fever.* Scrofulous disease of the lungs constitutes what has been named tubercular phthisis; to the article on which the reader is referred.

The heart has been found affected with scrofula but rarely: Dr. Otto† of Breslau, a very learned and able pathologist, never once met with a case of this sort; yet several cases of its occurrence are on record from Fabricius Hildanus‡ and Needham§ down to Andral,‖ Lobstein,¶ and Macmichael.** Tubercle of the heart never occurs except when the system is strongly imbued with strumous disease; and its existence in this situation does not appear to have been indicated by any peculiar diagnostic symptom.

The occurrence of scrofulous disease in the voluntary muscles appears to be not less uncommon than in the heart: instances, however, have been met with of tuberculous deposits in these organs, both in the human subject and the monkey.††

The effect of scrofula in modifying the symptoms of a large proportion of the diseases to which the human frame is subject has been long known to medical observers, and meets us daily in the course of our practice. Inflammatory affections, in a particular manner, exhibit the effects of this influence; losing the acuteness of their character, and becoming tardy and indolent, difficult of cure, and requiring for its accomplishment the use of stimulants and tonics. Frequent and striking examples of these facts are presented to us by many of the early consequences of syphilitic infection, and by the extensive tribe of ophthalmic diseases. Injuries of the soft parts, particularly where there has been much loss of blood, also often afford unequivocal evidence of the presence of a strumous habit: hence it is common for persons who are jealous of the imputation of scrofula to declare that their wounds are always readily healed. So strong sometimes is the modifying power of scrofula, that the writer has known the stump of a strumous girl's arm, which was removed on account of an extensive laceration, to discharge distinct curdy matter at the second dressing.

Scrofula appears to possess a certain degree of connexion with several other diseases. Some congenital affections, such as hare-lip, spina bifida, and external hydrocephalus, are more frequently met with among scrofulous children than others; and it is worthy of remark that in many cases of congenital peculiarity or defect, the same have been observed in ancestors, or near collateral relatives of the patients.

Of all the diseases allied to scrofula, perhaps the most closely connected is rickets, (see art. Rickets;) yet the distinction between the anatomical characters of the two diseases is sufficiently well marked. In rickets the whole texture of the bone is softened, though not exactly in the same manner in both species of that disease; but in scrofula, tuberculous matter is deposited in the cancellous structure, the outer wall remaining entire, or becoming necrosed; or tubercle invades the bone from the periosteal surface, the osseous substance being removed by absorption. Encephaloid or medullary tumours may also be enumerated among the affections connected with scrofula; they occur chiefly in individuals of a strumous habit, and the materials of which they are composed bear in their last stage of softening a considerable similitude to those of tubercle.* There is a fungous tumour, occurring in the lips and cheeks of young scrofulous subjects, which we have repeatedly met with: in its external characters it bears a very close resemblance to encephaloid; but it is formed with much greater rapidity, and admits of cure by a well-directed alterative and purgative treatment, and the application of leeches, astringents, and escharotics. It is the opinion of some experienced practitioners, that carcinoma occurs more frequently in persons of a strumous constitution than others; and our own observation inclines us to entertain a similar belief. The concurrence of scrofula with urinary calculus has led to the supposition that the two diseases are intimately connected; but it does not appear that they are in any way dependent on each other: the same causes, however, are likely to induce both. (See art. Calculous Diseases.)

The greater sensitiveness of most scrofulous individuals renders them more prone to diseases of the nervous class: hence an aggravated form of hysteria is more frequent in such persons; and we think, with Dr. Cheyne, that epilepsy affects strumous subjects oftener than others. (See Epilepsy.) The diseases of the mind claim an alliance with scrofula, which has not attracted the attention of writers on this subject so much as it seems to merit. An eminent physician of great knowledge and experience in the treatment of insanity has stated

* Recherches sur la Phthisie.

† Compendium of Pathological Anatomy, translated by South, p. 290.

‡ Observ. Chirurg.

§ Wiseman's Surgery, vol. i. p. 404. At the apex of the heart.

‖ *Andral and Bayle*, Revue Méd. Franç. et Etr. 1821.

¶ Anat. Patholog. At the apex of the heart, as large as the point of the thumb, and apparently formed in the substance of a false membrane.

** Lond. Med. and Phys. Journal, 1826, p. 119. The tubercles in the heart were connected with others in the lungs; yet they may have been originally distinct.

†† *Otto*, opus cit. p. 252, in the sterno-mastoid of a girl—in the muscles of the neck and thigh of scrofulous monkeys.—*Laennec*, Auscult. Médiate, tom. i. p. 556. In the sterno-mastoid of a phthisical man. *Lombard*, opus cit. Intercostal muscles.—*Reynaud*, Archives Gén. de Médecine, tom. xxv. 1831, pp. 149, 301. This writer has given a very interesting account of the tuberculous affections, particularly phthisis, occurring in monkeys at the Jardin des Plantes.

* The earliest distinct account of encephaloid as it affects the extremities, is to be found in Ruysch Observat. Anatomico-Chirurgic. No. 81, where he describes it under the title of the spongy or ossivorous tumour, and states that it was known to the Germans under the name of *schwamm*, and to the Dutch under that of *been eter*.

to us his belief that more than one-half of those who are subject to mental derangement are of a scrofulous constitution, having some manifest indication of its existence in their persons. With the view of elucidating this subject, we examined all the paupers of a lunatic establishment. Of forty-four females, exactly one-half presented indurated or enlarged glands of the neck or throat, and several had extensive scrofulous cicatrices. Of forty-six males, twenty-eight had no decided symptoms of scrofula, though several of these had the strumous aspect; sixteen presented the marks already mentioned in reference to the females; and two belonged to families known to be afflicted with scrofula in an aggravated form. All of these ninety lunatics were adults, and not one of them exhibited any active symptoms of scrofulous disease. It has been remarked to the writer by the physician already referred to, that he has often observed active scrofulous symptoms to alternate with attacks of mania. In several cases he has known the purulent expectoration of phthisis to cease during the urgent symptoms of insanity; and on the other hand, reason has been seen to return before the pulmonary disease proved fatal—soothing the feelings of affectionate relatives, and shedding a calm over the last days of the consumptive lunatic. In accordance with what has just been stated, the severity of the symptoms of scrofula does not appear to promote the developement of mental disease, but rather to impede it; for in families eminently scrofulous, we have sometimes observed the individual least afflicted with that malady to be the victim of insanity; while those who suffered most from scrofula possessed sound minds; as if the local irritation, or the drain from the body, afforded some protection against mental derangement. It has often been remarked by medical writers, and the observation of every physician must confirm the accuracy of the statement, that precocity of mental developement, and superior genius, are in a great majority of instances the accompaniment of the scrofulous constitution.

Causes.—In considering the causes of a disease so deeply rooted in the constitution as scrofula is universally acknowledged to be, it is necessary to direct our attention to circumstances very remote in the history of those who are its subjects. The foundation of a scrofulous habit is frequently laid during the fœtal state, by the transmission of that peculiar organization of the frame from parents who themselves possess it. Nothing, indeed, can be better established as the result of general observation than the hereditary nature of scrofula. This peculiarity of constitution may also be communicated to the fœtus by some defect of energy in one or both of the parents, arising from extreme youth, or very advanced years, or great disparity of age, or that premature decay which is induced by a life of dissipation, or the debilitated states resulting from protracted illness; or, on the part of the mother, repeated miscarriages, and by defective nourishment and other similar causes. Various occurrences, likewise, may take place during gestation—such as accidents, frights, prolonged disease, mental distress,—which interfere with the proper developement and growth of the embryo, and entail upon the child that feebleness of constitution which, if not identical with scrofula, leads to its appearance on the application of causes not adequate under other circumstances to produce that disease. The writer was recently called upon to examine a boy of six years, labouring under a complication of scrofulous ailments; the history of whose case may serve to illustrate the influence of injuries received by the mother during gestation. In this instance the mother was a tall and rather slender woman, apparently enjoying good health: the boy was puny for his age, his movements were quick and restless, his articulation very imperfect, and his mind in a state approaching to idiocy: the lips were seamed with the scars of former ulcers, the conjunctivæ relaxed and injected, the tarsi inflamed, ulcerated, and almost without cilia; the countenance pale and bloated; the skin dry and scaly; many of his teeth were gone, and most of those which remained were in a state of decay; the cervical glands were indurated, but not much enlarged. The last phalanx of one thumb was double, and each extremity of the fork had a perfect nail. He had always been a very sickly child, had had repeated suppurations in the groins, and was then labouring under chronic diarrhœa, part of his food passing undigested. During the time that his mother was pregnant with him she had suffered many severe falls, the first towards the end of the third month.

Scrofula is also observed to originate in the healthy offspring of healthy parents under certain circumstances, the principal of which are habitual exposure to cold and damp, privation of free air and light, and want of healthful exercise. Instances are recorded where persons previously in good health have been affected with scrofula after being confined in the dungeons of a prison, and there scantily fed.* The influence of such causes in producing tuberculous disease in the inferior animals has been made the subject of experiment by Dr. Jenner,† Dr. Baron,‡ and others; and the results have satisfactorily shewn both the great extent of that influence, and the power which we possess of removing the factitious disease by replacing the animals in healthy situations, and supplying them abundantly with wholesome food. The operation of cold and damp, as causes of scrofula, is greatly augmented even by a slight local injury.

A moist, cold, and variable climate, like those of Great Britain and Holland, is particularly favourable to the developement of scrofula; in proof of which it is sufficient to adduce the great prevalence of the malady in both of those countries. A very cold or a hot climate, on the other hand, serves rather to protect us

* *Pinel*, Nosog. Philos. t. iii. pp. 380, 385.

† *Jenner*, in Beddoes on the Med. Use of factit. Airs.

‡ Delineations, &c. pp. 25 et seq.

against scrofula; the former, dry and bracing, invites to exercise, and promotes digestion, and thus strengthens the system; while the latter favours the excretions, particularly that of the skin, and preserves the body from those sudden changes of temperature which in our island so often lay the foundations of scrofulous affections. But when an individual whose constitution has been formed in a warm climate is removed to a cold and variable one, the occurrence of scrofula is exceedingly frequent; convincing proofs of which are every day afforded by those natives of warm climates who reside in our island, as well as by the diseases of birds, monkeys, and other animals which have been brought to us from warmer latitudes.* Indeed it is not necessary for the inhabitants of warm climates to leave their native countries to experience the effects of a cold and variable atmosphere in the production of scrofulous disease; it is sufficient for them to ascend their own mountains, when they will be exposed to the same influences, and suffer the same evil consequences as if they had removed to a more northern climate.† The information communicated by Dr. Ferguson regarding the diseases of the black troops in different situations in the West Indian islands, illustrates this point in a very interesting and satisfactory manner.‡

Among the causes which appear to give rise to scrofula in children, are the practices of rearing them by the hand and suckling them too long—two extremes, both of which often lead to the same result, the imperfect nourishment of the child. The former of these is a fruitful source of scrofula in England, the latter in Scotland, where it is usual among the labouring classes for children of sixteen and eighteen months to be still at the breast: in some instances we have known them suckled for upwards of two years. A similar injurious effect will be produced by allowing the same wet-nurse to suckle several children in succession, which we have known to be pursued as far as three, when debility and symptomatic amaurosis forced the woman to resign her charge. Imperfect nourishment of the child, and consequent tendency to scrofula, is also likely to be induced in those cases where the wet-nurse menstruates regularly during lactation. It is an opinion professed by Wiseman and other writers of great ability and experience, that a scrofulous wet-nurse may occasion the disease to appear in the child to whom she gives the breast; and the idea appears consistent with reason, not on account of the existence of any scrofulous poison, capable of being imbibed by the infant, but because it is natural to suppose that the milk of a scrofulous female will not afford the same substantial nourishment as that of a woman in sound and vigorous health.

Another cause of this disease is confinement in ill-ventilated apartments; for the deficiency of pure atmospheric air cannot be long endured, especially during youth, without the most injurious consequences. While the frame is building up and the constitution acquiring that character which is to distinguish it through life, all the processes of the economy are peculiarly active, and any defect of what is to perfect the animal fluids and give energy to the nervous power, is felt with greater force, and is productive of much more injury than at an after period. Ill-aired apartments are in general imperfectly lighted, and the want of this vivifying influence of light favours the formation and developement of scrofula; for the human body requires a certain exposure to light for the proper performance of its functions, little less perhaps than plants, although in them the loss of colour renders the effects of seclusion more strikingly manifest. The experiments of Edwards on the spawn of frogs and on tadpoles clearly demonstrate the agency of light on the formative processes of living organization. He found when the light was excluded that the eggs were never fully hatched, and that tadpoles did not undergo their transformation at all, or did so after a considerable delay; but their size increased, although they were kept in darkness.* In accordance with the results of these experiments, it has been observed that monstrous births are exceedingly frequent among the miserable occupants of the dungeons under the fortifications of Lille.† We may in part ascribe to the deficiency of light the prevalence of scrofula among the inhabitants of cellars and of narrow alleys, where the beams of the sun never gain admittance. We are even inclined to think that the custom now so general among the wealthier classes in this country of sitting in darkened rooms during the day is far from being conducive to vigorous health; and where the young are concerned, we do not hesitate to say that it must be injurious. It is a custom borrowed from the luxury and effeminacy of warmer latitudes, and one which is calculated to enervate the body and induce a tendency to strumous disease.

In a great metropolis like London, where the moving crowds of human beings and the number of carriages are such that children cannot be allowed to go abroad in the streets, they grow up feeble and often scrofulous; while in villages and even in some populous towns, where they are almost constantly at play in the open air, they prove healthy and vigorous. The mischievous effects of the want of air, and sun-light, and healthful exercise, may be seen among the rich as well as the poor, though not to the same extent. The confinement, mental fatigue, and anxiety to which

* See *Reynaud*, on the Diseases of Monkeys at the Jardin des Plantes. Archives Gén. de Méd. t. 25.

† In every latitude there is a point of elevation above the plains where the thermometer never sinks below 32° Fah. Even at the equator this exists at a height of 15,207 feet. See Suppl. to Encycl. Brit. art. *Climate*; also *Humbolt*, Geography of Plants.

‡ *Alison*, in Edin. Medico-Chir. Trans. vol. i. p. 398.

* De l'Influence des Agens Physiques sur la Vie, p. 398 et seq.

† London Medical Gazette, Sept. 29, 1832.

female children in particular are so unremittingly subjected during their education, prove fertile sources of scrofula in boarding-schools, and even in the families of the higher classes: bodily health is too often sacrificed to the idol of accomplishment, and the intellectual powers, perhaps originally of excellent quality, are forced into a state of extreme culture and morbid precocity, destructive of all genuine soundness and vigour.

Acute diseases, especially those accompanied with cutaneous eruptions, as small-pox, measles, and scarlet-fever, are often observed to have the effect of producing the developement of scrofula; and the more tedious the convalescence, the more frequently do symptoms of this disease ensue. Various other causes of debility prove the means of developing scrofula —as long watching, protracted anxiety of mind, severe study, especially in the young, habits of dissipation, excess in sexual indulgences, solitary vice, profuse discharges of all kinds, repeated syphilitic disease; the abuse of mercury, of narcotics, of warm bathing, and of powerful evacuants. Different local irritations have the effect of causing the neighbouring lymphatic glands to swell, and where a strumous tendency exists, to become the seats of tuberculous deposits, as we see exemplified in the consequences of difficult dentition, and of the inflammatory affections of the mucous membranes of the respiratory and alimentary canals. Too great indulgence in sleep has been enumerated among the causes of scrofula, and excess in this particular will certainly debilitate, and thus dispose to the disease; but we are inclined to believe that the indulgence in sleep which appears to induce scrofula is, in fact, usually occasioned by that feeling of weakness and exhaustion which is among the earliest symptoms of the approaching developement of the disease.

Treatment. — The treatment of scrofula naturally divides itself into the preventive and curative, the former of which is the more generally successful, and obviously the more important. All children are liable to become scrofulous, and those more especially whose parents or near relatives are the subjects of this disease. Hence particular attention is required to prevent the formation of the strumous constitution in children, and the developement of the disease in those who may from birth be marked by this peculiarity of organization. Indeed, it will not be undeserving of our care to influence as far as we can the sound and perfect formation of the embryo, by more than ordinary attention to the health of the mother during her pregnancy, wherever there is reason to apprehend the existence of a scrofulous disposition.

When the child of a scrofulous father is born, the infant, unless the mother is free from all traces of the disease, ought to be consigned to a wet-nurse of sound and robust constitution, having an abundant supply of milk. This alone ought, for some months, to be sufficient for the nourishment of the child; but after a time, should it appear delicate, a little isinglass jelly may be allowed in addition, or liquid yolk of egg, or beef-tea, together with some preparation of wheaten meal or flour, or pure starch. Daily immersion in cold water, and gentle friction of whole body, will be found of great utility. The child ought to be warmly clothed, to be carried about in the open air as much as possible, and the apartment in which it sleeps ought to be kept at a steady moderate temperature, and perfectly well ventilated. All rooms occupied as nurseries for children ought to be spacious and lofty, never situated in a sunk floor nor in an attic, and, if possible, considerably above the level of the ground— directions which will be readily understood, when it is recollected that low rooms are ill ventilated and often damp, while those in the attic story are particularly liable to variations of temperature.

As the child grows up, a similar plan of management will be found to avert, as far as it can be accomplished, the formation of a scrofulous habit, and the developement of the disease in those who exhibit that tendency. A plain and nutritious diet, containing a larger than usual proportion of animal food, warm clothing, daily exercise in the open air, the cold plunge-bath, cool and well-ventilated rooms, moderation in the pursuits of pleasure, of study, and of business; strict temperance and virtuous habits; may be said to comprise all that is most likely in our mode of living to give protection throughout life against the occurrence of scrofulous disease. To those in affluent circumstances who can be removed to a climate more genial than that of Britain, such a change, if judiciously made in early life, will confer a still greater security from scrofula.*

When a well-marked strumous tendency exists, the management of the mind urgently demands our attention; and attempts ought to be made at a very early age to correct whatever is deficient or excessive in its operations. Children who are of a dull and apathetic character ought to be roused by presenting to them objects which are likely to interest and enliven, while the ardour of others in the pursuit of knowledge should be cautiously repressed; and when the genius gives promise of unnatural precocity, means should be used to retard the unfolding of the mind, and allow the faculties to mature themselves by slow degrees. The moral feelings, in an especial manner, require a strict control for the purpose of giving them a just direction, and preserving individuals of a sensitive character from indulging in those extravagant manifestations of sensibility which, if permitted, are apt to endanger the soundness of the mind.

Before proceeding to consider the cure of scrofula, it will be necessary to direct our attention to the different conditions of those who are afflicted with this disease. It is frequently engrafted on a feeble and attenuated frame; but it exists also in combination with

* *Dr. James Clark*, On the Influence of Climate. See also art. CLIMATE, in this work.

a plethoric habit, perhaps deceiving with a false shew of strength; the first of these forms being often exemplified among the poor, the second among the rich, although not by any means uniformly so. Hence a broad line of distinction arises between the methods of treatment adapted to such different types of the disease. In the former a generous diet and stimulating remedies are required; in the latter spare living, moderate evacuants, and local depletion are necessary: both, however, demand the employment of those tonic means which tend to communicate vigour to the constitution, and which increase that power of resisting the occasional causes of disease and repairing the injuries of the frame; a power which it is the remarkable characteristic of the scrofulous constitution to be devoid of, or to possess in a very imperfect degree.

To consider, in detail, the method of treating each of the extensive class of strumous affections would involve us in the repetition of what will be found under various specific heads of disease, and swell the present article far beyond its due limits. It will be sufficient, after premising a few general remarks, to pass in review the chief of the numerous remedies which have been held in estimation for the cure of scrofula; pointing out, as we proceed, the particular circumstances under which they have appeared to produce most benefit.

The management of scrofulous patients, in respect of air, exercise, clothing, and diet, must be conducted upon the principles already laid down, but varied according to the exigencies of each individual case, still keeping steadily in view the improvement of the constitution.

On the subject of diet, it is deserving of notice that, besides those varieties before alluded to, a very nourishing food may be prepared by boiling a small bag filled with suet in cow's milk. We have made trial of it on the recommendation of Dr. Paris,* and found it to answer remarkably well in cases of scrofulous marasmus when almost every other article of diet caused irritation of the bowels, and passed through undigested. It bears a near resemblance to goats' milk, but has the advantage of being more astringent.

Some eminent writers have not hesitated to state their belief that air, exercise, and proper clothing and diet, comprise the best and only method of controlling and removing scrofula. To such an opinion we cannot subscribe, although we fully acknowledge the vast importance of attending to these particulars, and the natural progress of cases of external scrofula towards a cure, after the age of puberty. An amusing instance of the effect of air and exercise alone in the cure of a scrofulous sore in the leg is afforded by the case of a young nobleman, who, after suffering under a variety of regular treatment, had a hole cut in his stocking, and was sent to range the fields, when a crust soon formed, and the ulcer healed. It is worthy of remark that this individual became afterwards insane.

1. *Evacuants.*—Although it be true, in a general sense, that scrofula is a disease of debility rather than of strength, and that profuse discharges, whether natural or artificial, prove among the most powerful of its exciting causes; yet in the early stage of many scrofulous diseases, and sometimes during their progress, a cautious employment of evacuants is found to be productive of the best effects; but it is only by a careful study of the existing symptoms of inflammation in each individual case that we are enabled to make use of depletory means with confidence and success. In strumous persons the occurrence of inflammatory symptoms is to be watched with unceasing care, and above all those of the respiratory mucous membrane, as well as of the serous membranes of the head and abdomen: a well-timed venesection in such cases may be the means of cutting short symptoms which would speedily induce the eruption of a crop of tubercles; on the fatal consequences of which, whether slow or rapid in their progress, it is unnecessary to enlarge. Leeches are often preferred from the timidity of patients and their friends, and sometimes perhaps from the indolence of medical attendants; but their effects are frequently irritating and exhausting, and, even in children, far inferior to those of the lancet. Cupping is also preferable to leeching, the ease and rapidity with which blood can be taken by this method placing it nearly on a level with venesection. The detraction of blood from the vicinity of parts suffering from scrofula, or in danger of becoming the seats of scrofulous affections, is in very many cases necessary; and in these both leeches and cupping may be employed, but under the guidance of a wise discretion, for which no general rules can be given. To promote the efficacy of sanguineous depletion, and supply its place when circumstances render it unsuitable, the tartrate of antimony may be exhibited in small doses, as a nauseant and diaphoretic; and it will sometimes be necessary to have recourse to this remedy during the progress of the tonic plan of treatment when it appears, as often happens, to be producing too much excitement. The tartrate of antimony or ipecacuan is also used, with excellent effects, in emetic doses, for the purpose of preparing the stomach for the reception of tonic medicines in many scrofulous cases.

Long-continued nausea, whether produced by sea-sickness or by the persevering use of tartar emetic, has a powerful effect in dispersing indolent tumours, and has been successfully employed for that purpose. Two cases of this nature, and one of presumed tuberculous phthisis, cured by the use of nauseants, have been communicated by Dr. Jenner; and he has expressed a hope that by such remedies we shall be enabled to effect the absorption of tubercles.* All that we know of the action

* On Diet, 2d edit.

* Baron's Inquiry, pp. 158, et seq.

of the absorbents leads us to believe that they are capable of removing tubercle; and that such an operation, to a certain extent, does really take place, is proved by the changes which that substance undergoes in its progress to the cretaceous transformation. If tuberculous masses of long standing are thus changed, what reason have we to doubt that the soft curdy matter of which they are at first composed is often absorbed and carried back into the circulation, to be converted into some less noxious constituent, or altogether expelled from the system?

The action of strong purgatives is sometimes, though rarely, required in scrofulous diseases; but the neutral salts combined with the administration of mercurials are very useful, as we shall presently point out. Moderate aperients, and those which tend at the same time to improve the powers of digestion, are required in the treatment of almost all scrofulous cases. Rhubarb and soda, and rhubarb and magnesia are well adapted to such cases; and as a mild evacuant, when the bowels are loaded, castor-oil is very serviceable.

2. *Mercurials.*—Of all the remedies employed in the treatment of scrofula, perhaps none have enjoyed a greater reputation than mercurials; but it is only from their purgative and alterative effects that they prove beneficial, and not when they produce that powerful influence on the frame which so rarely fails to ensue from their free exhibition. In the forms of calomel and blue-pill, mercury enables us to relieve the bowels from those morbid accumulations which are so apt to collect in strumous cases, and to restore to the liver its healthy action, which is rarely preserved, at least for any length of time, during the existence of scrofula. The success of a mild alterative plan of treatment, aided by the use of saline purgatives with senna, has been admirably illustrated by Mr. Abernethy;* and more exclusively in reference to the disease now before us by Mr. Lloyd.† Other mercurial preparations are also employed with benefit in different forms of scrofula: thus the hydrargyrum cum creta will be found very serviceable when the secretion of bile is faulty or deficient, whether combined with a torpid or relaxed state of the bowels, as in the early stages of mesenteric disease. The internal use of corrosive sublimate is also valuable, particularly in scrofulous ulcerations and leucorrhœal discharge; provided it be administered cautiously and in minute doses, such as the eighth of a grain three times daily. It seems to act rather by stimulating the mucous membrane of the alimentary passages, and promoting perspiration, than by any influence it exerts over the secretion of the liver. Mercury has likewise been employed in the form of ointment, rubbed on the skin, for the relief of scrofula, and, according to the report of Mr. Brandish,‡ with the most beneficial effects. It was his practice to use it in small quantities, continued nightly for months, but never during the cold season: it is proper to add that he avoided the full operation of the mineral, and combined its employment with the internal exhibition of liquor potassæ, with a generous diet, and the occasional use of vegetable tonics. Of this practice, in cautious and experienced hands, we are inclined to think favourably, although it must be admitted that medical opinion in the present day is adverse to the employment of mercurial frictions in scrofulous cases generally. But the local application of camphorated mercurial ointment to diseased joints and indurated testicles is now acknowledged to be in very many instances highly efficacious.*

As a sequel to the subject of mercurials, it will not be out of place to mention another remedy, less hazardous in its operation, but not of less approved efficacy in scrofula,—namely, *sarsaparilla*. We find it recommended by Wiseman,† and after a period of neglect it has been again restored to merited favour. It is a mild tonic, and well adapted to those cases where the skin is in a harsh and unkindly state: it proves a restorative to the stomach, and is found very useful in the chronic diarrhœa of strumous children. The decoction is the usual form in which this drug is exhibited, but the bulk of this preparation often renders it objectionable, particularly for children; and in most cases, both of children and adults, a much more concentrated preparation, such as the solid or fluid extract, will be found to possess many advantages. Powdered sarsaparilla, conjoined with soda, is an excellent form, though much less palatable than the extracts: it has been given with marked benefit in scrofulous disease of the tongue.

A feeble digestion, and prevailing acid condition of the stomach and alimentary tube, are the frequent concomitants of scrofulous disease; hence the employment of the *alkalies* and alkaline earths, but particularly the former, has been attended with very beneficial effects in its treatment. All the alkalies have been used with advantage in scrofula; but the liquor potassæ is that which in our hands has proved the most decidedly useful. The dose must be large, as Mr. Brandish has shewn—from half a drachm to a drachm and a half three times daily, for an adult; given in malt tea, mild ale, or infusion of hops.‡ Carbonate of soda is generally more agreeable to patients, and may be given freely with good effect, especially when combined with sarsaparilla, cinchona, or bitters. The volatile alkali (carbonate of ammonia) has also been administered in scrofulous cases,§ and with excellent results. But its stimulant and diaphoretic properties render it suitable only for cases in which there exist

* On the Constitutional Origin of local Diseases.
† On Scrofula.
‡ On the Use of Caustic Alkali in Scrofula, &c.

* *Scott*, Observations on the Treatment of Chronic Inflammation, &c.
† Vol. i. pp. 410 et seq.
‡ *Brandish*, Op. cit.
§ *Charles Armstrong*, on Scrofula.

torpor, languid circulation, impaired appetite, and a dry husky state of the skin, such as we often meet with among the poor, and in that form of the disease so well characterised by Alibert,* under the designation of *scrofule momie*.

A considerable number of the remedies which have enjoyed reputation in the treatment of scrofula, have belonged to that class which increase the secretion of urine. The alkalies which we have just considered are of this description; and besides these we may enumerate the muriate of lime, the muriate of barytes, and nearly all the mineral waters to which scrofulous patients are in the habit of resorting. These saline remedies not only promote the secretion of urine, but act gently on the bowels, and thus, especially when conjoined with the exercise and free air enjoyed at a watering-place, increase in a remarkable degree the powers of digestion, and so prove beneficial to the scrofulous invalid. In their specific effects we have no confidence. Muriate of barytes is now very rarely prescribed; and muriate of lime almost as seldom, excepting in the combined form in which it is furnished by nature at various mineral springs.

The opinions which we have already expressed regarding the nature of scrofula may have prepared our readers to look for the most valuable remedies in this disease under the head of *tonics*. Even inflammation, which in most cases requires depletory measures, is, when combined with scrofula, and thus rendered indolent in character, often successfully treated by tonic remedies: this is especially true of those inflammatory affections which are attended with little or no constitutional disturbance, as in strumous inflammation of the conjunctiva, where the efficacy of cinchona has so long been acknowledged. This admirable drug is, without doubt, the most efficacious of all the tonics used in scrofula, and, from the concentrated form in which it can now be exhibited, the most generally available. The virtues of cinchona in strumous diseases were first brought into notice by Dr. Fordyce,† and from that time until now it has enjoyed more or less favour. Sulphate of quinia has now very generally superseded it, having become a remedy of every day prescription. It is one, however, which requires to be carefully watched, and immediately intermitted when it produces, as it often does, a degree of feverishness. Other vegetable tonics and bitters have been administered with advantage in scrofula, such as calumba, gentian, and hop; and in Germany coffee made from roasted acorns has found many advocates, although, as Benedict‡ informs us, it often proves constipating and induces a feverish state.

Of the metallic tonics used in scrofula, iron is that which has been found the most beneficial. The best forms of exhibiting it are the vinum ferri, the muriated tincture, and the subcarbonate in powder: the chalybeate mineral waters also have often proved eminently serviceable in this disease.

Arsenic is a metal of much more questionable efficacy; but we have known it productive of great benefit in allaying the pain attending strumous affections of the bones and periosteum. Gold was given by Lalouette in scrofula, and its use has lately been revived by Chrestien as a remedy for syphilis.

In the advanced stages of scrofulous affections, one of the most permanent and exhausting symptoms is profuse perspiration; for the purpose of checking which the mineral acids, particularly the sulphuric and nitric, have been given with great benefit: their use, however, is apt to cause irritation of the bowels, and thus we are forced to alternate them with opium, or altogether to abandon their employment. The root of the tormentil has been recommended as a substitute, but it seems to possess very feeble powers of repressing either perspiration or diarrhœa. The mineral acids are also useful in restoring the tone of the stomach, and thus they frequently prove of great service in the treatment of scrofula.

Scrofula, as a chronic disease, often accompanied with feeble action of the stomach, and indeed of all the assimilative organs of the system, seems naturally to require the exhibition of stimulating remedies. In regard to dietetic stimulants, animal food, as we have already stated, is proper in a large proportion of strumous cases, and in some ale and wine may be given with great advantage. Of these, ale is the more nutritious and less heating, and when sound and well seasoned with hops, it proves in many cases a valuable auxiliary to the medicinal treatment of scrofula,—an opinion which is not given on theoretical grounds or the mere authority of others, but from what we have had frequent occasion to observe. Bitter tinctures have been prescribed in this disease, and that of Peyrhile, which contains also a proportion of alkali, was long a favourite among the French. Its effects, however, are known to have been often injurious, because too stimulating; and in the present day it is seldom or never employed.

Iodine, a powerful stimulant of the alimentary mucous membrane, and of the whole absorbent system, has lately been added to the catalogue of anti-strumous remedies; and as yet it can scarcely be said that a just estimate has been formed of its real virtues. The evidence contained in the writings of numerous authors, and the results of our own experience, prove satisfactorily that iodine possesses very considerable efficacy in removing scrofulous swellings of the lymphatic glands; and there is some reason even to believe that it is capable also of inducing the absorption of tuberculous deposits.* This remedy is successfully employed both internally and locally, in each of which modes it increases the action of the ab-

* Nosologie Naturelle.

† Medical Obs. and Enquiries, vol. i. p. 184. See also *Fothergill*, ibid. p 303.

‡ Handbuch der practisch. augen heilkunde.

* *Gairdner*, On Iodine, pp. 52 & seq.; also, Baron's Inquiry.

sorbents; and in the latter it likewise often induces suppuration of strumous tumours, and thus hastens their removal. After attracting for a time the attention of the medical profession, iodine was beginning to experience a degree of neglect, when the appearance of M. Lugol's Memoirs restored its reputation.* His extensive series of experiments in the employment of this substance have placed in a very clear and convincing light the powers which it possesses of controuling and even curing scrofula. The trials which we have made of it serve to confirm the representations of M. Lugol; but we are ready to admit that his strong partiality in its favour may in some instances, perhaps, have led him a little beyond the limits of legitimate induction. For farther information regarding the employment of iodine in scrofula, we beg to refer to M. Lugol's last memoir, where a full account will be found of his most improved method of administering this powerful drug. Iodine, like arsenic and some of the mercurial preparations, is apt to cause pain of stomach, and in some instances headach; and when taken in excess, to produce an inflammatory condition of the alimentary mucous membrane, diarrhœa, and even bloody motions. The first of these symptoms is relieved by wine of cinchona, but the others require that the remedy be discontinued; and when resumed, that the dose be reduced. In cases where iodine has produced debility and loss of appetite, while manifestly reducing the scrofulous swellings, we have obtained a return of health and continued diminution of the tumours, by administering in its place sulphate of quinia with extract of sarsaparilla and aromatic sulphuric acid. The evidence of many practitioners, whose veracity and correctness of observation are above suspicion, proves that iodine, when long continued in full doses, frequently produces great weakness and emaciation; but M. Lugol is disposed to throw doubt on this opinion, and he even asserts that, in his experience, thin females have not become emaciated, nor corpulent ones lost flesh. It ought to be remarked in explanation of this discrepancy, that the doses which he prescribes are usually small, always moderate, and much diluted; and that he endeavours to accomplish by long perseverance what others have attempted by rapidly pushing the remedy to its utmost limit. In these particulars, we conceive, consists the superiority of M. Lugol's mode of treatment. It is proper to state here, that he also avails himself, in the treatment of scrofula, of the auxiliary means of air, exercise, warm clothing, and good diet; and employs, besides, baths of watery vapour, of iodine, and of sulphureous water.

The use of *baths* in the treatment of strumous affections is of great value, the kind of bath made choice of being determined by the existing state of the patient. Sudden immersion in cold water, and especially sea-water, has long been an approved remedy in scrofula; but when the strength of the patient is so reduced that no kindly glow follows, and when there is decided feverishness, the cold plunge-bath is not admissible. In such cases the warm-water bath, and still more that of vapour, will be found highly soothing and restorative. To weak scrofulous invalids, the well-managed application of steam has very often proved signally beneficial. A greater degree of excitement may be communicated to the cutaneous surface, when the general torpor of the system or the indolence of the diseased parts demands it, by the employment of warm saline water, or impregnating the water or steam with irritating gases, such as sulphurated hydrogen, carbonic acid,* chlorine, or iodine. The use of baths of every kind ought always to be followed by friction; and this alone is a valuable mean of restoring the healthy actions of the skin, and furnishing a substitute for that bodily exercise which the condition of the scrofulous patient often disables him from using. In cases of abdominal obstruction and affections of the spine and joints of the extremities, the great benefit derived from friction is attested by all who have seen it carefully practised.

Other modes of stimulating the scrofulous patient are afforded by electricity and galvanism: hitherto these have been employed principally as local remedies for the dispersion of strumous swellings, and with excellent effects;† but they will be found equally, if not more beneficial, as general means of exalting the nervous energy, and improving the tone of the whole frame.

Like all diseases occasionally attended with pain, scrofula requires at such times the use of narcotics, and, among these, opium under various forms of preparation certainly holds the first place. Hyoscyamus, belladonna, and conium are also used with advantage; and the last obtained at one period, through the writings of Dr. Stoerck, a particular celebrity for its anti-strumous virtues. It has, both as an internal and external remedy, a considerable power of relieving pain; but none which we have observed of a truly discutient nature.

Topical treatment.—Of the local treatment of scrofula, it may be supposed that the physician ought not to speak; but, although this branch of the subject falls immediately within the province of surgery, we may yet be permitted to state generally our views regarding this matter. Long observation of scrofulous diseases has convinced us that much active surgical interference is usually injurious, and that mild and soothing modes of treatment are, on the whole, more generally successful. Thus the laying open of sinuses, the cutting away of undermined integument, and the application of strong escharotic ointments, often exasperate instead of improving the case; while small counter-openings, moderate pressure, brushing the integuments around ulcers and

* *Lugol*, Mémoires sur l'Iode. Paris 1829-1830. and Dr. O'Shaughnessy's Translation, with Appendix.

* See the Remarks of Prof. Osann on the Gaseous Baths at Eger. Osann und Trommsdorf Die Mineral Quellen, etc. Berlin, 1822.

† *Underwood*, Surgical Tracts.—*Birch*, on the Medical Application of Electricity.

fistulous openings lightly with nitrate of silver; and the application to strumous sores of bread-and-water poultices, astringent washes, lime-water, and the black mercurial lotion, proves very serviceable. When a scrofulous ulcer is highly irritable and painful, the bruised fresh leaves of the hemlock applied as a poultice seldom fail to give relief. In ulcers of the tongue, carrot pulp and Peruvian balsam are the best applications.

Indolent scrofulous tumours, when the health is little reduced, may be dispersed or made to suppurate by continued pressure or by blistering, which can be employed when the situation of the swelling will not admit of pressure. As soon as suppuration has taken place, and the matter approaches the surface, it ought to be evacuated by a small puncture, which will hasten the cure and diminish the chance of an unseemly scar. When the parts continue inflamed and hardened, poultices of bread and water, or rags dipped in cooling lotions, are the best applications; but when the discharge is considerable, finely carded cotton with gentle pressure checks the profuse secretion, and gives comfort to the patient. In those sudden depositions of fluid which sometimes occur in strumous cases, it is not always prudent to make an opening as soon as fluctuation can be detected; for by a little delay and soothing means we have not unfrequently known the fluid to be wholly absorbed.

The eczematous and impetiginous eruptions which occur in scrofulous individuals are greatly benefited by astringent applications, such as the liquor subacetatis plumbi and liquor aluminis compositus; and when these diseases have proved obstinate, the unguentum picis will often completely remove them This last application we have found particularly efficacious in those crops of psydracious pustules and extensive exfoliations of the cuticle which are so frequently seen on the fingers of scrofulous females and delicate children.

The tumid upper lip, so distinctive of scrofula, and often amounting to a deformity, may be greatly reduced or altogether removed by the repeated application of nitrate of silver. When the ulcerated fissures of the lip are very painful, relief will be obtained from the hemlock poultice, and nitrate of silver can be afterwards had recourse to.

Strumous enlargements of the tonsils were formerly treated by excision, and cases requiring this procedure do sometimes occur: the practice is as old as Celsus, and is still a favourite with the Baron Dupuytren; Dr. Hosack of New York has also lately borne testimony to the safety and advantage of this operation. When it is not absolutely demanded, the employment of iodine, leeches to the throat, the light application of nitrate of silver to the tumours, and a gargle of oak-bark, will generally prove sufficient, if not for a complete cure, at least to keep the swellings within moderate bounds.

Scrofulous diseases of the bones and joints require, in their first stage, local depletion, and at a more advanced period counter-irritation by croton oil, blisters, tartar emetic ointment, caustic issues, or moxa. The warm-water douche and careful friction are also eminently useful in indolent cases. A very successful plan of managing diseased joints has of late been made public by Mr. Scott,*—consisting of the application of camphorated mercurial ointment, pressure, and complete rest of the affected articulation without confinement of the patient.

When all hope of recovering a diseased portion of the body is at an end, the question immediately presents itself whether such part ought not to be removed by an operation, and the patient thus freed from what is in itself useless, perhaps burdensome, the cause of constant irritation, and in many cases of exhausting discharge. Scrofulous bones and joints are peculiarly of this description, and the question of their amputation is seldom determined without the concurrence of the physician. It has been asserted that amputation in such cases merely puts off the evil day, and that the patient, at no distant period, is destroyed by scrofulous disease of some other and more important organ; but the futility of this opinion is daily attested by the numerous living instances, not only of those who have suffered amputation for scrofulous affections in early life, but of multitudes of others who have survived with contracted and distorted limbs from the ravages of the disease. In considering the propriety of amputation, it is necessary to determine how far the continuance of the affection brings the patient's life into hazard, and whether he has still sufficient strength left to undergo the operation. It is truly surprising to observe how small a degree of vital force is adequate to carry a patient safely through an operation under such circumstances; but it must be remembered that amputation, severe as it certainly is, removes the very sources of irritation and exhaustion which are rapidly undermining life. This operation is nugatory when another important joint, or a vital organ, as the lungs or bowels, is already the seat of incurable disease; and in such cases unquestionably it should not be performed. Great caution, however, is required in making our final decision; for every practitioner of experience has seen instances where the symptoms of visceral disease appeared almost to preclude hope, and yet have yielded on the removal of the local irritation, and a cure has been the happy result.

(W. Cumin.)

SEDATIVES, from *sedare*, to calm. These are medicines which directly depress the energy of the nervous system, and diminish preternaturally increased action. They exert an immediate influence over the nervous system, by which its energy is either greatly weakened or wholly destroyed. They thus have a two-fold action, first, upon the nervous system, and, secondly, through it upon the

* Observations on the Treatment of Chronic Inflammation, &c.

muscular: if the dose be large, the individual quickly loses his volition and becomes vertiginous; the nerves of sensation cease to respond to ordinary impressions; consciousness fails; syncope supervenes, and in a few seconds life is extinct.

With the exception of Dr. Young* and Dr. Billing,† medical authors in general have confounded sedatives with narcotics. There is no doubt, however, that the distinctive characteristics of both classes are well marked, and that the boundaries of each may be readily traced. The only circumstance, indeed, which has prevented the distinction from being at all times perceived, is the transitory nature of the excitement which follows a large dose of a narcotic, and the rapidity with which the symptoms of diminished sensibility and mobility supervene, as if they were induced without any previous increased action. In the operation of every narcotic the depressing effect, therefore, is preceded by increased action; and both the degree of the collapse and the rapidity of its appearance depend on the extent of the previous excitement. In small or moderate doses, narcotics augment the force and increase the frequency of the pulse, promote the secretions, and elevate the powers both of the body and the mind, and if these doses be repeated at proper intervals, this excitant effect is maintained; but, if the dose be not repeated, the transitory nature of this excitement becomes conspicuous, and a state of depression or collapse follows, in which languor, dulness of sensation, and sleep ensue.

Such are the effects of a narcotic. The administration of a sedative, on the contrary, whatever be the dose, is not followed by any perceptible quickening or augmentation of the pulse, but by an immediate diminution both of its force and frequency, and by a general feeling of depression, too decided to be overlooked. It is, indeed, evident that this effect is exactly the opposite of that of an excitant; and if the dose be large, not only is the sensibility diminished, but the whole power of the sensorium is at once completely paralyzed. We are perfectly aware that Majendie and others regard the sedative influence of one of the most efficient of this class of medicines, the hydrocyanic acid, as that of transient excitement, followed by an immediate state of collapse; but the result of our own experiments on living animals is adverse to this supposition: the instantaneous diminution of the general powers of the system, the prostration of strength, the stupor, numbness, sleepiness, vertigo, and depression of the animal spirits, all indicate an immediate influence on the nervous energy. With these observations in view, and with the experiments of Mr. Brodie on some poisonous substances before us, we may venture to assert that it is upon the nerves of sensation chiefly that *direct* sedatives operate.

When sedatives are taken into the stomach, if they do not destroy life, their influence is much weakened after a certain time has elapsed, and soon afterwards it altogether ceases. It may, however, be maintained in the same manner as that of narcotics, by the repetition of the dose at moderate intervals; but the impression becomes weaker after each renewal of it, until it is almost lost, unless the dose be greatly augmented. If these statements be correct, it is evident that sedatives operate directly on the nerves of sensation, and that this effect is not the result of a stimulus rapidly exhausting the excitability of the nerves, but of a direct impression of a peculiar kind on the nervous system, which instantaneously destroys the susceptibility of the nerves for receiving impressions from external stimulants.

Owing to the ideas which we acquire in early life, the effects of excitants are connected with mechanical impressions, and, therefore, the mind has less difficulty in admitting the hypothesis that every instance of collapse must be preceded by a previous state of excitement, than that something is either abstracted from the nerves, or that some alteration takes place in these organs, which diminishes their faculty of receiving impressions. It is true that no organic change can be detected in the nerves of animals killed by sedative poisons, and we are equally unable to affirm from inspection that any thing has been abstracted from them, yet that some change has occurred is undoubted, as they are no longer susceptible of being excited.

Whether we can assume that the sedative effect is immediate, not secondary, is questionable; but we imply its direct character from the local effect of powerful sedatives where they are applied in small quantity to a limited portion of the surface of the body; as, for example, if the finger be held over the mouth of a bottle of hydrocyanic acid, it is numbed, and it continues so for a considerable time without any extension of this effect to the rest of the body. When the quantity is larger, their influence ceases to be partial, and is extended over the system; and when it is very large, the same rapid destruction of life follows as when the sedative is taken into the stomach. Sedatives consequently differ from many of the other classes of medicines, in their effects being more regulated by the extent of the dose than by the state of the body. Upon the whole we conceive that there are sufficient reasons for separating sedatives from narcotics, and allotting to each a distinct place in the arrangement of the materia medica.

Let us examine their influence, as physiological agents, on the different organs of the living system.

1. *On the digestive organs.*—No sensation in the stomach is experienced when a sedative is taken into it, except occasionally that of nausea: the influence of the sedative is rendered obvious rather by the change which follows in the state of the digestive function than by any thing which can be referred to the condition of the organ itself. If the viscus be morbidly irritable, the influence of the sedative is acknowledged by the diminished suscepti-

* Introduction to Medical Literature.
† First Principles of Medicine, p. 44.

bility of the gastric nerves, by the improvement of digestion from the lessened irritability favouring the formation of a more healthy, because more slowly secreted, gastric juice.

In this respect, when the dose is moderate, the direct influence of the sedative is local and confined to a certain set of nerves, although the general system ultimately benefits by the change thus effected,—a fact daily illustrated in the administration of hydrocyanic acid in dyspepsia; whereas the influence of narcotics is invariably propagated over the system, even when they are administered in small doses.

If the dose of the sedative, however, be increased, the impression then extends to the brain, and is manifested by slight vertigo, transient insensibility, sinking of the pulse, failure of the muscular energy, particularly in the thighs, general lassitude, and mental depression. If the dose be larger, but within the limit of a poison, it must be admitted that sensations, for example weight and an obtuse pain in the forehead, are superadded, which seem to indicate previous excitement; but that this has not existed is highly probable, since we know that coma may proceed from inanition as well as from increased action in the brain, and that stimulants are frequently requisite to relieve symptoms closely resembling those requiring venesection and depleting remedies. Taken into the stomach, therefore, sedatives operate directly upon the nerves of that organ, and, within a certain limit with respect to dose, the effect which follows is strictly local.

2. *On the circulating and respiratory organs.*—When the influence of a sedative extends to the general system, the action of the heart and arteries is diminished, but not in the ratio of the impression on the nervous system. Schubarth asserts that the heart loses its contractility, but the experiments of Coullen,* with which those of the author accord, lead to an opposite opinion. In poisoning by hydrocyanic acid, the heart continues to pulsate, and the intestines continue to display their peristaltic and vermicular movements after the death of the animal, and they do not lose their contractility for some time; at least such is the case when hydrocyanic acid is taken, and it is probable that the same occurs when other sedatives are employed. As far as relates to the lungs, if sedatives be applied directly to them either in the form of gas or of vapour, the effect is both more rapid and more decisive than when they are swallowed; the respiratory function is almost instantaneously suspended; no change takes place in the blood, which retains its venous character, and, on examining the organs, nothing is perceived which can authorize the idea of excitement having existed: death, in fact, is the result of the complete destruction of muscular irritability. When taken into the stomach, the action of sedatives on the lungs is greatly modified; the blood, however, remains dark-coloured and retains its fluidity.

* Researches, &c. p. 146.

3. *On the nervous system.*—It is unnecessary to repeat that the nerves are the organs on which the influence of sedatives is chiefly and directly exerted; but little is known with regard to the nature of the impression, except that it is different from that of any exciting agent; and after the most minute inspections of the brain, the spinal cord, and the nerves, in cases of death from poisoning by sedatives, no other conclusion has been arrived at. Whatever may be the impression, it is assuredly not that which is followed by excitement.

4. *On the secerning system.*—Sedatives produce effects which, to an ordinary observer, might seem almost at variance with the foregoing opinions: thus, salivation has occasionally followed the employment of hydrocyanic acid;* and the secretion of urine is not unfrequently greatly augmented by whatever produces a sedative effect on the system. But such results do not necessarily imply previous increased vascular action in the salivary glands and the kidneys: thus we know that in the lowest condition of the nervous excitability in fatuity, salivation is one of the most ordinary attendants, and under the influence of fear and other depressing passions, nothing is more common than a sudden and copious secretion of urine. Upon the whole, we have sufficient reason for concluding that there are powers which can destroy excitability and life without causing previous excitement, or, at least, without any signs of its being discoverable. This is not the result of the administration of narcotics, and therefore we feel authorized in forming a distinct class of sedatives.

In treating of sedatives employed as therapeutical agents, we may arrange them under two heads; 1. *direct*, or those which operate by their immediate influence on the nervous system; and, 2. *indirect*, those which operate through the medium of the vascular system.

1. The first and most powerful of the direct sedatives is *hydrocyanic acid*.† This acid, as prepared for medicinal use, is one-sixth only of the strength of the concentrated acid, but it differs from it in no other particular. It is colourless, limpid, and has a penetrating odour, which causes headach, nausea, and fainting, when inhaled in considerable quantity by the nostrils. This odour has been erroneously compared to that of the peach blossom,—an error originating from the odour of the volatile oil, which is, in some instances, as in the peach kernels, blossom, and leaves, and in the bitter almond, mingled with this acid. The odour of the free acid, when well examined, cannot be confounded with that of the peach blossom.‡

* Lond. Med. Journ. Feb. 1823, p. 128.

† This name is a compound of *ὑδῶρ*, water, and *cyanogen*, (a compound substance, named from *κύανος*, *blue*, and *γίνναω*, *to produce*,) signifying a producer of blue, as it gives the blue colour to the ferrocyanate of peroxide of iron, or Prussian blue.

‡ The plan of this work forbids any detailed account of the various methods proposed by Vauquelin, Gay Lussac, Robiquet, Pessinau, Frantwain, and others, for preparing the medicinal hydrocyanic acid; but it may be useful to describe the following

The pure acid is extremely volatile, and even the diluted or medicinal acid is so much so as to be greatly weakened when not carefully preserved. It is also spontaneously decomposed when it is not kept in a cool place: the best method of preventing this decomposition is to place the bottles containing it in water, or in porous jars saturated with moisture. In prescribing hydrocyanic acid, it is essential to know that it is decomposed by the aqueous solutions of chlorine and the oxides of antimony, and is precipitated by nitrate of silver and sulphate of copper. These substances are, therefore, incompatible in prescriptions with hydrocyanic acid, but it may be combined with the salts of iron if no alkali be present. This acid is the active principle of laurel water, the distilled water of the leaves of the prunus *lauro-cerasus*; cherry water, distilled from the bark of the cluster cherry, prunus *padus*; the kirch-wasser of the Germans, which is a spirit distilled from the fruit of the same species of prunus; and the oil of bitter almonds, now occasionally employed as a medicine, and very generally in confectionary.* But along with the acid in these and similar preparations, there is a volatile oil, the odour of which, as we have already stated, is very distinct from that of the hydrocyanic acid, is stimulant, and possesses poisonous properties nearly equal to those of the acid.† It is, however, not a direct sedative, but resembles a narcotic in its operation: thence the effects of the oil of bitter almonds and laurel-water differ considerably from those of free hydrocyanic acid.

Concentrated hydrocyanic acid cannot be employed as a medicine.* The same circumstance, the powerful influence of this acid on the nerves of sensation, which renders it so awfully formidable when it is taken in doses sufficient to produce its poisonous effects, renders it in the hands of the prudent and well-informed practitioner, when its dose is judiciously regulated, its administration properly timed, and its effects are carefully watched, a remedy possessed of powers which cannot be obtained from any other substance, and it is, therefore, extensively employed.

The use of hydrocyanic acid is indicated in diseases connected with a state of excessive or morbid sensibility, and those depending on a highly irritable state of the nervous system. This general statement is not solely influenced by the opinion which we maintain of its direct sedative power, and were the assertion that it produces at first a transient excitement capable of demonstration, it would not affect in any degree the administration of the acid; for as this excitement is said to be of a very transitory nature, it need not be taken into account in estimating the sedative powers of the remedy. In idiopathic fever hydrocyanic acid has been rarely if ever employed; it has, however, been supposed to act beneficially in hectic, moderating the force of the circulation and suspending the night-sweats which always accompany this symptomatic fever;† but, in reference to phthisis, the eulogy bestowed by some practitioners on this acid has not been merited. Neither, with the exception, perhaps, of phrenitis, is it calculated for the relief of the diseases classed by nosologists under the title Phlegmasiæ: even in phrenitis we have had no experience of its utility, but knowing that the inflammation of the membranes of the brain morbidly augments the general sensibility, as illustrated by the impatience of light and of sound, we are disposed to recommend its employment as an adjuvant to other remedies in this state of the brain. In pleurisy it has

processes, by which any practitioner can readily prepare it for himself.

1. Put into a wide-mouthed phial a solution of one part of bicyanide of mercury, dissolved in eight parts of distilled water, and pass through it a stream of sulphuretted hydrogen gas, extricated in another phial from a mixture of equal weights of sulphuret of iron and strong sulphuric acid, diluted with two parts of water. The gas must be passed as long as any sulphuret of mercury in the form of black powder is formed; the fluids then filtered, and any excess of sulphuretted hydrogen removed by agitating the solution with a little carbonate of lead, and filtering a second time.

2. Put into a phial twenty-two grains of cyanuret of potassium, and pour over it a solution of fifty grains of pure tartaric acid in six fluid drachms of distilled water, and eight of rectified spirit. After agitating the phial occasionally, secure the stopper, and set it aside until the precipitate falls to the bottom: then decant the clear acid. The acid thus formed should contain one grain of hydrocyanic acid in every fluid drachm, which is easily ascertained by adding in small quantities to a given portion of it peroxide of mercury finely levigated, as long as agitation enables the acid to take it up. By dividing the weight of the peroxide dissolved by four, the quotient expresses the quantity of real acid contained in the diluted acid. No heat should be employed.

* Hydrocyanic acid is found in the leaves and kernels of almost all the plants of the natural order Amygdaleæ, and in the pips of some of the Pomaceæ and Aurantiaceæ; it is formed when copaiba is distilled with diluted nitric acid.

† When the volatile oil of bitter almonds is redistilled, the first portion which comes over smells strongly of hydrocyanic acid, and affords indications of its presence when tested; but it smells very faintly of the peach-blossom: the second portion exhales a more powerful odour of the peach-blossom than the first, but less of that of the hydrocyanic acid. The first portion operates as a powerful direct sedative in the same manner as free hydrocyanic acid; the second, besides operating primarily as an excitant, produces violent convulsions when it poisons. What remains in the retort, if the distillation have been carried far enough, crystallizes on exposure to the air, and absorbing oxygen, acquires all the properties of an acid; this is completely inert on the living system. Vogel has suggested that these changes depend on the process, and he supports his opinion by the fact that a quantity of bitter almonds, which, if made into an emulsion, may be swallowed with impunity, when distilled would yield a product more than sufficient to destroy the life of one individual.

* For an account of its poisonous influence on the animal system, as well as that of the diluted acid, the oil of bitter almonds, and laurel-water, with the modes of detecting these poisons and of counteracting their effects, we must refer our readers to the article TOXICOLOGY.

† Historical and Practical Treatise on the Internal Use of the Hydrocyanic Acid, &c. By A. B. Granville, M.D. &c. p. 59. 1820.

been found beneficial in moderating the cough, one source of exasperation of the inflammation of the serous membrane; but beyond this it has no pretensions to be regarded as a remedy in this disease.

In the exanthemata, except as an external application, hydrocyanic acid holds forth no prospect of benefit. In the state in which it is found in the bitter almond, it was employed as an external sedative so early as the time of Celsus in several external diseases; his formula in a painful pustular disease, which he describes as peculiar to infants, is the following: "lapidis, quem pyriten vocant, partes octo, cum quinquaginta amaris nucibus miscetur, adjiciunturque olei cyathi tres."* But even as an external application, the volatile oil of bitter almonds requires to be used with much caution, and Coullen has recorded the case of a child killed by the leaves of the prunus *lauro-cerasus*, applied to a sore on the neck.† The free acid has been recommended by the author of this article in the proportion of ℥iii to ℥vi of bitter almond emulsion, as a lotion in impetigo or running tetter. In such cases also, when the irritability is very considerable, it may be combined with the acetate of lead according to the following formula:

R. Acid. hydrocyan. ℥iv.
Acet. plumbi, *gr.* xvi.
Alcoholis, ℥i.
Aquæ distillatæ, ℥viiiss. M.

This lotion not only soothes the irritability of the diseased surface, but also disposes the skin to renew its healthy action, and is productive of the greatest comfort to the patient: it has been found very useful in prurigo *inveterata*, in the various forms of psoriasis, and several other skin diseases attended with itching and tingling.

In passive hemorrhages no advantage can be expected from hydrocyanic acid; but in active forms of the disorder, much confidence may be placed on the internal use of it. In hemoptysis, by rapidly augmenting the dose from three minims (the medium dose) to twelve minims, or until the pulse begin to afford indications of the deleterious influence of the medicine, we have seen the most happy results in the absence of any organic affection. In phthisis, as we have said, the powers of hydrocyanic acid have been much overrated; nevertheless as a palliative it is not without its value. In small doses frequently repeated, it diminishes the hardness and frequency of the cough, and lessens the general hectic tendency; but more is not to be expected from it in this respect than from some of the narcotics. It has, however, one advantage over narcotics, namely, that, besides moderating the cough, it frequently favours sleep without exciting those sweats which are too often augmented when opium is employed. At the same time, as its tendency is to lower the powers of the system, it is in the early stages only of this disease that it can be regarded as likely to prove beneficial even as a palliative. Its employment in phthisis, in the combined state in which it is found in laurel-water, is, indeed, of no recent date, most of the old works on consumption enumerating laurel-water amongst the means to be employed for soothing the cough. From some experiments made by M. Jorg, at Leipsig, we might infer that it would prove injurious in the early stage of the disease, as well as in every inflammatory affection. This physician exhibited the cherry laurel-water in doses progressively increased from five to twenty-five, and finally to one hundred and twelve minims. He states that the symptoms were those of concentrated action of the brain, a sensation of weight in the head, drowsiness and torpor of the intellectual functions, lassitude, retardation of the pulse, and headach, preceded by a dull pungent pain of the head, chiefly in the region of the optic nerve. It also was attended with symptoms not unlike those of bronchitis. M. Jorg refers these symptoms to plethora of the cerebral vessels, but they may depend on paralysis of the brain itself. These observations are at variance with our own experience. We have found the laurel-water and also free hydrocyanic acid almost specific in that affection of the trachea which has been termed phthisis trachealis, and which is often as fatal as tubercular phthisis. The natural combination of hydrocyanic acid in the bitter almond emulsion is also an excellent vehicle for the administration of the compound powder of ipecacuanha in the above-mentioned diseases.

In affections of the mucous membrane, hydrocyanic acid is a much less equivocal remedy than in the diseases already mentioned. In chronic catarrh, and under certain circumstances in dysentery, sufficient proofs of its efficacy have been recorded. In the latter disease, when given at the same time with full doses of calomel, to the extent of four or five minims for a dose, in the bitter almond emulsion, and repeated at short intervals, it allays irritation and improves the secretions and excretions of the intestinal canal. On the same principle its power of allaying irritability, and thereby favouring a slower and consequently more healthy secretion of the gastric juice, the author of this article was induced to recommend its employment as a sedative in dyspepsia.* Dr. Elliotson prosecuted this suggestion, and laid the results of a very extended trial of its powers in St. Thomas's Hospital before the profession.† In dyspeptic affections it may be combined with the decoction of Iceland liverwort, infusion of calumba, or the extract of sarsaparilla; or it may be administered in water, from three to five minims for a dose, with the addition of ℥i. of tincture of calumba or of any simple bitter. In pyrosis it affords relief on the same principle, by allaying the morbid irritability of the stomach.

It is in spasmodic affections, however, as

* De Medicina, lib. v. c. 28, § 16.
† Researches, &c.

* See Granville's Historical and Practical Treatise on the Internal Use of the Hydrocyanic Acid. First Edition, 1819.

† Numerous Cases illustrative of the Efficacy of Hydrocyanic or Prussic Acid in Affections of the Stomach, &c. 8vo. 1820.

may be readily conceived, that the sedative powers of the hydrocyanic acid are most conspicuous. In spasmodic asthma, even when the pulse is small, irregular, and often not easily distinguished, we have seen it act almost instantaneously, relieving the oppressed state of the pulmonary circulation, and restoring the free action of the respiratory organ. In hooping-cough, also, this acid displays the most striking influence when early resorted to and judiciously administered. After emptying the stomach with an emetic, and purging briskly, it may be immediately administered three or four times a day, in doses of one or two minims, according to the age of the patient, in ℥iß of the bitter almond emulsion, sweetened with a few drops of syrup of tolu. It is seldom necessary to change the prescription, except to increase the dose of the acid, until the cough ceases, which generally occurs in less than a month or six weeks after commencing the use of the remedy. It is requisite to confine the patients to a graduated temperature, and to restrict them to a milk and vegetable diet. In epilepsy, chorea, hysteria, and tetanus, the results of the trials of hydrocyanic acid have been of a description which do not admit of any decisive opinion of its value in these diseases. In hydrophobia it has been tried both in this country and on the continent; in a few instances it appeared to allay the violence of the paroxysms;* but, as may be supposed, the effect was transitory, and in no instance has it warded off the fatal termination of the attack.

The essential oil of bitter almonds has been proposed as a substitute for hydrocyanic acid, on the plea that the strength of the medicine can be more certainly determined, and that it is less likely to suffer decomposition than the free acid from the influence of air, light, and variations of temperature. Twelve minims of the volatile oil of bitter almonds, dissolved in a fluid drachm of olive oil, and formed into an emulsion with mucilage, are regarded as equivalent to four minims of the ordinary medicinal hydrocyanic acid. An objection, however, to the use of this oil is the excitant property of the volatile oil with which the hydrocyanic acid that it contains, is mixed; it also produces an uncomfortable effect on individuals of a peculiar idiosyncrasy. Some people cannot eat even a single bitter almond without suffering severely from nettle rash, attended with vomiting and vertigo; a circumstance, as we have already stated, depending on something in the kernels independent of the hydrocyanic acid, which is further demonstrated by the fact that the sweet almond sometimes causes the same inconvenience, although no hydrocyanic acid has been detected in it.

A more useful substitute for the hydrocyanic acid than the volatile oil of the bitter almond, is the *cyanide of potassium*, which, although it does not hold a place in any of the British pharmacopœias, yet possesses sedative properties equal to those of the free hydrocyanic acid. In solution it is a hydrocyanate; but in this change it loses none of its sedative properties. One part of the cyanide and eight parts of water form a solution which may be administered in the same doses as the hydrocyanic acid; and in this state it has been successfully employed in neuralgic affections by Dr. Buttigny and Dr. Lombard of Geneva. They have also used in the same disease an ointment compounded of five grains of the cyanide and one ounce of lard. The cyanide has also proved useful in rheumatism.*

In closing our account of this powerful sedative, candour obliges us to notice some experiments and facts which have been published on the opposite side of the question, with regard to the mode in which its influence on the nervous system is effected. The author of this article supports the opinion that it operates directly on the nervous system, whilst Majendie, Orfila, and others contend that it is previously absorbed. The only experiments we shall notice are those of Dr. Krimer of Aix-la-Chapelle, who found that when it is applied directly to the neurilema of the nerves, or to the surface of the brain and spinal cord, it displays no activity. He also supposes that he has ascertained that it does not kill, even when applied to the tongue, until it is evaporated by the heat of the mouth, and is absorbed into the pulmonary circulation; destroying life first by diminishing the action of the heart and arteries, and then by extinguishing the energy of the spinal cord. Dr. Krimer found that when the arteries and veins of a part are tied and the nerves left free, if the acid be applied to a wound it produces no effect; but the instant the ligatures are removed, it displays its power: on the other hand, also, death occurs when the nerves are divided if it be introduced into the vessels. When all the vessels of the stomach, says Dr. Krimer, are tied, although the nerves remain entire, hydrocyanic acid when introduced into the stomach does not produce its usual effect; but it operates immediately when placed on the tongue, and in thirty-six minutes it can be detected in the blood by reagents: such is the case, also, when it is inhaled, without the vapour coming in contact with the nerves of the tongue.

Notwithstanding the apparent conclusiveness of these experiments, we cannot accord with the inferences deduced from them. For instance, we cannot conceive how the acid can be taken into the pulmonary circulation, and yet not act on the nerves in its vicinity; and an assumption is made respecting pulmonary absorption, which requires to be proved. On these accounts, and from having witnessed the instantaneous effects of this acid when taken in large doses, we see no reasons sufficient to alter our formerly expressed opinion regarding its mode of action.

* See Transactions of the Medico-Chirurgical Society of London, vol. xiii. p. 298.

* A method of obtaining this cyanide in a state of great purity has been lately discovered by Mr. R. Lamins.

Tobacco is another sedative of great power. The experiments of Mr. Brodie have rendered it probable that there are two efficient principles in tobacco; one, an *empyreumatic volatile oil*, which operates directly on the brain and the nerves of sensation, or on the sensibility of the system; the other a saline substance, *(nicotina,)* which appears to influence chiefly the motor nerves, confining its sphere of action particularly to the heart, which it renders insensible to its natural stimulus, the blood, and thereby causing death. In whatever manner this volatile oil is procured, its effects are so powerful on the animal economy, that, when it is applied to an abraded surface, or introduced into the rectum, it causes almost instant death.* When tobacco is infused in boiling water, this volatile oil is partially taken up by the liquid, and produces the sedative effects which always more or less result from the exhibition of tobacco enemata; but the greater part of the influence of the tobacco clyster is due to the nicotina, which, in the tobacco, is probably combined with some acid that increases its solubility. The sedative influence of nicotina is such that the action of the heart ceases even before that of the diaphragm,—an effect directly the opposite of that which occurs from the administration of hydrocyanic acid. The influence of both the components of tobacco is evidently directly sedative, without even the most transient stimulant effect, whether the infusion be introduced into the stomach or into the rectum.

It is remarkable, with the knowledge which the profession possess of the sedative influence of the tobacco clyster, that it should ever have been employed in cases of suspended animation: it is indicated and has been successfully used in cases of incarcerated hernia. If one drachm of the dried plant infused in a pint of of boiling water and strained, be thrown into the rectum, great muscular debility, partial insensibility, and sometimes cold clammy sweats almost immediately supervene; relaxation of the spasm follows, during which the gut is replaced. But occasionally the aid thus afforded to the taxis is not unattended with hazard; and in certain states of the system of some individuals which are not obvious, but greatly influence the action of the remedy, it is evident that it must not be inconsiderately resorted to, nor indeed at all whilst the least chance of any other means proving useful remains.† When it does not succeed, and the operation must be performed, the patients do not recover so well as those who have not been subjected to its use. The sedative influence of tobacco has also been taken advantage of, in smoking the plant for the relief of spasmodic asthma, violent tooth-ach, and some painful affections of the face.

The *hydrosulphuret of ammonia*, although less frequently employed than either hydrocyanic acid or tobacco, is a most powerful sedative, depressing the action of the heart and arteries by operating directly on the nervous system. In very moderate doses, namely five minims in a tumbler of water, it causes nausea and vomiting; and, when the dose is increased, drowsiness and vertigo supervene. It was employed and strongly recommended by Mr. Cruickshanks in diabetes mellitus, for destroying the ravenous appetite and morbid action of the digestive organs which always accompany that disease; but it has been very little used.

Two gaseous compounds of hydrogen, *sulphuretted hydrogen* and *carburetted hydrogen gas*, exert a powerful sedative influence on the animal economy, which proves rapidly fatal to animal life, if breathed, even when largely diluted with air. The former is noticed here rather with the view of alluding to the share which it has in causing the depression that always occurs in those febrile affections in which it is extricated largely in the intestinal canal, than to refer to its therapeutical properties, although its employment in phthisis has been suggested. There is undoubtedly a copious evolution of it in all low fevers, and its direct sedative influence on the intestinal nerves is the chief cause of the collapse which attends these diseases; to obviate this is, therefore, of much consequence, and the influence of chlorine in decomposing this gas by forming muriatic acid in combining with the hydrogen whilst the sulphur is deposited, points out an easy and effectual method of doing so. Either the aqueous solution of chlorine, or of the chloride of soda, should be administered in these cases. The presence of the gas is detected by the extremely offensive odour of the faeces; and still more decidedly by holding slips of paper covered with carbonate of lead over the vessels containing them. If sulphuretted hydrogen be exhaled, the carbonate will be immediately blackened.

The second of the above-mentioned gases, *carburetted hydrogen*, has been employed for medicinal purposes, as a sedative, in phthisis; but its use requires much caution, as, even when diluted with twenty or thirty times its bulk of common air, it cannot be respired for more than a minute or two without causing nausea, dizziness, and other symptoms of dangerous nervous depression. Although so destructive to animal life that it cannot be taken into the lungs undiluted without producing instantaneous death, yet to no gas does the system become so soon habituated; consequently the degree of dilution which is at first requisite, may be gradually reduced with impunity. The trials, however, which have been made of it as a remedy in phthisis are as yet

* This oil is gradually deposited in the wooden stems of the pipes of the Hottentots, who employ it for destroying serpents. Mr. Barrow mentions having witnessed its effects when applied to the tongue of a poisonous snake; the reptile stretched itself out, became stiff, and died in an instant.

† When the tobacco clyster produces deleterious effects, they should be immediately obviated by throwing into the rectum a strong infusion of nut-galls, or any other substance containing a large proportion of tannin and gallic acid, so as to combine with the nicotina, and by destroying its solubility, to render it inert. Brandy, ammonia, and other stimulants, should also be administered by the mouth, and artificial respiration maintained for some time, or until the sedative influence of the medicine begins to disappear.

far from sufficient to determine accurately its influence in that disease.

2. The *indirect* sedatives operate on the nervous system through the medium of the blood, either by altering the properties of that fluid so as to unfit it for affording the requisite stimulus to the brain and nervous centre, or by abstracting it in quantity sufficient to bring the brain into a similar state from defect of stimulus, or, as it were, from inanition.

The first of the sedative agents belonging to this division of the class which requires to be noticed, is *carbonic acid gas*. The influence of this gas in causing suffocation when it is attempted to be breathed undiluted, as it never enters the lungs, but causes a constriction of the muscles of the glottis, so that no air can enter the lungs, and no change take place in the blood passing through them, is supposed to be negative; thence the question, whether this gas is positively or negatively sedative? But although this gas is never admitted into the lungs in attempts to respire it, and therefore may be regarded as negatively sedative, yet there are facts which demonstrate its positive sedative properties. Thus, if the body of an animal be immersed in an atmosphere of carbonic acid gas, whilst atmospherical air is freely admitted to the lungs, sedative symptoms occur, such as weight in the head, dimness of sight, singing in the ears, vertigo, &c.; and that it even exerts a local influence on the nerves was demonstrated by an experiment of Dr. Priestley, who, having excited pain in a blistered hand by immersing it in oxygen, relieved the pain instantly by plunging the hand into a jar of carbonic acid gas. It is also a well known fact that the pain of a cancerous ulcer is allayed by directing upon it a stream of carbonic acid gas which has passed through water; and it is to the presence of this gas in the carrot and other fermenting poultices, that they are indebted for their sedative properties. On these accounts, although we have arranged carbonic acid gas among the *indirect* sedatives, yet it in some measure belongs also to the former division of *direct* sedatives.

Carbonic acid gas was at one time much employed as a sedative in phthisis: Dr. Percival introduced it as an antiseptic, and from the result of thirty cases concluded that it abates the hectic and improves the expectoration;* and Dr. Withering, who also looked upon it merely as an antiseptic, found that similar effects resulted from its administration. Favourable opinions of it were given by Dr. Dobson,† Dr. Hulme, Dr. Beddoes, and Dr. Fenwick of Durham: on the contrary, the experiments of Dr. Mnehry,‡ who gave it a fair trial in five cases without material benefit, and our own experience, have led us to place little confidence in it, even as a sedative. When it is employed, it should be largely diluted with common air; the best proportions are four parts of the air to one part of the gas.

The only other indirect sedative which requires to be noticed is *bloodletting*. It is scarcely necessary to remark that a certain quantity of the circulating fluid is required to be present in the bloodvessels, in order to support the energy of the brain and nervous centres; and, therefore, that when this proportion is diminished, the result is a sedative effect on the system. In man the average quantity of blood in proportion to the weight of the body, in a healthy adult subject, is as *one* to *five*; when a greater relative proportion exists, a diseased state of the body, plethora, takes place; when a smaller, the body becomes emaciated. If blood be suddenly abstracted from the vessels, a series of phenomena occur which demonstrate a diminished state of vitality; and if the quantity taken away be greater than a certain proportion of the whole, then death almost immediately ensues. But these effects do not depend altogether upon the quantity of blood contained in the vessels or abstracted from them, but partly upon other circumstances, which ought always to be kept in view when bloodletting is intended to operate as a sedative.

If these phenomena depend on the state of the vascular system in health, it is evident that a powerful effect must result, in disease, from the abstraction of blood, whether this be effected by opening a vein, by cupping, or by leeches. The immediate depression of the vital powers which follows this abstraction must have been early rendered obvious, from the effects of hemorrhages arising from the accidental rupture of vessels; and thence artificial means were adopted to diminish excitement by opening a vein. The syncope which succeeds is much regulated by the habit of the patient, the nature of the disease, and the manner in which the blood is abstracted; but as a particular inquiry into the morbid effects of bloodletting and the methods of obviating these are given in detail in other parts of this work, we think it unnecessary to enter into minute details, referring the reader to the articles BLOODLETTING, FEVER, INFLAMMATION, and PLETHORA.

(A. T. Thomson.)

SEX, DOUBTFUL.—Among the freaks of nature, there is none which has given rise to more erroneous ideas or more barbarous practices than those varieties in the formation of the organs of generation, which have given origin to the term *hermaphrodite*. This word, derived from Ερμης, Mercury, and Αφροδιτη, Venus, conveys the notion of an individual partaking of both sexes, and capable of both begetting and conceiving. The ancients believed in the possibility of such a combination in the human body; and enactments existed, both in Greece and Rome, ordering the destruction of infants born with confusion of the sexual organs. At Athens all the unfortunate beings considered to be hermaphrodites were thrown into the sea, and at Rome into the Tiber. In modern times it is admitted that

* Percival's Essays, vol. ii. p. 308.

† Medical Commentary on fixed Air. London, 1779.

‡ Inaugural Dissert. Gott. 1797.

no such phenomenon ever existed in the human species as a perfect hermaphrodite; although there are numerous instances of preternatural structure which gives the appearance of a double sex. In the lower orders of organized bodies hermaphrodism is common; thus in vegetables it is so prevalent as to have led some to suppose it to be an attribute of the order; and the more nearly the other classes of beings approach the vegetable, the more common is this combination of sex among them. Of this zoophytes, mollusca, acephali, and gasteropodes are examples. In these animals two kinds of hermophradism exist: in some it is absolute, that is, the animal is capable of impregnating itself, as in some of the bivalves, as oysters and muscles; but in others, as the univalves, this power is not possessed, but a union of two individuals is necessary, both, however, becoming impregnated at the same time.

We look in vain for any such admixture in the higher orders of animals, though some extraordinary approaches towards it are recorded. According to Sir E. Home* and J. Hunter † such combination is most frequently met with in neat cattle, the individuals so circumstanced being known by the name of free martins. In these, however, the testes and ovaria are always too imperfect to perform their functions. Instances are not wanting in the human species, in which, either from malformation of the genital organs in one or other of the sexes, or from a real attempt at mixture of the two in the same individual, considerable difficulty arises in deciding on the proper sex. This is the point to which the present article is more particularly directed, and it should be recollected that it is one of material importance; for upon the opinion pronounced by medical examiners may depend the employment in life of an individual, the right of inheritance to property, and the judicial decisions concerning impotence and sterility.

Sir E. Home‡ considers that all the monstrous productions hitherto noticed and described as hermaphrodites may be reduced to one of the four following classes:—1. malformations of the male; 2. malformations of the female; 3. males with such a deficiency in their organs that they have not the character and general properties of the male, and may be called neuters; 4. where there exists a real mixture of the organs of both sexes, although not sufficiently complete to constitute the double organ.

1. *Malformation of the urinary and generative organs of the male.*—Cases of this class usually depend upon imperfection of the scrotum and urethra; there is no deficiency of the natural parts, nor addition of foreign parts, but the confusion of sex arises from the scrotum being split along the middle line, each half containing a testicle, and resembling one of the labia majora of the female. The deep slit between these parallel folds of skin very much resembles the vulva, and the similarity is heightened by the circumstance of the urethra being usually split likewise in these cases, and opening in the perineum, which, having a red and tender appearance, is easily mistaken for the vagina. In consequence of the urethra terminating at the perineum, the penis is imperforate; and thus, if it be of small size, it may be supposed to be the clitoris. It is this malformation of the male organs which more than any other has given origin to mistakes respecting the mixture of the sexes. The case of the negro described by Cheselden* was of this kind. In him the scrotum was divided into two separate bags, with a deep slit between them, representing the labia majora and commencement of the vagina. Over these hung down the penis; the imperfection of the scrotum extended to the canal of the urethra,—a circumstance appropriately compared to the fissure of the hare-lip being continued through the bony palate. The penis was united by its under surface, through its whole length, to the folds of skin containing the testicles, resembling an enlarged clitoris, to which resemblance the absence of the urethra contributed. The urethra opened with a large aperture in the perineum, between the divisions of the scrotum, and from its size was mistaken for a vagina. Cheselden describes another case similar to the preceding, which he met with in the person of an European.

Persons afflicted with such malformation as we have described have not only been taken for females, but have been married as such. Adélaide Preville was married, and lived the last ten years of her life in Paris, and died in the Hôtel Dieu of that city. Giraud discovered by examination of the body after death that it was of the masculine sex, and except a false vagina, which consisted in a cul-de-sac placed between the rectum and bladder, this individual presented no resemblance to a female.† There is a very remarkable case related by Marc,‡ in which an individual, after having passed for a female for many years, was at length discovered to belong to the male sex, and was restored by public ordinance to his proper station. On the 19th of January, 1792, the curé of the parish of Ber certified the birth of a girl, and gave her the name of Marie Marguerite. This child arrived at the age of 14 without having particularly attracted the attention of the parents. It shared the bed of a younger sister, and grew up among other young persons with whom it was associated by education, exercise, and childish amusements. At this time Marie complained of pain in the right groin, where a tumour soon manifested itself. The village surgeon took it for a hernia, and applied a truss. This instrument gave too much pain to be borne, and was soon laid aside. The tumour descended, and the pains ceased. Some months afterwards the left groin was affected in a similar manner, and on the

* Phil. Trans. 1799.
† Anim. Econ.
‡ Loc. cit.

* Anat. of the Human Body, p. 314.
† Recueil périod. de la Soc. de Méd. Paris.
‡ Dict. des Sciences Méd. t. xxi. p. 91 et Jour. de Méd. Chirurg. et Pharm. Paris, Feb. 1806.

supposition of the tumour in it being also a hernia, a double truss was put on, which was as speedily thrown off as the former. At 16 years of age an offer of marriage was made, but refused by the parents as an unsuitable match for their daughter. Three years afterwards another proposal was made and broken off, after having been accepted of. Nevertheless, as Marie advanced in age, the graces of her person began to disappear; her clothes did not fit as well as before; her air and carriage had something extraordinary; from day to day her tastes changed, and became more masculine; indoor occupations seemed to interest her less, and she preferred field-work to her former duties. These masculine dispositions, and the report of the surgeon that Marie had been hurt in such a manner as to prevent her ever marrying, did not prevent a third lover from aspiring to her hand. This match was much desired by the friends on both sides, but the parents of Marie, knowing that she was not formed as other women, and recollecting that she had never menstruated, did not wish to deceive the son of an old friend, and determined on having a medical examination of their daughter. Worbe was requested to perform this office. The surprise of all was great indeed when he declared Marie to be a man. She (or he) shed tears at the announcement, and was for some months before she could be reconciled to the idea of not being a woman. At last he took the resolution of petitioning the authorities to alter the registry, and declare him of the male sex. A commission was accordingly appointed, consisting of three medical men, to inquire into the circumstances of the case, who reported that on examination they found the scrotum divided through its whole extent, each division containing a rounded body, which they recognized as true testicles. Between these parts a fleshy prolongation was observed, having a cleft at its extremity, but imperforate, covered by a process of skin, which was in reality the prepuce. The penis was but little developed; and beneath it, at about an inch and a half from the margin of the anus, an opening was discovered, caused by the abrupt termination of the urethra in the perineum. As to the rest of the body they found nothing remarkable, except a considerable developement of the breasts, resulting, as they imagined, from the form of clothing usually worn. They therefore gave it as their opinion that Marie belonged to the male sex; and the authorities declared it to be so, and ordered that the registry of birth and baptism should be altered. Dr. Worbe states that in 1816 this individual was 23 years of age, hair and eyebrows auburn, a light beard appearing on the upper lip and chin, the sound of the voice masculine, height four feet eleven inches French measure, skin very white, constitution robust, and the limbs round but muscular. The form of the pelvis did not differ from that of a male, the knees were not inclined inwards, and the hands and feet were large and strong. A year had not elapsed from the time of his metamorphosis when he was considered as one of the best farmers in the canton. On being questioned with respect to what he felt when sleeping with females, whether he had not desires different from those of others, and if curiosity had not prompted him to discover what opportunity permitted him so easily to observe, he answered, blushing, "quelquefois, mais je n'osais pas."

Dr. Schweikard* has published the history of an individual who up to the age of manhood was esteemed to belong to the female sex. He had been baptized as a girl, and regarded as such, until to the astonishment of all he demanded permission to marry a girl then pregnant by him. He submitted to an examination, when it was found that the penis was situated lower than ordinary, not quite two inches long, and a little less bulky than usual. The imperforate glans offered a slight curve towards the lower part; the inferior surface of the corpora cavernosa was deprived of urethra, but presented a channel or groove along its middle line. Behind and under the corpora cavernosa, between their root and the anterior superior part of the scrotum, a prominent oval opening was remarked; this was the orifice of the urethra, through which the urine flowed, and in consequence of its vicinity to the penis, the stream was conducted along the under surface of that organ so as to appear to issue from its orifice. The scrotum, situated below this opening, contained the right testicle only, that of the left being probably retained in the abdomen. In all other respects the physical constitution of this individual was perfectly masculine. According to his account, the desire for women and the secretion of semen were observed at puberty. He had frequently performed coition, and had, besides a child born before marriage, two other children well formed, born in wedlock. This case was evidently only an instance of hypospadias, of which malformation we have already spoken in the article IMPOTENCE; and it is a further confirmation of the opinion there advanced, that persons labouring under it are not to be considered as incompetent to procreation. It is most probable that the semen during the act of coition was conducted along the penis, as the urine is stated to have been, at least so far as to enter the vagina. A case very similar to that just mentioned is detailed by Dr. Wageler.†

The malformation of which we have now spoken is that which most frequently causes mistakes in the male, but by a careful examination of the individual the obscurity must be easily removed. There are other degrees of imperfection which are sometimes observed, but can never lead to much confusion. One of these consists in a close application of the penis to the anterior surface of the scrotum, by a continuation of the skin of the latter over the former. In such a case the penis is bound down in its unnatural situation, and the urine passes downwards; the erection of the organ cannot take place; it may become turgid,

* Hufeland's Journal, t. xvii. No. 18.

† Annales de Méd. Politique de Kopp. v. 129.

but never erect, and intromission is of course impossible. A case of this description occurred to Mr. Brand,* in the person of a child seven years of age, who had been baptized and brought up as a girl; he found a malformation of the male sexual organs consisting of the presence of such an unnatural integument. By a slight incision he liberated the restricted part, and proved to the parents that they had mistaken a boy for a girl.

Another form of lusus which has given rise to mistake of sex, is that in which the urinary bladder, or rather the rudiment of it, opens directly above the pubis, through a deficiency of the abdominal muscles and integuments at that part. In these cases the bladder can scarcely be said to exist; all that appears of it is a red fungous mass protruding through the integuments, consisting of the mucous lining of the viscus, with the ureters opening on it together with the vesiculæ seminales and vasa deferentia. The penis is always very short, scarcely exceeding two inches, and, from deficiency of the urethra, imperforate. The testicles are generally well formed, but are sometimes retained in the abdomen. Persons with this malformation are observed to vary in their sexual appetites; some being totally deficient in sexual desire, others exhibiting it in a trifling degree, while others have it strong. It may readily be supposed that persons constructed in this manner are impotent; but it sometimes happens that the vasa deferentia open in a small tubercle at the root of the penis, in which case it is possible that impregnation may be effected by the individual. It is only by such a disposition of parts we can explain the pregnancy of a young girl in Linlithgow in Scotland, stated to have resulted from her sleeping with a young person, who from a malformation, such as we have described, was supposed to be a female.† It is plain that if the seminal ducts opened externally above the pubis, such an event could not have taken place.

2. *Malformations of the female generative organs.*—There are two sorts of malformation in women which may lead to error in judging of the sex. The first consists in excessive dimensions of the clitoris. Although hypertrophy of this organ occurs most frequently in warm countries, it has also been observed in cold. Sir E. Home doubts that it ever takes place in these latitudes, and also is of opinion that even in those situations where it is most frequently observed, the enlargement never proceeds to such a length as to lead to any serious doubt. There are, however, some instances on record in which the increase in size was such as to cause the clitoris to resemble and be mistaken for the male organ. Columbus notices an instance in which it was the size of a finger. Haller observed one case in which he states that it was seven inches in length; and it has been said to reach the extent of twelve inches.* However, notwithstanding any excessive dimensions of the clitoris, an attentive observer will readily discover the difference between the genital organs of a female with such a developement, and those of a male. Thus, for instance, in a celebrated hermaphrodite exhibited in Paris and London in 1777, named Marie Auge, the clitoris was found to resemble perfectly the male organ, but it was unprovided with a urethra, and imperforate; it was situated above the other parts of generation, which presented no peculiarity, except an unusual contraction of the vagina. Schneider met with an instance in a child of two years old still more likely to mislead; he examined it after death, and found neither labia majora nor minora, nor the usual cleft between them; the clitoris was an inch and a half long, resembling a penis, with a well formed glans and prepuce, but it was imperforate, a small spot occupying the situation at which the male urethra terminates. Some lines below this organ there was an opening, by which the urine was transmitted; but this passage seemed also destined to perform the functions of a vagina, for it led directly to the uterus, and was of a length proportionate to the age of the subject; the vaginal rugæ were distinct, and at the upper part of the orifice a small opening was observed which led to the bladder, and was in fact the orifice of the true urethra. In Sir E. Home's† paper on hermaphrodites he gives an account of a Mandingo negress whose clitoris was two inches long, and of the thickness of an ordinary thumb: at first view the extremity seemed formed like a glans, but on more minute examination it was found imperforate, and not so round as a true glans, but more pointed; the clitoris was capable of erection, during which state its size increased to three inches. The other parts of generation were well formed, the urethra was situated just beneath the clitoris, which obstructed the flow of urine so much as to compel her to raise it when about to evacuate the bladder. Her person was very masculine, the mammæ were little developed, the voice was rough, and the countenance resembled that of a man. Beclard‡ has given a very detailed account of a female who was exhibited in Paris, in 1814, as an hermaphrodite, from which we extract the following. Marie Madeline Lefort was the name of the individual; she was then sixteen years of age, and in the general form of her body resembled a male; the voice was masculine, a beard appeared on the upper lip and chin, the breasts were developed, and the limbs were slightly hairy. The external genitals presented a rounded mons veneris, covered with hair, but the symphisis pubis was elongated as in the male; beneath it protruded a conoid-shaped body, twenty-seven centimetres in length, when

* Vide Brewster's Edinburgh Encyclop. art. *Hermaphrodites*, and Beck's Med. Jur. by Darwall, p. 45.

† Vide Piscottie's History of Scotland, p. 104.

* Dict. des Sciences Méd. art. *Clitoris*.

† Loc. cit.

‡ Jour. de Med. Chir. et Phar. Mars, 1815.

flaccid, but more when erect; this was surmounted by an imperforate glans, covered for three-fourths of its extent by a prepuce. Inferiorily this enlarged clitoris was furnished with a canal, which, however, did not run the whole length, but was pierced in the middle line with five small holes, capable of admitting a small probe. Beneath and behind the clitoris, there was a sulcus, bordered on each side by a narrow and short labium, which on being handled gave no sensation of containing any body like a testicle. This sulcus or fissure was very superficial, being blocked up by a dense membrane, but which gave, when pressed by the finger near the anus, the idea that it was spread over a cavity. At the anterior superior part, near the clitoris, this membrane was pierced by a round opening, which readily admitted a moderate-sized catheter. The external abdominal rings were very small, and gave no indication of containing testicles. The urine was passed partly through the opening in the membrane described, and partly through the small cribriform openings in the canal extending along the under surface of the clitoris. This was taken from her own account, as she found it impossible to void urine in the presence of the examiners. The bladder could not be reached by a catheter introduced through the large opening, but the instrument could be easily passed upwards and backwards, and in this manner it glided along the posterior surface of the membrane closing the vagina, which, being felt between the point of the instrument and the finger, seemed about twice as thick as the skin. She had menstruated regularly from the age of eight years, and on one occasion when Beclard examined her during menstruation, he observed the fluid to pass through the opening already described, and the catheter then introduced was withdrawn full of menstrual blood. She considered herself a woman, and preferred the society of men, and was persuaded that a trifling operation would render her fit for matrimony. This individual belonged decidedly to the female sex; she had many and the most essential of the female organs of generation, the vagina and uterus, the latter organ moreover performing its natural function with regularity; and those characters of the male which she exhibited were only of a secondary class, such as the proportions of the limbs and body, shoulders, and pelvis, the size of the larynx, tone of voice, developement of hair, and the prolongation of the urethra beyond the symphisis pubis: this, however, was not complete, for the canal did not extend to the extremity of the mimic penis.

The second kind of malformation of the female generative organs likely to mislead as to the sex of the individual, is a protrusion of the internal parts. The uterus when prolapsed has at times assumed so close a resemblance to the penis that it has actually been mistaken for it by medical men of the highest character. The following case came under the observation of Sir E. Home, who has given the particulars in his paper on hermaphrodites. "A French woman had a prolapsus uteri at an early age, which encreased as she grew up. The cervix uteri was uncommonly narrow, and at the time I saw her (when she was about twenty-five years old) projected several inches beyond the external opening of the vagina: the surface of the internal parts, from constant exposure, had lost its natural appearance, and resembled the external skin of the penis; the orifice of the os tincæ was mistaken for the orifice of the urethra. This woman was shewn as a curiosity in London, and in the course of a few weeks made four hundred pounds. I was induced by curiosity to visit her, and on the first inspection discovered the deception, which, although very complete to a common observer, must have been readily detected by any person intimately acquainted with anatomy. To render herself still more an object of curiosity, she pretended to have the powers of a male: as soon as the deception was found out, she was obliged to go away." There is in the Philosophical Transactions the history of an hermaphrodite which seems to be exactly similar to this, as is fully proved by the menses flowing regularly through the orifice of the supposed penis. The French physicians were, however, so perfectly convinced of her manhood, that they made her change her dress and learn a trade. To this she readily submitted, and the account says she could perform very well the functions of a man, but not those of the other sex.

3. *Males with such a deficiency in their organs that they have not the character and general properties of the male, and may be called neuters.*

This form of hermaphrodism usually takes place in individuals originally intended for the male sex, and is nothing more than the effect produced by atrophy, or absence of the testicles,—a circumstance to which is frequently joined a defective developement of the penis. The genital organs do not appear to grow with the rest of the body, but continue in the same state as at birth. In many the characters of both sexes seem mixed; in others there is a slight predominance of one or the other, discoverable chiefly by moral circumstances, such as the kind of life, habits and pursuits of the individual. An instance of this kind of deformity occurred to Hufeland at Koningsberg. An individual named Marie Dorothée Duriée, aged twenty-three years, was examined by him and Mursinna, who both declared the sex to be female, while Stark and Martens were of opinion that the same person belonged to the male sex.

A marine soldier, aged twenty-three years, in the year 1779 was admitted a patient into the Royal Naval Hospital at Plymouth, under the care of Sir E. Home. He had been there only a few days when a suspicion arose of his being a woman, which induced Sir E. Home to examine into the circumstances. He proved to have no beard, his breasts were fully as large as those of a woman at that age; he was inclined to be corpulent; his skin uncommonly soft for a man; his hands fat and short; his

thighs and legs very much like those of a woman; the quantity of fat upon the os pubis resembled the mons veneris; the penis was unusually small as well as short, and not liable to erections; the testicles were not larger in size than we commonly find them in the fœtal state; and he had never felt any passion for women. In this case the testicles had been imperfectly formed, and the constitution was deprived of the influence which it naturally receives from them. The two following cases shew a still greater degree of imperfection in the male organs: they are mentioned by Sir E. Home.

A woman near Modbury in Devonshire, the wife of a day-labourer, had three children: the first was considered to be an hermaphrodite; the second was a perfectly formed girl; and the third an hermaphrodite similar to the first. In the year 1779 the eldest was thirteen years of age, and of a most uncommon bulk, which seemed to be almost wholly composed of fat; he was four feet high; his breasts as large as those of a fat woman; mons veneris loaded with fat; no penis; a prepuce one-sixth of an inch long, and under it the meatus urinarius, but no vagina. There was an imperfect scrotum with a smooth surface, without a rapha in the middle, but in its place an indented line; it contained two testicles of the size they are met with in the fœtus. The younger one was six years old, uncommonly fat and large for his age; the external parts of generation differed in nothing from those just described except in the prepuce being an inch long. Both were nearly idiots. The immense accumulation of fat, and the uncommon size of these children, accords with the disposition to become fat so commonly met with in the free martin.

4. *Where there exists a real mixture of the organs of both sexes, although not sufficiently complete to constitute the double organ.*—Cases of this description which most nearly approach the absolute hermaphrodite are less common than those we have mentioned. A remarkable instance is mentioned in Dr. Baillie's Morbid Anatomy.* The person was twenty-four years of age, and bore the name and dress of a woman, had the breasts of a female, and no beard, and yet had a very masculine appearance. The clitoris and meatus urinarius had the natural appearance, but there were no nymphæ, and the labia pudendi were unusually pendulous, resembling a split scrotum, and contained a testicle each. The vagina was found to terminate in a cul-de-sac, two inches from the external surface of the labia. She had no partiality for either sex, and had never menstruated.

The Memoirs of the Academy of Dijon contain the following case, communicated by M. Maret.† Hubert J. Pierre died at the hospital in October 1767, aged 17 years. Particular circumstances had led to a suspicion of his sex, and these induced an examination after death. His general appearance was more delicate than that of the male, and there was no down on his chin or upper lip. The breasts were of the middle size, and had each a large areola. The bust resembled a female, but the lower part of the body had not that enlargement about the hips which is usually observed at his age. On examining the sexual organs, a body four inches in length and of proportionate thickness, resembling the penis, was found at the symphisis pubis. It was furnished with a prepuce to cover the glans, and at its extremity, where the urethra usually opens, was an indentation. On raising this penis, it was observed to cover a large fissure, the sides of which resembled the labia of a female. At the left side of this opening there was a small round body like a testicle, but none on the right. However, if the abdomen was pressed, a similar body descended through the ring. When the labia were pushed aside, spongy bodies resembling the nymphæ were seen, and between these and at their upper part the urethra opened as in a female, while below these was a very narrow aperture covered with a semilunar membrane. A small excrescence, placed laterally, and having the appearance of a caruncula myrtiformis, completed the similarity of this fissure to the orifice of the vagina. On further examination the penis was found to be imperforate; the testicle of the left side had its spermatic vessels and vas deferens which led to the vesiculæ seminales. By making an incision into the semilunar membrane, a canal one inch in length and half an inch in diameter was seen, situated between the rectum and bladder. Its identity with a vagina was, however, destroyed by finding at its lower part the verumontanum and the seminal orifices, from which by pressure a fluid, resembling semen in all its properties, flowed. The most remarkable discovery was, however, yet to be made. The supposed vagina, together with the bladder and testicles, was removed. An incision was made down to the body noticed on the right side. It was contained in a sac, filled with a limpid and red-coloured liquor. From its upper part on the right side, a Fallopian tube passed off, which was prepared to embrace an ovarium placed near it. It seemed thus proved that the body in question was a uterus, though a very small and imperfect one, and on blowing into it, air passed through the tube.

In April 1807 an individual was exhibited at Lisbon, uniting the organs of both sexes in the highest degree of perfection that has probably been ever seen. This person was twenty-eight years of age, and possessed of the male organs, a penis, or what represented one, capable of erection, covered by a prepuce, and pierced for a third of its length by a canal, and testicles. The air and appearance were masculine, the colour dark, and a light beard covered the chin. The female organs were labia, vulva, and vagina, well formed, but very small; the larynx and voice were feminine, and so were all the dispositions; she menstruated regularly, and was twice pregnant, but was prematurely delivered each time, once

* 3d edit. p. 410.

† *Mahon*, t. i. p. 100, and Beck by Darwall, p. 143.

at three, the other at five months.* This, if the account respecting the testicles be correct, is the nearest approach to a true hermaphrodite with which we are acquainted in the human subject.

In the Memoirs of the Royal Academy of Sciences of Paris† there is a very accurate description by M. Petit, of a similar mixture of organs. The person had wholly the character of a man, but was of a delicate constitution; he was a soldier, and died of his wounds. The appearance of the penis is passed over; but the scrotum not containing testicles drew M. Petit's attention, and in the dissection he found testicles in the situation of the ovaria, attached to two processes, continued from an imperfect vagina, but having vasa deferentia, which passed in the usual manner to the vesiculæ seminales; the vagina communicated with the urethra between the neck of the bladder and the prostate gland.

With respect to the formation of such monsters as we have spoken of, Sir E. Home was of opinion that the only mode in which it can be explained is by supposing the ovum, previous to impregnation, to have no distinction of sex, but to be so formed as to be equally fitted to become a male or a female fœtus; and that it is the process of impregnation which marks the distinction, and conduces to produce either testicles or ovaria out of the same materials. The following circumstances are in favour of this opinion. The testicles and ovaria are formed originally in the same situation, although the testicles, even before the fœtus has advanced to the eighth month, are to change their situation to a part at a considerable distance. The clitoris in fœtuses under four months is so large as to be often mistaken for a penis, and serves to explain an erroneous opinion at one time maintained in France, that the greater number of miscarriages between three and four months have been remarked to be males; which mistake arose from the above circumstance. The clitoris originally appears, therefore, equally fitted to be a clitoris or a penis, as it may be influenced by the ovarium or testicle. In considering this subject, it is curious to observe the number of secondary parts, which appear so contrived that they may be equally adapted to the organs of the male or female. In those quadrupeds whose females have mammæ inguinales, the males have also teats in the same situation; so that the same bag which contains the testicles of the male is adapted to the mammæ of the female. In the human species, which has the mammæ pectorales, the scrotum of the male serves the purpose of forming the labia pudendi of the female, and the prepuce makes the nymphæ. The male has pectoral nipples as well as the female; and in many infants milk, or a fluid analogous to it, is secreted, which proves the existence of a glandular structure under the nipple. This view of the subject throws some light on those cases where the testicles are substituted for the ovaria; since, whenever the impregnation fails in stamping the ovum with a perfect impression of either sex, the part formed will neither be an ovarium nor a testicle, sometimes bearing a greater resemblance to one, sometimes to the other; and may, according to circumstances, either remain in the natural situation of the ovaria, or pass into the situation proper to the testicle, whether it is the scrotum of the male or the labia pudendi of the female.

Means of ascertaining the true sex of a supposed hermaphrodite.—We say supposed, because, as has been already stated, we do not acknowledge the existence of a true hermaphrodite in the human species. Some cases no doubt have occurred in which it was very difficult to assign the proper sex; but even the most perfect of these complications of the genital organs did not give the individual in whom they existed the power of double copulation. Thus in the case of Hubert Pierre it is not easy to decide to which sex he really belonged: again, we must admit that great difficulty existed in coming to a conclusion when we find such men as Hufeland, Mursinna, Stack, Martens, and Metyger disagreeing. From these and other cases that might be quoted, we must agree that cases do occur in which the greatest difficulty must be felt, and the greatest caution should be used in forming an opinion. These cases of great difficulty all belong to the last class of malformations: in the other classes the solution is not so difficult. In proceeding to make an examination for the purpose of ascertaining the sex of an individual, the greatest care should be taken not to mistake appearances, and these should be all accurately noted down. The different openings that present themselves should be all explored with appropriate instruments, (taking care not to inflict any wound or cause pain,) in order that their direction may be ascertained. An accurate inspection of the whole body should be made, to elicit any predominance of the constitutional characters of either sex that may exist. These examinations should not be made hurriedly, but should continue for a length of time, and be frequently repeated, before a positive opinion is given; for the tastes, habits, and propensities of the individual must be taken into account, as well as the physical conformation in doubtful cases. It is of importance to be informed whether a discharge of blood has ever escaped from any of the openings, and if repeated, whether it has been periodical; as that circumstance alone will be sufficient to decide us in coming to a conclusion. In the case of young children, it is best to wait until the parts become more fully developed, as it has happened that instances of confusion of sex when young have at the age of puberty taken a decided leaning to one or the other sex. Above all, it is necessary to be most cautious in believing all that is stated by the individual or the friends, as, from interested motives, they may misrepresent facts in such a way as to lead us into error.

(T. E. Beatty.)

* Dict. des Sc. Méd., art. *Hermaphrodite.*
† An. 1720.

SMALL-POX.—The most approved authors concur in the belief that the disease known to us by the name of *small-pox* or *variola*, was not described by any of the writers of antiquity. From their silence, therefore, respecting a disorder so fatal, and possessing such very peculiar characters, we may reasonably presume that its origin was subsequent to their times, and that the world had existed some thousand years before it was visited with this dreadful pestilence. Etymology comes here in aid of history. The first authentic passage in which the words *variola* and *pocca* occur is to be found in the Bertinian Chronicle of the date 961.* There being no term for the disease in the Greek or Roman authors, variola was coined in the middle ages from the Latin *varus*, a pimple, or *varius*, spotted, and for several succeeding centuries was applied to designate measles as well as small-pox. From variola are derived the Italian vaiuolo, and the French vérole. The term *poc* is of Saxon origin, and signifies a bag or pouch. The Anglo-Saxons early adopted this word, which was variously spelt, and became pock, pocks, and pox. The epithet *small* in England, and *petite* in France, were added in the fifteenth century.

From very early times attempts have been made to prove the antiquity of small-pox, and even in our days this doctrine has found supporters. Dr. Baron, of Gloucester, the latest writer on the subject, entertains the opinion that small-pox is to be traced in the earliest writings of the Hebrews and Greeks; that it was seen by Hippocrates, and commented upon by Galen. According to this author, the account of the plague of Athens, as given by Thucydides, "presents as accurate an account of the leading symptoms of variola as could possibly be expected from any historian not medical."† In this opinion Dr. Baron is countenanced by Salmasius, Hahn, and more recently by Dr. Willan, in a posthumous dissertation "On the Antiquity of Small-pox." Rhazes, an Arabian physician, and the first acknowledged writer on this disease, laboured to prove that Galen had seen it, but with all his enthusiasm for his master, he acknowledged and was surprised at the unwonted brevity and inaccuracy of his description. This alone may be considered as decisive of the question; but we may further state that Friend and Mead, authors of the highest repute, after devoting great attention to the subject, agreed that there was no foundation for such a notion. We shall be fully justified, therefore, in adhering to the generally received opinion that small-pox is a disease of modern origin.

The first notices of a disorder which exhibits the well-marked features of small-pox, are to be found in the historical writings of Procopius,‡ who flourished during the reign of Justinian the First. The obscurity of its origin, the difficulty of its cure, the universality of its devastations, and above all, the complete immunity from second attacks which are mentioned as characteristic of this epidemic, bespeak it to have been truly small-pox. It began A.D. 544, at Pelusium in Egypt, from whence it spread to Constantinople. This corresponds closely with the era commonly assigned in medical books to the first appearance of small-pox, viz. A.D. 569, the year of the birth of Mahomet. In that year an Abyssinian army, under Abrahah the viceroy, appeared before Mecca, and was unexpectedly compelled to raise the siege. Several circumstances concur to render it probable that the sudden retreat of the army was owing to the breaking out of small-pox, and the dreadful mortality which it occasioned. Bruce, in his travels,* met with a manuscript account of this war, which confirms this story, and strengthens the opinion that small-pox, first appeared in Egypt and Arabia about the middle of the sixth century.

A further question has been raised and keenly agitated, whether the small-pox really began in Egypt, or was conveyed to the shores of the Red Sea from India. Attempts have been made to establish the existence of this disease in China and Hindostan at very remote periods. Mr. Moore, in his history of small-pox, advocates this opinion. He finds in the mythology, the religious institutions, the sacred and historical records, the medical works, and uniform tradition of those countries, abundant proofs that small-pox existed there at a period anteceedent even to Hippocrates.† He then enters into an investigation of the circumstances which may have prevented the spread of the infection from Asia to Europe and Africa. It must be acknowledged, however, that the facts on which Mr. Moore relies in support of this opinion rest on very questionable authority; and as the opinion itself has not met with many supporters, it is not necessary in a practical work like the present to bestow on it more particular examination.

The small-pox, and with it the measles, certainly burst forth in Arabia under circumstances most fatally favourable to their dissemination. It was in the year 622, when Mahomet began to collect the wandering tribes of Arabs whom he led forth, inflamed with religious zeal, against the neighbouring nations. To the devastations of war were now added the ravages of a new and most intractable disorder. But if we owe the introduction of small-pox to the Arabian armies, it is to the physicians of the same nation that we are indebted for the earliest accounts of it. Rhazes, an Arabian physician, who practised at Bagdad about the beginning of the tenth century, is the first author who treats expressly of small-pox. He quotes, however, several of his predecessors, of whom the most ancient is Ahron, a physician of Alexandria, who is supposed to have flourished about the year 622, the era of the Hegira, when Mahomet first went forth as a conqueror and a prophet.

* Moore's History of Small-pox, p. 87.
† Life of Jenner, p. 177.
‡ De Bello Gothico, lib. ii.

* Travels to discover the Source of the Nile, vol. i. p. 514.
† Moore's History of Small-pox, p. 35.

The treatise of Rhazes "De Variolis et Morbillis" deserves especial mention for the accurate description which is given of the several kinds of small-pox. His theory of the disease, however, is childish and scarcely intelligible, and his treatment lamentably deficient. He abounds, indeed, with directions for the management of every symptom, and more especially for that of the pustules in their several stages, which is very complicated, consisting of fomentations, fumigations, dry powders, ointments, and other applications chiefly intended to prevent pitting. In most of those instances his prescriptions are harmless, but this merit does not belong to his recommendation of free bloodletting and of the most powerful narcotics in all stages, and even in the confluent forms of the disease. Avicenna, another Arabian physician, gives also a very full and excellent account of the symptoms of small-pox, and he improves upon the treatment suggested by Rhazes, by restricting bleeding to plethoric habits, and to the three first days of the disease. Both Rhazes and Avicenna concur in the opinion that measles and small-pox are only modifications of the same disorder. Avicenna considered measles as a sort of bilious small-pox.

Hali Abbas, a third Arabian author on small-pox, deserves to be mentioned as having made an approach to the doctrine of contagious origin. The theory of small-pox adopted by him, as by all the Arabian physicians, was founded on the commotion and putrefaction of the humours of the body; but Hali observed that one of the accidental causes which excited the movement of the distempered humours to the skin was being in the same place with persons affected with the small-pox, or breathing air contaminated with the pestilential vapour of small-pox pustules. All the Arabian authors believed in the occasional occurrence of small-pox twice in the same person.

The successes of the Saracen arms in Spain and Sicily, during the eighth century, contributed doubtless to the gradual extension of small-pox through the different countries of Europe, but on this subject very little is known. We read that on several occasions a pestilence of fire raged, the body dissolving away as if burnt, with an intolerable fœtor of the putrid flesh. It is reasonable to suppose that some at least of these epidemics were the small-pox: others may have been the true Egyptian plague with buboes.

The researches of antiquarians lead to the belief that small-pox reached England early in the tenth century (907.) There is preserved in the British Museum a curious Anglo-Saxon manuscript, supposed to have been written in that century, containing an exorcism or supplication against the small-pox.* Nicasius was the saint especially addressed on these occasions. All that we read serves to shew how great were the terrors inspired by the small-pox in every period of its career.

The discovery of America by Columbus, which so wonderfully extended the boundaries of human knowledge, was the occasion also of scenes of desolation at which the heart sickens. Among all the calamities incident to that event none can surpass the introduction of small-pox into that continent, which took place in 1517, twenty-five years after its discovery. It is stated, on the authority of the Spanish historians, that in a very short time after the infection reached Mexico, three millions and a half of people were destroyed by it in that kingdom alone. Among the victims was the emperor, the brother and successor of the brave but unfortunate Montezuma.*

From the revival of learning to the present period, no subject has attracted the attention of physicians, both speculative and practical, more than small-pox. Every medical writer has treated of it, and some have devoted themselves exclusively to its study. It would be vain, therefore, to attempt more than a brief allusion to those who have distinguished themselves in this department of medical inquiry.

The humoral doctrines which prevailed in the schools during the sixteenth century led to the universal adoption of the hot or alexipharmic mode of treating pestilential and malignant diseases, including small-pox. Sennertus gives the following account of the practice pursued in his time (1628). The great object was to expel the noxious humour by perspiration, to accomplish which various decoctions of warm seeds are directed, containing mithridate, bezoar, and other drugs, denominated alexipharmic and sudorific. "While using these, every attention is to be paid, especially in winter, to prevent the admission of cold air. The patient is therefore to be tended in a warm chamber, and carefully covered up, lest by closing the pores of the skin the efforts of nature should be impeded, the humours driven upon internal organs, and matters which ought to be expelled retained within the body, to the imminent danger of the patient, and the certainty of increasing restlessness, fever, and other symptoms."†

Such had long been, and such was the state in which Sydenham in 1667 found, the theory and practice of small-pox. Bad as that practice was, it yet had the support of all the learning and all the prejudices of the age. It required, therefore, talent and boldness successfully to oppose it. Sydenham began by separating for ever small-pox from measles, with which, from the days of Rhazes, it had been so strangely yet so obstinately associated. He divided small-pox into two kinds, the distinct and confluent, traced with the greatest accuracy the usual course of both, and added many important remarks to the detail of symptoms given by others, particularly with reference to prognosis. Of the intimate nature or essence of small-pox he professed his ignorance in common with the rest of mankind, but adds immediately afterwards his suspicion that it consists of a specific inflammation of the blood and other humours, and that the inflamed particles, when duly digested and concocted, are

* Moore's History of Small-pox, p. 94.

* Robertson's History of America, vol. iv. b. viii.

† De Variolis et Morbillis, t. vi.

expelled from the body in the form of little abscesses. The chief merit of Sydenham consists in his criticisms on the prevailing treatment of small-pox. These, though worded with the most scrupulous care, and an anxious wish to avoid hurting the feelings of his professional brethren, yet exposed him to much obloquy, and he was calumniated as an innovator and a homicide. He introduced what is now called the cooling regimen, including fresh air, light bed-coverings, and abstinence from wine and all cordial and sweating medicines. The remedies on which he chiefly relied were moderate bleedings, acidulated drinks, and opiates. His principal faults consisted in the timid employment of purgatives, and his fondness for blisters.

Boerhaave, who was born when Sydenham was at the height of his fame (1668), entertained the highest admiration of him, and was contented to adopt almost without alteration the description and treatment of small-pox given in his works. But Boerhaave has the great merit of first putting prominently forward *contagion* as its direct exciting cause. He acknowledges "that as the first man who suffered from small-pox must necessarily have received it without contagion, so may it still be occasionally engendered by causes of which we are ignorant. Nevertheless, as a general law it may be stated that the contagion once generated multiplies itself without any assignable limit, as the smallest spark may spread the widest conflagration."*

The theory and treatment of natural small-pox, placed thus, by the combined labours of Sydenham and Boerhaave, upon their proper footing, underwent no important changes during the last century; the attention of authors was then directed almost exclusively to the new discovery of inoculation, of which we shall treat more fully in a subsequent page.

We now proceed to give a description of small-pox, and have to remark, in the first place, how singularly diversified are the appearances which it presents. A variety of causes contribute to this, but none more remarkably than the previous habit or condition of the body with reference to the contagion of small-pox. It will be useful, therefore, to begin by considering the disease under three different aspects:—

First, as it occurs, casually and for the first time, to those who have undergone no preparatory process. This is called the casual or *natural* small-pox.

Secondly, as it occurs to those who in early life have undergone the process of vaccination. This is called the mitigated or *modified* small-pox.

Thirdly, as it occurs to those who have been inoculated with the variolous virus: the *inoculated* small-pox.

Natural Small-Pox.

This disease is characterized by a long train of phenomena, some of which are peculiar to it, while others are common to it with other acute disorders. From very early times it was observed that these admit of a division into three *stages*. Such an arrangement is strictly natural, and admits of no improvement. These are, the stages of incubation, maturation, and decline; and they will require separate investigation.

1. *Stage of incubation.* Under this head is included the whole period that elapses from the reception of the variolous germ, or virus, into the human body, until the appearance of eruption. Rayer* subdivides it into the two stages of incubation and invasion, the former comprising the interval between the reception of the germ and the *sickening;* the latter extending from the sickening to the appearance of eruption. In very many cases, however, this distinction cannot be made, the two periods running into each other by insensible degrees.

The reception of the variolous poison into the human body casually by the mode of *infection*, (that is, through the medium of the respiration,) takes place in most instances imperceptibly and without symptoms. Occasionally, however, the patient experiences at the moment of imbibing the germ of disease some unpleasant sensation, such as a disagreeable odour, or a feeling of giddiness, or sickness at stomach, or, what is perhaps more common still, an inward sense of alarm or fright. The duration of this stage is subject to some variety. Fourteen days may be stated as the average period that elapses from exposure to contagion to the appearance of eruption. The extremes may be set down as one week and three weeks. This interval is passed differently in different cases. Sometimes the patient, during the whole or greater part of this period, has been weak, languid, low-spirited, and inactive, with impaired digestion and unquiet nights. He has felt poorly, without any assignable cause. In the greater number of instances, however, no uneasiness whatever is experienced until the eleventh or twelfth day after exposure to contagion, when an unexpected and perhaps severe rigor announces the commencement of the initiatory or, as it is sometimes called, the *eruptive* fever. This is accompanied in some cases with severe pain or weakness of the back, so that the patient has dropped down; in other cases with acute pain of the epigastrium, aggravated on pressure, and hence sometimes mistaken for gastritis; with nausea, vomiting, giddiness, or headach. Children are often very drowsy at this period. The nervous system sometimes participates in a more marked manner. There is extreme prostration of strength. The patient staggers in his walk, and the expression of countenance is anxious and haggard: children have an epileptic fit; adults become delirious. These more urgent symptoms generally indicate the approach of a severe form of the disease. Of this there can be no doubt, when, in addition to the symptoms already enumerated, we observe such as denote that the fluids of the body are implicated in the mischief which is going on—that is to say,

* Van Swieten's Commentaries, vol. v. p. 18.

* Treatise on Diseases of the Skin, translated by W. B. Dickinson, p. 108. London, 1833.

when petechiæ appear in different parts, or large patches of subcutaneous ecchymosis, with hemorrhage from the nose, mouth, stomach, bowels, or uterus. Under these circumstances death has been known to take place prior to any unequivocal appearances on the skin. Here the real nature of the disease must always remain in some degree doubtful, but it can often be inferred by tracing carefully the history of the case. It will be found to have succeeded exposure to small-pox contagion within the reasonable limit of time, or it may in its turn have communicated contagion to others. Several well-marked instances have occurred, rendering it almost certain that contagious emanations are thrown off from the lungs and skin even at this early period of the disease.

The duration of the initiatory or eruptive fever of small-pox has been a fruitful source of discussion among authors. Prior to the time of Sydenham the object of physicians was to shorten the period as much as possible, and to promote an early eruption, which they attempted to effect by powerful diaphoretics. Sydenham, on the other hand, maintained that the more tardy the eruption the lighter was the subsequent disease. This observation is not borne out by the results of our own experience; and it is not improbable that Sydenham's judgment might have been in some degree warped by his anxiety to dissuade from that heating regimen of whose injurious effects he was so well convinced. The fact appears to be that the period of the initiatory fever is most remarkably uniform. The eruption in a vast majority of cases shews itself at the end of forty-eight hours from the occurrence of rigor or headach, whether the subsequent disease be mild or malignant, confluent or distinct: in other words, one complete day intervenes. Sometimes, from accidental circumstances, (such as great weakness of constitution,) this period is protracted to seventy-two hours, but never, so far as we have observed, is it shortened. This may be looked upon as a remarkable law of the variolous disease, and a most important means of distinguishing small-pox from other exanthemata, particularly scarlatina, lichen, and measles. In the two former disorders, the duration of the premonitory symptoms is less than in small-pox; in measles it is greater.

II. *Stage of maturation.*—The eruption of small-pox shews itself in the first instance in almost all cases on the face and wrists, and thence gradually extends over the rest of the body. In a very few cases only has it been first observed on the inferior extremities. It consists of minute papulæ sensibly elevated above the general surface of the skin. In some instances the eruption is fully developed over the whole body in the course of twenty-four hours. In other cases, two and even three days elapse before the process is completed on the legs and feet. When the papulæ are few in number, and separate from each other, the disease is called *distinct*; when the eruption is close set and profuse, *confluent*. To the intermediate varieties the old authors gave the name of *contiguous* or *coherent*, but the term *semiconfluent* is preferable. We apply it to designate those cases where the eruption is confluent in one part and distinct in another, as well as those where the papulæ are numerous without actually running into each other.

Arrangement and structure of the pock.—This branch of the subject has excited much attention at various times, and in particular was investigated diligently by Cotugno, (better known under his Latin name of Cotunnius,) an Italian physician, in the year 1771.* When the papulæ are few in number, they will not be found indiscriminately diffused over the body, but arranged in groups of three or five, and assuming a crescentic or semicircular form. When two groups coalesce, a complete circle of papulæ may sometimes be observed. The papulæ have their seat in the true skin; and upon the third or fourth day from their first appearance are converted into vesicles, containing a thin transparent lymph. These vesicles are very curiously organized, being divided into six or eight cells tied together in the centre, which for several days is depressed. This central depression, or *umbilicated* form of vesicle (as it is sometimes called), is very characteristic of small-pox. It is exhibited only in one other disease—cow-pox. The specific matter or poison of small-pox is secreted by the parietes of the minute cells, and the progress of inflammation in the papula is denoted by the inflammatory circle (called areola) which about the fourth day begins to surround it. As the colour of this areola changes to a bright crimson, the lymph in the vesicle is converted into a thick opaque matter, of a white or straw colour. This distends the cells, and gradually increasing in quantity, breaks down the central band, in consequence of which the pustule *acuminates*. In favourable cases this process is usually completed in seven, or at furthest in eight days: occasionally it occupies only five or six days.

During the maturation of the pustules there is always some degree of fever present, varying of course, in violence, with the quantity of eruption, the habit of the patient, and the circumstances in which he may happen to be placed. If the habit of body be good, the season mild, the apartment cool, the diet duly restricted, and the mind free from anxiety, there will be very little fever, even though several hundred pustules are in the process of maturation. There is generally more or less tenderness of the skin present. Occasionally this tenderness is excessive, and productive of the greatest distress.

Confluent form of small-pox.—When the eruption is very copious over the whole or greater part of the body, this, its regular or normal progress, undergoes several important modifications, which are next to be described. In some cases, indeed, the confluent small-pox runs the same course as the mildest forms of the distinct disease. The vesicles are small, and

* De Sedibus Variolarum. Vienna, 1771.

each is surrounded by a minute areola, while the constitutional excitement is moderate. Such a form of small-pox may be characterized as the *confluent superficial*. The most familiar instances of it are presented when the disease is taken after vaccination, but it is sometimes witnessed among persons wholly unprotected.

Analysis of the symptoms of confluent small-pox.—1. The first peculiarity of confluent small-pox, as generally met with, is, that from a very early period it involves not only the cutis vera, but the subjacent cellular membrane in extensive and often violent inflammation. The eyelids are swollen, and by the fifth day the patient is unable to see. The scalp is tense and tender. The parotid glands participate in the increased action of the surrounding cellular membrane, and salivation takes place, with great turgescence of the cheeks. The limbs are tumid, and an erythematous redness often occupies such parts as are free from variolous papulæ. In the most aggravated cases, buboes form in the groin, often with intense pain. The skin being almost wholly occupied with vesicles, there is no areola. The pustules do not acuminate, but appear flat and doughy, and upon the face especially they coalesce into one large sore, which discharges a copious thin ichor. The constitutional symptoms accompanying this kind of small-pox are very severe. The pulse is rapid, with extreme debility, restlessness, and total want of sleep.

2. The second peculiarity of the confluent small-pox is, that the eruption occupies not only the skin but the mucous expansions of the mouth, nose, pharynx, larynx, and trachea to below its bifurcation. The tongue is also occupied with vesicles. The precise structure of the mucous vesicle has not been determined with the same accuracy as that of the cutaneous vesicle; but it runs a course in all respects similar. This complication of mucous inflammation adds immeasurably to the danger of the disease, besides that it modifies some of the other symptoms. Heat of the mouth, pain of the throat, difficulty of swallowing, hoarseness, dyspnœa, and more or less mucous expectoration, are the first symptoms that it occasions. These increase in severity until the eighth day, from which time a copious secretion takes place from all the structures so affected. In a large proportion of cases the swelling occasioned by the inflammation so narrows the opening of the larynx, and the effused matter so blocks up the air-passages, that suffocation is produced. Before this takes place, however, the respiration has been impeded to such a degree as materially to interfere with the due oxygenation of the blood. Hence arises a long and frightful train of symptoms, among which we may particularly enumerate gradually increasing dyspnœa, coldness and paleness of the extremities, lividity of the areola, especially in parts distant from the centre of circulation, a swelled and purple tongue, great restlessness, and a low muttering delirium.

Cases of the confluent form of small-pox are sometimes met with, which are altogether devoid of mucous complication, but they are very rare. The extent of mucous and of cutaneous inflammation, however, are not always and necessarily proportioned to each other. A case may be very confluent on the surface, with but few vesicles in the throat.

3. A third circumstance influencing materially the character of the symptoms in the confluent variety of small-pox, is the early and deep implication of the brain and nervous system. This fortunately is but a rare occurrence The chief symptom by which it is characterised is early and violent delirium, (the delirium *ferox* of old authors,) attended in many cases with such a strong disposition to self-destruction that the utmost care should always be taken to guard against the possibility of accident. Variolous delirium is accompanied with redness of the conjunctiva, contraction of the pupil, and a wild expression of countenance. It generally shews itself at the very commencement of the initiatory fever, but is sometimes delayed until the second or third day from the appearance of the eruption. Excessive restlessness, anxiety, and despondency may be viewed as lighter evidences of the same specific affection of the brain. Nothing indicates its absence so certainly as a calm and collected manner, with a succession of quiet nights, and a confident hope of recovery. Variolous delirium is always most violent in the early periods of the disorder. When the areola begins to form, still more when external inflammation is fully developed, delirium for the most part ceases. Cases of confluent small-pox complicated with delirium are extremely dangerous. A large proportion of them terminate unfavourably, sometimes by affection of the head, (coma,) sometimes by acute inflammation of some other internal part, especially the pleura, brought on or determined by the general derangement of the nervous system. We have stated, as a general rule, that the peculiar affection of the brain and nervous system now adverted to, is associated with a full confluent form of eruption, but occasionally it is found to accompany, and of course very materially to aggravate, the danger of distinct and semi-confluent cases.

4. The fourth circumstance which characterises and modifies the phenomena of the confluent forms of small-pox, is the implication of the *fluids* of the body,—in other words, the concurrence of that state of the blood called by the old writers *dissolved* or putrescent. To these, the most aggravated of all cases, the terms *malignant* or petechial small-pox are generally applied. They are thus distinguished. From the earliest period of the disease, petechiæ are observed in different parts of the skin. Sometimes the extent of subcutaneous ecchymosis is immense. As the vesicles advance to maturation, they fill, not with pus, but with a thin ichor tinged with blood. Hemorrhages break forth from all the mucous structures of the body. The gums bleed often very profusely. There is epistaxis, spitting of blood, vomiting of blood, and the passage of blood by stool. Females suffer from violent menorrhagia,

and abortion never fails to occur to such as are pregnant. There is bloody urine in some cases. All this occasionally happens without delirium, or any other well-marked evidence of cerebral affection. More commonly, however, these conditions, viz. disturbed brain and dissolved fluids, are found associated together. From this appalling variety of small-pox, recovery is scarcely ever met with. Death usually takes place between the fifth and seventh days of the eruption.

Complications. Such are the ordinary phenomena of the natural small-pox in its distinct and confluent forms, when it occurs to persons previously in good health and of sound constitution. But it must be remembered that this disorder may attack those who may be labouring, at the time of seizure, under some other disease, such as pneumonia, hooping-cough, hepatitis, or consumption; and further, that these and other disorders may come on, unexpectedly, at any period, early or late, during the progress of small-pox. An infinite variety of *accidental* symptoms may thus be superadded to those regular symptoms now enumerated. Besides which, small-pox may occur to persons of a weak habit, or in constitutions exceedingly exhausted, and unable to cope with a disease of such severity. It may occur, for instance, to those who have but recently recovered from a severe typhous or scarlet fever. Under these circumstances, we observe a very tardy eruption; collapse without advance of eruption; or in cases somewhat more favourable, an abundant formation of large blebs, containing a thin ichor, with a very tedious and hazardous period of convalescence. To this latter form of the disease the old writers gave the name of the watery or bladder pock.

III. *Stage of decline.* If the maturating stage of small-pox exhibits great diversity of symptoms, so also, even in a more eminent degree, does the stage of decline. The mildness and rapid progress to recovery which some cases present, contrast strongly with the severity, obduracy, and varied dangers of others.

In the distinct and mild form of small-pox the pustules burst and discharge their contents on the sixth, seventh, or eighth day. A scab succeeds, cicatrization commences, and in vigorous constitutions is completed in about eight or ten days. In the very mildest cases of all, which approach to the character of chicken-pox, there is very little discharge of matter, but the pustules harden, and the small portion of pus which they do contain is apparently absorbed. This variety of the disease has been called the dry or horny pock, and it is the most common form in which small-pox shews itself after previous vaccination.

In cases of greater severity, as well in the truly confluent as in those which we have distinguished as the semi-confluent variety, where the eruption is copious, but where the vesicles do not actually coalesce except in a few places, the decline of the disorder is attended with some remarkable phenomena, of which the most important are pitting and secondary fever. Cicatrization is tedious and ultimately effected with such a loss of substance in the true skin as occasions pits and scars, which continue during the remainder of life. From the great vascularity of the face, there is always greater confluence and a higher degree of inflammation there than in other parts. Hence, pitting is chiefly met with in the face, disfiguring and often completely altering the countenance of the sufferer.

Secondary fever.—The febrile symptoms subside entirely in all cases where the pustules have maturated kindly over the whole body; but in all severe cases, that is to say, where the cellular membrane and glands which it envelopes have become involved with the skin in inflammation, the fever, so far from subsiding on the ninth or tenth day, when the maturative stage has closed, is aggravated. The surface of the skin at this time becomes hot and dry, the tongue white, the pustules hard and scaly, the pulse increases in frequency, the patient is tormented with a great, sometimes inextinguishable thirst. Secondary fever is now said to have set in, and the variety of symptoms observed during its progress almost baffles description. The following attempt to enumerate some of the leading phenomena of secondary fever will serve at least to point out the character of this very singular condition

1. In a large proportion of cases, secondary fever is accompanied with some form of inflammatory action on the surface. An efflorescence identical with that of scarlatina occupies the trunk and extremities. Trails of erythematous redness appear in several parts, or a genuine erysipelas attacks the head, trunk, or limbs. In other cases the cutaneous and cellular inflammation is more circumscribed, leading to the formation of abscesses, often of great extent, of boils and carbuncles, and ulceration of those parts which are especially liable to pressure, such as the elbows, hips, and sacrum. In those situations sloughing sores are often met with, which from their extent and depth bring life into danger. In some cases the scalp is the part which receives the violence of the fever. Abscesses form there, or a diffuse cellular inflammation takes place, which is followed by purulent infiltration. Lastly, in a few instances the whole surface is occupied with pustules of *ecthyma cachecticum*, accompanied with fever of the hectic kind, which is with great difficulty subdued.

2. Secondary fever is accompanied, in a certain proportion of cases, with ophthalmia. The subject of variolous ophthalmia is one of great extent and importance. In the early periods of the disease it is not uncommon to observe a considerable degree of conjunctival inflammation, and sometimes a pustule forms at the edge of the cornea; but it is reserved for the decline of the disease to exhibit the aggravated form of this affection. In some desperate cases an intense form of ophthalmia sets in about the tenth day, which rapidly involves all the structures of the eye, and in the course of a few days destroys its entire organization. In other cases the sloughing is confined to a portion of the cornea, and this is followed by

a staphylomatous protrusion of the iris. It is rare to observe more than one eye involved in this very destructive form of inflammation, but still in all countries, and from the earliest periods at which we read of this disease, a large proportion of the blind have been found to owe their misfortune to the secondary fever of small-pox.

3. Another frequent occurrence in the progress of secondary fever is gangrenous inflammation of the genitals. This shows itself in the first instance on the scrotum or prepuce, runs on rapidly to mortification, and in almost all instances ends in the loss of life.

4. The destructive effects of secondary fever, however, are by no means confined to the surface of the body. It frequently happens that without any obvious cause some internal organ receives the violence of the febrile shock. Acute inflammation is set up, and the result is in almost all cases suppuration. The *pleura* is the part peculiarly disposed to suffer under these circumstances. Variolous pleurisy comes on about the eleventh or twelfth day of eruption, for the most part very suddenly, and proceeds rapidly to empyema. We have seen it prove fatal in thirty-six hours. In general, the pleuritic symptoms are violent and well marked. The pain of side is excruciating, and the shortness of breath equally unequivocal; but sometimes there is a latent form of pleurisy. The patient dies without making any complaint of the side, and on dissection one of the cavities of the thorax is found gorged with a sero-purulent fluid. In all cases of secondary fever, a strict attention to the respiratory organs, with such aid as the stethoscope can afford, should never be omitted. In a few cases the substance of the lungs is the seat of an intense form of inflammation, tending to abscess. Children are sometimes attacked with symptoms indicating laryngitis or croup.

5. Affections of the abdominal viscera are very uncommon. Inflammation of the liver and of the mucous membrane of the bowels have been noticed, but they are among the rarest forms of internal disease observable in the progress of small-pox.

6. The brain sometimes suffers during the presence of secondary fever. Phrenitis with delirium occurs in children; and in adults of plethoric habit a state of coma or lethargy is not unusual. But what is most worthy of attention in this respect, is that singular state of the nervous system which accompanies the destruction of large portions of skin, and which is so well known to surgeons as a consequence of extensive burns and scalds. It is characterised by severe and repeated rigors, succeeded by general tremors, low delirium, a weak and rapid pulse, a dry brown tongue, and collapse of the features, terminating in death.

7. The evils attending secondary fever are aggravated by the concurrence of the strumous habit. Nothing developes it more certainly than protracted small-pox. Accordingly, in scrofulous constitutions we see secondary fever complicated with strumous ophthalmia, characterised as well by its complete intolerance of light and abundant secretion of tears as by its obstinate resistance to every kind of remedial treatment. Irritable ulcers form under the lower eyelid, and around the knee, ankle, and elbow joints, and are found very difficult to heal. Glandular enlargements of the neck take place, which sometimes suppurate, but oftener continue indolent and of stony hardness. Children frequently suffer from otitis.

8. To all this must be added the danger of contracting, during the stage of decline, common fever of the typhoid or erysipelatous kind. At the Small-pox Hospital, it is not uncommon to find even the milder cases attacked, during apparent convalescence, with fever, irritable stomach, sore throat, and erysipelas of the face or extremities. This *superadded* disease has in many instances brought life into hazard, and in some has proved fatal. The great peculiarity of it is the concurrence of severe inflammation of the tonsils and subjacent cellular membrane with erysipelas of the head, neck, or back. It appears to have its origin in that vitiation of the air which is almost inseparable from the very nature of an hospital, and which any accumulation of malignant cases, more especially in a disease like small-pox, must necessarily tend to augment. This form of disease might be appropriately designated *hospital fever*. When it has once shewn itself, there is abundant reason for believing that such a fever, whether exhibiting anginose or erysipelatous symptoms, or their combination, is truly contagious.

Prognosis.—The following are the chief grounds on which the prognosis in small-pox should rest.

1. Confluence is always unfavourable, because it necessarily occasions a large drain upon the system; but if the pustules acuminate well, and the areola on the extremities be of a good, that is, crimson, colour, a reasonable ground of hope exists. Confluence on the face is more to be dreaded than in any other part. When the vesicles on the trunk of the body are flat, when the eruption on the face is white and pasty, when the extremities appear of a clarety or livid colour, little or no hope of recovery can be entertained.

2. With reference to prognosis, great attention is due to the state of the larynx. Hoarseness, with copious spitting, occurring at an early period is very unfavourable, as indicating the extent of mischief in that important organ. On the other hand, a natural tone of the voice is a favourable sign, and with a good constitution gives a fair ground of hope, even though the eruption be full and confluent.

3. Quiet nights, composure of mind, a collected manner, and confident hope of recovery are good omens, because they indicate the comparative freedom of the brain and nervous system from all serious complication. Patients who from an early period of the disease are restless, delirious, moaning, and desponding, rarely recover. There is not a worse symptom in children than grinding of the teeth: very few recover in whom it is observed.

4. In estimating the danger of confluent and

semi-confluent cases, the age of the patient merits particular attention. Persons above forty years of age seldom recover from any of the severer forms of small-pox. Infants also are in danger even from a moderate quantity of eruption. In both cases the reparative process is attended with great exhaustion of nervous power, the result of which is that the brain, larynx, or some other important organ loses its tone, takes on acute inflammation, and by its disorganization life is destroyed. The most favourable age for taking small-pox is from the seventh to the fifteenth year, when the powers of life are in the greatest vigour, with the least chance of plethora.

5. The habit of body is likewise to be taken into account. In the middle periods of life the danger of small-pox is much increased by its concurrence with a *plethoric* habit. Great weakness of constitution is equally a source of danger. Of the additional risk which a strumous habit entails we have already had occasion to treat.

6. Everything indicating a dissolved or putrescent state of the fluids is of course most unfavourable, such as petechiæ, menorrhagia, and epistaxis. Recovery from the petechial or malignant form of small-pox, indeed, is so rare as scarcely to enter into calculation.

Mortality of small-pox.—It is commonly stated that one-fourth of those who are attacked by small-pox in the natural way perish. The records of the Small-pox Hospital indicate a somewhat higher proportion. The deaths during the last fifty years at that institution have averaged thirty per cent., the extremes being eighteen and forty-one per cent. The days of greatest mortality, or critical days, as they are called by the old authors, have been much commented upon, and in all ages it has been observed that the eighth (counting from the date of eruption) is the day of greatest danger. The following table, extracted from the register of the Small-pox Hospital for the years 1828 and 1829, illustrates this fact, while it shews at the same time that small-pox proves fatal at various periods, from the third to the thirty-eighth days of eruption. From this table it also appears that nearly two-thirds of the total number of deaths take place during the second week of eruption.

Table of the critical days in small-pox, shewing the period of eruption, at which 168 *cases proved fatal. (From the Records of the Small-pox Hospital for* 1828 *and* 1829.)

	There died on the	cases.	
1st week.	3rd day of eruption	1	
	4th	5	
	5th	10	32
	6th	5	
	7th	11	
2d week.	8th	27	
	9th	15	
	10th	14	
	11th	16	99
	12th	11	
	13th	11	
	14th	5	
3d week.	15th	7	
	16th	5	
	17th	3	
	18th	3	21
	19th	1	
	20th	2	
4th week and after.	22d	3	
	23d	1	
	24th	3	
	25th	1	
	27th	1	
	28th	1	16
	29th	1	
	31st	1	
	32d	1	
	35th	1	
	38th	2	
	Total		168

Causes of death in small-pox.—It may not be irrelevant to recapitulate the several causes of death in small-pox. 1. Prior to the maturation of the pustules, that is, between the second and seventh days of eruption, patients die of malignant fever; of that peculiar condition of the fluids and nervous system to which the name of *acute malignancy* may properly be given. 2. Between the eighth and thirteenth days of eruption, the chief cause of death is to be found in affection of the throat, and consequent *suffocation*. 3. In the state of secondary fever, that is, between the fourteenth and twenty-first days of the eruption, death may take place in three ways—either by violent febrile excitement with effusion on the brain; or by sloughing, gangrene, and destruction of large portions of the surface; or lastly, by supervening pleurisy, peripneumony, or laryngitis. 4. At a still later period, that is, after the third week from the appearance of eruption, death may take place from mere exhaustion, or from erysipelas and superadded fever.

Morbid appearances.—It has been remarked from the earliest periods that the internal organs do not suffer in small-pox so extensively or so frequently as might be expected. In a large proportion of cases, the condition of the surface is the sole cause of death. In the throat, however, some very characteristic appearances present themselves, provided death has taken place between the seventh and twelfth days of the eruption. The pharynx, larynx, and trachea are then found covered with a copious, viscid, puriform, or purulent secretion of a grey or brownish colour, thrown out by the numerous vesicles which had formed upon the mucous membrane of those organs. The mucous membrane itself appears thickened, pulpy, and in the worst cases black and sloughy.

There is no point wherein pathologists have more widely differed than in this, whether the specific inflammation of small-pox invades the internal parts! The phenomenon has been asserted as a matter of fact by some, while others have, with equal confidence, denied it. Columnius* made a vast number of dissections with a special view to ascertain whether

* De Sedibus Variolarum, passim.

any of the viscera were the seat of variolous pustules. His conclusion is, that they are exclusively confined to the skin, and those mucous membranes which are in direct contact with the external air. There can be no doubt that this opinion of Cotunnius is strictly correct. Inflammation may originate from accidental causes in any internal organ during the progress of small-pox, and its effects will be seen after death; but these are not to be confounded with, or mistaken for, the specific effects of small-pox on the skin and mucous expansion of the throat and chest.

When death has taken place in the third week from the appearance of eruption, the pleura will sometimes be found inflamed, and coated with layers of coagulable lymph, while in the corresponding cavity of the thorax, purulent matter or a sero-purulent fluid will be collected, often in enormous quantity, compressing by its bulk the lung of that side into a small space. Occasionally a portion of the lung itself is found infiltrated with pus.

In some cases, where great determination of blood to the head has been indicated during life by swelling of the head and face, delirium, headach, and high fever, the bloodvessels of the brain and its meninges are found turgid, with more or less of effusion into the ventricles.

Nothing is more worthy of notice than the freedom of the abdominal viscera from all traces of disease in those who die of small-pox. Among the numerous dissections made at the Small-pox Hospital, we have never been able to detect variolous pustules on the mucous membrane of the intestinal canal. Ulceration of the bowels indeed sometimes takes place in children during the violence of the secondary fever, but differing in no respect from that which occurs in other and more familiar forms of hectic fever.

Pathology.—For more than a thousand years after the first appearance of small-pox, this disease was considered by physicians to have its origin, like other fevers, either first, in some state of the atmosphere, or secondly, in some vitiated condition of the humours of the body. A large portion of the community at the present day are of the same opinion, and confidently believe that the small-pox is, to use their own expression, bred in the blood. The pathologists of the last century, however, from the time of Boerhaave, reasoning from the very peculiar train of symptoms observed in small-pox, and from the comparatively recent date at which it became known, adopted the notion that this disease is in all cases the product of a specific poison or contagion, received into the blood from without. Such is still the general opinion of the best informed physicians. It cannot indeed be denied that great difficulties are experienced in tracing the source of contagion in numberless cases, and that the doctrine of *spontaneous* origin admits of being supported by some ingenious and plausible arguments; but the weight of evidence is decidedly in favour of the invariable origin of small-pox by *contagion*. How the variolous poison was first generated is wholly unknown. A tradition has been handed down by the Arabian physicians* that it was originally derived from the camel, but no substantial reasons for such an opinion have ever been advanced.

The peculiar miasm or morbid matter of small-pox is receivable into the human body in three modes: first, by the lungs through the medium of the respiration: this is called the mode of *infection*. Secondly, by application of the matter to the unbroken surface of the skin or mucous membrane of the nose. This is properly denominated *contagion*, although the terms infection and contagion are generally made synonymous. Thirdly, by application of matter to the wounded surface, which is the mode of *inoculation*.

The diffusion of small-pox by the air in the mode of infection, as thus defined, presents many interesting peculiarities. It takes place much more energetically in certain states of the air than in others. Occasionally the atmosphere appears to be altogether incapable of disseminating the poison. That peculiar, or, as it is sometimes called, *epidemic*, constitution of the air which is so favourable to the propagation of small-pox, is not at all understood. It is neither appreciable by the thermometer, the hygrometer, nor the barometer. Small-pox spreads sometimes in a dry and warm, sometimes in a cold and moist state of atmosphere. The phenomenon may possibly depend upon some electrical state of the air, which has hitherto eluded the researches of philosophers, but which time and closer observation may perhaps eventually succeed in discovering. It has been supposed that the peculiar condition of the atmosphere predisposing to the dissemination of the variolous germ recurs every five or seven years, but no adequate grounds for this opinion appear to exist. Dr. Haygarth† has taken great pains to ascertain the sphere of contagious influence in the case of small-pox—in other words, the distance to which the contagion extends beyond the person of the individual affected. He inclined to the opinion that it was very limited, not exceeding a few feet. There is reason to believe, however, that some fallacy exists in the experiments made to determine this point, and that the distance at which the poison ceases to be energetic is much greater, varying, however, according to the condition of the atmosphere.

Effluvia capable of communicating small-pox are generally considered to be given off by the lungs as well as by the skin, and at every period of the disease from the earliest to the latest. Drs. Haygarth and Heberden maintained‡ that prior to the appearance of eruption, and even for the first two or three days after, a patient is seldom if ever found to communicate infection. We have already, however, expressed our belief, founded on facts within our own knowledge, that even

* See Baron's Life of Jenner, p. 522.

† Inquiry how to prevent the Small-pox, p. 78. 1801.

‡ Ibid. p. 47 and 216.

prior to the occurrence of eruption, while the body is labouring under the premonitory fever, the secretions are infectious. It is admitted by all that the contagious property hangs about the body as long as any scabs remain, which may be said to contain the poison in a concentrated form. Again, it has been well ascertained* that for some considerable period after death the matter of the pustules continues energetic, and that a confluent case will so taint the air as to spread the disease, by infection, for at least ten or twelve days after death.

All mankind, with few exceptions, are susceptible of the variolous poison at some period of their lives. It has been received by the fœtus in utero, by the infant immediately after birth, and by the adult, up to the most advanced period of human life. As a general law, it may be stated that the susceptibility of small-pox is equally great at all ages, but it often happens that a particular individual shall resist infection at one period of his life and receive it at another. Some constitutions imbibe this morbid germ mildly, others with great alarm. In such cases the nervous system may truly be said to be *poisoned* by it. A full and plethoric habit predisposes to a confluent and malignant form of the disease. Huxham has well remarked that the ebullition of the fluids consequent on the circulation of the poison in such persons is, *cæteris paribus*, most severe and dangerous.† Hence the great mortality of the disease in that class of adults who indulge in full living, with a large allowance of ale and porter. At the same time, it must be remembered that the opposite state of body, extreme weakness, is equally unfavourable for the quiet reception and safe elimination of the variolous poison.

The *quantity* of eruption is sensibly influenced by the state of the surface at the period of its developement. Great heat of the apartment, the warm-bath, the use of strong diaphoretics, abundance of bed-clothes, and the local irritation of blisters, all favour confluence. It might be expected that cold would possess some power in diminishing the number of papulæ. It must be confessed, however, that though by injudicious measures we may often aggravate the quantity of eruption, we possess few or no means of lessening it. The character of the disease is not with any certainty influenced by the source whence the infection was derived. The mildest form of what is called varioloid eruption will communicate to another the most confluent and malignant disorder.

Variolous effluvia are very volatile. A free ventilation, therefore, is the most effectual means which we possess of diminishing the danger of contagion. The clothes and bedding of a small-pox patient, if closely wrapped up, will retain and give out the disease to others at great distances of time; while medical men who visit small-pox patients and subsequently go into the open air, seldom if ever communicate the disorder. Dr. Haygarth is of opinion that they never do. Be this as it may, variolous effluvia are rendered comparatively innocuous by dilution.

A few persons pass through a long life apparently insensible to, or unsusceptible of, the small-pox virus. It is a curious and important circumstance that, so far as is yet known, such constitutions exhibit a like inaptitude to receive and nourish the vaccine disease.*

Recurrent small-pox.—Few facts in medicine are better ascertained than that once undergoing small-pox gives to the individual through life complete immunity from future attacks. Exceptions to this law, however, have undoubtedly occurred. They have been noticed in all ages, and stand recorded in the writings of almost all authors who have treated of small-pox.† They are, nevertheless, comparatively rare occurrences, and many persons, practising extensively, have never seen even a single case of the kind. There is no instance recorded of a patient being received twice into the Small-pox Hospital. Second attacks of small-pox, when they do occur, are generally, so far as our own experience extends, different in their character from the first: when the first attack, that is to say, has been severe and unequivocal, the second has been light and trivial, and *vice versâ*. Sir Gilbert Blane remarks‡ that "almost all the well-authenticated cases of second small-pox have been of those persons who in the first instance had undergone it in its most severe and dangerous form." This would seem to connect the recurrence of small-pox with a peculiar proneness in such a constitution to suffer under the variolous germ. Others, again, have attempted to explain this phenomenon on the supposition that the first attack did not perfectly saturate the system. Instances of death from recurrent small-pox are not common, but they are to be found recorded in authors of undoubted veracity. It has been alleged that second attacks of small-pox are more frequent after the inoculated than after the casual disease, but Baron Dimsdale, a high authority on such matters, denies this. A predisposition to receive small-pox more than once has been stated to exist in certain families.

Concurrence of small-pox with other exanthemata.—Among the peculiarities of the contagion of small-pox, the possibility of its simultaneous occurrence with other exanthematous diseases deserves mention. Several cases have been recorded wherein measles and small-pox have appeared together,§ and both diseases have run their regular course uninfluencing each other. Such cases, however, are very rare. It has occurred to us to see at the Small-

* See cases detailed by Mr. Hawkins in the London Medical Gazette, vol. iii. p. 282.

† On Fevers, p. 126 et seq.

* See London Medical Gazette, vol. viii. p. 494.

† See Medico-Chirurgical Transactions, vol. ii. p. 31. Also Edin. Med. and Surg. Journal, vol. iv. p. 460.

‡ Blane's Select Dissertations, p. 209.

§ Dr. Russell in Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. i. p. 90.—Mr. Delagarde in Medico-Chirurgical Transactions, vol. xiii. p. 163.

pox Hospital several unequivocal cases of the simultaneous existence of small-pox and scarlatina anginosa. Small-pox and cow-pox may sometimes be seen together, each running its natural course, but in general, under such circumstances, one or other disease is modified. This subject will be more fully discussed when treating of vaccination.

Communication of small-pox to the fœtus in utero.—A number of facts illustrating this very curious subject have been collected together by Dr. George Pearson.* From them it appears that the small-pox does not often extend from the mother to the fœtus; that whenever it is so taken, it is fatal in almost all cases to the fœtus; that inoculating a pregnant woman generally destroys the life of the fœtus, and, lastly, that the disease in the fœtus and mother is scarcely ever in the same degree of intensity. Dr. Jenner has published two cases† in which the fœtus in utero took the disease from the mother, without the mother being herself affected, though exposed, of course, to the contagion. Mead entertained the fanciful notion, that if a pregnant woman underwent small-pox without aborting, the child would remain through life unsusceptible of small-pox.

Treatment.—1. It is seldom that opportunities offer of treating this disease in its initiatory stage, for its existence is generally unsuspected until the eruption manifests itself. The eruptive fever of small-pox, therefore, supposing its nature unknown, would be managed like other forms of inflammatory fever. Blood would be taken from the arm, when the pain of the epigastrium or of the head were urgent. Saline medicines in a state of effervescence would be given to lessen the feverish excitement and to allay the irritable state of the stomach. Coldness of the extremities would be met by hot bottles to the feet, sinapisms, and the pediluvium. When from concurrent circumstances, especially a known exposure to contagion, the real nature of the disease should be ascertained or very strongly suspected, the plan of treatment would not be materially different from this. Bloodletting would not then be repeated under a confident expectation that the appearance of eruption would speedily relieve the symptoms. Leeches to the temples would be advisable, provided the headach continued urgent. The bowels should be relieved by injections and the milder kinds of aperients. All drastic purgatives should be then avoided. The saline diaphoretics might be advantageously directed, with the addition of an opiate at night, in cases accompanied by much delirium. Bleeding from the arm is not found to afford relief to that specific affection of the brain and nervous system which ushers in a certain proportion of the severe cases, and accompanies their maturative stage for the first three or four days. Leeches, cold lotions to the head, aperients, and an anodyne at night, offer a better prospect of relief. The antiphlogistic regimen is to be pursued in all its details.

2. During the period of maturation the following plan of treatment is to be recommended. When the stomach remains irritable, with a tardiness of eruption on the extremities, a blister may be applied to the epigastrium, and frequent pediluvia administered, made more stimulating by the addition of mustard-powder. Pain of the fauces with difficulty of swallowing is benefited by the application of leeches to the throat, followed by fomentations made of camomile-flowers or poppy-heads. The bowels are to be duly regulated by aperient draughts, consisting of senna and salts, castor-oil, or jalap with cream of tartar, in sufficient doses to insure one motion daily, or two motions, if the degree of fever requires it. The action of the kidneys in like manner is to be encouraged by frequent doses of the citrate of potash, the liquor ammoniæ acetatis, or any similar mild diuretic. An opiate consisting either of laudanum, of the liquor opii sedativus, or of Dover's powder, may be given at bed-time, if there be any considerable degree of restlessness or of irritation of the skin.

When the surface is tender and painful to the touch, with much heat, cooling lotions may be applied with considerable advantage. Under all circumstances the diet is to be regulated as in other cases of inflammatory fever. Lemonade may be given for common drink, and Sydenham's strong recommendation of small-beer may be unhesitatingly adopted.

Symptoms indicating local inflammation must be met by appropriate means. When cough and copious expectoration of a puriform mucus occur, and give evidence that inflammatory action has spread to the smaller branches of the bronchi, blood should be taken from the arm to the extent of twelve ounces, and repeated according to the exigences of the case, bearing always in mind the drain upon the system which an extensive pustulation will ultimately occasion. When headach, a flushed face, redness of the eye, and activity of the carotid and temporal arteries denote the presence or probable approach of phrenitic inflammation, particularly in persons of plethoric habit, blood must be taken from the arm freely. In the same habit of body it is sometimes advisable to take blood from the arm to moderate the violence of inflammatory action upon the surface, and to lessen the danger during the state of secondary fever. In all these cases the blood will be found buffy, and generally in a high degree. Ophthalmia occurring during the maturative stage is generally relieved by leeches to the temples, a strong purgative of calomel and rhubarb, and lotions containing Goulard and the extract of poppies. In all cases of small-pox it is desirable to keep the chamber darkened to guard as far as possible against this occurrence, and for the same purpose, as well as for the general comfort of the patient, the hair should be taken off at an early period of the disease.

* Duncan's Medical Commentaries, vol. xix. p. 213.

† Medico-Chirurgical Transactions, vol. i. p. 269.

3. The treatment of small-pox during the stage of decline and secondary fever is to be regulated on the following principles. When the disease is mild, a few doses of purgative medicine are useful, to keep down feverish excitement, and to carry off foul secretions, or, in the language of the vulgar, to get rid of the dregs of the disorder. Where the disease has been more severe and secondary fever has set in, the excitement is to be allayed by occasional doses of antimonial powder with calomel, followed by an active aperient. The propriety of purging during the secondary fever of small-pox was for a long period the subject of keen controversy, but the question was satisfactorily settled in its favour. Calomel and rhubarb, senna and salts, and castor-oil are the forms of purgative which will generally be found to answer best.

Bleeding from the arm is seldom advisable in the course of secondary fever, unless accidental and superadded symptoms, such as pleurisy or coma, occur to render it necessary. When the face continues swollen, with tendency to delirium and a very dry skin, leeches should be applied to the temples. In those aggravated cases accompanied with the destructive form of ophthalmia already described, little can be done for the assistance of the patient. The loss of blood which the intensity of the symptoms indicates would be followed by great and rapid exhaustion. To save the patient's life, therefore, the eye must sometimes be sacrificed.

The period of secondary fever is frequently accompanied with symptoms of debility, which call for the employment of tonic and cordial remedies. If there be a cold surface, a trembling hand, and dry tongue, wine should be administered, together with cordial draughts, consisting of camphor julep, ether, and the subcarbonate of ammonia. When the pustulation is profuse over the whole body, and the consequent drain upon the system great, beef-tea should be given freely, with a liberal allowance of porter, wine, or brandy. In this condition of the surface it is extremely useful to absorb the matter by frequently and largely sprinkling the body with some simple dry powder, such as hair-powder, dried flour, the powder of starch, or of calamine. Starch-powder is the best. When sloughy and gangrenous sores have taken place upon the hips or extremities, reliance must chiefly be placed on the administration of wine and brandy, assisted by cordial draughts containing quinine, camphor, the aromatic confection, and laudanum.

Particular symptoms must be met, as they arise, by appropriate remedies. Pains of the legs are best relieved by warm fomentations made of the decoction of poppy-heads. Extreme debility and nightsweats call for the administration of bark and acid. An ecthymatous state of the surface, with languor and loss of appetite, will sometimes yield, and cicatrization advance, under the use of sarsaparilla and small doses of the pilula hydrargyri. In many cases, however, this troublesome sequela of the disease will not give way except to change of air, the beneficial influence of which is very manifest in the convalescence from all the severer forms of small pox. Erysipelas is to be treated by purgatives of calomel and rhubarb, followed by castor-oil; by lotions to the surface, applied either warm or cold according to the feelings of the patient, and the internal administration of saline diuretics, aided towards the decline of the complaint by the decoction of bark.

When small-pox has called into activity the dormant seeds of scrofula, the tonic and alterative treatment usually pursued in the management of that disorder is demanded, although the most scientific efforts of the physician will then too frequently be baffled. The abscesses and ulcers, as well indolent as irritable, which are so often left by small-pox, are to be treated according to the ordinary rules of surgery. There is no peculiar method which can be devised for the prevention of pits and scars. The masks and ointments formerly in use for that purpose, and so highly vaunted, are in reality more hurtful than beneficial. The application of a little cold cream to the hardened scabs is all that can be recommended.

The greatest attention should be paid during the latter stages of confluent small-pox to the state of the scalp. The matting together of the pustules is apt in this situation to occasion extensive abscesses, which are very troublesome and difficult to heal. To obviate these evils, the hair should be kept close cut, the scalp, when hot, should be covered with cold lotions, and purgative medicines administered, to relieve that determination of blood to the head on which the occurrence mainly depends.

Modified Small-Pox.

Small-pox taken casually by those who have undergone no preparatory process of any kind, is sometimes of an exceedingly mild character. The pustules, though perhaps very numerous and close set, do not run into each other, but maturate separately, and *turn*, as it is called, on the fifth day. The eruption feels hard to the touch, and is of the kind commonly denominated seedy or horny. In the works of the oldest authors on small-pox a description of the variety called *horn-pock* or stone-pock may be found.* It is a fair presumption that such natural mildness of disorder is attributable to some fortunate peculiarity in the constitution of the patient.

When small-pox occurs a second time, whether after inoculation, or after the disease casually taken, the second attack is very often of a spurious or anomalous kind. The papulæ are prematurely surrounded with an imperfectly formed areola; some are developed and pustulate; others harden and die away. The eruption is limited to the face, or, at furthest, extends only to the face and trunk. Such instances of a spurious or modified small-pox are recorded in all the old writers, and do not appear to have been of unfrequent occurrence. Their close resemblance to cases of common chicken-pox gave occasion to much ambiguity,

* Van Swieten's Commentaries, vol. v. p. 10.

and even dispute concerning the identity and relations of these diseases.

Since the discovery of vaccination, the milder varieties of small-pox have greatly increased in frequency, so as at the present time to be familiar to every one engaged in practice. Vaccination may be said to have multiplied prodigiously the number of constitutions that imbibe the small-pox mildly. It has generated a sort of artificial habit favourable to the peaceful reception of the variolous virus. It becomes now, therefore, an object of considerable importance to investigate carefully the phenomena of the mitigated or modified small-pox. It is reserved for a future opportunity (see VACCINATION,) to explain the circumstances under which small-pox occurs after cow-pox, and the presumed causes of such an occurrence. All that we now propose is to state the appearances which small-pox presents at some considerable interval of time after vaccination, as, for instance, ten or twenty years.

In a certain limited number of such cases, even when the proofs of correct vaccination have been most undeniable, the small-pox has been found to run its regular course unaltered in its symptoms, and unmodified in any of its features. We cannot, therefore, be surprised if it has sometimes, when so occurring, proved fatal. In an infinitely larger proportion of cases, however, the small-pox, when it attacks an individual who in the early period of life has felt the full influence of vaccination, is altered or modified, as well in its primary aspect as in its subsequent developement and progress. No reasonable doubt can be entertained, from the abundance of facts now before the world, that such modification is the *law* of the animal economy, and that the regular or normal progress is the *exception*.

It does not appear, however, that the modifying power of vaccination displays itself in the incubative stage. In the modified as in the natural disease, the same interval of time elapses between the reception of the variolous germ, the first developement of symptoms, and the subsequent appearance of eruption. The same pain of back attends the initiatory fever. The same constitutional disturbance, as well in kind as in degree, precedes the eruption. But though the primary fever rages uncontrolled by vaccination, its influence is often perceptibly seen at the very first appearance of the papulæ. The eruption is both less in quantity, and more limited in extent than in the common forms of the disease. It shows itself in the face and breast, and not at all, or very scantily, on the extremities.

In many cases, indeed, this description does not apply. The eruption is profuse, and equals, both in extent of surface affected and in quantity, the worst cases of natural confluent small-pox. The modifying power, however, begins to show itself almost immediately afterwards. The feverish excitement, which with such a state of surface might be expected to run high, subsides entirely. Some of the papulæ never advance at all towards maturation, while around others an imperfect attempt to form areolæ may be observed as early as the second or third day. The course of the disease is then so rapid, that by the fifth day the pustules on the face have maturated. The pocks are horny and speedily desiccate, leaving however, for a considerable time afterwards, tubercular elevations of the skin surrounded often by a mottled redness. During the progress of this imperfect maturation the patient is generally able to walk about. He enjoys a good appetite and sound sleep. The unsightliness of the eruption alone disturbs him. No inflammation of the cellular membrane interrupts the period of convalescence. No pits remain to attest the violence of the disorder.

We are warranted, as well by etymology as by the custom of old authors, in applying to this mild form of small-pox the term varicella; but to distinguish it from another disease which has received the same name, (the genuine or infantile chicken-pox,) we may with propriety call this the *varicella variolodes*. It resembles the true chicken-pox in the mildness of the external inflammation and the absence of all severe constitutional excitement. It differs from it, however, in its undoubted origin from the variolous germ, and in its power of communicating the most perfect small-pox to others, as well by inoculation as by infection.

In some cases, especially where the interval from the date of vaccination has been short, small-pox in the vaccinated shews itself in a form so singularly mild that the real nature of the disorder can be with difficulty ascertained. In fact, none but those who are in the constant habit of seeing such cases, of tracing them to their source, and observing the minute gradations by which the several kinds of small-pox run into each other, could recognize them. A few scattered pimples perhaps are all that exist to attest the fact, but these pimples, in their progress to maturation, will be found to exhibit (with or without the aid of the microscope) that great and undoubted criterion of variolous origin, *depression of their centres*. The diagnosis is aided by carefully inquiring into the history of the initiatory fever, and observing if forty-eight hours have elapsed between the occurrence of rigor and the developement of papulæ. It is put beyond dispute by tracing the source of the disorder to some case of undoubted variola, at the distance of eight to fourteen days, or by its simultaneous occurrence with other cases in which the character of the disease is unequivocally displayed.

Such are the phenomena of small-pox as it usually presents itself in those who have undergone regular vaccination in early life. It remains to state that every intermediate degree between the thoroughly confluent and the mildest varioloid will sometimes be seen. It is seldom, however, that any severe affection of the bronchial passages is witnessed. A few vesicles may be observed on the tongue and soft palate, but they seldom extend to the larynx. Affection of the brain and nervous system is more common. Intense delirium may often be found accompanying a very modified aspect of

eruption, giving rise to much anxiety and some real danger. The cause of this anomaly generally exists in the peculiar habit of the individual. He will be found to be a person of an irritable or nervous temperament, and who has probably displayed, on some former occasion, a similar occurrence under the pressure of acute disease.

Small-pox after vaccination very rarely exhibits dissolution of the fluids, hemorrhages, and the other phenomena of malignancy. Such an occurrence has been witnessed, and followed too by a fatal result, but it must be looked upon as the most rare of all observed deviations from the ordinary course of the modified disease.

Inoculated Small-Pox.

Small-pox existed in the world, and had been studied by physicians for at least a thousand years, before any idea prevailed that its course could be controlled and its virulence assuaged by any artificial means. When, where, and by whom this great discovery was first made is not accurately known. It has been conjectured that it had its origin in the countries bordering on the Caspian sea, Circassia and Georgia, but the opinion rests upon no adequate authority. Nor can we place much more reliance on the statements which have been made as to the antiquity of inoculation in China and Hindostan. Our first accounts of it are derived from Constantinople, and there, towards the close of the seventeenth century, inoculation must be considered as having had its origin.

About the year 1703, rumours of the great success of this operation attracted the attention of Dr. Emanuel Timoni, a Greek physician, who had studied and graduated at Oxford. He subsequently settled in Constantinople, and being convinced of the importance of the discovery, wrote an account of it in 1713 to his English correspondent Dr. Woodward, which, in the following year, was published in the Philosophical Transactions. In 1715, Dr. Pylarini, the Venetian consul at Smyrna, having also learnt the success of this Turkish practice, published an account of it at Venice. A notice of this work appeared in the Philosophical Transactions for 1716, and these favourable accounts were fully corroborated by the reports of Mr. Kennedy, (an English surgeon, who had travelled in Turkey) in his "Essay on External Remedies," published in London in 1715.

No notice, however, was taken of these important facts by any English physician, and the idea of transplanting or engrafting small-pox (as the process was called) was well-nigh forgotten in London, when the celebrated letter of Lady Mary Wortley Montague appeared, which described the practice in so lively a manner as to attract public attention.* "The small-pox," she writes, "so general and so fatal amongst us, is here entirely harmless by the invention of *engrafting*, which is the term they give it. There is a set of old women who make it their business to perform the operation. Every year thousands undergo it, and the French ambassador observes pleasantly that they take the small-pox here by way of diversion, as they take the waters in other countries. There is no example of any one that has died in it, and you may believe I am well satisfied of the safety of the experiment, since I intend to try it on my dear little son. I am patriot enough to take pains to bring this careful invention into fashion in England." She kept her word, and to the spirit and enterprize of this lady the introduction of inoculation into this country is altogether due. It was not until her return to London that any attempt was made to profit by a discovery which had been announced for five years; and her own daughter was reserved to be the first example of inoculation in England. This event occurred in April 1721, and as its success was complete, Dr. Keith, who had been witness to the experiment, submitted his child to the same process, and with a like happy result. Several months elapsed, but the medical profession in London still remained sceptical; some, because the practice originated with ignorant old women, and others from inability to understand the rationale of the process.

The next step was to obtain a pardon from King George I. for six condemned criminals, on condition of their submitting, by way of experiment, to inoculation. This was effected through the agency of the Princess of Wales, who was anxious to follow Lady Mary's example, and to secure her own children by the new process. These and some other trials having been deemed satisfactory, the Princesses Amelia and Caroline were inoculated on the 19th April, 1722, the former being then eleven and the latter nine years of age. Both of them passed through the small-pox favourably; but the new practice, begun under such brilliant auspices, received a severe check in the death of three persons, (one of them a child of the Earl of Sunderland,) which happened within a few days afterwards.

Cotemporaneous with these experiments in London were those performed at Boston in North America, by Dr. Boylston, on the authority of Timoni and Pylarini. 244 persons were inoculated by him in Boston and its neighbourhood between June, 1721, and January, 1722, of which number six died. The subjects, however, were ill chosen, and the operator betrayed both ignorance and rashness. Dr. Boylston, however, deserves credit for having been the first to remark that the period of incubation is shorter in the inoculated than in the natural small-pox, and that the former may be employed to supersede the latter.

When these occurrences at Boston became known in London, the clamour against inoculation increased. Objections were made to it both in a medical and moral point of view. By Dr. Wagstaffe it was declared to be unsafe, and by the Rev. Mr. Massey impious. Under these discouraging circumstances, it is hardly to be wondered at that the practice of inoculation advanced but slowly. Prejudice and mismanagement combined to throw obstacles

* Vol. ii. Letter 31, dated April 1, 1717.

in its way. It was calculated that during the first eight years only 897 persons were inoculated throughout the whole of Great Britain, of whom seventeen died.

By slow degrees the medical profession became convinced of the advantages of inoculation, but it was not until the middle of the last century that it was practised in England to any considerable extent. Several circumstances contributed about this period to bring it into repute. In the year 1746 the Small-Pox and Inoculation Hospital of London was founded, for the express purpose of extending to the poor the benefits which had hitherto been almost exclusively confined to the rich. The results of the practice in the hospital were eminently favourable to the cause of inoculation. In 1747 Dr. Mead, then in the zenith of his fame, published his work *De Variolis et Morbillis*, and in a chapter expressly treating of inoculation, adduced many cogent arguments in support of it. In 1754 the Royal College of Physicians of London put forth a strong approbation of inoculation; but the popularity which it ultimately acquired is mainly attributable to the improvements which, in 1763, the Suttons introduced in the mode of conducting the process.

Robert and Daniel Sutton were sons of Mr. Robert Sutton, surgeon, of Debenham in Suffolk, who had acquired some celebrity as an inoculator. Both followed their father's profession. The former established himself as a professed inoculator at Bury St. Edmund's, and the latter at Ingatestone in Essex. The success which attended Daniel (the cleverest of the family) at Ingatestone was unparalleled, but he fairly earned it by the boldness and dexterity of his management. The peculiarities in his system of inoculation were chiefly the following:—he reduced the preparatory process from a month to a week; he employed very freely, during the whole period, a strong purgative powder, containing calomel and emetic tartar; he inoculated by means of a single puncture; he exposed his patients freely to the coldest air prior to and during the eruption, and prescribed cooling drinks and a spare diet. There was nothing new in the plan. Lady Mary Wortley Montague had stated that the Turkish children were suffered to play about in the open air during the period of eruption; Sydenham taught the value of the cool regimen; and the purgative powder had been introduced from North America. The merit of the inoculator consisted in the skill with which he selected what was beneficial in the several plans already known.

The system of Daniel Sutton was ably followed up by Baron Dimsdale, who enjoyed a high reputation and extensive practice, and whose admirable treatise on inoculation* (1779) contains everything then known on the subject. Nor was any further improvement attempted. For twenty years the mode of practice recommended in Dimsdale's work was adhered to, and the result was, that in every succeeding year inoculation became both more popular and more successful. The close of the century, however, which saw the rise of inoculation was destined to witness its fall. In 1798 Dr. Jenner announced the discovery of vaccination, almost immediately after which the general practice of inoculation declined, and has never since been revived.

Theory of inoculation.—The object of inoculating is to secure a mild form of the disease, and this result follows in a very large proportion of cases. No adequate explanation has ever been offered of the singular fact, that mildness of the disease should be occasioned by the germ being received into the system by means of the cutaneous vessels. Something, it has been said, may be attributed to the influence of the preparative process, but this explanation will not go far when we reflect that the same means applied during the incubation of the natural disorder are not productive of the same effects.

The beneficial influence of inoculation is displayed not only in moderating the quantity of eruption, but in determining the whole force of the disease upon the surface. In a very large proportion of inoculated cases, the eruption is of the distinct sort, and moreover widely scattered. An efflorescence (roseola exanthematica) frequently precedes for one or two days the developement of the true variolous papulæ. Sometimes a full and confluent crop is produced, but under these circumstances it is very seldom that the mucous membrane of the pharynx and larynx become implicated to any dangerous extent. The cellular membrane, in like manner, is rarely involved in the inflammatory action, so that the disease is then properly characterized as *confluent superficial*. Secondary fever, therefore, is rarely met with in the latter stages of inoculated small-pox; and further, that affection of the fluids which constitutes the leading feature of acute malignancy is almost or altogether unknown as a consequence of inoculation. The result of all this is, that the mortality by inoculated small-pox is very small indeed, and bears no sort of proportion to that of the casual disease. The average number of deaths at the Inoculation Hospital was only three in a thousand. In the wards appropriated to the casual disease the deaths were (and continue to be) three in ten!

Practice of inoculation.—According to the statement of Lady Mary Wortley Montague, the old women of Constantinople "opened with a large needle one or more of the veins of the arm or leg, and put into the wound as much matter as would lie on the head of the needle, afterwards binding it up with a hollow bit of shell." This simple mode was first followed in England, but it was afterwards supposed more desirable to have large wounds, which might ensure a more plentiful discharge of matter. For this purpose incisions were made three quarters of an inch in length, and deep enough to penetrate through the skin; and some cotton charged with variolous matter was laid on them for twenty-four hours, and retained

* The present Method of Inoculating for the Small-Pox, by Thomas Dimsdale, M.D. seventh edition, 1779.

there by means of a plaster.* Another mode of giving the small-pox, said to have been first practised in China, consisted in inserting crusts or cotton charged with variolous matter in the nostrils. These rude practices were very injurious to the cause of inoculation, and they have long since yielded to the simple expedient of making a *single* wound with a lancet armed with fresh variolous matter in any convenient part; and by a sort of general consent, the arm, at the insertion of the deltoid muscle, has been selected for the purpose.

It is of little moment at what period of the disease the matter for inoculation is taken, but thin, limpid, or *crude* lymph of the fourth and fifth days is generally preferred to the purulent or well-concocted matter of the eighth and ninth days. It is of as little importance whether the matter be supplied by a distinct or a confluent, a casual or an inoculated case. The Suttons preferred the crude lymph of a *primary* inoculated vesicle. Common sense would dictate the propriety of rejecting a case of extreme malignancy.

The best age for inoculation is from the third to the sixth month from birth, and again, after the period of dentition is passed. Adult persons in the middle periods of life may be inoculated with perfect safety, due attention being paid to the habit of body. Season has but little influence upon the results of inoculation, but, *cæteris paribus*, the extremes of heat and cold should be avoided. The spring season was generally preferred by the professed inoculators in England. At Constantinople the month of September was the period usually selected.

The circumstance chiefly to be dreaded in inoculated small-pox is an inflammatory state of the blood. Hence it is that the only preparatory measures of any importance are such as have for their object to repress this tendency. A dose of purgative medicine should be given prior to the operation, and two or three more during the period of *incubation*. The purgative should consist of calomel, combined either with antimonial powder, emetic tartar, or powder of jalap. The patient is to be restricted to a spare vegetable diet. He should sleep in a large airy apartment, without a fire, and during the day should be exposed freely to the cold air. The influence of cold in repressing the quantity of eruption was strikingly manifested in the practice of the Suttons, and constituted, in fact, the principal peculiarity of the Suttonian system.

Phenomena of inoculation.—On the second day after the operation, if the part be viewed with a lens, there appears an orange-coloured stain about the incision, and the surrounding skin seems contracted. On the following day a minute papular elevation of the skin is perceptible, which on the fourth day is transformed into a vesicle with a depressed centre. The patient perceives an itching in the part. On the sixth day, some pain and stiffness are felt in the axilla, proving the absorption of the virus into the general mass of blood. Occasionally on the seventh, but oftener on the eighth day, rigors occur, accompanied sometimes with faintishness, sometimes with pain of the back, headach, or vomiting. The patient complains of a disagreeable taste in the mouth, and the breath is offensive, soon after which the eruption shews itself.

The incision in the arm, when viewed through a glass, now appears surrounded with an infinite number of small confluent papulæ, which daily increase in size. On the tenth day an areola or circle of inflammation forms around the inoculated point, now distended with matter. This areola is irregular in shape, and in its progress becomes interspersed with numerous minute vesicles. By the fifteenth day the primary pustule has scabbed, and the eruption on the body generally has begun to maturate. By the twenty-first day, in the great majority of cases, the disease is wholly at an end. The number of papulæ dispersed over the body is subject to great variety. In some cases not more than two or three are perceived. It is important to know that an eruption is not indispensable to the success of inoculation. In some cases the full change has been produced upon the frame, and a complete insusceptibility to future attacks given, by means of the single pustule excited artificially upon the arm.

Treatment of inoculated small-pox.—In mild cases nothing is required but one or two doses of simple aperient medicine, such as the infusion of senna, with manna and Epsom salts. In cases of greater severity we are to proceed in the manner already directed for the natural small-pox.

The objections which have been urged against inoculating for the small-pox, and which have caused the abandonment of the operation, are the following. Although in many instances the subsequent disorder be slight, still it is sometimes severe, and occasionally brings life into hazard. It often proves the exciting cause of other disorders, and more especially calls into activity the scrofulous taint. But more than all, it is urged against small-pox inoculation that it adds to the danger of the public by multiplying the foci of variolous contagion,—that it preserves one life at the risk of many. This objection to inoculation, which has been so strongly insisted on of late years by almost all writers, was long since fully appreciated. Dr. Watkinson, Dr. Schwencke, and others, in the year 1777, attempted to obviate it by shewing that the diffusion of variolous contagion takes place only in certain epidemical states of the air; that when such a condition of atmosphere prevails, the disease would propagate itself quite as widely, independent of all cases artificially excited; and when it was not present, inoculation would be perfectly harmless. The argument is ingenious, and certainly calculated to shew that this charge against inoculation has been overstated. It might seem easy to determine the point at once by reference to the Bills of Mortality, where a gradual augmentation of deaths, in proportion as the

* Woodville's History of Inoculation, p. 99.

practice of inoculation extended, will at first sight appear. Dr. Adams, however, very justly remarks* that this argument is more plausible than solid, for in the first place, admitting the fact to be as stated, there has been a corresponding increase in other diseases, not communicable by inoculation; and, secondly, the statements may be so put as to shew a diminution rather than an increase. Thus, in the thirty years between 1741 and 1770, there died of small-pox, according to the Bills of Mortality, 63,308; whereas in the next thirty years (viz. from 1771 to 1800) there only died 57,268.

Although, then, it would be difficult to support this objection against inoculation by a reference to statistical tables, it is obvious that it must necessarily contribute to diffuse the contagion, and so far therefore is an evil. Notwithstanding this defect, however, and others already adverted to, inoculation must still be viewed as a most valuable discovery, and a merciful provision of nature against the ravages of a dreadful pestilence.

(George Gregory.)

* Inquiry into the Laws of different Epidemic Diseases, by Joseph Adams, M.D. 1809. p. 144.

END OF VOL. III.

LONDON:
MARCHANT, PRINTER, INGRAM-COURT.

ERRATA IN VOL. III.

Page 468, *for* PORRIGO, see RINGWORM, *read* PORRIGO, see TINEA.
Page 532, *for* PRURIGO, see TINEA, *read* PRURIGO, see SUPPLEMENT.