CONTRIBUTIONS

TO

PHYSIOLOGICAL AND PATHOLOGICAL

ANATOMY;

CONTAINING THE

OBSERVATIONS

MADE AT THE

PHILADELPHIA ANATOMICAL ROOMS

DURING THE SESSION OF 1824–25.

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ΜΕΛΕΤΗ ΤΟ ΠΑΝ·

To industry, all things are possible.

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PRELIMINARY REMARKS.

From the earliest dawn of medical science to the present hour, the importance of Anatomical knowledge to all Physicians has been fairly set forth, and fully illustrated; yet, strange as it may appear, Anatomy has never been cultivated as it should be, by the Profession at large, neither has society received half of the benefits this science is capable of conferring, because of the imperfect manner in which it is generally understood. It is true, that a great degree of perfection has been attained in this study in various quarters, by numerous individuals—but of the great mass of Practitioners throughout the world, it would not be incorrect to state, that at least six out of ten have very vague, indefinite, and unsatisfactory ideas on the subject, and of necessity can neither understand the diseases to which the human body is liable, nor know how to address themselves properly to their removal.

This is, in a great degree, to be accounted

for, 1st. by the actual difficulty of acquiring a thorough knowledge of Anatomy; 2d. from the inveterate prejudices existing in relation to this study; and, 3d. from a preposterously absurd idea, that a man may become a good practitioner without being well acquainted with this science.

The existence of an actual difficulty, although it might suffice to deter indolent and irresolute persons from attempting the study of medicine, can never serve as a justification to those who have assumed the responsibility; but it is undeniable that the time usually appropriated by students to this department is altogether inadequate to the acquisition of more than a smattering, and must ever continue so, while preceptors are content that a pupil should devote to Anatomy not more than half the time that would be required for learning the rudiments of Latin or Greek grammar. In relation to the prejudices generally existing against our science, they are obstacles of great magnitude, and can only be removed by a gradual improvement in the common sense of mankind: in this country, however, the prejudice is nowhere so strong* as to

* Perhaps we should except that famous town in NEW ENGLAND, where the people, instigated by their "enlightened" pastor, have *recently* exiled a Physician for dissecting, and have "resolved never to employ *a Physician*" who has dissected dead

prevent a physician from gaining a very valuable acquaintance with Anatomy.

The third reason given why anatomy is not properly studied, is the common refuge of those who are willing to shelter themselves in a crowd, because too inactive to exert their own strength. It is true, there have been a few rare instances of *good* Physicians who were not good Anatomists; but how much *better* would these have been if they had possessed this knowledge? How painfully and slowly did they acquire their ability to act aright, and with what an unnecessary expenditure of human lives! advancing with faltering and undecided steps; *guessing* at the condition of the various organs, and waiting in anxious trepidation for the result of their *experiments:* for every thing done by persons thus deficient is no better than an experiment, the success of which may be hoped for, but cannot be anticipated with certainty, as it is not based on principle. Allowing, however, that even at this great and unnecessary expense of life, time, and anxiety of mind, a few persons have at length become expert, it is by no means applicable as

bodies, or assisted others in dissecting. We are confident that on such terms, these good folks will *never* employ "A PHYSICIAN." Conduct like this, is a libel on the present times, and on "a Christian land," professing to believe that the body is corruptible—the soul, immortal—the ETERNAL, omnipotent.

a general rule, any more than that, because a few men have become celebrated without classical education, all others may dispense with its assistance.

The science of medicine is *at least* two centuries behind what it ought to be; and we may add, that mankind are equally in the rear of what they would have been, if anatomy had been properly *persisted in* by Physicians. If after gaining in the schools an elementary acquaintance with the subject, they had, on all proper occasions, taught those who employed them the true value and application of this science, the reign of prejudice would have long since been overthrown, and medicine raised to its merited elevation. Instead of having their worst passions aroused, mankind would have learned with pleasure, that the bodies of their departed relatives were examined by their friend and Physician—and every benevolent and enlightened member of society would be rejoiced to think, that even after his decease he might contribute to the prolonged and comfortable existence of those he loves, by the aid of that science which interrogates death itself, in order to benefit the living.

The opposite course of conduct has entailed distrust of the Profession, and injury to the pa-

tient. The physician who does not know enough of Anatomy to appreciate and explain its universal application to Medicine, is not qualified to remove the prejudices against this study, and while mankind continue to look on attempts to examine the dead, as an outrage, they lock the door against the improvement of their physicians: hence it results, that there is but this difference between the parties—the practitioner lives *in*, and the patient too often dies *from*, his ignorance.

We are, of course, speaking in the most extensive and universal view of the subject, being perfectly aware that a very admirable progress has been made and is still making in this respect, and the advantages thereof have already been reciprocally experienced by the profession and society—witness the triumphantly successful investigation of diseases of the chest and brain. These, formerly the most mysterious and obscure of our diseases, have, by the light of Anatomy, been made plain and intelligible to all, and every day is shedding a similar light over equally interesting and difficult subjects of medical research.

Believing, as I do, in the necessity of a more general and devoted attention to the study of physiological and pathological anatomy, I may hope

to be forgiven for thus pressing on the notice of practitioners the importance of my favourite pursuit: I am willing to be called *enthusiast*, if those who examine the subject properly do not agree with me in opinion, though I have little fear of being censured by any one who has duly considered the excellence and importance of this science.

My own pathological observations have been almost exclusively drawn from the inspection of bodies, with the history of whose lives and diseases I was unacquainted; connected with a knowledge of the appearances exhibited previous to death, every fact remarked might have been of much greater moment. What I most wish to recommend to the serious attention of the profession, is, that they should endeavour to profit by all the cases terminating unfortunately under their notice, and by anatomical examination to connect the symptoms and diseased changes together—so that on the recurrence of similar affections, they may advance at once to the rescue, guided by an unwavering light, and with that self-possession which a consciousness of strength alone can bestow.

CONTRIBUTIONS

TO

PHYSIOLOGICAL AND PATHOLOGICAL ANATOMY.

In my "Anatomical Investigations," recently published, the *fascia superficialis* is described, as it extends over the trunk, head, and neck, anteriorly and posteriorly, and continues on to the arms. Subsequent examinations have confirmed these dissections, and have enabled me to show, most conclusively, that the *brachial fascia*, described heretofore as distinct, is a continuation of the great superficial fascia.

The fascia superficialis forms sheaths for all the mucles of the trunk, neck, head, and arms. It forms, in a manner analogous, the sheaths of the muscles of the neck, and passing down into the chest with the great vessels, gives the important sheath called *pericardium* to the noblest part of our muscular structure, the heart.

The fascia superficialis is a strong membrane, extending over the abdominal muscles, and is placed nearly in the middle of the cellular substance, between the surface of these muscles and the integuments, having a layer of fat above and below it. This fascia is very readily perceptible in dropsical subjects, (in two of which we have recently demonstrated it,) as in them the cellular substance above and below the fascia is fully distended with water, leaving the fascia in its integrity.* The strength of the fascia superficialis is very great, for when freed of cellular substance, and raised continuously from over the belly up to the shoulder, we can raise the upper part of the trunk and superior extremities of a large subject from the table by this structure, as we have repeatedly shown to the Class, and as the dissectors at *the Rooms* are frequently in the habit of doing.

The importance of this fascia can scarcely be comprehended without a fair statement of what I have hitherto related on the subject: but as it is impossible for me, at the present moment, to describe all the physiological views I have formed in consequence of these researches, I

* Sir Astley Cooper, who first observed this fascia on the belly, may be advantageously consulted on this subject.

hope, at no distant period, to lay before the profession a work descriptive of the whole of the relations and arrangements of these structures, systematically digested. It is now in my power to state that the *fasciæ* of the human body are *three* in number, the *superficialis*, *lata femoris*, and *interna abdominis*—all of the sheaths of the muscles, and all the processes of fasciæ, being formed from them, with the exception of the *temporal*, *palmar*, and *plantar* aponeuroses. The three great fasciæ are all continuous at certain points, and might, without any effort, be considered as one, though their differences of density, &c. are sufficient to justify us in viewing them separately.

The brachial fascia is a simple continuation of the superficialis, as it may be traced from the chest under the great pectoral muscle, or from the back on to the deltoid muscle. The portion from the under surface of the pectoralis major joins the part covering the deltoid, at the inner edge of the last muscle, and when the attachments are broken through at this part, the fair and uninterrupted continuity of the superficial and brachial fascia is made evident.

We then follow the fascia upwards, on the short head of the biceps, and on the outside of the arm, on the long head of the triceps, up to

the edge of the acromion and glenoid cavity, as heretofore described.*

This portion of fascia is external to the tendons of the muscles arising on the scapula, and inserted into the tubers at the head of the humerus. Each of these muscles, the supra and infra spinati, teres minor, major, and subscapularis, have a sheath or double covering of fascia, derived from the superficial fascia. If we split the external covering of these muscles, and cut the body of the muscle across, so as to allow us to remove it from its place, leaving the inferior layer, we shall find this inferior portion running to the edge of the glenoid cavity of the scapula, and thence to the humerus, forming a layer of the capsular ligament. Thus each of these muscles forms a layer of the capsule, which, when raised, removes a part of the thickness of the capsule, and when we raise the lowest portions we open into the shoulder joint.

It has been stated that these sheaths of the

* The ensuing details relative to the brachial fascia, are required to complete the description of the capsular ligament of the shoulder joint, as given in the "Anatomical Investigations."

I have made several examinations of the connexions existing between the fascia sheathing the muscles of the leg, and holding their tendons in place, and the ankle joint, but have concluded to defer the publication of them, until by repetition of my dissections, during the ensuing season, the conclusions I have drawn may be more thoroughly established.

muscles are formed from the fascia superficialis, which surrounds the muscles above and below. When these layers are about to expand over the joint so as to form the ligament, it is not possible to say how far the successive portions extend from the point where they first reach the joint.

The capsular ligament of the shoulder joint is tolerably equal in its thickness, but where the tendons of the scapular muscles overlay the ligament, the thickness is very much increased by their attachments. The principle on which this joint is formed from the superficial (*brachial*) fascia is entirely analogous to that of the formation of the capsular ligament of the hip joint, by the fascia lata femoris.

The fascia superficialis not only forms the sheath of the muscle, but sends the little septa through, enwrapping the bundles of muscular fibres. These septa extend from the superior to the inferior portion of the sheath. This arrangement is very beautifully evident if we raise a part of the sheath of the muscle, and pull it upwards; we shall then see the exact manner in which these little partitions pass between the muscular bundles, and modify the direction of their actions.

The observations published relative to the muscle of the *thyroid gland* have been confirmed

by a great number of dissections; we have had as many as five instances in the Rooms at the same time, and I am still inclined to believe that it occurs in almost every subject. In examining several for this curious muscle, I have found it in an imperfect condition, or rather like the rudiment of a muscle coming off from the isthmus of the gland,* and running up but a very short distance before it became thin and indistinct. It should be recollected that I have figured the *exception* to the general rule, which arose from *both lobes*, and was inserted directly in the centre of the os hyoides. It most frequently rises from the *left* lobe, and ascends a little on the left of the median line of the trachea, to be inserted into the basis of the os hyoides. I shall hereafter be able to give a fuller and more interesting description of the modifications observed in this singular structure.

The high bifurcation of the axillary artery

* Fyfe notes such an appearance, which he says may be mistaken for a muscle. He appears never to have seen the fully formed muscle of the thyroid gland, called *levator glandulæ thyroideæ*, by Haller. It is only when the *isthmus* is prolonged upwards that the rudimental appearance is presented; where the fibres come from one or both sides, they cannot be mistaken, and I have injected in several instances the distinct artery appropriated to this structure, commencing its ramifications above the thyroid cartilage, and being accompanied by a corresponding vein.

has been found this season so frequently as to incline me very strongly to believe that some modification of this arrangement occurs as often as that usually described, below the bend of the arm. In one or two instances, the bifurcation took place as high as the tendon of the pectoralis minor, in others, opposite the insertion of the coraco brachialis, and in one case the bifurcation was about two inches above the condyles of the humerus. Of seven instances of high bifurcation, occurring within the month of November, of the humeral artery, in but one did the artery pass down external to the sheet of tendinous fascia, connected with the tendon of the biceps flexor cubiti. This, and my former experience, is entirely opposed to the statement of the celebrated JOHN BELL, who inferred, from what he had seen, that when the artery bifurcates above the ordinary place, the vessels pass to the forearm, external to the expansion attached to the biceps. We wait, however, for a more extended experience to enable us to ascertain positively whether Mr. Bell's rule may not be the most general.

The third head of the biceps was found, during November, in one instance, rising from the middle of the os humeri, at the inner edge of the bone, about four inches above the ex-

ternal condyle. It was inserted into the proper tendon of the muscle, and not into the tendinous fascia, as has been heretofore noted. This third head of the *biceps* was, as far as I know, first described by Douglass in his excellent comparative myography. In the "Anatomical Investigations" I have made mention of several instances, though at that time I had no opportunity of knowing that Douglass had observed it.

It may not be amiss to inform students of anatomy of the means we adopt in the *Philadelphia Anatomical Rooms*, to render wounds received in dissecting entirely harmless. Whenever the fingers or hands are cut or punctured, the part is speedily washed with warm water and soap, and the wound sucked forcibly for a considerable time, until thoroughly freed from any matter introduced, or the suction is continued till blood flows no longer. A piece of fish-glue (court) plaster is placed over the orifice, which is thus kept covered until healed. Such is the certainty with which this process averts any evil consequences, that the students who adopt it, feel no uneasiness relative to cuts or punctures, which, after the old mode of trusting to caustics, would give rise to the greatest anxiety. Where the cuts or punctures have been so slight as to escape ob-

servation at the time they were made, and the severe irritation and inflammation have commenced, all the unpleasant symptoms have been entirely removed by this operation.

The advantages given us by this mode of treatment are very evident, on comparing the present with the past season. Last season several of my class suffered very severely; the attendant on the rooms, from a slight scratch on his thumb, nearly lost his life, and was only saved by the suppuration of his axillary glands. In my own person, I three times suffered dreadfully; in one instance, the whole arm swelled, with immense irritation, accompanied by the most sickening sense of prostration, and several weeks elapsed before I could use my hand. In every instance the injury was slight, and had been promptly treated with caustic potash, or butter of antimony, both of which, I believe, without destroying the poison, added to the irritation.

This season we have had fully as man cuts, punctures, and scratches from dissecting instruments, without the least inconvenience. One member of my class had slightly punctured his finger under the nail, and had applied the caustic alkali; his finger and hand were becoming stiffened, and the peculiar irritation had begun to affect his forearm. I pared the nail as closely

to the wounded surface as possible, and directed him to suck it forcibly, which being done, a piece of court plaster was laid over the end of the finger, and a poultice kept on during the night. The next day the tension and irritation had disappeared.

That such symptoms are not produced by the caustic, I know by full experiment; the caustic causes much irritation at the moment of its application to surfaces injured in any way, except with anatomical instruments, but is not followed by any of the circumstances produced by the terrible poison of the putrefying human body.

During this winter I have myself been wounded very frequently with a variety of instruments, even having my hand lacerated by a long used and thickly coated saw. I have been punctured slightly and deeply in the sides and extremities of the fingers, while dissecting bodies in various stages of putrefaction, without being followed by the slightest injury, and which, without the treatment mentioned, must have produced most serious if not fatal results.

There is one instrument I hope to see banished from the dissecting room and from the cases of dissecting instruments; this is the *hook*, which, whether single or double, is one of the most detestable poisoners that can be imagined. Being

generally made with very sharp points, which are more or less ragged on their sides, it is hardly possible to use hooks, especially at night, without receiving punctures, and these wounds are so slight as not to be perceived until the mischief is done. They may be entirely superseded by the forceps and fingers, or if a hook be considered necessary for holding up nerves or vessels, let it be a blunt one. The double hook is still more dangerous than the single one, and is totally unnecessary, as it may be superseded by using common straight pins.

We frequently see, in the periodical papers and in dissectors, directions given for the preservation of anatomical subjects. The materials recommended are mostly solutions of saltpetre, common salt, corrosive sublimate or pyroligneous acid. I have tried them all, and know that they all are attended with one very great disadvantage, that of destroying the edges of the knives; and unfortunately, the sublimate and pyroligneous acid, the two best preservers of the flesh, are the speediest destroyers of instruments. A better agent than any of the above, and one free from the great inconvenience of injuring the knives, is common whiskey. We fix a pipe into a large artery, and inject the whiskey, until no more can be thrown in. It does not flow out by

the bowels or mouth, as the solution of common salt, which may be attributed to the action of the spirit contracting the delicate extremities of the capillary vessels. In this way, the whole of the muscular and cellular system is acted on, and if the skin be then sponged with *impure* pyroligneous acid, the body may be kept for a great duration of time, even in warm weather; the flies may be prevented from depositing their larvæ in the cavities of the nose, mouth, &c. by pouring into these some spirit of turpentine, which will prevent them from coming to life if they have been already deposited.

The *impure* pyroligneous acid is the most excellent corrector of the bad smell of dead bodies, by merely sprinkling or sponging with it. The *pure* acid is little better than common vinegar, when compared with the impure.*

Having received from Professor Brown, of the Transylvania University, on his arrival from Paris, an account of Civiale's operation for the removal of stone, with the *lithon-*

* I have heretofore expressed an opinion relative to the inadequacy of chlorine gas as a purifier of the air in dissecting rooms. I am now inclined to believe, in consequence of some suggestions from a friend well versed in chemistry, that my mode of disengaging the gas was not sufficiently perfect to justify the conclusions I drew. Hereafter I hope to repeat the experiments, with proper attention to all the circumstances.

triptor, which is used through a straight tube passed into the bladder through the urethra, I made some experiments to ascertain the practicability of introducing a *straight* instrument. For this purpose I chose the largest sized flexible metal catheter, which, though easily straitened in the hand, cannot be bent by any degree of force that could with propriety be used on the urethra. The diameter of this tube was three-eighths of an inch. My surprise was very great to find that this instrument, perfectly straight, could be introduced without *any* difficulty, the subject being extended on its back on the table, and the legs bent, so as to allow their weight to rest on the soles of the feet. By passing it almost perpendicularly, until its extremity was made to project at the bulb of the urethra; then drawing the penis up on the catheter, and slightly withdrawing the instrument, and at the same time depressing the point of the penis for two inches, or a little more, the catheter passed into the bladder with ease. The same experiment was repeated on all the male subjects then in the Rooms, in which the urethra was uninjured, and has been since performed on several others. It is not to be expected that the same ease of introduction will be allowed in the living man, as the irritability of the parts will provoke a consi-

derable disposition to spasm in the muscles of the bulb, perineum, and neck of the bladder. Neither do I think, as a general rule, that the catheter of the largest size can be used; still, the muscles may be gradually accustomed to the action of the straight catheter, or they may be relaxed and rendered quiescent by the injection of a tobacco clyster into the rectum, the introduction of a suppository of tobacco, or possibly by the use of an injection of laudanum. Whether Civiale's operation be immediately followed with all the advantages expected or not, we have, doubtless, reason to hope that the introduction of the straight catheter will be of great use in various affections of the bladder, as it is more manageable than the common curved instrument.

Where there is no deformity of the urethra produced by stricture, ulceration, or tumours within the pelvis, there is never any difficulty of introducing an instrument into the bladder, provided the operator *knows* the actual condition of the structure of the urethra. In other words, where there is no deformity, the difficulty is produced by a vague notion of the anatomy, and an indistinct idea of certain mysterious manœuvres to be performed with the catheter. The catheter curved in any proper degree, may be introduced, by one acquainted with the struc-

ture, in the living subject, without any very perceptible change in the position of the instrument, or movement of the penis. In saying this, we leave out of the account the difficulty produced by spasmodic disposition in the muscles connected with the urethra, because this is to be overcome by patience, or by the use of antiphlogistic or anodyne remedies. In the common introduction of the cathether, the point of the instrument is passed down to the bulb, and then the bulb is doubled against the triangular ligament, or the operator, in attempting to execute the grand movement of depressing the penis and catheter, throws the point upwards, and catching it on the ligament, renders the introduction impossible. If it be recollected that the membranous part of the urethra is continuous with the line of the upper surface of the urethra, and in the natural condition, is always held in the same place, there is nothing necessary to be done in the introduction of the curved sound, or catheter, than to stand on the right side, and with the catheter well oiled, pass it down the penis, keeping the external part of the catheter as much as possible in a line with the trunk of the body, whether lying, sitting, or standing, inclined obliquely outwards, over the anterior superior spine of the ilium. When the curved part

of the catheter is passed down low in the perineum, keeping the point of the catheter gently pressed against the upper part of the urethra, we straighten the penis slightly on the instrument, and pass it onwards into the bladder without difficulty.

When the patient lies on his back, the knees should be bent, letting the weight of the limbs rest on the soles of the feet. When he is sitting, he may rest his thighs on the edges of two chairs, and incline his body a little forward. If standing, it is only necessary to make the same inclination of the body, and separate the knees to a short distance, also slightly bending the thighs on the legs. As to the correctness of these directions, I have nothing further to state, than that I have during the last winter taught students, who never used a catheter in their lives, to pass the instrument with ease and certainty in different subjects, in a very short time.

PATHOLOGICAL ANATOMY.

Diseased actions produce changes in the living body infinitely various and exceedingly singular in character, which, in the present state of our knowledge, are often altogether inexplicable. It is true, that in numerous instances we can trace the connexion between cause and effect, especi-

ally after acute or chronic inflammation has existed, where manifest injury has been done to important organs by external violence, or where great irritation has been long continued in various parts of the system. But, in a great majority of cases, we have no guide to a correct understanding f the mode in which such alterations are produced, nor can we form any satisfactory opinion of the causes deciding their commencement. We frequently find tumours of peculiar construction growing from textures of most dissimilar nature, and we term them diseased, rather from the situations they occupy, than from any want of organic characters in themselves. If these bodies were more uniform in place and appearance, we might consider them in the light of parasite animals, deriving their support from, but having no continuity with, the body to which they are attached. Such animals we know to exist; and not unfrequently they are supposed to be mere degenerations of natural structures, though they are invariably characterized by a generic or specific resemblance, which is inseparable from them, wherever they may be found. Tumours, on the contrary, cannot be otherwise considered than as local alterations occurring in the regular structures of the body, consequent to some peculiar impression made on the

nerves, and of necessity on the secretory or formative vessels of the part. Sometimes, as in the case I shall first relate, there is a regularity of arrangement in these productions, which appears as if they were *designed* for some important purpose, though this is by no means to be admitted; in other instances, the structure is so very different from the surrounding parts, and so curiously organized, that we are led to infer, that quite as much nervous and vascular energy was necessary to their formation, as would be required for the growth and support of the great organs of the system. Much, however, remains to be discovered, before we shall be able to understand the operation of the agents by which tumours are excited, or the signs indicating their origin within cavities of the body, although it is at once evident how highly important and extensively useful such knowledge would become. Our present inability should not prevent us from carefully observing and recording every fact that may eventually be useful in elucidating this subject; nor should we consider those labours lost, which barely place effects before us, without giving us the slightest clue, by whose aid we may hope to arrive at their causes.

The spinal column was frequently found slightly curved laterally, and in a few instances anchylosed at the anterior edges of the vertebræ; but the most frequent alteration discoverable in the individual vertebræ was a flattening or apparent compression of their bodies, with an irregular excurvation of their superior and inferior margins. That this was the result of absorption of the bodies, and a simultaneous growth of the edges, was proved by a similar peculiarity being observable along the external margin of the crest of the ilium, which, in one or two instances, had the anterior superior spinous process prolonged, and terminating in an obtuse, roughened extremity. In one instance, the right sacro-iliac synchondrosis was entirely obliterated, and the ilium smoothly continuous with the sacrum,* being perfectly anchylosed, and appearing as if it had been thus formed originally.

* As the subject of nomenclature is of as much importance in anatomy as in any other part of medicine, and we have the most stupid blunders handed down from one writer to another, in consequence of misconception, I shall subjoin what I have said in another work on the meaning of this term.

"We are told that the bone terminating the spinal column is called "*os sacrum*," because it was formerly offered in sacrifice, and hence called "sacred or holy." This fable is entirely the offspring of ignorance. The words "os sacrum" do not

I am indebted to my friend Dr. J. R. Barton, for two interesting and very perfect instances of

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mean "holy" or "sacred bone," but *great* bone; either because of its being made up of several pieces, or from being the base of the spinal column, or from the important organs placed in its immediate vicinity. The word Ιερος means *præstans, magnus,* as well as *sacer.* The word *sacer* is used in Latin for *great* as well as *holy.* Aretæus, speaking of the reason why epilepsy was called "Ιερον νοσον," *morbus sacer,* expressly states that it was called so, not because of its being a judgment from Heaven, but because of its violence and distressing character, as the word *sacred* was used in the sense of *great.* "Και ΙΕΡΟΣ γεν το ΜΕΓΑ·" [περι Επιλεπσιος; βιβλ· α·] In like manner, we have *ignis sacer* among the Latins; and numerous instances may be selected from the Latin poets, as in the common quotation from Virgil:

> "'Quid non mortalia pectora cogis,
> Auri *sacra* fames.'

"Homer, speaking of the manner in which Patroclus, after thrusting his spear through the cheek of Thestor, draws him from his chariot, says—

> ——"'As when a man
> Seated on jutting rock, drags from the deep
> With cord and shining hook, the *mighty* fish.'*

"If we desire further proof of the synonymous use of the terms *holy* and *great,* we may observe in the Hebrew language

* —— "ως οτε τις φως,
Πετρη επι προβλησι καθημενος ΙΕΡΟΝ ιχθυν
Εν πουτοιο θυραζε λινω και νηπι χαλκω" ΙΛΙΑΔ: Π.

—— "*Veluti cum vir*
Scopulo in prominenti sedens, SACRUM piscem
Ex ponto foras lino et splendido ære." Glarkius.

anchylosis, the one of the hip and the other of the elbow joint. These are both so consolidated as to be utterly immoveable, yet without any of that irregularity which we most frequently see after fractures, or ulcerations resulting from constitutional diseases. In the hip joint, the head of the femur is firmly united to the upper part of the acetabulum, which seems slightly widened or pressed upwards at that part. A more remarkable irregularity is to be perceived in the anchylosis of the elbow, where the union has been effected without the least alteration of the articulating surfaces, if we except a considerable elongation of the coronoid process of the ulna, and a gentle increase of thickness on the margins of the bones.

We should believe, with Dr. Barton, from these

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there is this peculiar mode of expressing a superlative degree. The word מלך [*Malach*] signifies a king; but to express a king of great power and grandeur, the word יה [*Yah*] *God,* is prefixed to it; יה-מלך *God-King* or Great King. The English epithet *godlike*, refers the possession of more than human power or energy of mind, and very seldom indeed to superior sanctity."

Accident has recently placed within my reach, a copy of GALEN's treatise Περι οστων, with a commentary by the celebrated JACOBUS SYLVIUS, who makes the following remarks on the title, Περι τα ιερα οστα: "Os ιερον, id est sacrum et magnum, hoc est, cæteris racheos ossibus maius (veteres enim ιερα, μεγαλα vocarunt,) vel πλατυ, id est latum."

appearances, that this anchylosis resulted from simple, or at most rheumatic, inflammation of the joints. The importance of being vigilant, when there is danger of such anchylosis taking place, to prevent the members from being improperly flexed, is very obvious; for if we allow this union to form with the thigh flexed on the body, or the knee bent to a right angle with the leg, the deformity will be extremely unpleasant, and the convenience and comfort of the patient unnecessarily sacrificed.

Among irregular growths of the osseous system, we may mention the occasional prolongation of the crista galli of the œthmoid bone; in one case it was almost an inch in breadth, and a plate of bone extended for some distance from its anterior part along the curvature of the frontal bone, becoming gradually obsolete in its ascent.

GENITAL SYSTEM.

Tumour on and within the uterus.—This subject was about thirty-five or forty years of age, having a considerable quantity of fat throughout the cellular texture, and exhibiting no external peculiarity of appearance, except a projection of the abdominal muscles on the right side, the center of which was midway between the ante-

rior, superior spine of the ilium and the median line; the whole of the prominence occupying the greater part of the right iliac region. The external organs of generation were lax, and much dilated, the vagina being covered with large quantities of mucous looking fluid, which on first examination was supposed to be the result of gonorrhœa.

When the belly was opened, a singular appearance was presented within the pelvis. A tumour, almost perfectly globular, four inches and a half in diameter, occupied the greatest part of the pelvis, compressing the rectum to a considerable degree, and nearly hiding the uterus from view. The anterior surface of this tumour was in contact, though not adherent, with the peritoneum, while its superior surface was partly covered by the ileon and head of the colon. The bladder of urine, pressed to the left side, small, flat, and empty, (of necessity, as we shall presently see,) was immediately between the anterior surface of the tumour, and the internal face of the pubes. On closer inspection, and drawing the tumour upwards, the fundus of the uterus and the left Fallopian tube were seen low down in the pelvis, turned so as to present towards the spine of the ischium, having the rectum to pass down behind it, concealing the right

tube and ovary. Both ovaries were found altered, and apparently disorganized, though closely resembling hydatids clustered together.

When the tumour, bladder, womb, and rectum were carefully removed from the pelvis, it was evident that the tumour grew from within the thickness of the cervix uteri, as the peritoneal covering of the womb, and its peculiar texture, were observed extending over it, the uterine substance becoming thinner as it approached the upper part. The tumour was hard, incompressible, and remarkably spherical, having very slight depressions or undulations on some parts of its surface. On cutting through the external covering derived from the peritoneum and womb, which was about an eighth of an inch thick at the base, and less than a sixteenth above, I was surprised to find that the whole tumour had a covering of bone, about the twentieth of an inch in thickness, so hard as to require a saw for its division. This bony envelope being divided, the tumour was cut through the centre with the knife, and the sensation imparted resembled that produced by cutting through a mass of cartilage, which the internal substance more closely resembled than any thing else, being tough, dense, semi-transparent, elastic, and apparently homogeneous. This whole tumour ap-

peared perfectly sound throughout, exhibiting no trace of inflammation nor ulceration in any part, neither was there any sign of increased vascularity discoverable where it rose from the uterus. Its origin was three inches wide, and had no communication with the cavity of the womb.

The uterus being opened, the lining membrane looked perfectly healthy and unchanged. The cavity would have been of the ordinary size, but for the encroachment of another tumour, at the upper and back part. This second tumour was also situate within the posterior thickness of the womb, and resembled the larger one in its structure, except that it had none of the bony matter. The cavity of the womb was perfectly natural from the lower part of this posterior tumour to the os tincæ, and the depressions and curved lines on the anterior and lateral parts of the internal surface of the cervix uteri, (called *arbor vitæ*,) were beautifully and distinctly marked.

When the vagina was opened from the back part, a most unexpected circumstance was made manifest. The neck of the bladder was extensively *destroyed*, and an aperture of three-fourths of an inch in diameter allowed the bladder to communicate with the vagina, so that one or two fingers could be passed at once from the vagina

into that organ. Every trace of meatus urinarius was gone, and the edges of the communication between the vagina and bladder were rounded and smoothly cicatrized. On close inspection, the vagina showed no appearance of inflammation, though it was covered with tenacious mucus, no doubt thrown out to defend the vagina from the constant flowing of urine over its surface. In all other respects the parts seemed natural; the rectum was but slightly compressed, there being neither enlargement of the sigmoid flexure, nor of the arch of the colon.

In considering all the particulars of this interesting case, the destruction of the neck of the bladder seems most remarkable. If we recollect the form of the tumour, and the manner in which it occupied the pelvis, we might, without much difficulty, suppose that the pressure of the tumour had caused the bladder to slough at its neck, as this organ would have been over-distended by a comparatively small quantity of water, on account of the filling up of the pelvis by the tumour, and because the situation and projection of the tumour would deprive the bladder of the assistance given under ordinary circumstances by the abdominal muscles. If we reject this attempt to account for the destruction mentioned, we might attribute it either to lacera-

tion produced during labour, or to the improper use of obstetrical instruments. If it had been produced in the former way, we should have expected some evidences of simultaneous laceration of the perineum, of which no trace was discoverable. It is possible that this injury might have been caused by the use of obstetrical instruments, though we can scarcely see in what way, unless by using improper violence. Dr. DEWEES has remarked, that the lock of Haighton's forceps sometimes does injury by including a part of the labium, or the capilli from the surface:* none of these modes of explanation can be resorted to in this case, unless we knew whether the destruction of the neck of the bladder preceded or followed the growth of the tumour.

* To obviate the inconveniences produced by the lock of the forceps, in October, 1824, I caused a pair to be made for my friend Dr. MORELL, of Havana, by that excellent artist JOHN RORER, the blades of which were like Haighton's, having in addition the superior and inferior curvature of Baudelocque's forceps. The lock was made according the plan of Siebold, as commended by DEWEES, with the handles of wood in the usual way, but lighter. This instrument, that may well be called the *composite forceps*, appears to be better suited to the purpose than any other, as it combines the advantages of all the forceps hitherto introduced. Mr. Rorer has further improved the excellent joint of Siebold, by taking off the projection of the nut, and giving a greater degree of obliquity to the notch. This improved joint he now makes on all the different forceps used by practitioners.

It is exceedingly probable that this tumour caused many symptoms which were similar to those occurring during gestation, and this idea should induce us to avoid pronouncing an opinion in cases where pregnancy is imputed, without inquiring into the possibility of the existence of a tumour on the womb, or within the pelvis. In medico-legal investigations, the appearance of discharges from the vagina cannot be esteemed positive evidence that the lining membrane is the actual seat of disease, as such discharge as was found in this subject might be caused in a similar way, or be produced by the fluids thrown out from a tumour in a state of ulceration. In my "Anatomical Investigations" I gave an instance where puriform discharge was produced by a fistulous ulcer, descending from the kidney, and opening through the cervix uteri into the vagina, in which case, all the appearances must have deceived the physician as to the true seat of the disease. In the subject having the tumour above described, we may readily discover how fruitless must have been all treatment for the incontinence of urine; and yet it is very probable that both the patient and physician might have had no idea that this incontinence was produced by a simple destruction of the neck of the bladder. Nothing but a careful examination

Fig. 1.

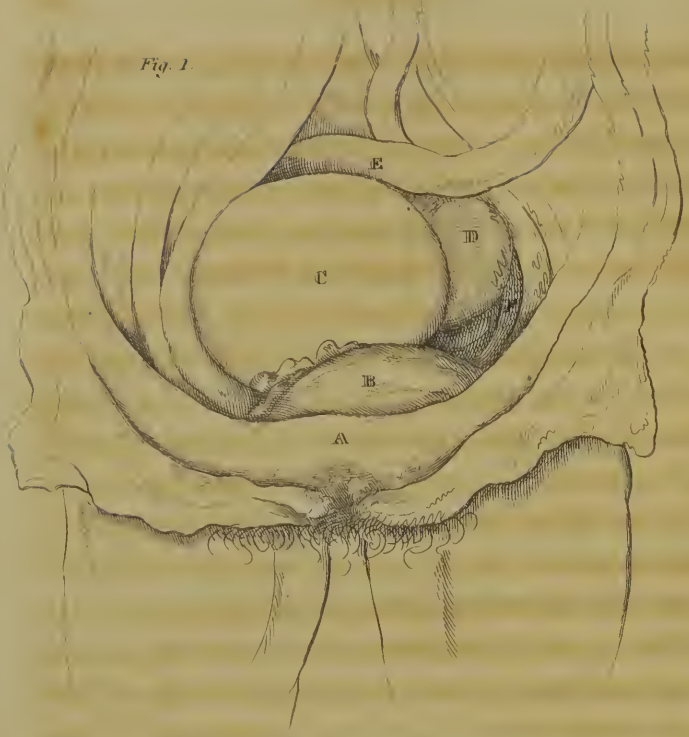
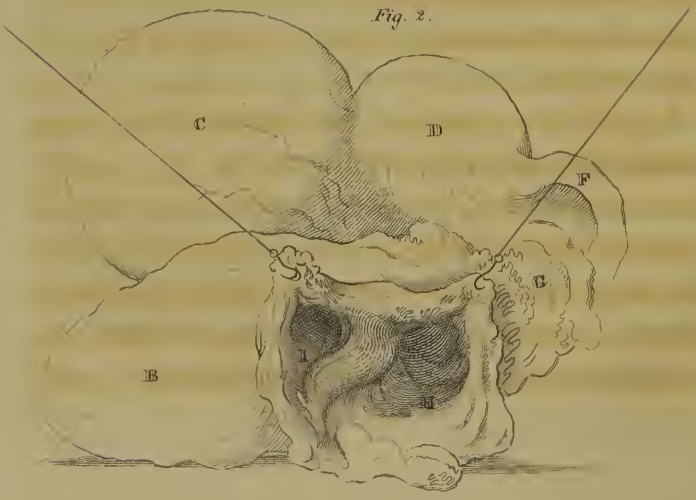


Fig. 2.



Drawn from Nature by J. Drayton.

could have led to such a conclusion; and it may be well in all cases of doubtful character to examine whether a loss of substance or malformation may not exist, the discovery of which, would at least save the patient from severe and necessarily fruitless use of medicine.

Explanation of the Plate.

Fig. 1. A. pubes.
B. bladder.
C. tumour.
D. womb.
E. rectum.
F. left Fallopian tube.
Fig. 2. B. bladder.
C. tumour.
D. womb.
F. left Fallopian tube.
G. diseased ovary.
H. vagina.
I. lacerated entrance into the bladder communicating with the vagina.

Hernia.—The subject of this investigation was the body of a well formed and muscular man, who had committed suicide a day or two previously. A tumour, somewhat pear-shaped, and about the size of the doubled fist at the lower

part, occupied the right side of the scrotum, extending up to the external abdominal ring, growing smaller in its ascent. The testicle was to be distinguished at the under and back part of the tumour; the sensation imparted by touching the tumour resembled that produced by pressing on slightly elastic dough. From the uniformity with which this sensation was produced at all parts of the tumour, the conclusion was drawn that this was a case of pure omental hernia, or epiplocele.

The integuments being removed from over the whole of the tumour, the fascia superficialis came into view, strong and well defined; covering the whole of the tumour in the scrotum, and being strongest immediately over the situation of the ring.

When the fascia superficialis was raised from the whole tumour, the cremaster muscle presented, though its fibres were not distinct, except at the upper part immediately below the ring. The cremaster was attached with considerable force to the whole of the anterior part of the true hernial sac, or peritoneal envelope; so that it would have been impossible to cut through the cremaster muscle without at the same time laying open the sac, if this tumour

had been operated on during the life of the patient.

The sac being opened from about an inch below the ring to the extremity of the scrotum, the contents of the tumour were exhibited, and proved to be a great mass of the omentum, folded on itself in a singular and beautiful manner.

Towards the lower part the omentum was much altered in structure, being thickened, loaded with fat, and studded with knobs of various sizes, from that of a hazelnut to less than a pea. Nearer to the neck of the sac the structure was more natural, though denser and firmer than the ordinary character of this membrane.

The external abdominal ring was very greatly enlarged, so that all traces of its usual appearance were obliterated. The omentum, as it passed through the ring, was more than an inch in diameter, and several adhesions existed between the omentum and the surface of the sac below. The internal edge of the external ring, seen when the muscle was detached in the middle, and thrown downwards on the thigh, appeared as if rolled on itself.

Nothing peculiar was observed in the cremaster muscle within the external ring. When this muscle was removed, the fascia interna, (or fas-

cia transversalis, as it has been incorrectly called,) through which the internal abdominal ring is formed, came into view, being strongly marked, and most so immediately at the ring, though without any circumscribed thickening. It was now seen that the internal ring was almost directly behind the external one, a necessary consequence of the continual dragging of the tumour.

When the fascia interna was split through at the internal ring, the neck of the sac became fairly visible, and though covered only by the peritoneum, this membrane was so altered immediately where it had been pressed on by the ring as to appear firm and rounded, bearing considerable resemblance to an annular ligament. Above this circular portion, the peritoneum was removed, and then a part of the arch of the colon was found immediately above the neck of the sac, being firmly held in this situation by the protruded omentum.

The view was still more interesting when the abdominal muscles were divided and turned back. Then it was evident that almost the whole of the floating portion of the omentum was thrust out. The part of the bowel pulled down to the neck of the sac, was the central por-

tion of the great arch of the colon. The stomach was very much and forcibly displaced, being pulled down within a hand-breadth of the pylorus, so as to form a sort of constriction, as if there were two pouches to the stomach. The stomach was placed diagonally across the centre of the body towards the right side the lowest portion being between the constriction caused by the weight of the hernia, and the pylorus. This orifice presented almost directly upwards, and instead of its usual place, occupied a situation immediately below the middle of the gall bladder.

From this description it is seen that the arch of the colon, instead of crossing the centre of the body through the hypochondriac and epigastric regions, formed a semicircle crossing the lower part of the abdomen, and having the concave part of its sweep upwards, or towards the stomach.

The other appearances were natural, if we except a considerable adhesion of the rectum along the upper part of the interior strait of the pelvis, the more remarkable from the turgescence or rather the varicose state of the veins, at this part, and nowhere else. The mesentery was very much charged with fat, and the large intes-

tines were peculiarly so. The liver was studded with black spots of a small size, resembling the appearance of melanosis.

The ensiform cartilage in this subject was turned directly upwards and outwards, resembling a spur, and on a closer examination, a cushion of dense fat was found, covering the point of the cartilage. This cushion was full three-fourths of an inch in length. I have recently seen a subject with two ensiform cartilages, as large as this cartilage usually is, and an inch and a half long.

The muscle of the *thyroid gland* was also found in this subject, distinctly marked, and being as we have most frequently found, to the left of the median line of the trachea, as described by Sœmmering.

Prostate gland.—Some time after making the experiments on the introduction of the straight catheter, as related p. 22. I examined one subject, in which there were three perforations between the posterior part of the bulb of the urethra, and neck of the bladder. When the catheter was introduced through the urethra to the first opening, it entered this false passage very readily; when withdrawn and pass-

ed onwards, it as readily passed into the second; and in like manner, when withdrawn from this situation, it lodged in the third; when freed from this situation, and the handle slightly depressed, although it was of a large size, it entered into the bladder with facility. The prostate exhibited no other appearance of disease than a slight enlargement, perhaps owing to the lacerations, which, although irregular, were fairly cicatrized. The first perforation was through the membranous part of the urethra, and under the prostate, in the direction of the curve of the catheter; the second was through the anterior edge of the prostate, reaching to the rectum; and the third, entering a little beyond the second, passed through the whole length of the prostate, inclining somewhat to the left side. From a careful examination of the parts, there was no evidence of stricture or other disease in the canal, which was of large size, although every one who saw the openings immediately inferred that they had been produced by violence exerted in attempting to pass the catheter. Judging from all the circumstances, I should decide that this was one of those cases, (which I fear are not rare,) in which some one totally ignorant of the structure, had attempted to accom-

plish by brute force, what can never be properly effected without a combination of anatomical knowledge and manual dexterity.

ARTERIAL SYSTEM.

Aneurism of the aorta.—Male subject, apparently sixty years of age, strongly muscular. A pipe was inserted in the right carotid artery, and the body injected. On opening the chest, the commencement of the aorta, uncommonly large, presented far towards the left side of the chest. A tumour of great size was found, extending from the origin of the left subclavian artery, down to the sixth dorsal vertebra, swelling out on the left side, so as to occupy the largest part of the left cavity of the chest. The tumour extended across the spine at the upper part, over the first and second dorsal vertebræ, so as to be more than two inches within the right cavity of the chest. When filled with injection, the commencement of the aorta lay immediately under the articulation of the upper ribs with their cartilages, attached by a circular adhesion; the anterior part of the tumour was within two inches and a half of the inner surface of the chest. Over this part of the tumour the trachea and œsopha-

gus were placed; the trachea being on the left, and so much turned round as to have the membranous or posterior part exactly on the right side. In consequence the trachea was at this part flattened, having full one-third of its caliber obliterated. The œsophagus was partially covered by the trachea. At the lower part, the left division of the trachea doubled round the tumour to reach the left lung. It was compressed flat, and its caliber obliterated by adhesion. The left lung was altogether consolidated, and occupied about one-third of its proper space, being entirely hidden by the tumour. In texture it resembled a very hard liver, and gave a sensation when cut into, something similar to that produced by cutting through a turnip.

The continuation of the aorta came from the lower part of the tumour, opposite the sixth dorsal vertebra, though so far to the left as to be considerably curved toward the centre, before it reached the bodies of the vertebræ. It was very much enlarged, far below its separation into the common iliacs.

On removing the ribs of the left side, a fair view was obtained of the tumour. It was firmly attached to the pleura, over the heads of the fourth, fifth, and sixth ribs. On the right side

a similar attachment was observed over the bodies of the fourth, fifth, and sixth dorsal vertebræ. When this attachment was cut through, the back part of the aneurismal tumour was opened. This posterior part was filled with large clots of blood, very firmly coagulated, and they rested on the vertebræ, without any intervening substance. All the left half of the fourth, fifth, and sixth vertebræ was destroyed, as if by ulceration, and this destruction extended to the heads of the ribs which were within the tumour.

Some specks of ossification were observable around the edges of the posterior part of the sac, where adherent to the vertebræ. The distention produced by the aneurism had consolidated the posterior mediastinum, in such a manner, as to render it impossible to distinguish any part of it. The coats of the aneurism were of uniform thickness, except at the edges adhering to the vertebræ, beyond which they were discontinuous.

In Baron Ferrusac's Bulletin for 1824, the dissection of a celebrated comic actor is given. This man, throughout his life, had been subject to a singular hoarseness, which was thought to be owing to some disease about the glottis; but after his death, which suddenly occurred, it was

discovered that there was no original disease in any part of the trachea, but an aneurismal tumour, very similar to that above described, compressed the trachea for a considerable extent. Although we have no knowledge of the symptoms which were present during the life of our subject, we are much inclined to believe, that his voice must have been much altered by the compression of the left division of the trachea. As the œsophagus was also much compressed, difficulty of swallowing very probably existed. The use of the *stethoscope*, too much neglected in this country, would render such a disease unequivocally evident. We should suppose that a physician who should treat his patient for disease of the lungs, or be engaged in cupping and leeching his throat for chronic bronchitis, during a long time, would be deeply mortified to discover, by dissection, that there had been incurable disease of the heart, or aneurism of the aorta, which might have been palliated, if he had been better informed.

Explanation of the Plate.

Fig. 1. Aneurism seen from above, the subject lying on its back; sternum and part of the ribs removed.

A. the heart.

B. arch of the aorta.

(*) Adhesion to the cartilage of the ribs.

C. arteria innominata.

D. left carotid.

F. trachea.

G. œsophagus.

H. aneurismal tumour, extending underneath G and F. into the right side of the chest.

I. descending aorta.

J. cœliac axis.

Fig. 2. Lateral view of the same aneurism, the ribs of the left side taken away.

A. clavicle.

B. arch of the aorta.

(*) Adhesion to the cartilage of the ribs.

C. arteria innominata.

D. left carotid.

E. left subclavian.

F. left division of the trachea.

G. extremity of the œsophagus.

HH. tumour.

I. descending aorta.

(††) Coronary arteries.

Fig. 1.

Fig. 2.

In two instances, I have found most extensive ossifications of the arteries, one subject being nearly ninety, and the other more than seventy-five years of age. The patches of ossification were largest in the neighbourhood of the heart; and in the second case, the superior surface of the aortic arch was literally lined with bone. At the origin of the great vessels, large irregular patches of ossification extended for some distance within the caliber. On the general internal surface of the aorta, the pieces of bone were flattened rather concave, but irregularly incurved at their edges. In all instances, they were placed between the middle and internal coats of the artery, and though occasionally projecting, were never uncovered. In these cases the ossifications were traced through all the principal arteries, and many of the smallest partook of the same morbid condition. In some parts the incipient formation of bone was made evident by a cartilaginous thickening very perceptible in the coats of the artery. In the elder subject, the tricuspid, mitral, and semilunar valves, very much occupied by patches of bone, were thus prevented from accurately closing the orifices of the ventricles, as well as the mouths of the pulmonary artery and aorta.

Among the irregularities observed in the ar-

terial system since my last report, may be noted the high bifurcation of the brachial artery, which, in one case, divided immediately under the clavicle, and in four others, as high as the point where the musculo-cutaneous nerve enters the coraco-brachialis muscle. But in none of these cases did either artery run externally to the aponeurosis of the biceps at the bend of the arm. I have uniformly found where this high bifurcation occurs, that a large inosculating branch crosses immediately from the radial to the ulnar artery, an inch below the bend of the arm, and from the middle of this, the interosseous artery is sent downwards. The more extended my experience becomes on this subject, the more am I persuaded that this high bifurcation occurs at least half as often as the usually described arrangement.

In two instances the *right hepatic* artery was the first branch of the superior mesenteric; being, of course, nearly an inch lower down than the right hepatic usually is, and occupying the right side of the cord of vessels, ducts, &c. belonging to the liver. It passed under the head of the pancreas and duodenum obliquely upwards, instead of being rather transverse to the epigastric region, as under ordinary circumstances. In the healthy condition, this arrange-

ment would be of no great consequence: but in case of an indurated pancreas, or other organic change, affecting the quantity of blood sent through the cœliac, this branch from the superior mesenteric passing behind the pancreas where but slightly subject to compression, would supply the liver with the necessary quantity of blood.

In order to preserve a record of the fact, I will here introduce the following singular result, obtained, in the winter of 1823, by injecting from the carotid artery. I placed a pipe in the left carotid artery of a tall, slender, and emaciated subject, apparently thirty or forty years old, and having thoroughly warmed it by immersion in heated water, I threw into the body, with the ordinary brass injecting syringe, melted tallow, highly coloured with fine King's yellow, which gave it a very rich hue. The syringe was filled, and emptied through a tube in the artery, three or four times. On examination, I was very much pleased to find that the fluid had returned through the veins, so as to fill them very perfectly: but on more attentive observation, my surprise was increased, by discovering that the smallest veins in both arms distinguishable by the naked eye, were filled with a material differing in colour from that contained in the arteries. In fact, the

colouring matter was separated entirely from the tallow during its passage from the arteries to the veins; in the arteries, the colour was a rich yellow, deepening as it approached their extremities, and in the veins, the pure white of the tallow was entirely free from any admixture. I have not since repeated this experiment, nor was it in my power to preserve the specimens, as this circumstance occurred the day before the conclusion of my winter course, at a time when I was obliged to remove, at an exceedingly short notice, from the house I then lectured in. Although the idea did not occur, until too late, to throw them into spirits, and subsequently dispose of them at leisure, I induced some members of the profession to examine them, who were well qualified to ascertain the correctness of my observation; and I should have extended this invitation to many others, had it not been that I have too often found invitations of this kind accepted and neglected with chilling apathy.

RESPIRATORY SYSTEM.

Abscess and suppuration of the lungs.—Subject female, apparently twenty-five years of age, extremely emaciated, having a long neck, and very narrow chest. When the left cavity of the thorax was opened, there was no part of the lung

apparent. The space usually occupied by the lung was void, and seemed to have been emptied of a fluid previous to death, as some flocculent matter, resembling whitish coagulated mucus, still adhered to the surface of the membrane lining the chest, which was red, thickened, and universally adherent to the ribs. At the lower and back part of the chest, instead of lung, there was a mass of brownish, ash-coloured matter, which had several openings communicating with the cavity of the chest. When cut into, the substance seemed to be nothing more than a collection of semi-coagulated, puriform substance, intermingled with flocculi, resembling half-boiled membrane. The right cavity of the chest was natural in appearance.

DIGESTIVE SYSTEM.

The stomach of the same subject was in a condition which is often referred to by medical writers as preventing the operation of medicines. The internal surface was lined with a thick investment of mucus, so tenacious and dense as to appear like an additional coat, and nothing but actual experiment could have convinced me that such a vitiated secretion could be thus fixed on the villous coat. In attempting to remove it, I inverted the stomach, and washed it. first in cold.

then in warm, and subsequently with soap and water, but without removing any notable quantity. I next rubbed it between my hands, as if washing a cloth, by which a few flakes were detached, but the greater part of it still adhered. If this condition of stomach frequently occurs during disease, it must be next to impossible that medicines can be administered with any advantage. There was a considerable quantity of ether mixed with the fluids in the stomach, but even this powerful agent might as well have been placed in contact with dead matter, for any effect it could have produced on a surface coated as this was. The same condition is thought to exist in cynanche trachealis, which frequently renders emetics almost entirely unavailing, unless the most powerful and stimulating are administered. In delicate females habitually costive, and leading sedentary lives, I have several times suspected this state of stomach, which rendered the system almost utterly insensible to the presence of medicines. One instance of this kind, which occurred in the practice of my much esteemed friend Dr. John W. Buckler, of Baltimore, required the most violent emetics, at a time when the patient appeared so much prostrated that the slightest exertion must destroy her. The emetic, after some very violent efforts,

caused the discharge of a thick, lining, mucous substance, resembling the inner coat of the stomach broken into large flakes, and a great improvement in her state of health immediately ensued. The extreme prostration in this case was the consequence of want of nutrition, as the digestive function must have been for some time altogether suspended. It would be of great moment if we could determine with any certainty the condition of system leading to this state of the stomach, which always must indicate the use of emetics, notwithstanding the apparent debility may be truly alarming.

BILIARY SYSTEM.

A male subject about forty years of age, extremely emaciated, and seemingly dead of consumption, was examined. Both lungs were hepatized, and adherent to the pleura costalis. The diaphragm was permanently and remarkably convex on the right side; slightly so on the left. Other viscera gave no signs of disease. The liver contained a great number of tumours, differing in magnitude, from the size of a middling apple, to that of a hazelnut; they were whitish, firm, projecting above the surface of the liver, and rather softer in the centre than at the edges. They were readily separable from the liver, and

left a clean bed, without shreds or patches of attachment: some of the largest might well be compared in consistence and colour to a rotten apple. It would be very interesting could we ascertain the symptoms accompanying such cases, as well as how far the hepatization of the lungs was dependent on the diseased liver. Nothing remarkable occurred in the cystic or hepatic duct, the gall bladder, or vena porta.

The body of a female, about twenty-five or thirty years of age, was inspected, whose whole system was most perfectly imbued with the colouring matter of the bile. The bones, tendons, ligaments, brain, and in short every part that could be seen, with the exception of the nails and hair, were of a deep, bright yellow, resembling that made with chrome. Contrary to all expectation, there were no biliary calculi; there was no obstruction of the ducts, nor disease of the liver, nor peculiarity in the blood-vessels. The bile in the gall-bladder was in moderate quantity, though the pori biliarii were rather full. The only remarkable circumstance in this subject besides the bilious colour, was the entire absence of the left *rectus capitis posterior*, while its fellow of the right side arose and was inserted with the most perfect regularity, as regards

its relation to the median line; being only a very little broader than usual at its origin.

There is one circumstance not generally attended to by persons engaged in the study of medical jurisprudence, which is that appearance produced on the dead body, very closely resembling the effects of violence committed during life. We frequently find the bones of subjects brought for dissection singularly fractured; sometimes the skull is broken and depressed, or the pelvic junctions separated, with other injuries of similar character. These, if found on a body submitted for medico-legal investigation, would be readily enough attributed to violence done previous to death. Perhaps the best mode of deciding in these cases will be to examine the muscles, which are usually broken in the dead subject at the same time with the bone, and exhibit no effusion of blood, whereas it would be found in quantity, if the injury preceded death. Those who are accustomed to these appearances can distinguish such injuries, though they are not always perfectly easy to determine, except by referring to the circumstances under which the body may have been moved after death.

Wherever the cuticle is destroyed, or much compressed, in a dead body, it will in a short time have all the appearance of a very serious injury, done during the life of the subject.

NOTE

ON

THE ACTIONS

OF THE

MUSCULAR SYSTEM.

During a great lapse of time, the muscular system has been carefully studied by numerous intelligent and acute observers, in all countries where science has been cultivated, yet, notwithstanding their important labours, much remains to be known and explained, relative to the structure of the muscles and their modes of action. It is not with an expectation of supplying what is wanting to complete our knowledge of the muscular system, that this note is written, but to invite attention to some interesting particulars which have been singularly overlooked, by those who have heretofore treated of muscular action.

However rough and irregular the skeleton may appear when entirely denuded, it is most

admirably formed for giving support and proper attachments to the soft parts designed for the growth and motion of the frame, and in the living condition, the adaptation of the soft textures to the bony fabric is productive of every variety of beautiful outline, whether the body be in a state of exertion or of repose.

In various parts of the system, beauty of configuration is obtained at the expense of power; the motive instrument is not placed in a situation where it can exert the greatest possible degree of force, neither is the lever it operates on the most advantageous for raising a given weight: still the effect is produced with the least sacrifice of convenience and beauty, and all apparent disadvantages are fully compensated by the combined action of different muscles. This is very evident when we reflect that the lever of the third order is the one most universally employed in the human body; the lever itself being the least efficient of all, yet allowing an arrangement of muscles, &c. about the bone, the most conducive to symmetry and convenience, while the want of absolute power from the use of this lever is compensated by the greater number of muscles brought into action, and the much greater variety of motions to be performed in consequence of the peculiar relations of the bones.

In addition to the general attention to symmetrical arrangement displayed in the muscular system, there are very numerous instances of wonderful design exhibited in the combinations effected for the purpose of modifying and directing muscular action, and to these I more especially wish, at present, to refer. The study of these modifying causes opens a wide field of observation to the physiologist and rational anatomist, and confer on the muscular system a degree of interest sufficient to repay one for all the labour endured in gaining an acquaintance with its minutiæ.

It has no doubt forced itself on the mind of every one who has attempted the study of anatomy, that the mere enunciation of a muscle arising at one point and being fixed to another, is, to say the least, a very dry and uninviting task for the memory. When such an enunciation is coupled with an apophthegmatic sentence, declaring the use of the muscle, as a general rule, it is received as a thing to be believed, because it is said, rather than as a proper consequence of the origin and insertion before stated. There is a great deal wanting to the establishment of a proper conclusion in the mind of the learner, and for a good reason, the action ascribed to three-fourths of the muscles could not possibly

take place, if it were not for the peculiar causes which modify and direct the exertion of their powers. These, both in books and public lectures, are as entirely left out of sight, as if they did not exist, or rather as if they were utterly unknown to writers and teachers; the latter inference may be considered fair, for we believe that no man knowing the circumstances would pass them by in silence.

The circumstances modifying muscular action have been my favourite study for some years past; this study has led to all the observations relative to the fasciæ, heretofore published in the Philadelphia Journal, and to all the discoveries made known relative to the capsular ligaments of joints, &c. in my "Anatomical Investigations."

I shall at this time take a view of the modifiers of muscular action, under the following heads:

1st. Fasciæ and sheaths.

2d. Position in regard to bones; relation of muscular fibres to tendons.

3d. Modifying muscles.

4th. Modifying tendinous connexions.

5th. Special modifying constructions; annular ligaments, trochleæ, &c.

1st. *Fasciæ and sheaths.*—The fasciæ covering the extremities of the body will be the fair-

est exemplification of this part of our subject, because they are the most obvious and generally known. They are strong, dense, and inelastic fibrous membranes, stretching from the bones over the muscles, so as to give them an uniform external covering, and thus far the fasciæ were studied previous to my researches. In addition to the external covering, sheets or layers are sent off from the great exterior sheet, by which each of the muscles is enwrapped or included in a distinct sheath, the layers of which terminate on and around the joints for the formation of their capsular ligaments. In consequence, the muscles thus covered, instead of swelling during their contraction in a single mass, resisted only by the general external covering, contract and swell within their own particular sheaths besides, and these being fixed to the bone as well as to the external fascia, direct the form of the muscle to the greatest possible advantage. The same circumstance of the sheaths for the individual muscles being formed from the great common fasciæ, enables us to understand how muscles apparently very similar in place and appearance, are capable of performing very different actions.

Let us, to make the idea clearer, consider some of the muscles individually. The *sarto-*

rius arises from the anterior superior spine of the ilium and is inserted into the tuber of the tibia, its use being to cross the legs on each other, as is done by tailors when seated at their work, whence the muscle has its name. But the sartorius is the longest muscle in the human body; its origin is very nearly over the median line of each thigh; to reach its insertion it passes under the inside of the knee to arrive at the tibia. When the muscle contracts, it makes an effort to straighten itself, and if it were not forced by some cause to contract in the line corresponding to its course while in a state of repose, it could not produce the movement above mentioned. What is this necessary modifying power? It cannot be the general or external fascia lata, because, if this were all, it might compress the muscle during its contraction, but could not prevent it from being drawn towards the middle of the thigh, or even from starting over the inner condyle of the femur. On examination, we readily discover the modifying cause to be the sheath or double layer of fascia in which this muscle is included; and this, together with the general fascia, so binds it to its place, as to prevent it from starting in any direction, or producing inconvenience or deformity. The efficacy of the sheath is distinctly manifest in this case, but not

more so than it is in all the muscles belonging to the extremities.

There are a few instances where muscles have their actions modified by the agency of a single sheet of fascia on their exterior, though in these cases the term aponeurosis is most applicable to the modifying membrane. Such is the aponeurosis of the temporal muscle, the palmar and plantar aponeuroses, which are the only parts not belonging to the great general fasciæ of the body. The mass of the temporal muscle arises on the side of the skull, but a layer of muscular fibre concerned in modifying the action of the whole muscle, arises from the inner surface of the aponeurosis, external to the beautiful tendon of the temporalis. These fibres, generally slighted or overlooked in the description, and almost universally cut away in the demonstration of this muscle, serve the purpose of aiding the aponeurosis to resist the swelling of the muscle, by contracting *from* its internal surface towards the tendon, or the skull, at the same moment that the powerful part of the muscle is contracting and swelling outward against the aponeurosis. The aponeurosis of the palm serves a very important purpose, not only by strengthening the connection of the bony structure, but by binding down all the tendons flexing the fin-

gers, and compressing the inter-osseous and other palmar muscles situate beneath it. The plantar aponeurosis bears a very striking resemblance to the fascia lata in its structure, and relation to the muscles, and to the temporal aponeurosis in the manner of giving origin to muscular fibres. It forms three grand divisions, in the first place to embrace the central, external, and internal muscles of the sole, and on the inner surface of the central portion, the flexor brevis digitorum pedis derives a very considerable part of its origin.

If the coverings of the scapular muscles were not to be traced continuously with the brachial fascia, we should be disposed to class them with the temporal, plantar, and palmar aponeuroses, as they are in various circumstances analogous to them, being much thickened by successive additions of tendinous fibres, and because the infra spinatus has a series of modifying muscular fibres arising from the inner surface of the fascia. This attachment of muscular fibres is very different from what we observe in the origin of the muscles of the forearm and leg, where a part of the main body of the muscle arises from the fascia; in the case of the temporalis and infra spinatus it is a layer of fibres distinct from, and ex-

ternal to the common mass of the muscle, and serving the purpose heretofore specified.

2d. *Position; relation of fibres to tendons, &c.* —The effect of position as a modifier of action, may be very fairly illustrated by the origin of the *flexor longus pollicis*, and the *flexor longus digitorum pedis*. The long flexor of the great toe, arising from the posterior and inner part of the fibula, and passing under the inner ankle to its insertion, flexes the great toe in a line corresponding with the inner edge of the foot, or a line drawn from the under surface of the toe to near the centre of the heel. The long flexor of the toes, on the contrary, rising from the outer and back part of the tibia, and running to be inserted in the smaller toes, contracts so as to draw them inwards, or towards a line obliquely crossing the sole of the foot from the outer to the inner side. It would be natural enough for one who was unacquainted with the structure, to expect that the common flexor of the toes should rise from the bone most immediately in a line with the toes to be flexed; that the flexor of the great toe should come from the tibia, and not from the fibula, and the contrary of the common flexor. We shall hereafter see some additional modifying circumstances connected with these two muscles of great importance and beau-

ty. An instance of a corresponding arrangement may be observed in the relative positions and actions of the extensor longus, and extensor brevis digitorum pedis. Other instances of the adaptation of situation to the direction of action will present themselves to any one engaged in studying the subject.

The relation of muscular fibres to the tendons through which they are to act, is another admirable provision for the modification, or rather direction of their action. This is beautifully seen in all the penniform muscles, especially those belonging to the motions of the foot. They arise by narrow origins, and their fibres run obliquely outwards to receive a tendon on the edge of the muscle, and not at the inferior extremity. Hence, as the successive portions of these muscles come into action, the motion of the foot is effected, and the whole tendon is more and more closely drawn in towards the bones. From the very nature of the space the tendons of the upper part of the foot have to traverse, they could not, under any other circumstances, act to advantage, although they were furnished with fasciæ and annular ligaments. Another excellent instance of modification, owing to the relation of fibre to tendon, may be observed in the *semi-membranosus*, one of the great flexors of the leg on the

thigh. The origin of this muscle from the upper and posterior part of the tuber ischii, is a broad flat tendon, lying between the biceps and the semi-tendinosus. As it is passing through the thicker part of the thigh, this flat tendon has the fleshy fibres attached to it, beginning by short fibres running obliquely, gradually growing thicker and longer for a few inches; then, shortening again, with the same obliquity of fibre, the muscle receives the terminal broad tendon, which is to be inserted into the inner and back part of the head of the tibia. Hence this muscle is able to co-operate in the flexion of the leg on the thigh, bringing it directly backwards, and at the same time by its figure aiding in giving symmetry to the thigh; whereas, if its fleshy fibres were direct, or corresponding to the course of its origin and insertion, it could do neither.

3d. *Modifying muscles.* This is a very extensive source of modification in muscular action, and the design of the modifying portions is unequivocally evident. We shall select a few of the most obvious instances as sufficient for the present. The long flexor of the thumb ariscs on the upper part of the radius below its tuber, and for a considerable distance along that bone towards the wrist. The fibres are necessarily penniform, and the tendon received on the outer

edge of the muscle; according to what we have observed on the penniform muscles, this arrangement will draw the tendon more immediately toward the bone, and if this arrangement were the whole of the muscle, the flexion of the thumb could not take place as advantageously as it now does. But a modifying muscle, having direct fibres, and terminating in a distinct tendon, acted on by all its fibres at one, arises from the internal condyle of the humerus, and is fixed into the commencement of the tendon belonging to the radial or penniform portion, and as its origin is much more favourable to the proper flexion of the thumb, it modifies the action of the lower part of the muscle. It may be said that this modifying portion is not always present—this may be said of various parts whose uses are unequivocal: but this part of the muscle is not frequently absent, perhaps once in ten times, if so often.

Another and more striking instance of modifying muscle, is found in the second head of the *biceps flexor cruris*, the only muscle inserted into the fibula for the flexion of the leg on the thigh. This biceps derives its principal origin from the tuber ischii, in immediate company with the semi-tendinosus, which goes to the inside of the leg. Whoever examines the origin of the biceps,

and observes the obliquity of this first head, compared with its insertion, will see that if this greater part of the muscle were alone, it would rather pull the leg towards the inside, like the semi-tendinosus, than towards the outside. But a second portion of muscle comes off from the outer part of the posterior surface of the thigh bone, beginning below the insertion of the glutæus maximus, into the rough line. This second head has its fibres running obliquely outwards and downwards, and it lays hold of the proper tendon of the biceps on the inside; when the larger portion of the muscle contracts, this short head operates on the tendon, drawing it in the immediate line of the bone, thus correcting the obliquity of flexion which would be produced, if the upper portion coming from the tuber, were to act alone.

A modifying structure having considerable analogy with this, exists in the relation of the gastrocnemius and soleus. The gastrocnemius arising from the condyles of the femur is nearly immediately in a line with the os calcis, and by the projection of the condyles, has great power in commencing the extension of the foot on the leg, though it could not, from the very circumstance of the slenderness of its origin, suffice to

sustain much of the weight of the body. The soleus, arising from the head of the fibula and posterior and upper part of the middle of the tibia, and acting on the common tendon fixed to the os calcis, completes the action, draws the heel directly upwards and inwards, in a line with the bones, and thus the whole muscle is enabled to sustain a great weight.

The last instance I shall mention of modifying muscle, is the accessory of Sylvius, in the sole of the foot. The situation of the long flexor of the toes has already been referred to, and it has been stated that the object of the flexion is to bring the toes downwards and inwards; but in passing under the os calcis from the posterior part of the tibia, the tendon passes rather obliquely across the sole, and would draw the toes too directly or violently inwards. This evil is prevented by the intervention of a small but strong mass of flesh, arising from the sinuosity on the inside of the os calcis, and terminating by an oblique insertion into the tendon of the long flexor just where it separates into four tendons for the lesser toes. This accessory muscle contracting in the direction of a straight line drawn through the middle of the sole, at the time when the long flexor tendon is drawn immedi-

ately inwards, produces that modification of action which is intermediate to what either portion would separately produce.

4th. *Modifying tendinous connexions.* These will be sufficiently obvious to every anatomist; it will be enough to refer to a few of them. Among the most important may be mentioned the splitting of the tendon of the obliquus internus abdominis, which, with the external, oblique and transversalis, constitutes the sheath of the rectus abdominis. This muscle, in consequence, has its power of flexing the trunk vastly increased, inasmuch as it is affected by every degree of contraction which occurs in the other abdominal muscles, at the same time that its own contractions are performed. In addition, this muscle is broken into portions by tendinous matter, which gives it something of the character of several distinct muscles.

There is a strong tendinous connexion existing between the tendon of the long flexor of the great toe, and the tendon of the long flexor of all the other toes. This tendon enables the flexor of the great toe to participate in the modifying influence exerted by the accessory muscle of Sylvius, recently mentioned under the third head. Various other instances will be recollected, more or less analogous to these.

5th. *Special modifying constructions, &c.*— The most beautiful of these are the trochleæ in the orbit of the eye for the obliquus superior, and the hook on the internal pterygoid plate of the sphenoid bone for the circumflexus palati, both of which are so obvious as to need nothing beyond a mention. The interposition of the patella, by which a pulley is formed at the knee joint, and of the sesamoid bones, occurring in the tendons of the short flexors of the thumbs and great toes, are also well known.

The annular ligaments of the wrist and ankle are also peculiarly worthy of attention as modifiers of muscular action, and without which our present construction of muscles would be almost useless. If any one wishes to ascertain how far these instruments direct the action of the muscles, let him cut them through, and he will at once see, from the starting forwards of the tendons, that without the aid of these annular ligaments, the motions of the extremities could not be properly effected. The same principle is resorted to by nature for confining the tendons of the fingers in place, only that in this case the material used is much stronger than that of common annular ligament.

I have not leisure to pursue these investigations further at this time, and am conscious of

their manifold imperfections, yet I hope that these remarks may not prove uninteresting to those who are engaged in the study of anatomy, because they appear to me to have a very useful bearing on the physiology and pathology of the muscular system. Some happier genius, by a more extended inspection of all the existing relations of the muscles, may be enabled to explain very many circumstances, which now appear dark and difficult, concerning their functions.

DESCRIPTION

OF

THE OS HYOIDES

OF

THE MASTODON.

*Read before the Academy of Natural Sciences of Philadelphia, June 8, 1824.**

The Os Hyoides is one of the few parts of the bony system, belonging to this interesting genus, which has not yet been described.

The specimen, from which this description is made, consists of the whole of the basis, with the posterior cornu and styloid apophysis of the right side. The posterior cornu and styloid apophysis of the left side were either not found originally, or have been lost since the erection of the fine skeleton in the Philadelphia Museum, to which this os hyoides belonged. But as we have the right side nearly entire, with the whole of the basis or central anterior portion, there is no difficulty in forming a sufficiently accurate idea of the character of this bone.

* Extracted from vol. iv. of the Academy's Journal.

The figure of the basis bears a considerable resemblance to the ordinary shape of the os hyoides in man and other animals at the anterior part, being curved at the extremities, so that both the outside and inside of the bone have a semicircular outline.

The basis or inferior portion is thick, strong, and convex externally; the whole surface, especially in the centre, being rough and irregular, as if for the attachment of muscles. At the upper and anterior part, the rough bone rises in the centre about the eighth of an inch above the convexity of the inside of the bone, having, at both extremities, a groove, which is perceptible nearly all round at the base of this projection.

On the inside of the basis, and immediately below the projection at the upper edge, the surface is rounded and smooth, having no other markings than slight furrows for nutritious vessels; the thickness increases until within half an inch of the lower edge, where there is a projecting line, which forms an irregular semicircular sweep towards both the articulating surfaces. A little to the right of the centre of this line, a depression commences, which is about an inch in length, and gives the greatest degree of depth to the inside of the basis, as will be seen in the subsequent measurements.

The articulating surfaces both descend below the level of the body of the basis, so that if the bone be placed on a plane, and inclined backwards, it is supported on these extremities, forming an arch, whose centre is that of the depression before noted. When the basis is placed fairly on a plane, it rests on an obliquely flattened inferior surface.

The articulating surfaces are rough, that of the right side most so; both are obliquely curved inwards towards the upper edge of the bone; the right side presenting most of this obliquity. The upper edge of the right articulating surface projects more than the left, forming at its anterior part an evident tuberosity.

The posterior cornu of the os hyoides has, at its anterior extremity, a deep and rough surface, the cavity appearing as if an epiphysis had been broken off.* This extremity is placed obliquely on the extremity of the bone, the outer part of which, in approaching the basis, forms an in-

* The appearance of the extremities of the basis and posterior cornu is such as to induce the belief that an epiphysis had been removed from each. There are no data on which we can found an opinion of the exact amount of substance lost, although it is probable that from one to three inches have thus been removed from the total extent of the os hyoides.

clined plane of an inch and a half in breadth on its inferior surface, gradually blending with the middle line of the bone on the outside. Above this, the bone is flattened toward the perpendicular, being continuous with the posterior edge of the whole shaft. The posterior edge of the posterior cornu, at a short distance from the anterior articulation, becomes gradually sharp, and this sharpness increases till it ends at the superior articulation. The outside of the posterior cornu is regularly convex, until within three inches of the superior extremity, where it expands to more than twice the breadth of the shaft. The inside of this cornu is compressed at the centre of the shaft, entirely flattened, and slightly concave from within three inches of the superior, and also flattened at the inferior extremity, except where the articulating surface is strengthened by the bone being continued for the distance of two inches, projecting at first about the fourth of an inch, and terminating imperceptibly in the sharp anterior edge of this bone.

The figure of the superior extremity of the posterior cornu is that of about one-third of an irregular segment of a circle, two inches in diameter; the anterior part being the most regular; the superior being broader and rougher, and terminating above in a round and smooth tube-

rosity. Immediately anterior to this, there is on the outer surface a curved indentation, apparently forming a part of a small articulating surface at the superior and outer portion of the superior extremity of the cornu.

The styloid apophysis differs from the base and posterior cornu by having but one articulating surface on its anterior extremity, which is irregularly triangular, deep, and unequal. Immediately behind the articulation it is almost cylindrical, but gradually grows flatter towards the posterior edge, terminating at length by a broad and flattened surface, two inches and a half from the articulation, curving inwards slightly at the inner edge. The rest of this apophysis forms a considerable angle with this part of the bone, rising upwards, gradually becoming smaller, continuing to the posterior extremity thinner on its posterior, and rounded on its anterior surface. On the inside, and near the posterior part, the inner surface rises so as to form a prominent line. The whole of the basis, posterior cornu, and styloid apophysis, have not been fossilized, but still retain the characters of bone.

I am indebted to Mr. Rembrandt Peale, who was particularly engaged in the exhumation of the two most perfect skeletons of the Mastodon that have yet been obtained, for the following

particulars. The morass, which contained the Mammoth bones, was sounded by means of long pointed rods, shod with iron. On the removal of the mud, after finding some resistance made to the rod, an entire under jaw bone was discovered, over the top of which the scapula of the animal was so placed as to form a covering to the space between the rami of the jaw. When the scapula was raised, the bones of the os hyoides were found lying within the jaw, thus being protected from the fluctuations which had scattered the other small bones to various distances, previous to the hardening and fixing of the mud.

Measurements.

Of the Basis.—From the commencement of one articulating surface to the other, over the middle of the bone, on the outside, four inches and three-eighths.

In like manner on the inside, three inches and five-sixteenths.

Depth of the bone measured in the centre on the inside, one inch and a half.

Depth on the outside, one inch and one-eighth.

Height of right articulating surface, one inch and three-eighths.

Breadth of the same, seven-eighths of an inch.

Perpendicular height of left articulating surface, one inch and one-eighth.

Diagonally, from the upper and inner to the lower and anterior edge, one inch and three-eighths.

Of the Posterior Cornu.—Length, seven inches and three-eighths on the outside.

Length on the inside, six inches and a half.

Height of anterior articulating surface, one inch and five-eighths.

Breadth, one inch and one-eighth.

Posterior articulating surface, measuring the whole semicircle, two inches and seven-eighths.

Breadth of the same, seven-sixteenths of an inch.

Circumference in the centre, two inches and one-eighth.

Breadth (externally) behind the anterior articulating surface, one inch and eleven-sixteenths.

Breadth (externally) just before the posterior articulating surface, one inch and thirteen-sixteenths.

Of the Styloid Apophysis.—Length, eight inches and one-sixteenth on both sides.

Breadth through the angle, one inch.

Circumference midway between the angle and articulation, one inch and a half.

Circumference midway between the angle and extremity, one inch and one sixteenth.

At the posterior extremity, five-eighths of an inch.

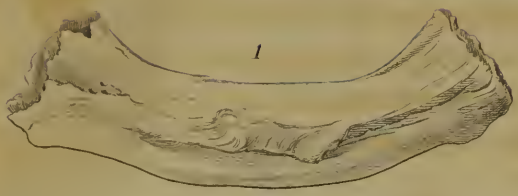
Explanation of the Plate.

Fig. 1. Basis, front view.

2. Posterior cornu.

3. Styloid apophysis.

The whole reduced to two-thirds of the natural size.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