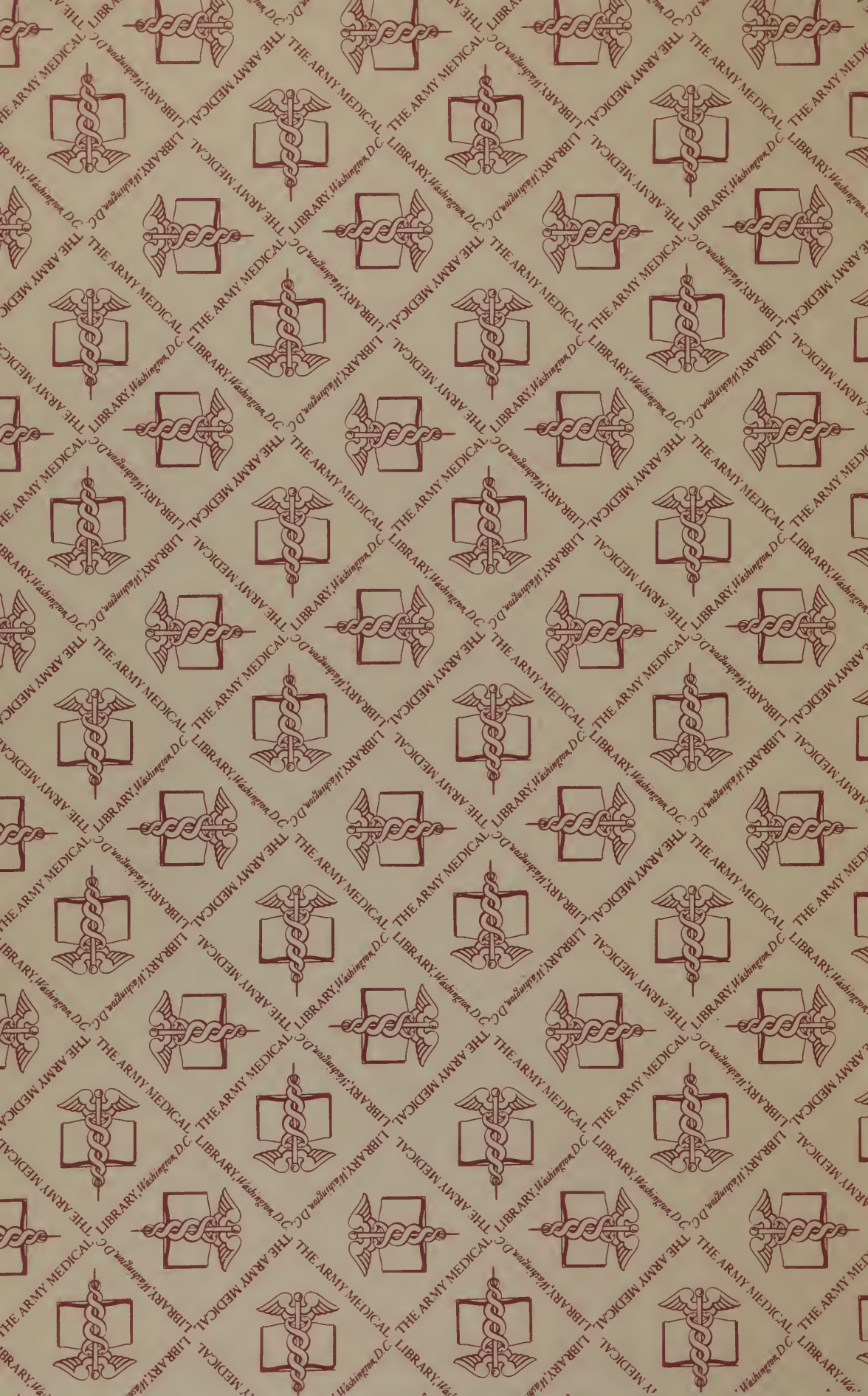
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FREDERICK WOLLICK, M.D.

F. Wollick M.D.

GEO. W. REICHENBACH.

OUTLINES

OF

ANATOMY & PHYSIOLOGY,

ILLUSTRATED BY

A NEW DISSECTED PLATE OF THE HUMAN ORGANIZATION,

AND BY

SEPARATE VIEWS.

DESIGNED EITHER TO CONVEY

A GENERAL KNOWLEDGE OF THESE SUBJECTS IN ITSELF,

OR AS

A KEY FOR EXPLAINING LARGER AND MORE COMPLETE WORKS.

BY

FREDERICK HOLLICK, M. D.

LECTURER ON ANATOMY, PHYSIOLOGY, AND THE PRACTICE OF MEDICINE; AND AUTHOR OF VARIOUS POPULAR WORKS ON THE SAME SUBJECTS.

WITH A PORTRAIT OF THE AUTHOR.

PHILADELPHIA:

T. B. PETERSON, No. 98 CHESNUT STREET.

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DEDICATION.

This work is respectfully dedicated to all those ladies and gentlemen who, with generous zeal, came to my assistance when I was subjected to an unscrupulous and illegal persecution, for attempting to destroy the existing monopoly of scientific knowledge.—That it may repay their kindness, in some slight degree, by being of service to them, to their children, and to the cause of mental progress, is the earnest wish of their

Grateful friend,

THE AUTHOR.

PREFACE.

The present work, it is thought, possesses many advantages over any similar one. It is strictly scientific, but not technical; and is brief, but at the same time comprehensive. It will serve either as a complete general treatise on Anatomy and Physiology itself, or as a key by which other works on those subjects can be explained. Its grand feature, however, is its illustrations, particularly the "*dissected plate.*" This not only gives views of the different organs separately, but also exhibits them in their proper places, and connected together as they are in the body; thus supplying the place, in a great measure, of a model. Nothing like this has ever before been seen, and its great advantages, particularly in teaching children, must be obvious. By studying separate plates, such as are usually found in anatomical works, unconnected ideas only are gained, of isolated parts, but no conception is formed of the general structure of the body. By studying this plate, however, in conjunction with the wood cuts, we go through a similar process to actual dissection, and have the whole organization before us, with each part in its proper place. It has been the result of much study, and careful observation of what was really needed, and I trust will be found useful. Every human being ought to be acquainted with these subjects; it is not only useful for them to be so, but is rapidly becoming indispensable, both to individual and social well-being. Such knowledge must eventually be universally acquired, notwithstanding it has hitherto been a monopoly; and I flatter myself that these *Outlines* will assist in bringing about so desirable a result.

F. HOLLICK.

GENERAL DIRECTIONS.

Open the several parts *only* in the order indicated in the following explanations of the several Views, commencing with the *First View*, page 2. In closing the parts together again, the reverse order must be observed to that when opening them, and each part should be carefully pressed into its place before the next is brought down upon it.

F Hollick del

PART I.

CHAPTER I.

DESCRIPTION OF THE PLATE.

FIRST VIEW.

Raise up only the front walls of the trunk of the body, not removing the head and face. This will expose the interior of the trunk, as it first appears. It is divided into two parts, by the Diaphragm G G—The upper part called the *Chest*, and the lower part the *Abdomen*.

Contents of the Chest.

A The Heart.
B B The Lungs.
G G The Diaphragm.
a The Great Aorta.
b The Vena Cava.
c c The Carotid Arteries.
d d The Jugular Veins.
e e The Subclavian Veins.
f f The Thoracic Duct.
g The Trachea, or wind-pipe.
h The right Auricle.
i The Coronary Vein and Artery.
n The ring of fatty matter surrounding the upper part of the Heart.
o The Diaphragmatic Artery and Vein.

Contents of the Abdomen.

C The Liver.
D The Stomach.
E E E The Colon, or large intestine.
F The Spleen.
j The Gall Bladder, on the under surface of the Liver.
k The Vermicular appendage to the Cœcum.
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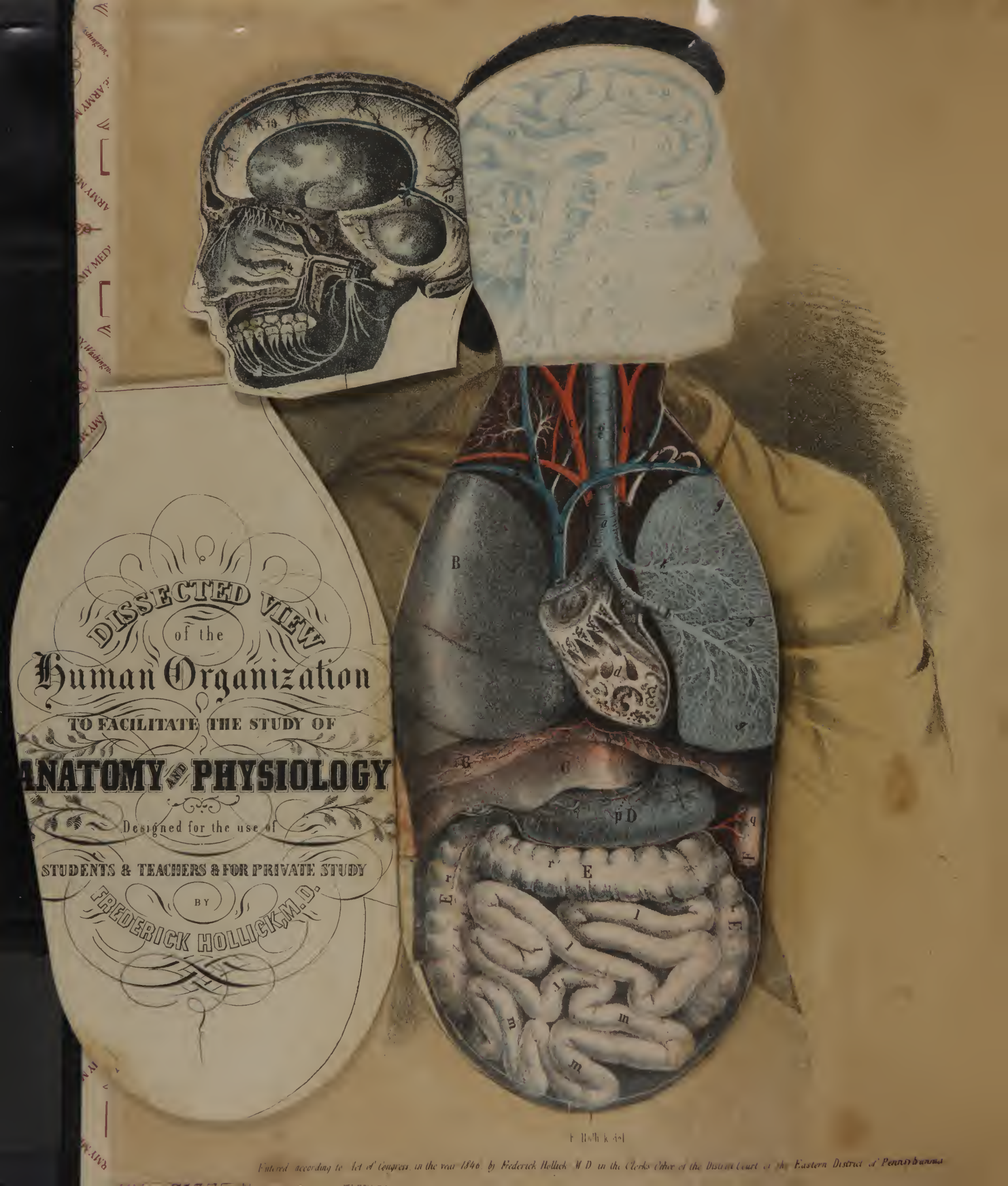
DISSECTED VIEW
of the
Human Organization
TO FACILITATE THE STUDY OF
ANATOMY AND PHYSIOLOGY
Designed for the use of
STUDENTS & TEACHERS & FOR PRIVATE STUDY
BY
FREDERICK HOLLICK, M.D.
B
G
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F
Entered according to Act of Congress in the year 1846 by Frederick Hollick M D in the Clerks Office of the District Court of the Eastern District of Pennsylvania

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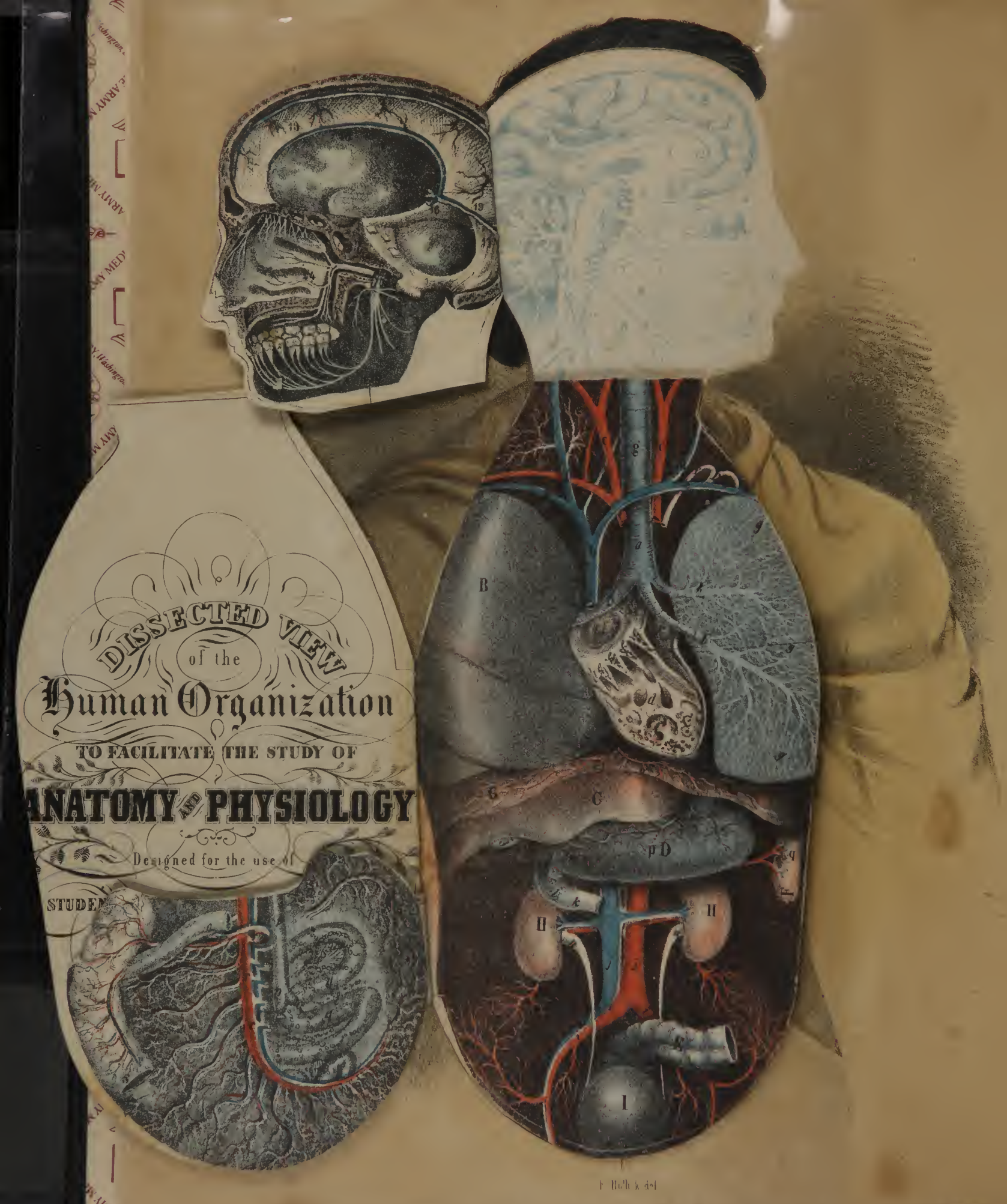

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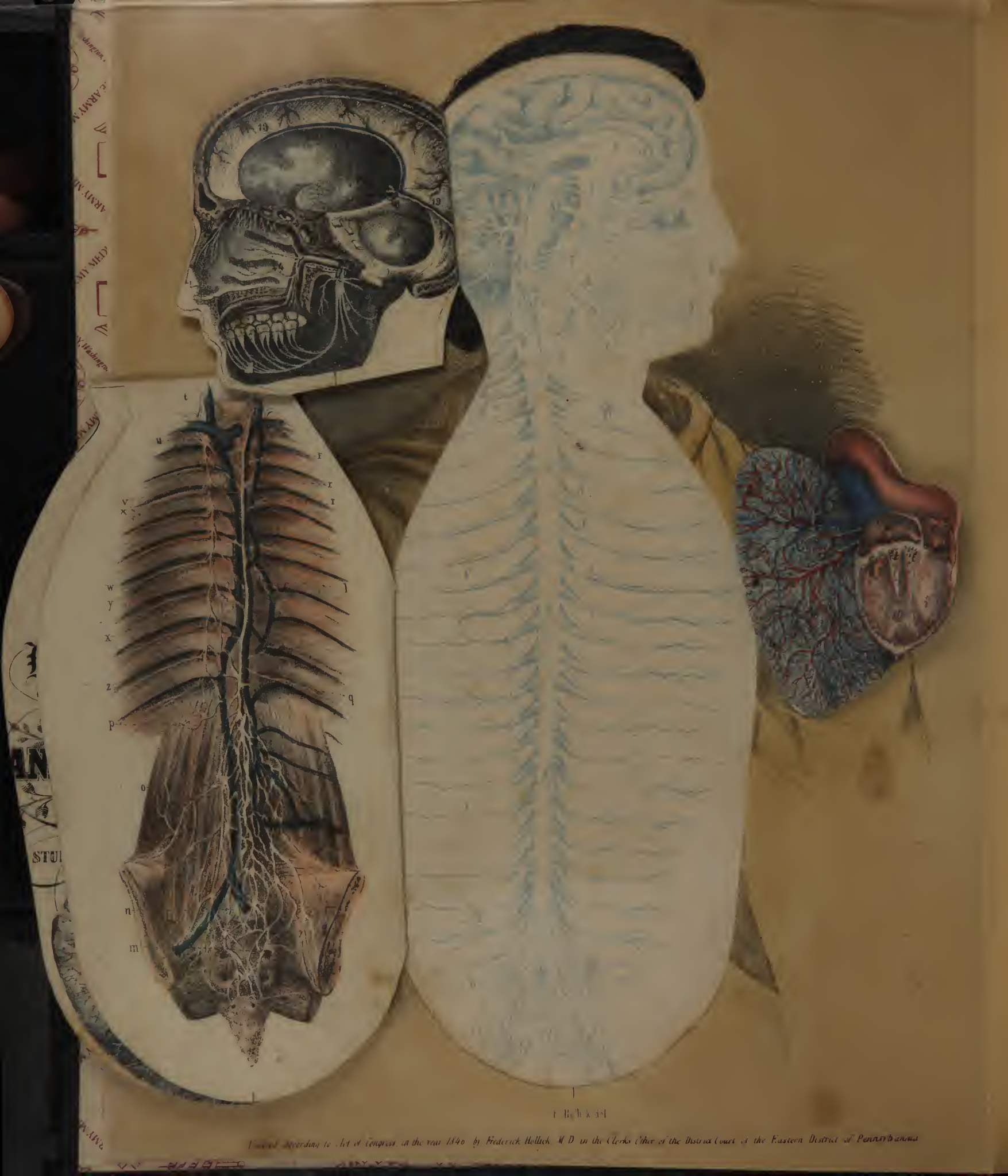

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SECOND VIEW.

Raise up the Intestines. This will expose the deep seated organs of the Abdomen, and those of the Pelvis. The *Pelvis* is the most inferior part of the great cavity of the Trunk, and recedes posteriorly further than the Abdomen.

Deep Seated Organs of the Pelvis.

H H The Kidneys.

i i i The Abdominal Aorta, dividing into two branches, called the right and left Iliac Arteries, one branch going each side of the Bladder, into the Pelvis.

j j j The Ascending Vena Cava, dividing like the Aorta, into the right and left Iliac Veins.

k The Duodenum, or commencement of the small intestines, cut off from them at *o*.

l A portion of the Pancreas or Sweetbread.

m m Anterior branches of the Iliac Arteries.

n n The Ureters, or Tubes which convey the Urine from the Kidneys to the Bladder.

Under Surface of the Intestines.

o The commencement of the Jejunum, cut off from k, the Duodenum.

p p The Thoracic Duct.

q q The Lacteals, and Mesenteric Glands, emptying into the Thoracic Duct.

r r The Mesenteric Artery. The Mesenteric *Vein*, coloured *blue*, runs side by side with it.

s The termination of the Colon, where it joins the Rectum.

Contents of the Pelvis.

I The bladder.

E The Rectum, or lower part of the large intestine, cut off from the Colon at *s*.

THIRD VIEW.

Raise up the left Lung and the Heart, and sections of both organs will be seen.

Section of the Left Lung. (Lower side.)

a The Trachea.
b b b The Bronchia, or larger divisions of the wind-pipe.
g g g The minute Air Tubes of the Lungs.
h h h h (Upper side), The Pulmonary Arteries and Veins.

Section of the Heart. (Lower side.)

c Commencement of the Pulmonary Artery.
d Cavity of the Right Ventricle.
e e e e The Tricuspid Valve.
f The Cavity of the right Auricle.
t t (Upper side), the Mitral Valve.
u The Cavity of the left Auricle.
v The Semi-lunar Valve, at the entrance of the great Aorta.
w The Cavity of the left Ventricle.

FOURTH VIEW.

Lift up all the remaining parts of the Chest, Abdomen, and Pelvis, in one piece, and also the Face and Head. This will bring into view, the *Brain*, *Spinal-Marrow*, and their *Nerves*.

The Brain and its Nerves.

a a a Convolutions of the upper part of the Brain, called the Cerebrum.
b b The lower part of the Brain, called the Cerebellum.
b^{1} b^{1} b^{1} The Arbor Vitæ, or Tree of Life.
c c The Medulla Oblongata.
e The Eye.
f The Lateral Ventricle.
1 The Olfactory Nerve.
2 The Optic Nerve.
3 4 5 6 The third, fourth, fifth and sixth Nerves.
5^{1} 5^{11} Branches of the fifth Nerve.
7 The Portio Dura of the seventh Nerve.
7^{1} The Auditory Nerve.
8 The Glossopharyngeal Nerve.
8^{1} The par Vagum.
8^{11} The Spinal Accessory Nerve.
9 The Hypoglossal Nerve.
10 The Sub-occipital Nerve.
11 The Pineal Gland.
12 The Corpus Callosum.

The Spinal Marrow and its Nerves.

d d d The Spinal Marrow.
e^{1} The Sub-occipital Nerves.
f^{1} The Cervical and upper Dorsal Nerves.
g The Dorsal Nerves.
h The Lumbar Nerves.
i i The Sacral Nerves.
j j Two Ganglions.
k The Sacral Plexus.

FIFTH VIEW.

This view represents a section of the head and face, on the part covering the brain, and the Thoracic Duct and Great Sympathetic Nerve, on the under surface of the Chest and Abdomen.

Section of the Head and Face.

13 The Falx Cerebri.
14 The Superior Longitudinal Sinus.
15 The Torcular Herophili.
16 Left side of the Tentorium Cerebelli.
17 The Falx Cerebelli.
18 The Inferior Longitudinal Sinus.
19 The Straight Sinus.
20 The Vena Galeni.
21 External divisions of the Olfactory Nerve.
22 The fifth pair of Nerves.
23 The inferior Dental branch of the inferior Maxillary Nerve, giving off small Twigs to the Teeth.
24 Nasal Ramifications of the Spheno-Palatine, and Palatine Nerves.

Thoracic Duct.

l The Thoracic Duct.
m Part of the Hypogastric Plexus.
n External Iliac Plexus.
o Lumbar Plexus.
p The Receptaculum Chyli.
q Common Centre of the Lacteals.
r r Deep Lymphatic Vessels of the Lungs.
s The Thoracic Duct emptying into the left Subclavian Vein.
t The Great Lymphatic Vein, emptying into the right subclavian.

Part of the Great Sympathetic Nerve.

u The Inferior Cervical Ganglion.
w Two Ganglions of the Great Sympathetic Nerve, from which are given off two branches to connect with the intercostal nerves x and y.
x y Intercostal Nerves, coming from the Spine.
z Another Ganglion of the Great Sympathetic.

PART II.

OUTLINES OF ANATOMY,

ILLUSTRATED BY THE DISSECTED PLATE, AND OTHERS.

CHAPTER I.

GENERAL DESCRIPTION OF THE STRUCTURE OF THE DIFFERENT ORGANS, AND PARTS OF THE SYSTEM.

The human organization is divided into *Bones*, *Muscles*, *Arteries*, *Veins*, *Nerves*, and the *Viscera*.

The Bones are the hardest and most solid parts; and are intended to form a frame-work for the support of the softer portions. When connected together in their natural order, they form what is called the *skeleton*. The bones are united together by ligamentous fibres, which prevent them from separating, but allow of their moving one upon the other. The articulating surfaces of the joints are covered with an elastic cushion of cartilage, and moistened by a fluid called the *synovial fluid*, which is secreted from a little capsule, or bag, called the *synovial capsule*. By these means they move freely upon each other, and without friction.

PLATE I.

THE HUMAN SKELETON.

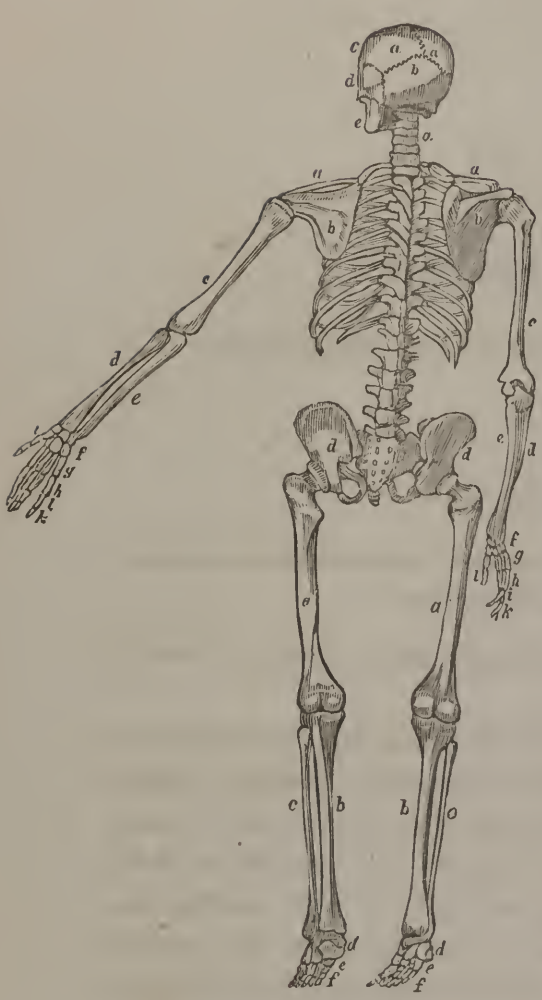


Figure 1.

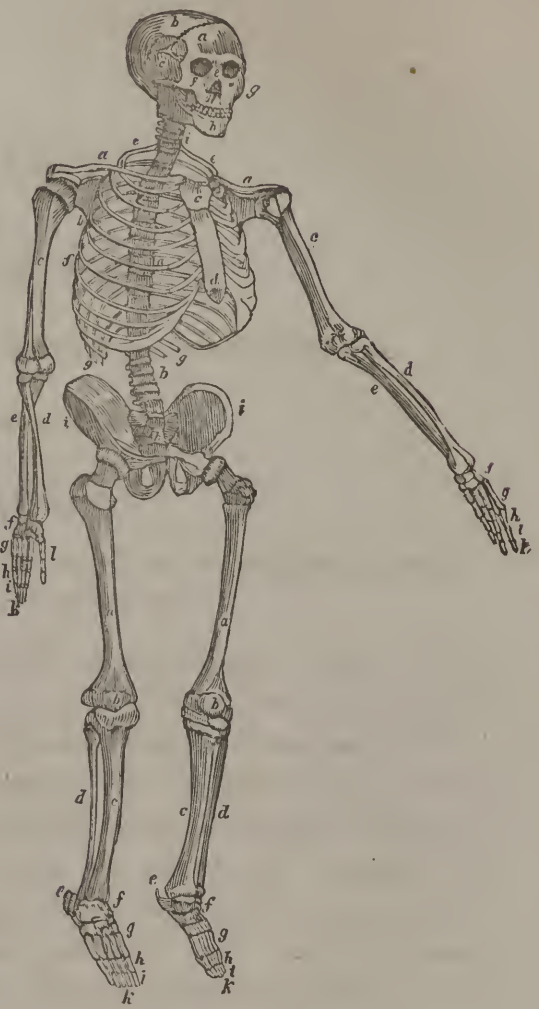


Figure 2.

Figure 1.

THE ARMS.—*a* The Clavicle, or collar bone. *b* The Scapula, or shoulder blade bone. *c* The Humerus, or upper bone of the arm. *d* The Radius; and *e* The Ulna; the two bones of the lower arm. *f* The bones of the Carpus, or wrist. *g* The bones of the Metacarpus, or hand. *h* The First Phalanges, or bones of the fingers. *i* The Second Phalanges. *k* The Third Phalanges. *l* The Thumb.

N. B. The Lettering for the Arms refers to *both* figures.

THE HEAD.—*a a* The Parietal, or side bones. *b* The Occipital or behind bone. *c* The Frontal bone. *d* The Temporal bone. *e* The Lower Jaw bone, or submaxillary.

THE TRUNK.—*a* The upper part of the back bone, called the Cervical or neck portion. *b* The Dorsal or middle portion. *d d* The Hip bones, or Ilium.

THE LOWER LIMBS.—*a a* The Femur, or thigh bone. *b b* The Tibia, or large bone of the leg. *c c* The Fibula, or small bone of the leg. *d d* The Os Calcis, or bone of the heel. *e e* The bones of the foot, or Metatarsus. *f f* The bones of the Toes.

Figure 2.

THE ARMS.—These are lettered the same as in figure 1.

THE HEAD.—*a* The frontal bone, or Os Frontis. *b* A Parietal, or side bone. *c* The Temporal bone. *d* The Occipital bone. *f f* The cheek, or Malar bones. *g* The Superior Maxillary, or upper jaw bone. *h* The Lower Jaw. *i* The bones of the Neck.

THE TRUNK.—*c* The upper part of the Sternum, or Breast bone, and *d* The lower part. *e* and *f* The long, or True Ribs. *g g* The short, or False Ribs. *b* The Lumbar Vertebra. *h* The Sacrum, or lower end of the spine. *i i* The Hip bones.

THE LOWER LIMBS.—*a a* The Thigh bones. *b b* The Patella, or knee cap. *c c* The Tibia. *d d* The Fibula. *e e* The Os Calcis, or heel bone. *f f* The Astragalus, or bone of the instep. *g* The bones of the Tarsus or foot. *h i k* Bones of the Toes.

The Muscles are the soft, red, fibrous masses, usually called *flesh;* they are susceptible of contraction and relaxation, or, in other words, they become alternately shorter and longer. The fibres of Muscle are plainly to be seen in a piece of flesh that has been well boiled; if we attempt to cut this cross-wise we find a difficulty, because it pulls, or separates into threads the other way,—these threads are the fibres. When we examine them attentively we find that they are not straight, but in zig-zags, or almost like a *wire-spring;* which explains at once how they are able to relax and contract. These fibres may be divided and subdivided, until they become too small for the naked eye to see; they are first joined together in small bunches, called *fascia*, and these fascia are again joined together to form muscles. The muscles are of various forms; some are straight, some curved, and some have their fibres bent round till their extremities meet, forming a *ring*, as we see in the Heart, and in the Intestines. The various motions of the body are all accomplished by muscular contraction, and the way in which they are effected will be readily seen by a simple illustration. By referring to the skeleton, (Plate I. figs. 1, 2.) it will be seen that the arm is in two parts, the upper consisting of the bone called the *humerus* (*c*), and the lower part composed of two other bones called the *radius* and the *ulna*, (*d* and *e*). These two parts are united together by a hinge-joint, called the elbow, and a number of muscles are attached to them, one end to the upper part, and the other end to the lower part. Now it will be readily seen that if, while the arm is straight, one of these muscles on the front side of it contracts, or shortens, it must draw the two parts together, or *bend* the arm at the joint; and when that muscle relaxes, and the one on the opposite side contracts, it is equally obvious that the arm must *straighten* again. The circular muscles, as those which open and shut the eyes for instance, may be compared to an Indian-rubber ring, which enlarges or diminishes according as it is contracted or relaxed. The muscular fibres are terminated by a white shining substance, of a dense firm structure, called *aponeurosis*, when it is flat, and *tendon* when it is round, like a cord. The same substance in the form of a *sheath*, binds the fibres into fascia, and the fascia into muscles. It is partly dissolved, when meat is boiled, and thus allows the fibres to separate.

The Nerves are white cords, which spring from the brain, or spinal marrow, and ramify to every part of the body. Their form is usually cylindrical, and their size small. They divide into branches, twigs, and

threads, which again subdivide into filaments, so small that neither the eye nor the microscope can follow them. The uses of the Nerves are, to transmit to the brain the impressions received by different parts of the body, and to transmit to them in return the will of the brain. (See the Fourth View, and its description.)

If a nervous cord be cut through, or even compressed with force, so as to intercept all communication between the brain, or spinal marrow, and the part to which it is distributed, that part becomes *paralyzed*. Or in other words, no impressions made on that part are perceived in the brain, nor can the will exert any power over it. This is often perceived when a person sits for a long time, in a certain position, upon a hard seat. One of the limbs will *go to sleep*, as it is called, and become incapable both of feeling and of motion. This is owing to the great *Sciatic Nerve*, which ramifies to the limb, being pressed upon too hard, and communication with the brain cut off in consequence.

The Veins are the vessels which carry the blood from all parts of the body *to* the Heart.

The Arteries are the vessels which carry the blood *from* the Heart to all parts of the body.

Naturally we see very little difference between the Veins and Arteries, and it is therefore customary, in anatomical preparations, to inject the Arteries with *red* wax, and the Veins with *blue*, to distinguish them from each other, not to show their actual appearance. In the same manner they are coloured red and blue in our plate, and for the same purpose. The walls of the Veins, however, are thinner than those of the Arteries, and are of a bluish tint, owing to their containing black blood. The walls of the Arteries are thicker, and their colour is whiter; when cut across they remain open, while the Veins partly close. It is on the Arteries that we feel the *pulse*, which is the beat of the Heart transmitted along them.

The Arteries, Veins, and Nerves ramify to every part of the body, even the most minute, and solid. This is well shown in a case of inflamed sore, like a gangrene. In such cases the very finest needle that can be procured cannot be inserted the smallest distance, without causing a flow of blood, and giving pain; which proves that it wounds both Nerves and blood-vessels.

PLATE II.

Arteries.

PLATE III.

Veins.

The Arteries and Veins are separated here, for convenience, but in general they run side by side with each other, so that where one is seen, the other nearly always accompanies it. This is seen in the Second View, where the large Abdominal Aorta, and the Vena Cava, (*i i* and *j j*,) are side by side, the blood in the one running *upward*, and in the other *downward*. And also on the under surface of the Intestines, where the Mesenteric Artery, (*r r*,) coloured red, is accompanied by the Mesenteric Vein, coloured blue, through all its tortuous windings. The same thing may be observed in various other parts of the body.

The Viscera are certain organs composing a great part of the structure of the body, ordinarily lodged in great cavities, the *Head*, the *Chest*, the *Abdomen*, and the *Pelvis*.

The Head contains the brain, the organs of taste, smell, hearing, and sight, and a great part of the apparatus by which we swallow. It is a bony case admirably constructed so as to combine strength with lightness, and afford adequate protection to the important parts it contains. (See the head in the Fourth View, and in Plate I.)

The Chest is the large cavity enclosed by the ribs laterally, the back bone behind, the breast bone in front, and the Diaphragm beneath. It is

a kind of cage, the ribs forming the bars, and the diaphragm the floor. It contains the principal organs of circulation and respiration—the Heart and the Lungs. (See the First View.)

The Abdomen, or belly, is the remaining part of the hollow of the Trunk, contained between the Diaphragm above, and the Pelvis below. It is the largest cavity in the body, and contains the greater part of the organs of digestion. (See the First and Second Views.)

The Pelvis is the lowest part of the hollow of the Trunk, and is in form like a basin. It contains the Urinary organs, the Rectum, and most of the Generative organs. (See the Second View.)

PART III.

OUTLINES OF PHYSIOLOGY,

OR GENERAL DESCRIPTION OF THE USES OF THE DIFFERENT ORGANS.
ILLUSTRATED BY THE DISSECTED PLATE AND OTHERS.

CHAPTER I.

NUTRITION.

Anatomy teaches us merely the structure of the body, and of its different organs. Physiology teaches us what part each organ performs in the general economy. The first of these sciences has already been sufficiently explained; we will now treat upon the second,—commencing with those organs that nutrify, or support the body.

When it is recollected that all organized beings continually require nutriment, either to enable them to *grow*, or to make up for the *waste*, which is always going on in the system, the paramount importance of those functions by which it is supplied, will be seen. Several distinct sets of organs are concerned in this process, some by which nutriment is formed, and others by which it is distributed, or modified when necessary. These will all be considered in separate sections. The *formation* of nutriment, of course, engaging our attention first, under the head of Digestion.

SECTION I.

DIGESTION.

The human body, like every other organized structure, is continually wasting away, even to the deepest and most solid parts. This waste requires to be made up, by the addition of new matter, and hence is required the function of digestion, which consists in changing foreign substances into the materiel of the body. This change is one of the

most extraordinary phenomena we can contemplate, and eminently worthy of our study, even as a mere matter of interest, independent of its utility. Every part of the body is formed from the fluid we call the *blood*, which is first formed from the *food* which we eat. When it is recollected how various are the articles of food, and how dissimilar all of them are to the blood, it scarcely seems possible that such a conversion can occur. For instance, let a person compare a piece of bread, or a potato, with a portion of blood, and observe how unlike they are to it, in every respect; and then let him reflect, that they are, nevertheless, converted into that fluid, and the change will appear little less than a miracle.—No chemist has yet been able to accomplish it, although it is done every day in our own bodies, without our being conscious of it.

We are not acquainted with the precise means by which nature performs this function, or indeed any other, but we can point out the organs employed, and trace the changes the food undergoes in each one.

Mastication. The first part of the process consists in the preparation of the food, by grinding, or breaking it up into small parts. This is accomplished by means of the *Teeth*, a set of organs varying in their size, shape, and structure, in different animals, according to the food on which they subsist.

During the process of mastication, the food is moistened with a fluid called the *Saliva*, which is secreted by certain organs called the *Salivary Glands*, found in the mouth. This moistening assists the act of mastication, and is essential to the passage of the food down the œsophagus into the stomach. If it remained dry, neither act could be well accomplished, as most people know from experience. It is also probable that the saliva assists in the process of digestion afterwards.

Deglutition. The next act, after mastication is accomplished, is that of deglutition, or swallowing, which, though it appears so simple an act when we perform it, is nevertheless, a very complicated one, in which many curious scientific principles are concerned; suffice it to say here, that the food is passed, when masticated, down a pipe, or tube, called the *Œsophagus*, or meat pipe, into the stomach. This tube lies immediately behind the Trachea, or windpipe, (see *g* in the first view, and *a* in the second view,) and it joins the stomach at the point where it is seen passing under the diaphragm. (First view.)

Most animals masticate their food first, and then swallow it; but there are some who swallow it first, and masticate it afterwards. Fo-

instance, the lobster and grasshopper have their teeth connected with their stomachs. The gizzards of grain-eating birds serve the same purpose as teeth; they are hard, and grind together like mill-stones. It is supposed, also, that their effect is increased by the small stones which these birds swallow, and which are sometimes found in their gizzards, in great numbers.

All these processes are merely preparatory ones, which it would be possible to dispense with. Digestion itself is performed in the stomach and intestines. The structure of these organs varies much in different animals, according as their food varies in its nature from the substance of their bodies. Thus the sheep, that lives upon grass, requires a very complicated apparatus to turn that grass into mutton; while the lion or tiger, living upon flesh, requires a comparatively simple apparatus, because its food is already nearly like the substance of its body. The sheep, accordingly, has *four stomachs*, and its intestines are *twenty-seven* times the length of its body; while the lion and tiger have but *one stomach*, and their intestines are only *three times* the length of their bodies. Man being omnivorous, has an intermediate organization; he has one stomach, and the intestines are about six times the length of his body.

Chymification, or digestion in the stomach. When the food has entered the stomach, from the œsophagus, it undergoes the first part of the real process of digestion, and is converted into a greyish pulp, called the *Chyme*. The stomach itself, is a kind of pouch, or bag, with strong muscular walls, which, by their contraction and relaxation, keep the masticated food continually in motion; churning it, as it were, from side to side, and thus breaking it still finer and finer. The grand agent, however, in converting the food into chyme, is a peculiar fluid, called the *Gastric juice*, which is secreted from the inner walls of the stomach. This fluid has a remarkable solvent power, which few substances can withstand. It acts upon all our ordinary articles of food with the greatest readiness; and has been known to attack, also, such substances as bone, wood, and even iron. Its powers are exhibited out of the body, the same as in it; so that a portion put in a bottle will dissolve, or digest, a piece of meat, or other food suspended in it, the same as it does while in the stomach. The gastric juice varies in its nature, according to the food on which the animal subsists; thus, in animals who live altogether upon vegetables, it cannot dissolve flesh, while in carnivorous animals it cannot dissolve vegetables; but in the human being, as in many others that are omnivorous, it acts equally upon both. It cannot, however,

act upon any body so long as that body retains its vitality. Thus we often find worms that live unhurt in the stomach and intestines, but immediately they die they are digested, or dissolved: and in like manner the stomach itself is uninjured during life, but frequently after death is found partly corroded, or eaten away by it.

The natural appearance of the gastric juice, is that of a limpid, colourless fluid, slightly viscid, and rather acid to the taste. A substance almost identical, and with which similar experiments can be performed, may be made by mixing the dissolved mucus of the stomach with a little muriatic acid.

Passage of the food into the Intestines. During this process of chymification the food is continually moved about, as already stated, by the action of the walls of the stomach, and each portion is thus alternately presented to the opening from the stomach into the small intestines, called the *Pylorus.* This opening is at the *right* end of the stomach, the œsophagus opening into the left, or *cardiac* extremity. (See the Stomach, in the first view.) Here we observe a remarkable phenomenon which we cannot explain. This pyloric opening will let the digested portions of food pass through, but not those that are undigested; these have therefore to be returned, till they are more fully acted upon. By what means it makes the selection we do not know, but it is done so perfectly that the earlier physiologists could not help comparing it to the act of a rational being, and hence the name Pylorus, *a porter.*

Chymification. Or separation of the nutritious portion of the food from the refuse. When the chyme is passed from the stomach, through the pylorus, it enters the first part of the small intestines, called the *Duodenum*, (k, in the second view). Here it meets with two fluids, one secreted by the Liver, (C, first view,) called the *Gall*, or *Bile*, and the other secreted by the Pancreas, or Sweetbread, (l, second view,) called the *Pancreatic juice.* The gall is a dark green, bitter and alkaline substance; the pancreatic juice somewhat resembles the saliva. The position of the liver, (C) is seen in our first view, with the gall bladder, (j,) in connection; and a portion of the Pancreas, (l,) in the second, the remaining part lying behind the stomach. The fluids from both are conveyed into the duodenum by small tubes, or canals. Immediately after the admixture of the chyme with the fluids, it begins to separate into two distinct portions, one consisting of the nutritious portion, called the *Chyle*, and the other of the refuse portions forming the *Fæces.*

Absorption of the Chyle. The refuse portion of the food passes off by the bowels, but the chyle is *absorbed*, from the inner surface of the small intestines, by an immense number of minute vessels, called the *Lacteals*, (q q, second view). The chyle is white, like milk, it resembles blood, however, in nearly every particular but its colour. The lacteals are supposed to terminate on the inner surface of the intestines by small tubes, with open mouths; but externally they appear like strings of beads, owing to their being full of little *valves*, to prevent the return of the chyle, (see *q q*, second view). In passing through them this fluid also traverses certain bodies, called the Mesenteric Glands, in which it is supposed to undergo some alterations. In the second view, the beaded lacteals are seen to join together into bunches or knots,—the knots are the mesenteric glands. Eventually the whole of the lacteals terminate in a vessel called the *Receptacle of the Chyle*, (see the lower *p*, in the second view, and *p* and *q* in the fifth view). This vessel is the commencement of a tube, in man about as large as a crow-quill, called the *Thoracic Duct*, (*p p*, second view; and *b* in the fifth view,) which runs up the spine, as seen in the fifth view, till it reaches the left subclavian vein, into which it empties, (see *f f*, first view, and *s* in the fifth view). The chyle is thus passed into the venous blood, and goes with it to the lungs, where the action of the air turns it red, and converts it into real blood. There are also other vessels which empty into the thoracic duct, besides the lacteals; these are called the *Lymphatics*, (fifth view, *r r*, *m*, and *n*; at *t*, the great Lymphatic vein is seen emptying into the right subclavian, like the thoracic duct on the opposite side). They carry a fluid called the *lymph*, which is somewhat similar to chyle, and is supposed to be the superfluous particles of nutriment not needed in particular parts, and which is thus thrown into the circulation again, instead of being wasted,—nature being a perfect economiser. We are not acquainted with the force that moves the chyle upwards, but it is sufficiently powerful to burst the thoracic duct, if it be tied in a living animal.

The absorption of the chyle appears to take place principally from the first part of the small intestines, called the *jejunum*, (*l*, first view,) less from the second part, the *ileum*, (m, first view,) and still less from the colon, (E, first view,) though it probably occurs, to some extent, in the whole length of the canal.

The propulsion of the fæces along the intestines is accomplished by

the alternate contraction and relaxation of their muscular coat, producing what is called the *peristaltic motion*, which may almost be compared to that of a worm, carrying their contents gradually the whole length of the canal.

SECTION II.

CIRCULATION OF THE BLOOD.

Having thus described the manner in which *blood* is made, we have next to state its properties, and explain how it is transmitted to every part of the system. It is evident that if it remained in one part, it would nourish that part only; some apparatus is therefore needed to convey it every where, and such an apparatus, of the most perfect kind, is accordingly provided.

The Blood. The appearance of blood is familiar to most persons, and we need do little more here than repeat the fact, already stated, that it contains the elements, or materials, for forming and nourishing every part of the body. In man, and most of the vertebrated animals, it is of a florid red colour, but in insects it is transparent; in fishes it is only red in certain parts of the body, and in the caterpillar it is green; even in the human being it is colourless in certain parts of the body—as in the fluids of the eye, for instance. In some diseases, also, the blood will lose its colour, and become nearly white. On examining it with a microscope, it is found to be full of little red *globules*, which vary in their size and shape in different animals, and are more numerous in warm than in cold blooded animals. The difference in the shape of these globules is a matter of great moment. It is a common practice to let the blood from one human being run into the vessels of another, to support life, in cases of sudden exhaustion; and some physiologists, before much was known upon the matter, advised using the blood from other animals in the same manner. It is now found, however, that if the blood from one animal be transfused into another whose globules are of a *different shape*, it will cause death, instead of supporting life.

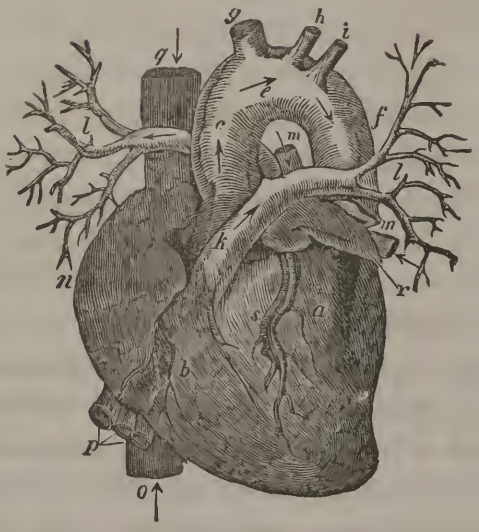
When blood stands for a time after it is drawn, it separates into two parts; one a fluid, called the *serum*, and another more solid, called the *clot*, or *crassamentum*. The serum is formed, principally, of water, and *albumen*, which is the same as the white of an egg, and enters largely into the composition of various parts of the body. The clot is com-

posed partly of the red globules, and partly of a number of whitish, tough threads, called *fibrin*, which is probably identical with muscular fibre.

Apparatus of the Circulation. The apparatus by which the blood is conveyed all over the body, is a mechanical one, though moved by a vital power. It is composed of a propelling engine, called the *Heart*, (A, 1st view,) and of a number of tubes, called the Arteries and Veins.—(See plates 2 and 3.) It may be very aptly compared to a fire engine and its hose: as the engine forces the water into the hose, and that conveys it wherever needed, so does the heart force the blood into the arteries, and they convey it to all parts of the system. The heart, itself, is a *double organ*, or more properly speaking there are *two hearts*, in the organ we usually call *one*. These hearts are both formed on the same plan; they are each composed of two chambers, the upper one called the *Auricle*, (*f* and *u*, 3d view,) and the lower one the *Ventricle*, (*d* and *w*, 3d view,) with a valve communicating between them. This valve, in the *right* heart, is called the *Tricuspid valve*, (*e e e e*, 3d view,) and in the *left* heart the *Mitral valve*, (*t t*, 3d view.) The different tubes entering into and coming out of the heart, are also provided with valves, to prevent the blood from returning. The valve at the commencement of the great aorta, (*v*, 3d view,) called the *Semilunar valve*, is formed of three triangular, or rather half-moon shaped flaps, which fall together at the points when it is closed, exactly like a three-sided roof, and recede when it is open. Now the blood proceeds *out* of the heart, along the aorta, and the valve opens upwards, from which its mode of action will be readily seen. —The blood moving upwards, pushes the three points asunder and passes through; but when it attempts to return, it pushes the points together again, and thus effectually closes the passage. Excepting at their connection with the heart the arteries have no valves, but the veins have a great number. The reason for this will be seen when the particular action of each is understood. The valves of the heart are formed of *Cartilage*, or gristle, which being tough, and elastic, enables them to work with ease. In some diseases, however, they become converted into *bone*, and are then said to be *ossified*. This, of course, prevents their action, and so stops the circulation, and causes death.

Circulation in the whole body. The pure blood is first brought into the *left auricle;* (*u*, 3d view, *r*, plate 4). This contracts, and so forces the blood through the *mitral valve* (*t t*, 3d view) into the *left ventricle;* (*w*, 3d view, *a*, plate 4). The ventricle then contracts in its turn, and forces the blood through the semilunar valve, (*v*, 3d view) into the aorta, (a, 1st

PLATE IV.



The Heart viewed externally.

a The left Ventricle. *b* The right Ventricle. *c e f* The Aorta. *g h i* The Carotid, and other arteries springing from the Aorta. *k* The Pulmonary Artery. *l* Branches of the Pulmonary Artery in the Lungs. *m m* The Pulmonary Veins emptying into the left Auricle. *n* The right Auricle. *o* The ascending Vena Cava. *p* The Azygos Vein joining the Vena Cava. *q* The descending Vena Cava. *r* The left Auricle. *s* The Coronary Vein and Artery.

view, *e*, plate 4) from which it passes into all the other arteries. Immediately the auricle is emptied into the ventricle, it expands again, and is refilled by a fresh supply, and immediately the ventricle is emptied into the Aorta, it also opens again and receives a fresh supply from the auricle; so that the action of the two chambers alternates, when one is full the other being empty. The mitral valve only opens *downwards*, and the semilunar valve only *upwards*, so that when the ventricle *contracts* the blood cannot pass backwards into the auricle, nor return from the aorta when it *expands* again.

The aorta is merely the first large trunk, all the other arteries branching off from it, (in the manner seen in plate 3,) so that when the blood enters that, by successive jerks it is propelled into them also, till the minutest tube is filled. It is this jerk, caused by the successive portions of blood entering the aorta, which is transmitted along the arteries, and constitutes what we call the *pulse*. The heart pulsates, or beats, about 70 times a minute, or about *one-hundred thousand times* in the course of a day; and the quantity of blood which passes through it, in the same space of time, is no less, in an ordinary man, than *thirteen thousand*

pounds. What a wonderful operation this is to contemplate; sleeping or waking, let life be long or short, from birth to death it never ceases. But if it appears so wonderful to us in man, how much more so must it seem in some other animals. The aorta of a man, through which all this blood passes, is only about *one inch* in diameter, while the aorta of a whale is often nearly *a foot!* Dr. Paley compares the circulation in a whale, to the passage of the water through the city waterworks, at London bridge; and it is only by some such comparison that an adequate idea can be formed of it. What causes the contraction of the heart we do not know, but it will sometimes continue after the organ is removed from the body. In some animals it will beat for hours after it has been torn out and hung up to dry. It is also observed to move in the fœtus, when the organization is so rudimentary as scarcely to be observed.

The arteries, as already stated, ramify through the whole system, even in the colourless parts, and the solids. They are so minute, at their termination, that the most powerful glasses can scarcely follow them, and so numerous, that if every other part was removed, they would appear to form the body of themselves.

The object in sending the arterial blood in this manner, to the different parts of the body, is, to supply them with the materials for their growth, or to make up for the waste continually occurring in them. Now it will be evident that this must alter the character of the blood,—if any of its elements are abstracted it cannot be the same as it was when it first started from the left side of the heart. Besides this, many impurities have doubtless entered it, which require to be removed, and from its peculiar constitution it requires frequent contact with the external air. Another apparatus is therefore needed, by which it can be returned from the arteries, and brought into contact with the atmosphere. This is accomplished by means of the *veins*, and *right side of the heart.* Immediately where the minute arteries end, the veins, equally small, begin; or rather we should say, they pass into one another *insensibly*, for we cannot tell precisely where one terminates and the other commences. These small veins gradually join together, forming large ones, and these again forming larger still, (see plate 3) until at last they terminate in two large trunks, called the ascending and descending *Vena Cava*, (b first view, and *j* second view; also *o* and *g*, plate 4). The ascending one brings the blood from the lower part of the body, and the descending one from the

upper part. They both empty into the right side of the heart, which propels the blood in the same way as the left side, but for a different purpose.

Circulation of the blood in the Lungs. The *right auricle*, (*f*, 3d view, *n*, plate 4) being filled with impure blood, from the veins, contracts and forces that blood through the *tricuspid valve*, (*e e e*, 3d view) into the right ventricle (*d*, 3d view. *b*, plate 4); the ventricle then contracts, and the blood opening the right semilunar valve, passes into the *Pulmonary artery*, (*c*, 3d view, *k*, plate 4). The tricuspid and right semilunar valves, acting precisely like the mitral and left tricuspid, prevent the blood taking a wrong direction in the same manner that they do. The pulmonary artery divides into two branches, one going to the right lung, and the other to the left lung, where they branch off into numerous subdivisions, (see *l l*, plate 4, and *h h h*, *blue*, 3d view), which become so extremely minute that we cannot follow them to their terminations. Side by side with these small arteries are placed the equally small *air tubes*, (*g g*, 3d view) which branch off from the trachea, or wind-pipe, (g, 1st view, *a*, 2d view). The pure air is thus brought into contact with the blood, and takes up, or unites with, its impurities, which are then sent out with the breath when it is expelled. In this way the blood is purified, and made fit to circulate in the body again. We have then another set of blood-vessels in the lungs, called the *Pulmonary veins*, which run side by side with the arteries, receive the blood when it is purified, and take it back into the *left auricle*, to be again sent round the system. (The pulmonary veins are seen, in the 3d view, coloured *red*, interlacing with the pulmonary arteries, coloured *blue*, and passing into the left auricle, *u*. The main trunks are also seen in plate 4, *m m*). The two sides of the heart, therefore, have no *direct* communication with each other, in any way, but merely an indirect one through the lungs. In the fœtus, however, which does not use its lungs, there is a hole through the partition, called the *Foramen Ovale*, which closes a few days after birth. Sometimes, however, it remains permanently open, and then the pure and impure blood mixes together, causing what is called the *blue disease*, from the dark blue colour which the impure blood gives the skin.

Reptiles have but one ventricle, and two auricles. Only a small portion of their blood is sent to the lungs, and when purified is mixed with the general mass in the common ventricle; so that they only have pure blood in the pulmonary veins and left auricle: in all the rest of the body it is mixed with the impure.

In the crocodile, the arrangement is made so that pure blood circulates in the brain, and anterior parts of the body, while the posterior parts receive nothing but mixed blood. In fishes there is only one auricle, and one ventricle, and the gills act as lungs. The crab and the lobster have only one cavity, or large ventricle, placed in the arterial circuit. When we come lower down still, in the animal scale, the heart is wanting, and we find nothing but a large vessel running along the back.

We have thus described, minutely, the course of the circulation both in the body and in the lungs. By reading this description carefully, and referring to the views and plates, it will be plain to any one. In plate 4, the course of the blood is marked by arrows, (*f*) which assists the comprehension very much. It will be seen that the veins all run *towards* the heart, while the arteries all run *from* it, so that the blood always moves in contrary directions in the two sets of vessels; or, in other words, if one goes upwards, the other goes downwards. The reason for the blood moving in the arteries is easily seen,—it is the force of the heart that drives it along, but what moves it in the veins is not so apparent. No force from the heart is applied to them at any point, nor from any other source, so far as yet known. Some explain it by supposing the veins themselves keep contracting, and so forcing their contents along; while others suppose that when the right auricle opens again, after emptying into the ventricle, it necessarily *sucks* the blood from the vena cavas, to fill up the vacuum. This suction certainly does take place, but it is contended by many physiologists, that it is not powerful enough to account fully for the phenomenon. The veins are plentifully supplied with *valves*, particularly where they run upwards, and these all open in one direction, so that the blood cannot run back again.

SECTION III.

RESPIRATION.

Necessity for Respiration. In our previous section, we stated that the blood was sent to the lungs, that it might be purified by contact with the air when we breathe. This purification is indispensable, for so deleterious is the venous blood, that it would soon cause death if it were to remain in the body unchanged. This as an ordinary fact, most people

are aware of, though they may not know the reason for it. When a person is prevented breathing for some time, by any means, he dies; because the venous blood, sent to his lungs, is full of poison, which can only be removed by *breathing;* if, therefore, the breath be stopped, he dies from the effect of that poison, the same as if he had taken a dose of arsenic into the stomach. This is the reason, also, why people are suffocated, or die, from breathing the same air over again too many times: it has become so full of the deleterious matter, that it poisons them directly they inhale it. In badly ventilated houses, and in public buildings, people are often poisoned in this way to a great extent. They may not be killed immediately, but they have headaches, faintings, nervous depression, and other affections, which often lay the foundation of serious disease. Some curious experiments have been performed at different times, for the purpose of illustrating these important facts in a more striking manner. Among others, Bichat connected, by means of a tube, the *jugular vein* of one dog with the *carotid artery* of another, so that the venous blood went to the brain instead of the arterial. Immediately this was done the animal became insensible, and would evidently have died in a short time, had not the experiment been suspended. On allowing the arterial blood to resume its proper channel however, he soon recovered.

Chemical changes of the Blood and Air. The manner in which the purification of the blood is effected, will be understood by observing the changes which it and the air undergo, when they come in contact. The atmospheric air is composed of about four parts of a gas, called *Nitrogen*, and one part of another gas called *Oxygen*. On examining the breath, however, which is the air after it has been in the lungs, the greater part of the oxygen will be found to have disappeared, and we find another gas, called *Carbonic Acid*, in its place. This new gas is formed by the union of the oxygen with a substance called *Carbon*, found in great quantities in the blood, and body generally. Carbon is the same substance as common charcoal, and, though harmless in itself, is a deadly poison when combined with oxygen, forming carbonic acid. This is the same gas that often destroys miners and others, in pits and wells, by choking them; it is, also, the same as that given off by burning charcoal, which has often suffocated people who have thoughtlessly left it to escape into their chambers. A number of persons shut up in a close room, poison the air by their breath, as effectually as if a charcoal fire

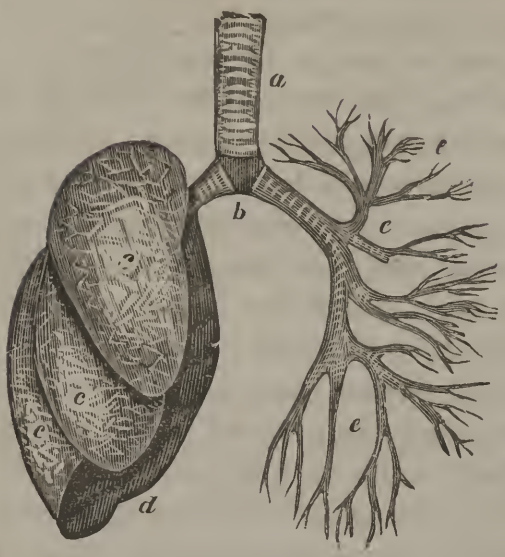
was burning in it. Many frightful instances of this kind are upon record, the most famous of which occurred in what is called the *black hole of Calcutta.* This was a dungeon, 18 feet square, with only two small windows to admit air. 146 men were thrust into this place; 96 of them died in six hours, with most horrid sufferings; and in the morning, when the doors were opened, only 23 were taken out alive. I have seen some school rooms, in which children were confined, and many apartments in which human beings lived and slept, that were black holes on a small scale. This gas, also, extinguishes fire, and is thus often detected in cellars, by its putting out the candle.

An ordinary man requires about 45,000 cubic inches of oxygen gas every twenty-four hours; about 40,000 of which combine with the carbon to form carbonic acid. From this simple fact, any person may form an idea, or make an accurate calculation if he chooses, of the quantity of fresh air needed in a given time, to be admitted to any buildings where people assemble. It is very seldom, indeed, that this matter is attended to, or even understood. One or two hundred people are crammed into a place where only sufficient air can enter for half the number; the consequence is they all feel uneasy and oppressed, and possibly suffer afterwards still worse. Much more could be said on this subject, which is much needed to be known, but our present limits will not allow us to expatiate more fully; on another occasion we will do so.

Different animals require different portions of oxygen to sustain life; thus a frog, or a lizard, will live a long time in air which a bird has used as long as it can; and insects will breathe in it even after it has suffocated the frog and the lizard. No animal, however, can do without air altogether. Even fish breathe, by means of their gills, which extract the small portion of air contained in the water.

Structure of the Lungs. The principal organs employed in breathing are the *Lungs* and their appendages. These are composed of the *Air Tubes* (*g g g*, 3d view; *e e*, plate 5,) and the pulmonary veins and arteries, (*h h h*, 3d view.) The air tubes branch off from the trachea, or windpipe, (g, 1st view; *a*, 2d view; *a*, plate 5,) and are supposed to terminate in little vesicles, or cells, varying in size from the fiftieth to the hundredth part of an inch in diameter. The whole extent of these air tubes has been calculated at 20,000 square inches, or more then *twenty times the surface of the whole body:* and the quantity of air received into, and expelled from them, in one day, cannot be less than

PLATE V.



The Lungs and Trachea.

a The Trachea, or windpipe. *b* The Bifurcation, or branching of the Trachea. *c c* The upper face of the right Lung. *d* Under surface of it. *e e e* The Air Tubes, the fleshy part of the lung being dissected away.

between 3,000 and 4,000 gallons, in an ordinary man. The ramifications of the pulmonary arteries and veins, interlacing these air tubes in every direction, are so numerous, and so minute, that they have been called, by anatomists, *the wonderful net work.* (See *h h h*, 3d view.)

Form of the Chest, and position of the Lungs. The chest is formed by the back bone behind, the breast bone in front, the ribs on the sides, and the diaphragm below. (See plate 1, figures 1 and 2.) It is lined all through by a smooth, shining membrane, called the *Pleura*, which divides the chest into a right and left side, covers the lungs, and separates them from the heart. The lungs, however, are on the *outside* of the pleura, the same as a person's head is on the outside of a double night-cap, or the foot on the outside of a stocking, before it is fully turned on. The air, therefore, cannot get between the lungs and the side of the chest, but can only enter them by the windpipe.

Mechanism of Breathing. When we draw *in* a breath we are said to *inspire.* This is accomplished by raising the ribs, which are provided with a vast number of muscles for the purpose, and by depressing the diaphragm. (G, 1st view.) This, of course, makes the chest larger, and so creates a partial vacuum, which the air rushes in to fill. The only

place, however, at which the air can enter, is the windpipe, (g, 1st view; *a*, 2d view, and *a*, plate 5,) and the only part it can fill is the air tubes, in the lungs, (*g g*, 3d view; *e e*, plate 5,) and they, therefore, become inflated. The air remains a sufficient time to purify the blood, and is then ejected; this is accomplished by the falling in again of the ribs, and the rising of the diaphragm, which is pressed upwards by the abdominal muscles. The expulsion of the air, or sending the breath *out*, is called *expiration;* and the whole process of drawing in and sending out the air, is called *respiration* or *breathing*.

This explanation shows at once how *corsets*, and other tight bandages, do injury. These bind down the ribs, and prevent the action of the diaphragm; so that the chest cannot fully enlarge, and consequently the quantity of air which enters the lungs is less than it should be, and the blood is only partially purified. A quantity of poison is thus forcibly detained in the body, in the form of carbonic acid, which injures the unfortunate victim just the same as if she breathed it from a charcoal furnace. Want of exercise also operates in the same manner. Unless the body be briskly in motion, the muscles of the chest only act imperfectly, and the quantity of air taken in is very small, but immediately active motion commences we breathe quicker, the blood is better purified, more heat is engendered, and the whole system is revived. When a man sits perfectly still, thinking intensely, or listless, their inactivity is often so great for a time, that he feels compelled at last to take a long breath, to make up for previous deficiency,—this is called a *sigh*, and always indicates insufficient breathing. We take, on an average, about twenty inspirations a minute.

Modifications of the breathing apparatus. Whales, which have no gills, but breathe air, have reservoirs, in which large quantities of pure blood can be stored, for them to use when they cannot breathe, and this is supposed to explain why they are able to remain so long under water.

The lungs of birds are not loose in the chest, like ours, but fixed fast to the sides, and communicate with air cells that exist in other parts of their bodies, so that they breathe with nearly the whole surface. If the large bone in the wing of an eagle be broken, and the windpipe tied, it can still obtain air enough, through the broken bone, to sustain life for a long time. The respiration of birds is therefore double, as the air acts upon the blood while passing through the lungs, and also in returning, and possibly even while in the cells. They therefore consume more air than any other animals.

Reptiles generally breathe but little air, on account of their having such large air cells, which of course decreases the amount of surface. The frog has neither ribs nor diaphragm, but its chest and abdomen form one cavity, so that it is obliged to *swallow* the air, as we do water. If its mouth be kept open, therefore, it dies, because it cannot swallow. By watching one of these animals it will be seen to *gulp* the air down continually.

The gills of fishes, sometimes are of vast extent. Those of the skate are said to be equal to the surface of the human body. It is thought that fish might breathe air directly, if it were not for their gills becoming dry, and collapsing. Indeed, some kinds, as the carp for instance, may be kept alive a whole day out of the water, by simply wrapping them in moist cotton. The eel, and the crab, which both have gills, can breathe in air for a long time, as well as in water.

In all the above cases the blood is brought to the air, either in lungs, or gills. In insects, however, the air is taken to the blood. They are permeated in all directions by little air tubes, opening on the surface, so that the whole body is a lung. The veins that we see on the wings of a butterfly are these air tubes, which open on the surface by what are called *stigmata*, or little mouths. The bee-worm, and many others, exhibit the same structure. If these little tubes be closed the insect dies. In most of the lower animals, up to reptiles, the skin also assists in respiration.

Animal heat. In one of our previous sections we remarked that nature was a great economiser, and this is admirably illustrated by the manner in which heat is generated in the body. We have shown that the carbon *must* be expelled from the lungs, because it is a poisonous substance when there; and we have also shown that its expulsion is effected by its combination with oxygen, forming carbonic acid gas. Now this combination produces *heat*, just the same as if charcoal were burnt in the open air; and thus we find the same process purifies the blood, and produces animal heat at the same time. Strange as it may appear, it is nevertheless true, that the carbon, (or charcoal) is *burnt* in our lungs, precisely the same as it is in a stove, or chafing-dish, and with the same result. *Eleven ounces* of carbon are supposed to be consumed in the lungs of a healthy man, in the course of a day, the combustion of which, it has been proved, would generate nine-tenths of the heat produced in the same time. The remaining part is probably produced by friction of the different parts, and by chemical changes. This explains why we get heated by exercise, or any means by which we are made to breathe

quicker. The more frequently we respire, the more carbon is consumed, or, in other words, the more fuel is burnt, and of course the more heat given out. We often see a person who sits still, by a large fire, on a cold day, feel quite chilly, while another, moving briskly about, out of doors, will be quite warm. The reason is, the sedentary person is vainly trying to imbibe warmth *externally*, while the active one is producing it *internally*. This explains why so many young ladies, who never exert themselves, scarcely ever experience a glow of warmth on their bodies, but always complain of cold hands and feet; while young persons of the other sex, who are in constant exercise out of doors, scarcely ever make such complaints. This is a subject of great interest, and importance too. Those who wish to see it *fully* treated upon, by an able man, should read *Liebig's Organic Chemistry*. It is necessary to remark, however, that many facts have been recently observed, which seem to prove that the generation and diffusion of animal heat, is much controlled, in some way or other, by the nervous system; though there is no doubt but that it is mainly produced in the manner we have described.

This completes our view of the *nutritive* functions; we have explained how blood is *made*, how it is *circulated*, and how it is *purified*. Other functions now repuire notice.

CHAPTER II.

SUPPLEMENTARY FUNCTIONS AND ORGANS.

SECTION I.

GLANDULAR SECRETIONS.

Our previous chapter having explained to us the formation, circulation, and purification of the blood, we have now to describe certain organs that *secrete*, or separate, from it particular substances. These organs are generally termed *Glands;* they are of various kinds, and situated in all parts of the body. It is not possible here for us to refer to all of them, they are so numerous, but merely to the principal ones. Some of them are indispensable, others are apparently of little consequence, and some may even be dispensed with altogether.

The Salivary glands. These are situated in the mouth, and secrete the saliva, the use of which has been stated. There are six of them,—two near the angles of the lower jaw, two under the tongue, and one on each cheek, immediately opposite the second or third double tooth. By turning down the cheeks the fluid may often be seen trickling down in drops, and on putting a steel point to those under the tongue it will often start forth in a stream. In case of salivation, from taking mercury, these glands are excited to intense action, and sometimes pour out an enormous quantity of saliva. The camel has additional salivary glands in its throat, which assist very much in enabling it to dispense a long time with water.

The Liver, (C, 1st view). This is the largest gland in the body; it secretes the *bile*, or gall, so necessary in digestion. This secretion is formed from the *venous* blood, which is not the case with the others. It is probable from this that we have here another instance of nature's economy. The substances taken from the impure blood by the liver, are doubtless, such as are wanted to be got rid of, but are not such as would pass off by the lungs, they are therefore separated in the form of bile, which is then passed into the *gall bladder*, (j, 1st view,) and afterwards made use of in digestion, as already shown. The bile is strongly alkaline,

and contains a peculiar resinous substance. Sometimes it solidifies, or forms little hard bodies, called *gall stones*, which, by obstructing the ducts cause pain and disease. This is a frequent cause of the disease called *jaundice*, in which the gall is disseminated all over the system, producing a peculiar yellow colour of the skin, and much constitutional disturbance. The quantity secreted daily, in a healthy state, is about six or eight ounces. Purified ox-gall, under the name of *fellis bovinis*, is used in medicine, particularly in those affections of the digestive organs which are supposed to result from deficiency of bile.

The Kidneys, (H H, 2d view). These organs are probably assistants to the lungs, like the liver; but their secretion is not made use of. The substances which they separate are chiefly certain salts, particularly *ammonia*, and a peculiar substance termed *urea*. These, when dissolved in water, constitute what is termed the *urine*. When this fluid is secreted in the kidneys, it passes down the tubes proceeding from them, called the *ureters;* (*n n*, 2d view,) and by them is conveyed to the bladder, (I, 2d view,) into the sides of which they open. The salts in the urine often harden, or crystallize, and are then called *urinary calculi*, or stones in the bladder. Sometimes they form in the kidneys, or ureters, and produce serious results.

The Lachrymal glands. These are situated in the corner of the eyes, and secrete the *tears*. They often become diseased, and are continually running; but sometimes they are diseased the other way, or become dry, which is almost as great an inconvenience. Some of the ducts from these glands communicate with the nose, and when tears are shed many of them escape by that passage.

There are numerous other glands scattered all over the body, but which it is not necessary to refer to. Some animals can secrete *light*, as the fire-fly, for instance; and some can secrete *electricity*, as the torpedo, or electrical eel.

In disease we have many morbid secretions, not found at other times, as in cancers, tumours, and consumption. There are some secretions which are found only in one sex, as the milk in the female breast, for instance.

The manner in which secretions are effected we do not know, in any case. But it is certain that they are very much affected by the state of the feelings. Depression of spirits either retards, or sometimes even stops them altogether. This shows the importance of a well regulated mind.

SECTION II.

EXHALATION.

Exhalation means the escape of some portion of the blood through the sides of its vessels, and it probably occurs through little *pores*. If we inject a portion of water, coloured with vermilion, into the veins of a dead animal, the fluid will pass out of them, or be exhaled, but the vermilion will remain. If a solution of phosphorus be injected into the veins of a living animal, the fumes of the phosphorus may be detected in the breath a few minutes after. The chief exhaling organs are the skin, the intestines, and the lungs.

The lungs exhale a large portion of vapour, as may be seen by its condensation into fluid on a frosty day, and so do the intestines; but the great exhaling organ is the skin.

The Skin is formed of three layers; the upper one, which is destitute of feeling, and almost of vitality, is called the *cuticle*, or *epidermis;* the under one is called the *dermis*, or true skin; this is plentifully supplied with blood-vessels and nerves, and is therefore highly sensitive and vital; between these two layers is a third one, called the *rete mucosum*, in which resides the colouring matter. This is light in the European, dark in the intermediate races, and black in the Negro. The cuticle and dermis of a Negro could not be distinguished from those of a white man, the colour being altogether in this middle layer, and not on the outside or underneath.

It is calculated that from *thirty to sixty ounces* of fluid pass off by the skin every day, in the shape of *insensible perspiration;* and we all know how much this is increased in hot weather, or by violent exercise. It is this insensible perspiration that makes the insides of india rubber shoes and capes damp, even in cold weather. An experiment was once performed, on some workmen at the Phœnix glass-house, London, to see how much a man could lose by perspiration. These men had to work hard, and were exposed to a very high temperature at the same time. They were accurately weighed, before going to work, and on coming away. One man lost *two pounds fifteen ounces* in an hour and a quarter. And on another occasion one lost *four pounds three ounces* in three quarters of an hour.—This was in the month of November. In the month of June, a man lost no less than *five pounds two ounces* in an hour and ten minutes. It is this tremendous evaporation from the skin,

aided by that from the lungs, which enables the living body to withstand such high temperatures. Sir Charles Blagden, in one of his experiments, remained, without inconvenience, in a room whose temperature was 52 degrees hotter than boiling water. He staid there while eggs were roasted hard, and a beef-steak completely cooked, by merely blowing the hot air upon it. Many other such experiments have been tried. If, however, the skin be varnished, or the air saturated with moisture, so that no evaporation can go on, it is not possible to bear a temperature half so high. These facts show us what an important organ the skin is, in removing waste matter from the body, and how necessary it is to keep it clean, and its pores well open, by warmth and friction. If this be neglected, the waste water that should pass off as insensible perspiration, is driven back to the internal organs, and by overtasking them produces inflammations and other disorders. More disease is caused in this way than people are aware of, particularly of the bowels and lungs. The skin is made thin and delicate on those parts with which we touch, or feel, and on others where much friction takes place it is thick and hard. Most persons have observed how the skin is wrinkled, or veined, particularly on the hands, and other moveable parts, without thinking *why* it is so. It will be seen, however, that this is necessary to allow the various motions to be accomplished. If it was drawn smooth and tight, especially over the joints, no motion could take place, as we often see when they are swelled.

The skin sympathizes extensively with all the internal organs, so that sudden cold, or heat, applied to it, affects them instantly. A burn, or scald, will often stop the action of the heart, by the shock which it gives, when the surface injured is apparently small. And a sudden chill will often produce diarrhœa in a few minutes. Eels will live without inconvenience in water at 30 degrees, or at 60 degrees; but if one is taken out of that at 60, and suddenly plunged into that at 30, the shock will kill it instantly. It is well known, also, how soon intense cold produces sleep, from which the person never wakes.

SECTION III.

ABSORPTION.

By absorption is meant the removal of any parts of the body, or of any substances placed in contact with them. Thus, when a fat person becomes lean, or when the fluid in a dropsical person disappears, the fat and the fluid are said to be absorbed. It was formerly supposed that this removal was effected by certain vessels formed for the purpose, which were therefore called *absorbents:* but this is now known to be incorrect. There are some vessels which directly absorb certain substances, as the lacteals and lymphatics for instance; but in such cases as those above referred to, the matter merely passes through the walls of the veins into the current of blood, and is thus carried off. Almost all substances will be taken up by the veins in this way. The skin absorbs but very little while the cuticle is perfect; and the strongest poisons may be then handled with impunity: but if the cuticle be removed, so that the true skin is removed, the absorption occurs immediately. It is a practice at the present time, to give some medicines in this way.—The cuticle is raised by a blister, and the medicine deposited underneath; absorption promptly occurs, and the characteristic effects of the drug are soon seen. Tartar emetic given this way will soon cause vomiting, and several cathartic medicines will speedily act on the bowels. This is called *Endermic medication.* In inoculating we have to break through the upper skin for the same reason.

The intestinal canal absorbs considerably, also; but the great agents in this operation are

The Lungs. Various poisons and other hurtful substances, which float in the atmosphere, are taken up by these organs. The malaria, from marshes, and decaying vegetable matter, is taken in with the breath, and produces fevers of various kinds, as we see in the west and south of our own country particularly. A familiar proof of this rapid absorption from the lungs is afforded when we breathe the vapour of turpentine; it may often be detected in the urine, in a very short time after. Some poisons, as prussic acid for instance, are taken into the system so rapidly in this manner, that the vapour of them, if inhaled, will often produce death, almost instantaneously. Various infectious disorders are commu-

nicated in this way, from one person to another. M. Majendie confined some dogs where they were compelled to breathe the effluvia from putrid flesh, and he found, though they eat well, and continued lively, that they gradually wasted, and at last died, about the tenth day; and a few drops of putrid water injected into the veins of some dogs, by the same person, produced symptoms exactly like those of yellow fever. This makes it clear how many diseases originate, and shows the reason why so much sickness is found in crowded houses, and streets, where there is little ventilation, and where filth and dirt is allowed to accumulate. These poisons will often remain in the body for months, before they begin to produce mischief openly, so that many diseases are attributed to other causes which are due to them alone. Our common *Fever and Ague*, is no doubt caused by the absorption of some subtle poison, produced by marshes, or decaying matter; and we often find it disappear from a whole district, by draining a swamp. Several medicinal substances have been administered in the same way.—Camphor, and other articles, are made up into a kind of cigar and smoked, the vapour being of course absorbed by the lungs.

SECTION IV.

SUPPLEMENTARY ORGANS.

The Spleen, (F, 1st view.) This organ is a somewhat prominent one in the body, and of course persons observing it wish to know its use. Of this, however, we are not able to inform them. The fact that the spleen has often been removed, without the animal appearing to suffer, or any of its functions becoming deranged, proves either that it is of little use, or that its functions are readily performed by other organs. Some call it the centre of organic life, and suppose it to bear the same relation to the organic life, that the nervous system does to the sentient life. Others again suppose that it is only a kind of reservoir, in which superfluous blood, and fluid, may be stored, to relieve the stomach during digestion. But the fact is, nothing is known about it with certainty. It often becomes much swollen in fever and ague, producing what is called *the ague cake*.

There are several other organs which, like the spleen, we know not the uses of, we need not, therefore, refer to them.

CHAPTER III.

THE NERVOUS SYSTEM.

The nervous system is that by which we think and feel, and by which all the organs in the body are put in motion. It is composed of the *Brain*, the *Spinal Marrow*, and the *Nerves*. (4th view.)

SECTION I.

THE BRAIN AND SPINAL MARROW.

The Brain is contained in the skull; it is composed of a soft, grey, pulpy substance externally, and of another similar, but whiter substance internally. It is divided into two distinct parts, the upper one called the *Cerebrum*, (a a a, 4th view), and the lower one the *Cerebellum*, (b b b, 4th view). It is enclosed in three distinct membranes, the outer one, called the *dura mater*, is very strong and tough; the middle one, called the *arachnoid*, is so fine that it is scarcely to be seen; the lower one, called the *pia mater*, is stronger, and penetrates, in some parts, into the interior. The cerebrum is the largest portion, and exhibits numerous convolutions, or folds. The cerebellum is more compact, and when cut through appears like the branches of a tree in the interior. (b^1 b^1 b^1, 4th view). Both parts are divided into two distinct and similar halves, called the *hemispheres*, and these again are divided into smaller portions called *lobes*. The hemispheres are divided from each other by portions of the membranes, which dip down between them, in the manner seen in the fifth view, (13). The cerebrum and cerebellum are separated from each other in the same way. (16, 5th view). The hemispheres of the cerebellum are however connected by a prolongation, or arm, called the *pons varoli*, or bridge of Varolius.

Several cavities are found in the brain, called *ventricles*, one of which is seen in the fourth view, (f). A quantity of clear fluid is constantly poured into these cavities, which is immediately absorbed in the healthy state, but in the disease called hydrocephalus, or watery head, some-

times accumulates to several gallons. The brain itself has but little sensation, and may be punctured, or even cut away, without pain being experienced from the operation, except in certain parts.

The Spinal Marrow is contained in the spine, or back bone, and is composed of similar materials to the brain, but the white matter is external and the grey internal. It has also similar membranes to the brain, and may properly be considered as a prolongation of it. It is divided into six parts, or columns;—two in front, called the *anterior columns*, two at the sides, called the *lateral*, and two behind called the *posterior*. It is however commonly spoken of as having only *two*, the anterior and the posterior. All these columns are found to be composed of fibres, or threads, which may be traced upwards, and are found to be continuous with similar ones in the brain. The upper part of the spinal marrow is called the *medulla oblongata*, (c c, 4th view); it is divided into several parts, two of which, called the *corpora pyramidalia*, connect the cerebrum with the anterior column of the spinal marrow; two others, called the *corpora olivaria*, connect it with the lateral columns; and two more, called the *corpora restiformia*, connect the cerebellum with the posterior columns.

SECTION II.

THE ENCEPHALIC AND SPINAL NERVES.

The Nerves are simply small cords, or threads ramifying from the brain, or spinal marrow, and are composed of similar matter, (see 4th view). Each nervous cord is composed of a great number of filaments, and each of them is found, under the microscope, to be composed of others, still smaller. These are all bound together in a kind of sheath, called the *neurilema*, or nerve coat. From some experiments recently tried it seems probable that the nervous filaments are *tubes*, filled with a fluid.

Classification of the Nerves, and their origins. The nerves are arranged into two classes, *regular* and *irregular*. The foundation for which division is, the double structure of the brain and spinal marrow.—The brain being divided, as already stated, into the cerebrum and cerebellum, and the spinal marrow into two main columns, the anterior and posterior.

The Regular Nerves originate by double roots, one from each of the spinal columns, or from each of the two parts of the brain, and have also

a knot, or ganglion, near their origin, (j j, 4th view). They impart both the power of *motion* and *sensibility* to the parts to which they are distributed. These nerves are common to all animals, from the simple zoophyte up to man. One peculiarity of them is, they always run at right angles to the body when standing, or in the direction of the extended arm, and never the other way, (see f, g, and h, 4th view). The following is a list of these nerves:

1. The Fifth pair, (5, 4th view). 2. The Sub-occipital, (10, 4th view). 3. The three superior Cervical, (e^1, 4th view). 4. The four inferior Cervical nerves, and first Dorsal, (f^1, 4th view). 5. The Dorsal nerves, (g, 4th view). 6. The Lumbar nerves, (h, 4th view). 7. The Sacral nerves, (i i, 4th view).

Which make *one* fifth pair, *one* occipital, *seven* cervical, *twelve* dorsal, *five* lumbar, and *six* sacral; or *thirty-two* regular double nerves; being *thirty-one* from the spinal marrow, and only *one* from the brain—the fifth pair. From this circumstance they are sometimes called the *spinal nerves;* the fifth pair being the only exception, and that even, by some, is conjectured to arise from the ultimate fibres of the spinal column.

The Irregular Nerves, called also the *encephalic*, because they originate from, or are connected with, the brain. These nerves originate only by a single root, and are distributed irregularly; whereas the regular ones originate in double roots, and go in similar pairs to each half of the body, as seen in the 4th view. These may be called additions to the previous class, and are found only in the more perfect animals, according to the extra functions which they possess over the lower ones. Some of these are nerves of special functions, and others have complicated uses. The following is a list of these nerves.

1st. The Olfactory nerve, or the nerve of the nose, by which we smell, (1, 4th view.) 2d. The second pair, or Optic nerve, the nerve of the eye, by which we see, (2, 4th view.) 3d. The third pair, which is distributed to the muscles of the eye, and enables them to move, (3, 4th view.) 4th. The fourth pair, called, also, the Trochleare, the smallest nerve in the body; it is distributed only to the oblique muscle which moves the eye, (4, 4th view.)—The two last nerves are supposed to originate from the anterior column of the spinal marrow, being only nerves of motion: but this is not certain. 5th. The sixth pair.—This is, also, distributed to a single muscle of the eye; it originates like the two last, (6, 4th view.) 6th. The seventh pair.—This is in two portions, one

called the portio dura, or hard portion, is distributed to the muscles of the face and forehead, (7, 4th view;)—the other, called the soft portion, goes to the ear, and is the nerve of hearing, (7^{1}, 4th view.) 7th. The Glossopharyngeal.—This is distributed to the roots of the tongue, and the pharynx; its uses are not accurately known. It is thought that one branch of this is the nerve of *taste*, (8, 4th view.) 8th. The Par Vagum, or eighth pair; called, also, the pneumogastric, from being distributed to the lungs and stomach, and also the heart and larynx, (8^{1}, 4th view.) 9th. The Spinal accessary.—This is distributed to the muscles of the neck, (8^{11}, 4th view.) 10th. The Hypoglossal nerve; the ninth pair, or lingual, distributed to the muscles of the tongue, (9, 4th view.)

We have spoken of the regular nerves as originating from the spinal cord, (with the exception of the fifth pair,) and of the irregular nerves as originating from, or being connected with, the brain. Some physiologists, however, contend that all the nerves should be considered as arising from the spinal column. That the regular ones do so is plainly seen, with the one apparent exception; and the irregular ones which have not been traced directly to the column itself, are found to proceed from the medulla oblongata, which may be regarded as its termination, or the connecting link between it and the brain. The nerves which go to the upper and lower limbs, are merely prolongations of the others; those of the arms originate from the inferior cervical and first dorsal, which unite to form the axillary plexus; and those of the lower limbs originate from the sacral and lumbar, which unite to form the lumbar and sciatic plexuses. A plexus means a collection of nerves interlaced with each other. (k, 4th view.)

SECTION III.

USES OF THOSE PARTS OF THE NERVOUS SYSTEM ALREADY DESCRIBED.

The Brain proper, or the cerebrum and cerebellum, appears to be the especial seat of intellect and moral feeling, to guide and direct our actions.

The Spinal Marrow. It is found that the anterior and posterior columns of the spinal cord, and the nerves proceeding from them, have totally different powers. The anterior column giving the power of *motion*, and the posterior giving *sensibility*, or the capability of feeling.

As an illustration of this, if we take the nerves which go to the arm, or any other part, and cut through the portion which originates from the anterior column only, all power of motion will be lost, though sensation will remain as perfect as before; but if we cut through the portion which originates from the posterior column only, we destroy all sensation; the arm might be cut, or burnt, but the individual would feel nothing of it, though he could move it as well as he did before. If, however, we cut through *both* portions, there will be neither sensation nor motion. We see many similar instances from injuries, and from disease. It is quite common to see persons who have lost the power of motion, or sensation, or both, from paralysis, palsy, or a *stroke* as it is called. I lately saw a little boy, whose arm had lost all power of motion, and sensation, from a blow received from some machinery. He was sitting one day by the stove, and let the hand fall upon it; no feeling whatever was experienced, and a very serious burn resulted, without his knowing any thing about it till told. The regular, or spinal nerves, therefore, originating from both columns, give both motion and sensation. Usually the sensitive and motor portions are bound up together, in the neurilema, but sometimes they are separate. The fifth pair for instance, has three branches, —the first of which (5, 4th view,) gives common sensation, or *touch*, to the eye, eye-brows, and forehead. If this branch were destroyed we should still have the sensation of light, as that depends on the optic nerve; but we should not feel when any thing *touched* the eye, though it injured it severely. The second part (5^{1}, 4th view,) gives sensibility to the jaw and lips, and to the palate. The third branch, 5^{11}, 4th view,) goes to the muscles and skin of the lower jaw, tongue, and mouth, and it gives both sensibility and the power of motion. It is the sensitive portion of this nerve that is usually affected in tic doloureux, and toothache. The irregular nerves, on the contrary, having but a single origin either from the anterior column, or from the posterior; either give sensation only, or motion only, but not both. The optic nerve, for instance, gives sensation only, while the third pair, which goes to the muscles of the eye, gives the power of motion only. If the optic nerve be cut through we cannot see, though the eye may appear as perfect as before. Sometimes it becomes paralysed by disease, and complete blindness ensues, without any alteration at all in the structure of the eye. This is called Amaurosis, or nervous blindness. If the auditory nerve be severed or paralysed, we become deaf, from the same cause. Sometimes the nerves

going to the muscles of the eyelids become paralysed, and then they cannot be moved; at others the hard portion of the seventh nerve is affected, and then the mouth is drawn on one side.

The nature of the nervous power is unknown; we can merely observe its effects. If a needle be thrust into the hand it wounds a nerve of *sensation*, by which the feeling of pain is excited and carried by the nerve to the brain. A desire is immediately excited to remove the needle, and the will, transmitted along the nerves of *motion*, causes the necessary muscles to act for withdrawing it. It has been conjectured that this power is identical with the *galvanic*, and many experiments make this extremely probable. If a muscle be paralysed, by disease, or by accident, it may be made to act by galvanism, the same as by its proper nervous stimulus. Even after death this effect may be produced. This subject, however, has been so fully gone into in my work on Neuropathy, that I need not refer to it further in the present one.

SECTION IV.

THE GREAT SYMPATHETIC NERVE.

This nerve forms a distinct class of itself, being different in its origin, its distribution, and its uses, from any of those above enumerated. It is sometimes termed the *organic* nerve, because it is chiefly distributed to the great organs of the trunk. It extends from the lower part of the head to the lower part of the spine, on each side; and consists of a number of ganglions, or knots, connected together by a nervous cord. It communicates with each of the spinal nerves, and with some of the encephalic, and where this communication occurs it gives off little branches which accompany the arteries, and are distributed chiefly to the organs whose functions are *involuntary*, as the heart, and stomach. In the 5th view, a representation is given of this nerve in the right side of the body, the thoracic duct being seen on the left. *u*, Is the inferior cervical ganglion, there being one still higher up in the neck. Others are seen at *v* and *w*, the whole being connected by the main trunk, as seen from *u* to *z*. From the superior cervical ganglion it sends off filaments to join with the sixth pair of nerves in the head, and also with part of the fifth pair, which brings it in connection with the ophthal-

mic ganglion. Each of the ganglions down the main trunk, (from *u* to *z*,) gives off two twigs which unite with the spinal nerves, as they emerge from the holes in the side of the spinal column, as seen at *v* and *x*, and *w* and *y*. They also give off numerous other branches which are distributed to all the internal organs. The ganglions are 24 or 25 in number, and the two lower ones, at the extreme end of the spine, often unite with each other. The great sympathetic therefore, communicates with both the regular and irregular nerves, and thus serves as a bond of union, or sympathy between them; hence its name. It is generally believed, however, that it is a distinct nervous system in itself, connected with the brain and spinal marrow, but independent of both. In order to give some idea of its functions as compared with the others, we must make a slight digression. Every organ in the body must have nerves, or it can neither act nor have sensibility. This rule is universal. Perfect as every part is, in its structure and adaptation, it cannot move without the nervous influence; if that be cut off all action ceases. The whole organization may therefore be compared to a connected mass of machinery, and the nervous power to the *steam* which sets it in motion. If any part of the machinery, or any organ, fails to receive sufficient of the motive power, it stops.

It must strike every one, however, who becomes acquainted, even cursorily, with the physiology of the human system, that there are two distinct kinds of organs, which are under two distinct nervous influences. There is one kind which receive their nerves from the *brain*, or *spinal marrow*, and are dependent upon them for sensibility and the power of motion, that are generally under the dominion of the *will*, or, in other words, have the power of *voluntary motion*,—as the muscles of the hand, face, and lower limbs, for instance. All impressions made on those parts are communicated, by one set of nerves, to the brain, as we have already explained, and its will, transmitted by another set, puts them in motion, or keeps them at rest. There are other organs, however, that do not receive their nerves from either the brain or spinal marrow alone, but are more or less independent of them. For instance, the heart propels the blood, the stomach digests, the liver forms bile, and the kidneys urine, without our having the power, by an act of the will, to stop them from doing so, or to accelerate their action. Such are called, therefore, *involuntary* motions, or those not under the dominion of the will. These organs receive their nerves chiefly from *the great sympathetic*, and are not

connected immediately with the brain at all, which explains why the will has no direct power over them.

The importance and reality of this distinction was first pointed out by the celebrated Bichat. He divided all our functions into two classes, the *animal* and the *vital*. The vital or organic functions are those common to all organized beings, both animal and vegetable, and which are necessary to mere existence; as the various nutritive functions, digestion, respiration, absorption, and the circulation, for instance. The animal functions are those which belong to animals alone; as sensation and voluntary motion, for instance. The difference in these two sets of functions are obvious, and it extends also to the organs themselves. Thus the organs of the animal functions are all *double*, or may be divided into *two equal and similar parts;* as may be seen in the brain, spinal marrow, and nerves; in the organs of sense, the voluntary muscles and the limbs. The organs of the vital functions, on the contrary, are *single*, and not capable of division into equal and similar parts; as may be seen in the heart, stomach, and liver; even when we have two of them, as in the kidneys and lungs, they are not exactly similar.

It must be remarked, however, that though there is so great a difference between these two kinds of organs, and though they receive their nervous influence from two different sources, yet still there is a *sympathetic* union between them, owing to the union of fibres from the great sympathetic, with the spinal nerves, as seen in the 5th view, at *v*, *w* and *z*. This explains to us why any strong mental emotion, as sudden joy, or a fright, can accelerate or retard the action of the heart, and other organs; and why anxiety, grief, and depression of spirits, will retard digestion, though any direct mental effort can do nothing of the kind. And in the same manner it explains to us why many morbid conditions of the digestive organs, and other parts of the system, affect the brain, though they are not immediately connected with it.

It is still a disputed point with physiologists, whether the great sympathetic nerve is absolutely independent of the brain or not; some advocating one opinion and some the other. Cuvier considered the ganglions to be little brains, which eliminated nervous power themselves, independent of the brain in the skull; and he remarked that they were largest in those animals whose brains were least. Dr. W. Philip thought the ganglions were mere reservoirs, receiving the nervous influence from the brain, and storing it up for the use of the vital organs.

It is also disputed whether the great sympathetic *alone* is the source of power to the vital organs. Some experiments have made it probable that though it may be the *chief* source, yet still it is not the only one. The experiments of Weber and others, make it probable that the eighth pair of encephalic nerves exercises a great influence over them. Sir Astley Cooper tied the great sympathetic nerve on both sides, in a dog, and found that the motion of the heart went on, and the animal lived as usual; but when the eighth pair and the phrenic were tied along with it, the animal died in about a quarter of an hour, from inability to breathe. It has been supposed, however, that when the great sympathetic is cut through, it may still engender power, because each ganglion is a brain in itself, and therefore its influence could not be altogether destroyed till it was totally annihilated. The most probable explanation of these seeming anomalies however is, that though the brain and spinal marrow, through their nerves, are the usual source of power to the animal organs, and the great sympathetic, through its nerves, to the vital organs, yet still one may, to a certain extent and for a short time, supply the place of the other.

In certain parts of the body the fibres of the great sympathetic ramify and interlace with each other like the roots of a tree, forming an intricate mass called a *plexus;* these are called by different names,—the semilunar and solar plexus, for instance, and are found in various parts of the body.

SECTION V.

EFFECTS OF INJURIES TO THE BRAIN.

It is remarkable that the brain, though the organ of perception, may be cut, pricked, and even *burnt*, without producing any painful sensation. And it is also remarkable that though an injury apparently trivial, to a portion of the brain, will often cause insensibility, or permanently derange the mental functions, yet the greater part of it is sometimes removed altogether, by disease or purposely, without any disturbance whatever taking place.

In one of the London hospitals, a few years ago, a man was brought who had fallen from the mast of a ship and fractured his skull. He remained for some weeks perfectly unconscious, but recovered almost instantly, when a small piece of bone was raised up that had pressed on

the brain; he had not the slightest recollection of the time that had passed, nor of what had been done. In another similar case the operator showed his pupils that, by merely pressing the brain with his thumb, he could destroy all consciousness in an instant, and restore it as quickly by merely removing the pressure. Cases of permanent derangement, more or less extensive, or even complete insensibility, from blows on the head, are common enough. And yet, on the other hand, Sir Charles Bell gives us a case where he thrust his finger deep into the substance of a man's brain, in search of a pistol ball, without his complaining of pain, except when he touched the integuments. And in several cases the brain has been found almost entirely destroyed by disease, and yet the individual enjoyed perfect health, and had his mental faculties unimpaired, up till the day of his death, though the injury must have existed many years. In some of the lower animals the brain has even been cut away to a great extent, purposely, without any serious result occurring, except in certain parts.

The spinal marrow is much more sensitive, in some parts, than the brain, and injuries to it often produce graver results.

Tortoises have lived for six months after the brain was all taken out: and a young puppy both breathed and sucked the finger, some time after a similar mutilation. M. Majendie observed some curious results from removing different parts of the brain. He found that when the corpora striata (the parts within the ventricles,) are cut, the animal immediately darts forwards, with the greatest rapidity; and is evidently impelled to do so by some irresistible power. It is singular that horses, and other animals, sometimes exhibit the same propensity in their natural state; they will go *forward* without difficulty, and even have a difficulty in stopping themselves, but cannot move *backwards!* This is probably owing to some disease in that part of the brain. When, however, the cerebellum, or medulla oblongata, is injured in a similar manner, the tendency is equally irresistible to run *backwards!* Some pigeons that he operated upon in this manner moved backwards for more than a month, both in walking and flying. Still more singular results followed when the crura cerebelli were cut, (the parts leading from the spinal cord to the cerebellum). There are two of them, one on each side, and when the right one was cut, a *whirling motion* commenced on that side, so rapid that M. Majendie says at least *sixty* turns were made in a minute; and this continued, without the slightest intermission, for eight days. When

the left side was cut, the same motion commenced, but in the contrary way; and when both were cut all motion ceased in both directions. This may also explain many curious actions observed in disease.

SECTION VI.

SIZE OF THE BRAIN.

As a general rule, the brain of man is larger in proportion to his body, than that of any other animal; but still there are some exceptions to this rule, and many circumstances prevent this being a proper mode of comparison. If we take the proportion between the brain and the nerves issuing from it, we shall find that the advantage is on the side of man. Thus the brain of a horse is only *half* the size of a man's, and yet the mass of the nerves issuing from it is nearly *ten times* as great as that in a human being. To this principle there are few or no exceptions.

With very few exceptions, the human brain is in fact, both relatively and absolutely, the largest. Thus the brain of a whale, whose body weighed *eleven thousand two hundred pounds*, was found by Mr. Scoresby to be only *three pounds twelve ounces*, while the brain of Byron weighed $4\frac{1}{2}$ pounds, and that of Cuvier 4 pounds $13\frac{1}{2}$ oz., though either of their bodies would probably not exceed 200 pounds.

It is probable that peculiarities in the composition, structure, and density of the brain, may much modify its manifestations, and may also account for some of the anomalies we have mentioned.

FINIS.

NOTICES OF

DR. HOLLICK'S LECTURES AND BOOKS.

DR. HOLLICK AND PHYSIOLOGY.—The second of a series of lectures, by this gentleman, on human physiology, and the all important truths connected with our physical constitution, was attended by a full house, in National Hall, last evening. The time was well spent, and so appeared to think the audience. On the delivery of the first of these lectures on Tuesday evening, the speaker in a comprehensive and well-digested exordium, placed himself and the subject right with the public. His manner, language and style did the first; his sound logic, his argument, his candor and research, accomplished the second Apart from the interesting and apposite details of the wonders of reproduction, the illustrations of the immutable wisdom of nature, which teem in the animal and vegetable worlds—which

> "Glows in each stem, and blossoms in each tree;
> Lives through all life, extends through all extent,
> Spreads undivided, operates unspent."

Apart from all this, Dr. Hollick's lecture was excellent as a defence of truth, a vindication of the right of free and unshackled inquiry, and as a convincing refutation of that silly, but far too prevalent opinion that there are truths of which it is better to remain in a state of ignorance. Had nothing else been imparted in the forcible and well defined expression of Dr. Hollick than this judicious demolition of that fallacious, silly, but injurious twaddle which would forbid research, to pass in advance of the old landmarks prescribed by custom, ignorance, or a spurious morality—even that would well deserve the public patronage. Truths, well set forth, will make an impression, whether their investigation be fashionable or not. There is an affinity between the capacity to learn, and the truths to be learned, which always results, when a fitting opportunity is presented, in a free inquiry, and the gentleman who is bringing, in a judicious and elevated manner, a knowledge of those fundamental principles of our corporeal existence which are abused because unknown, will accomplish more good than half a dozen teachers of higher pretensions, and lower ability. It was gratifying to observe the decorum—the sense of respect for both speaker and subject, that was observed throughout the evening,. which evidently shows that those who go there are actuated by higher motives than mere curiosity; by desires more ennobling than a passing gratification; in a word, it was clear that those who composed Dr. H.'s hearers, are men who know and dare to think, and who will profit by these most useful discourses.

New York Herald, Aug. 7, 1844.

THE ORIGIN OF LIFE.—We attended Dr. Hollick's lecture at the Masonic Hall, on Monday evening, and if we were to say we were delighted, we should but feebly express the gratification we experienced. It was, in fact, a whole series of anatomical lectures crowded into one, and that one so divested of technicals, and rendered so concise, so intelligible to the most illiterate mind, and withal couched in such delicate as well as perspicuous language, that the most fastidious could find no fault, nor the idlest curiosity go away uninformed. The human figure—a French model, made, we believe, of *papier maché*—is beautifully constructed, and every trifling organ is not only an accurate counterpart of nature, out can be taken apart, opened, examined, &c., with an ease that renders the study as perfect as an actual dissection, without the *desagremens* that attend a scrutiny of the real subject. We advise all who love knowledge, and particularly a knowledge of their physical organization, to attend these lectures.—*Phila. Spirit of the Times, Dec.* 4.

DR. HOLLICK has just closed a course of Lectures on Physical Man, illustrating his remarks by most admirable wax models. We had not the advantage of listening to the Lectures, but we learn from some who were in attendance, that the Lectures were highly instructive and pleasing; and every thing was so accurately and delicately developed and explained, as to insure a great amount of valuable information to every class of listeners. Many ladies were present at a part of the course. We see by our paper, this morning, that the members of the class have borne further testimony to Dr. Hollick's excellence as a lecturer.—*U. S. Gazette, Philada., Dec.* 14, 1844.

DR. HOLLICK.—The ladies composing Dr. Hollick's class have presented that able lecturer with a beautiful writing desk, a gold pen, and all the appliances of such a useful piece of FURNITURE. A resolution of thanks for past, and a request for future lectures, was contained in a very flattering and gratifying letter from the ladies.

U. S. Gazette, Philada., March 22, 1845.

DR. HOLLICK'S LECTURES.—Last evening Dr. Hollick delivered another of his Lectures on the "Origin of Life." These lectures continue to attract much attention, and are commended by all who hear them. During the past week Dr. H. has given a private lecture and exhibition of his models to many of our prominent Senators and public men, all of whom expressed themselves highly gratified, and desirous that another class should be formed to accommodate their friends who had not attended.—*National Intelligencer, Jan.* 30, 1846.

DR. HOLLICK'S Second Lecture was delivered last Wednesday night, at Concert Hall. The lecture was well attended by many distinguished gentlemen, among whom were noticed Ex-President Adams, several members of Congress, and eminent medical practitioners. The lecturer seemed to make a very favourable impression upon the audience.—*National Intelligencer, Washington, D. C., Jan.* 25, 1845.

DR. HOLLICK'S LECTURES ON ANATOMY AND PHYSIOLOGY.—We attended Dr. Hollick's introductory lecture at Gilman's Saloon, last evening, and we take pleasure in expressing our gratification, and commending his lectures to public attention. We can assure our citizens that there is nothing improper, or in the remotest degree indelicate in the exhibition of his models, or in the manner in which the subject is treated; on the contrary, we are sure the most fastidious will be delighted with the perspicuity of the lecturer, and will approve and commend the lectures and their objects. They will serve to correct many erroneous impressions, and convey much interesting and important information with regard to the anatomy and functions of the human body. We are certain all who attend will never regret it.—*Hartford Daily Journal, July* 17.

DR. F. HOLLICK.—This popular Physiological and Medical Lecturer, who is developing the physical structure of man in a series of popular lectures, and to whom we listened in Washington with profit and pleasure, has, it appears, run against some interested jackanapes, who has had the Doctor presented by the Grand Jury of Philadelphia. This attack will prove a benefit to him, as it will call public attention more directly to his important lectures. We are gratified to learn, by the Philadelphia papers, that a beautiful Gold Medal has been presented to him by Ladies who have attended his course of Lectures. We refer the reader to an article from the pen of Dr. Hollick, on the outside of to-day's paper, which, for severity and effect, we have seldom seen equalled.

Portsmouth New Era, April 2, 1846.

At a Meeting of the Class attendant upon Dr. Hollick's Select Lectures on the Physiology and Philosophy of the "Origin of Life" in Plants and Animals, held at the Lecture

Room of the Museum, Wednesday evening, Dec. 1, 1844, George G. West, Esq., was called to the Chair, and Samuel W. Black appointed Secretary.

"*Resolved*, That we have listened with unfeigned pleasure and interest to the Course of Lectures delivered by Dr. Hollick, and now brought to a close, and that we deem it an act of justice to him and the community, to express our entire confidence in his character, ability, and the manner of illustrating his subject, which, to use the words of a daily journal, 'is couched in such delicate as well as perspicuous language, that the most fastidious could find no fault, nor the idlest curiosity go away uninformed.'

"*Resolved*, That a committee of three be appointed to tender to Dr. H. the thanks of the Class for his courtesy to the members in affording them every facility for obtaining information upon the subject of his Lectures, and that he be requested to repeat the Course at the earliest period consistent with his other engagements."

Published in all the Philadelphia daily papers of December 14, 1844, and signed by *one hundred and forty* of the most respectable and influential inhabitants.

(See similar Resolutions, with *over two hundred names* attached, in the Philadelphia daily papers of March 9, 1844; also of March 16; and on several other occasions.)

From the Philadelphia Daily Papers, Feb. 21, 1845.

At a meeting of the Ladies composing Dr. Hollick's Class, held on Wednesday afternoon, February 19th, in the Lecture Room of the Museum, the following resolutions were unanimously adopted, and ordered to be published in one or more of the city papers:

Resolved, That we have listened with great pleasure and interest to Dr. Hollick's Lectures, and are happy to add our testimony to the many already recorded in behalf of such lectures: and regarding Dr. Hollick as a benefactor of his race, and especially of our sex, we cordially wish for him abundant success, and ample reward in the consciousness of doing good.

Resolved, That we will exert ourselves to induce our female friends and acquaintances to avail themselves of the great and rare privilege of obtaining the valuable instruction imparted in these lectures in so chaste and dignified a manner.

Signed on behalf of the meeting by

SUSAN WOOD, President.

SARAH WEBB, Secretary.

☞ With over 50 names attached thereto.

From the Philadelphia Ledger, March 7, 1846.

A CARD.—At a Meeting of upwards of 300 Ladies attending Dr. Hollick's First and Second Course of Lectures (new series) ending March 6th, 1846, it was, without one dissenting voice,

Resolved, That they view with surprise and indignation, the efforts made by *one* or *more* anonymous writers, to cast contempt and odium, not only upon the able and eloquent lecturer, who devotes his talents and energies to the philanthropic purpose of diffusing knowledge, which has hitherto been almost as "a sealed book" among the "million," but upon the numerous class of females attendant upon the same. Therefore,

Resolved, That they will not be turned aside from what they deem the duty they owe to the public—to Dr. Hollick—and themselves on this occasion; but cordially unite in *again* expressing their approbation of, and in returning their sincere thanks for, his unwearied exertions to disseminate the most important truths.

Resolved, That they *renew* to Dr. Hollick the assurance of their continued influence in his behalf; and also,

That these proceedings be published in three or more of the daily papers in this city.

Signed in behalf of the meeting,

ELIZABETH BUNTING, President.

Mrs. R. P. KING, Secretary.

(See also similar Resolutions, with numerous names, on Feb. 27, 1846, March 20, 1840, and on April 10, 1846, with over *three hundred names attached.*)

ORIGIN OF LIFE.—Dr. Hollick will commence his Lectures this evening at Franklin Hall, which will well repay the attendance. His success in this city, Philadelphia and Washington, make it useless to say any thing to induce people to go. His models are very numerous and valuable, and cannot fail to give his audience a clear idea of the subject with which he is so well acquainted.—*N. Y. Express, April* 22. * * He deserves all the praise which the press has heretofore bestowed upon him.—*N. Y. Express, April* 24.

DR. HOLLICK'S LECTURES.—By reference to an advertisement in another column, it will be seen that a repetition of these useful discourses commences this evening, to be continued during the week. We are happy to state that these lectures are creating very considerable interest and attention among the intelligent portion of our citizens; and we doubt not that much practical benefit will result from their more general dissemination. Dr. Hollick is a gentleman of no less knowledge in his profession than eloquence in his means of imparting it, and he is certainly deserving of great credit and support for his exertions in a new field of such universal importance. We commend these lectures with the fullest confidence to the attention of our citizens.—*N. Y. Sun, Aug.* 6.

DR. HOLLICK'S LECTURES.—The course of lectures given at National Hall, by Dr. Hollick, are worthy of attention. He is in possession of an artificial female figure, which is one of the most admirable pieces of mechanism that we have seen. There was an impression that these lectures were improper and indelicate, but we can assure our readers, after having attended them, that they are not so, but highly interesting and instructive. Dr. Hollick's manner is chaste, clear, and agreeable, and his remarks contain a great deal of sound sense. A lady of high reputation in the world, who has made one of his afternoon class, informs us that she has been very much gratified and improved by the knowledge communicated.

N. Y. Evening Post, April 29, 1844.

DR. HOLLICK.—We see that although some persons are disposed to persecute Dr. Hollick, for issuing a book on the Anatomy of Life, and lecturing on that subject, the ladies of Philadelphia, attached to a class before whom he has lectured, have presented him with a Gold Medal as a testimony of their respect for him as a courteous gentleman and eloquent lecturer. The Doctor is now on trial before a court in the "City of Brotherly Love," at the instigation of some sickly scrupulous persons, but for the life of us we are unable to come to any other conclusion, from having heard his lectures, than that he must be acquitted, under a belief that whatever tends to the promotion of science and the alleviation of human misery cannot be declared adverse to the public good—the aim and object of all laws.—*Baltimore Republican, March* 30.

A GOLD MEDAL TO DOCTOR HOLLICK.—The Ladies of Dr. Hollick's class have presented him with a beautiful Gold Medal, enclosed in a handsome morocco case. The Medal speaks for itself—and must be gall and wormwood to the anonymous scribblers who have first attempted to injure the Doctor and then tried to traduce the reputation of his female classes. The front of the Medal bears the following inscription:

"Presented to Frederick Hollick, M. D., by the Ladies who attended his lectures on Physiological Science, delivered at Philadelphia, March, 1846, as an expression of their approbation of the knowledge therein conveyed, and as a testimonial of personal regard."

On the reverse is the Sun, and reflected by the rays of the luminary, a scroll containing the words

"To give light to them that sit in darkness."

Philada. Spirit of the Times, March 28, 1846.

"LETTERS FROM NEW YORK, No. 11."

"* * * * There have been several courses of Lectures on Anatomy, this winter, adapted to popular comprehension. I rejoice at this; for it has long been a cherished wish with me that a general knowledge of the structure of our bodies, and the Laws which govern it, should extend from the scientific few into the common education of the people. I know of nothing so well calculated to diminish vice and vulgarity as universal and rational information on these subjects. But the impure state of society has so perverted nature, and blinded common sense, that intelligent women, though eagerly studying the structure of the Earth, the attraction of the Planets, and the reproduction of Plants, seem ashamed to know anything of the structure of the human Body, and of those Physiological facts most intimately connected with their deepest and purest emotions, and the holiest experience of their lives. I am often tempted to say, as Sir C. Grandison did to the Prude —'Wottest thou not how much *in*-delicacy there is in thy delicacy?'

"The only Lectures I happened to attend were those of Dr. Hollick, which interested and edified me much. They were plain, familiar conversations, uttered and listened to with great modesty of language, and propriety of demeanor. The Manikin, or Artificial Anatomy, by which he illustrated his subject, is a most wonderful machine invented by a French Physician

It is made of *papier mache*, and represents the human Body with admirable perfection, in the shape, coloring, and arrangement, even to the minutest fibres. By the removal of wires it can be dissected completely, so as to show the locality and functions of the various Organs, the interior of the Heart, Lungs, &c.

"Until I examined this curious piece of mechanism, I had very faint and imperfect ideas of the miraculous machinery of the house we live in. I found it highly suggestive of many things to my mind." * * * *

L. M. C.

[Extract from a Letter in the "Boston Courier" of Monday, June 3d, 1844, by Mrs. L. M. Child.]

DR. HOLLICK'S CASE.—Dr. Hollick was yesterday acquitted. We rejoice at this event, and we trust that it will end the misrepresentations and persecutions to which he has been subjected. We are opposed to the treatment which Dr. H. has suffered, and believe it is hostile to the spirit of our institutions. He professes to be a public benefactor—he professes to believe that his book and lectures are calculated to enlighten masters, parents and guardians, on subjects highly interesting to the youth that have been entrusted by Providence or the laws to their care. He alleges that he teaches nothing but what is taught in the medical schools, and he is prepared, we believe, to verify this by conclusive evidence.

What tribunal then in this country shall undertake to say that he shall not teach to the mass of the people, if they are pleased to learn, what is taught to the young gentlemen at our Medical Schools? Who shall say that what it is right for the latter to learn, is wrong for a merchant, mechanic or labourer to learn? We are opposed to monopolies of all kinds—we wish every man to learn whatever of knowledge he has an opportunity to acquire—and there is not, we think, any power among us that can or will attempt successfully to interfere with this right. No one is bound to agree with Dr. H.'s views; to attend his lectures or read his books; but we know that there are many who approve his course. That was very manifest from the testimony of some of the witnesses examined yesterday, though called by the commonwealth. The indictment on which the Doctor was arraigned contained three counts. The Attorney General in opening for the Commonwealth fairly admitted that he had no evidence to support the last two counts, nor did he offer any. Thus it seems that a Grand Jury has presented these lectures upon the allegation of some one who dare not confront the Doctor and his witnesses, and that there was not a particle of evidence to support this part of the presentation.

Philadelphia Daily Keystone, April 21, 1846.

DR. HOLLICK ACQUITTED.—It will be seen by a report in another column, that the scientific lecturer, Dr. Hollick, who was lately considered "a roaring lion seeking whom he may devour,"—by certain *moral* censors of this community, has passed through the fiery ordeal of a criminal trial, and stands before the public, by a verdict of his peers, fully acquitted. The indictment was a curiosity. The complainants were completely discomfited, and found themselves before a crowded court room, in a most unenviable situation. If their countenances were any index, they were truly ashamed of the proceedings.

Philadelphia Spirit of the Times, April 21, 1846.

SCIENTIFIC LECTURES.—Dr. Hollick is now delivering courses of lectures in this city, to large classes of ladies in the afternoon and gentlemen in the evening, upon the Origin of Life, or the reproductive system in man and the lower animals. We have heard these lectures; and though our business is not to *puff* the lecturer, who can best speak for himself, our public duty is to offer a few remarks upon his subject, as a theme for a promiscuous, or to speak more definitely, a nonprofessional audience.

The smaller lights of the medical profession will say that such lectures should be confined to students in medicine with the intention of practice. We say that the subject of such lectures ought to be understood by every human being, and therefore that lectures upon it, in a proper spirit and manner, are eminently useful. God has placed no interdict upon knowledge. On the contrary, having endowed man with reason, and having placed all things on earth within reason's apprehension, he has made knowledge of all such things man's duty.

Those who enter Dr. Hollick's lecture room through morbid curiosity, will be disappointed. However perverted may have been their feelings or thoughts, they will be awed into respect for the works of God,

"And fools who go to scoff, remain to pray."

We therefore advise our readers to investigate the subject in a reverend spirit, to cast to the winds the mystery which ignorance and impurity have thrown over it, and to approach it with a determination to comprehend its uses and the evils of its abuses; and we can safely promise that most, if not all, will retire from the inquiry both wiser and better.

Philadelphia Public Ledger, Nov. 25, 1845.

DR. HOLLICK publishes a card this morning, which deserves attention, as part of the history of the controversy that has been originated in reference to his lectures. There seems to be a general feeling of approval among those who have attended his courses, and several modes have been adopted to express their full belief in the utility of the physiological information he imparts. The ladies have presented a very elegant gold medal to the Doctor, with a very flattering inscription. His card will be found in another column.

North American, Philadelphia, March 28, 1846.

☞ DR. HOLLICK, who has published books and delivered lectures on Anatomy, &c., has been prosecuted in Philadelphia for doing so! The citizens, however, have rallied to the support of the Doctor, who is a very able and scientific lecturer, and he will undoubtedly be saved from harm. This prosecution is almost as absurd as the trial of the Salem witches!

Boston Post, May 8, 1846.

NOTICES OF BOOKS.

OUTLINES OF ANATOMY.—The celebrated Dr. Hollick has published a work in Philadelphia, entitled "Outlines of Anatomy and Physiology for Popular Use," which brings the study of those important sciences home to every reader. It is accompanied by an ingeniously arranged plate, which opens by pieces, exhibiting the anatomy of the human structure, with explanations in English, and is thus divested of all technicalities and mysteries by which the ordinary study is shrouded. Dr. Hollick seems determined to do his part in a medical way towards affording that knowledge to the people embraced in the axiom, "Know Thyself."—*Baltimore Republican and Argus.*

OUTLINES OF ANATOMY AND PHYSIOLOGY, WITH A DISSECTED PLATE OF THE HUMAN ORGANIZATION, by Frederick Hollick, M. D. New York, Mark H. Newman, J. & H. G. Langley and Samuel S. and Wm. Wood. We regard this as one of the most valuable works issued in a long time. It is a complete general treatise on anatomy and physiology, and the dissected plate answers the purpose of a model of the human frame. Dr. Hollick is entitled to great credit for his laudable desire to disseminate a knowledge of subjects that are of such vital consequence to all, but which hitherto has been monopolized by the medical profession. We commend it to all as a work of great merit and usefulness.—*N. York Herald.*

"OUTLINES OF ANATOMY AND PHYSIOLOGY FOR POPULAR USE," by F. Hollick, M. D.

An excellent work, illustrated by a profusion of plates, views, &c.—*Boston Times.*

"NEUROPATHY, or the True Principles of the art of healing the Sick," &c. by Frederick Hollick, M. D.

Dr. Hollick may be looked upon as an innovator, and he will doubtless be tabooed by the whole faculty, but we are convinced that he is a man of probity, as well as of learning and sagacity. * * * Nor do we jest, though to speak of expelling a disorder by *Neuropathic* means, *i. e.* by applying the remedy to the *Nerves* instead of to the *Stomach*, may seem too absurd to some minds for reality. It is so much easier to laugh at, than to controvert a novel position. Galileo was laughed at, so was Harvey, and so were Fitch and Fulton. Laughing at Dr. Hollick, therefore, or *persecuting* him by legal process, for choosing to add to the stock of general intelligence, and refusing to bleed, blister, and purge suffering humanity, when he conscientiously believes that he can produce the same amount of relief by less debilitating, less disgusting, less injurious, and less expensive means, is certainly not likely to overthrow his doctrines. It is just as certain to beget *him* a sympathy, and likely to render *them* as popular, as in his most sanguine moments his sanguine nature could desire.—*Extract from an article in the Phila. Spirit of the Times, Dec.*, 1846.

Neuropathy.—This is a new work from the pen of Dr. F. Hollick, and from the casual glance we have given it, should judge it was of much interest and real worth. It treats of the real origin of Disease and the true principle of Medical Treatment; explains the action of Galvanism, Electricity and Magnetism; contrasts Homœopathy and Aleopathy, both in theory and practice; in short, the work is full of interesting and valuable information. We will have more to say of it, however, in a short time.—*N. Y. Tribune, Jan.* 8, 1847.

Neuropathy—This is a new name, but a good one, being the title of a work by Dr. F. Hollick, whose excellent lectures on various subjects will be remembered by many of our citizens. In this work is explained the action of Galvanism, Electricity and Magnetism; Homœopathy and Aleopathy are contrasted in theory and practice; Mesmerism is discussed, and other subjects 'too numerous to mention,' treated in a manner at once novel and instructive. Dr. Hollick has also published a work on 'Anatomy and Physiology for Popular Use,' illustrated with a new dissected plate of the human organization, of most ingenious construction. Of this work we shall have more to say anon. It is no ordinary production.—*N. Y. Argus, Jan.* 9, 1847

Dr. Hollick.—We are glad to hear of the success of this gentleman in the various cities he has lately visited and delivered lectures in. We know of no one more thoroughly conversant with his profession, both in theory and practice, than Dr. Hollick, and having just received a new work from his pen, on what is called *Neuropathy*, have laid it aside for an early reading, of which we shall soon speak.—*N. Y. True Sun, Jan.* 8, 1847.

An Interesting Book.—Dr. F. Hollick, already favourably known to our citizens, has lately published a work on "*Neuropathy*, or the real Origin of Disease, and the true principles of Medical Treatment." In this work is explained the action of Galvanism, Electricity, and Magnetism, forming a mass of information exceedingly entertaining and instructive. We understand that Dr. Hollick has a new work in press, of very unusual interest.—*N. Y. Atlas, Jan.* 10, 1847.

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Neuropathy; or the true principles of the art of Healing the Sick. Being an explanation of the action of Galvanism, Electricity, and Magnetism, in the cure of Disease, and a comparison between their powers, and those of Drugs, or Medicines, of all kinds, with a view to determine their relative value, and proper uses. By Frederick Hollick, M. D., lecturer on Anatomy and Physiology, the Origin of Life, etc. Illustrated with an Anatomical Plate of the Human form, coloured to life. Paper cover, price 25 cents.

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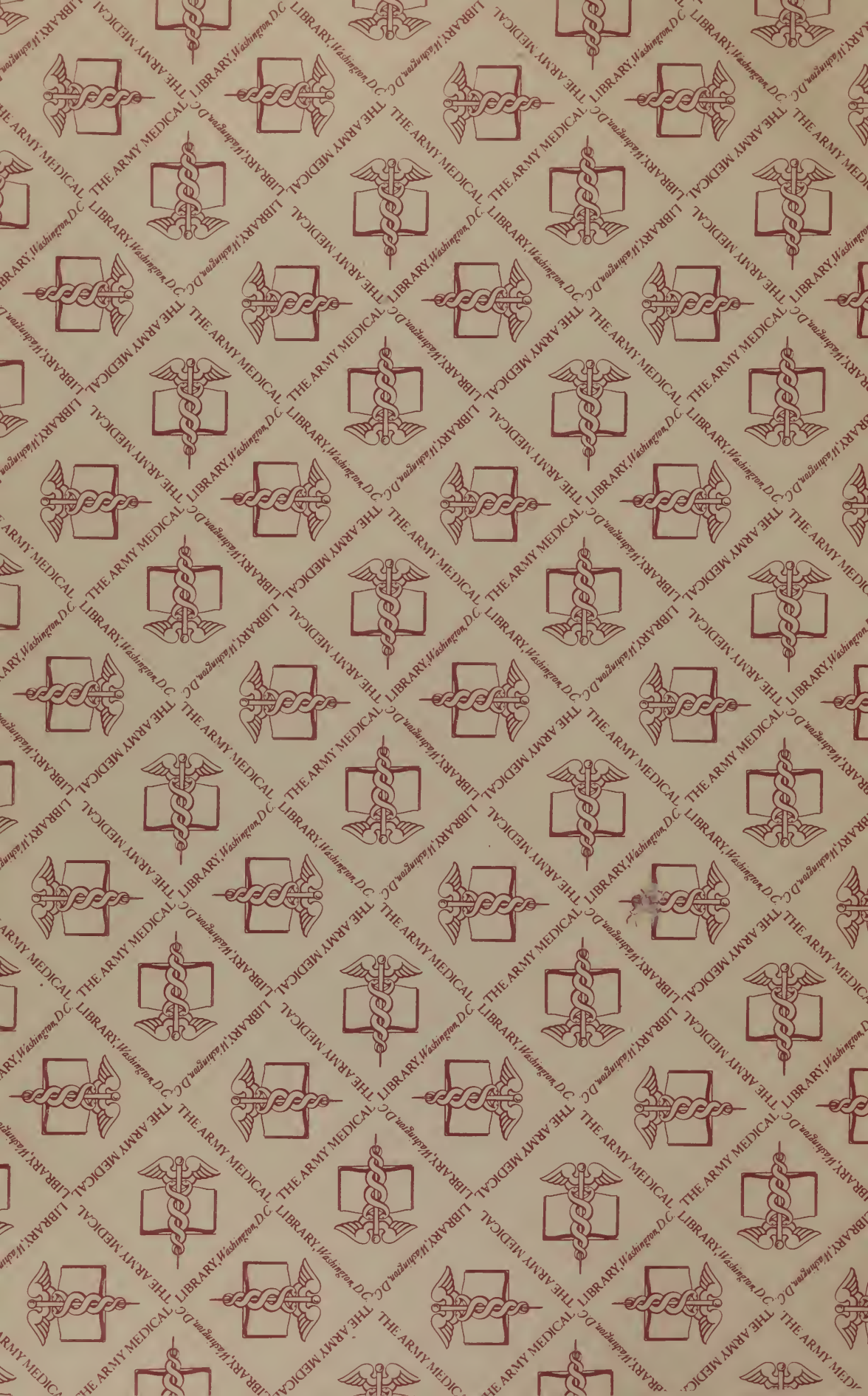
Dr. Hollick's New Work.—Among the various volumes lately issued from the press, none have struck us more favourably than a treatise on Neuropathy by Dr. F. Hollick. This gentleman is known to many of our citizens from his instructive lectures, delivered here some months since. The work alluded to contains numerous facts of great importance to every one, regarding the real nature of disease and the true mode of effectual treatment, together with a comparison of Galvanism, Electricity and Magnetism as remedial agents, which at this time possesses unusual interest.

This work should be in the hands of every one, and, as its merits become known, such will be the case.—*N. Y. Sunday Mercury, Jan.* 10, 1847.

Dr. F. Hollick.—Our readers will probably remember the eloquent and instructive lectures of this gentleman about a year ago in this city. Since then, these lectures have been repeated with very great success in Washington, Philadelphia, and other cities; indeed, such was the enthusiasm attending their delivery in Philadelphia, that the doctors persuaded the city authorities to interpose, and Dr. Hollick was actually indicted by the grand jury. Of course this only resulted in the direct benefit of the accused, who immediately acquired an extensive business, which he is now prosecuting. Our attention has been directed to this gentleman, from having lately received two of his works, which have struck us as peculiarly worthy of notice. One of these is what is called "Neuropathy, or the real Origin of Disease, and the true principles of Medical Treatment," in which is explained the action of Galvanism, Electricity and Magnetism. This work is by far the ablest on these subjects we have seen. In it Homœopathy and Aleopathy are contrasted, both in theory and practice. Mesmerism and other nervous influences are discussed, and the honest opinions of many eminent men given regarding the real value of their art. The other work is called "Outlines of Anatomy and Physiology, for Popular Use," illustrated by a new dissected plate of the human organization, and by separate views. The work is designed either to convey a general knowledge of these subjects in itself, or as a key for explaining larger and more complete works. These Outlines should be in the hands of everybody; and Dr. Hollick, or any one else, is a public benefactor who furthers the publication of such able, interesting, and truly important works.

N. Y. Sunday Times and Messenger, Jan. 10, 1847.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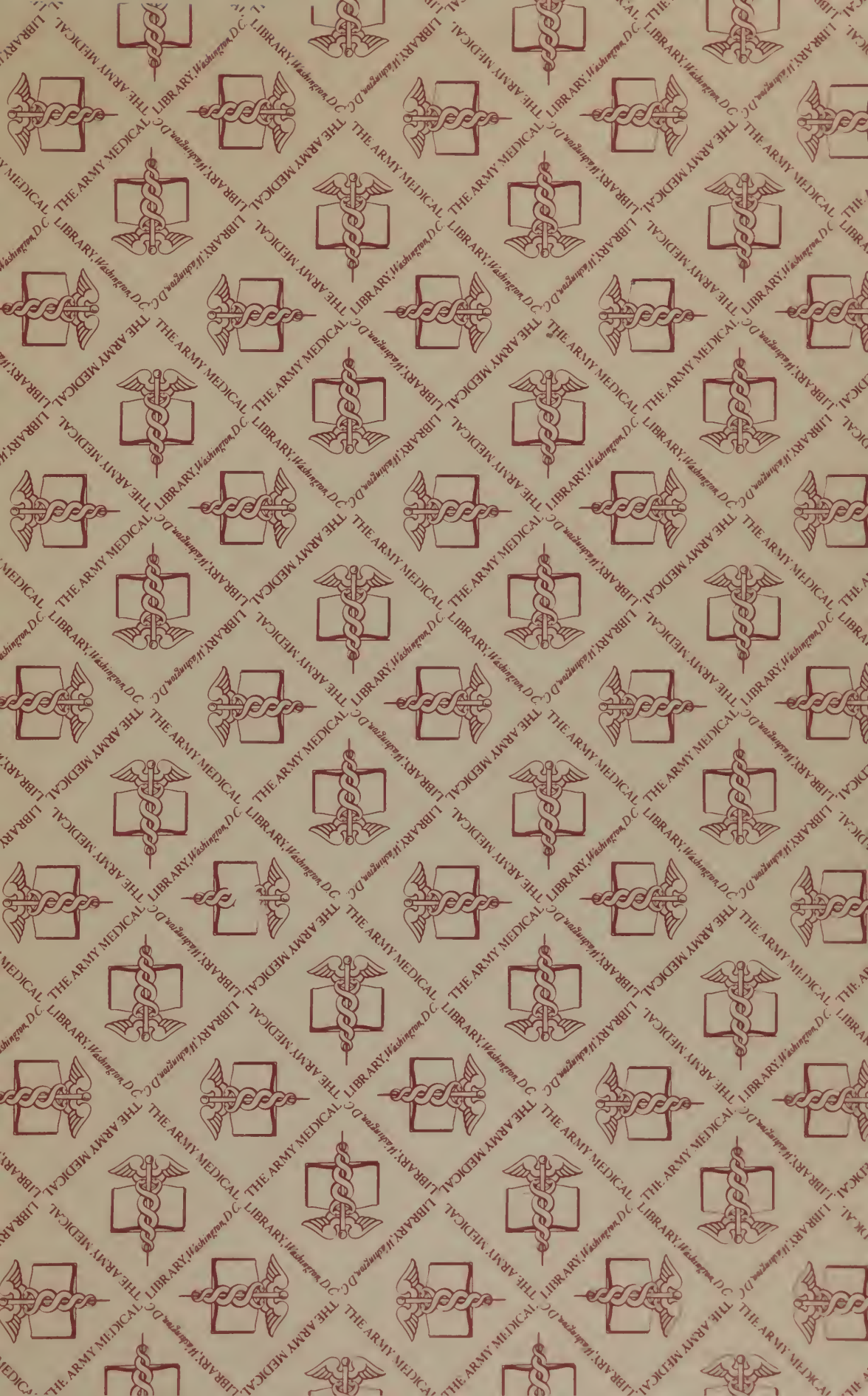
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