Lecture introductory to the course on anatomy in the University of Pennsylvania : for the session 1858-59 / by Joseph Leidy.

LECTURE INTRODUCTORY

TO THE

COURSE ON ANATOMY

IN THE

UNIVERSITY OF PENNSYLVANIA,

FOR THE

Presented by
C. H. Martin

SESSION 1858-59.

BY

JOSEPH LEIDY, M. D.

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University of Pennsylvania,
Philadelphia, October 26th, 1858.

At a meeting of the Medical Class of the University of Pennsylvania, held this day, in the Amphitheatre of the University, on motion of Mr. R. B. Cruice, of Pennsylvania, Mr. Leonard W. Dick, of South Carolina, was called to the chair, and Mr. Wm. H. Egle, of Pennsylvania, appointed Secretary. The object of the meeting having been stated, it was moved, and unanimously resolved, that a committee, consisting of one medical student from each State, District, and Country, represented in the University, be appointed, to request of each Professor a copy of his Lecture introductory to the present course, for publication.

Whereupon, the Chairman appointed the following gentlemen, members of the said committee:—

*Benj. S. Barnes,	*Alabama.*
Jno. Hostetter,	*Canada West.*
Gasper M. Villa,	*Cuba.*
N. Pratt,	*Delaware.*
Wm. I. Craigen,	*Dist. of Columbia.*
Edward Clark,	*England.*
Thos. H. Edwards,	*Florida.*
G. W. Thomas,	*Georgia.*
Francis M. Usher,	*Kentucky.*
Thos. M. Cavett,	*Louisiana.*
*Chas. C. Lee,	*Maryland.*
*Leonidas Richmond,	*Mississippi.*
C. A. Black,	*New Brunswick.*
Jacob F. Holt,	*New Hampshire.*
*Robt. W. Elmer,	*New Jersey.*
A. A. Lawrence,	*North Carolina.*
A. Cowie,	*Nova Scotia.*
*Noah Koller,	*Ohio.*
R. B. Cruice, and *H. E. Goodman,	*Pennsylvania.*
E. C. Franklin,	*Rhode Island.*
Jos. Arzona,	*South America.*
*Henry M. Clarkson,	*South Carolina.*
G. M. Wortabet,	*Syria.*
J. B. Childers,	*Tennessee.*
L. A. Rottenstine,	*Texas.*
Jno. C. Baylor,	*Virginia.*

Those marked by an asterisk (*) were appointed to act as a special committee, and Mr. Clarkson as Chairman.

CORRESPONDENCE.

UNIV. OF PENNSYLVANIA,
October 30, 1858.

DEAR SIR: We, the undersigned, have been appointed a committee of the Medical Class of the University of Pennsylvania, to ask of you a copy of your Lecture introductory to the present course, for publication. Hoping that you may grant this unanimous request of the class, allow us to be, sir,

Yours, very respectfully,

HENRY M. CLARKSON,
H. E. GOODMAN,
CHAS. C. LEE,
BENJ. S. BARNES,
ROBT. W. ELMER,
NOAH KOLLER,
LEONIDAS RICHMOND.

PROF. JOSEPH LEIDY.

PHILADELPHIA, *November* 2, 1858.

GENTLEMEN: It affords me pleasure to comply with the request of the Class, that I should give to them a copy of my Introductory Address, for publication.

With my best wishes for yourselves and the Class you represent, I remain your friend,

JOSEPH LEIDY.

To Messrs. H. M. CLARKSON, &c., Committee of the Medical Class of the University of Pennsylvania.

INTRODUCTORY LECTURE.

GENTLEMEN: It is with much pleasure, that I thus meet you, at the outset of my annual course of lectures, in this ancient school of medical science in America. Among you, I am glad to recognize former friends and pupils; and to new acquaintances, I bid a hearty welcome.

It is hardly necessary to mention the nature of the branch I am to teach you, for you have already learned it in the curriculum of the University; its importance to the physician has been acknowledged for centuries, by the universal acclamation, of the people, as well as of the profession.

Human Anatomy, which is specially adapted to the wants of the physician, is a part of the more extensive science of Comparative Anatomy, which treats of the structure of all animals in their relation with one another.

Human Anatomy is divided into four departments, namely: Special Anatomy, Topographical Anatomy, General or Microscopical Anatomy, and Pathological Anatomy. The former three fall within the limits of my course of lectures; the fourth department is excluded, as forming part of the course on Surgery, the Theory and Practice of Medicine, and the Institutes of Medicine.

Special Anatomy treats of the characters, such as form, size, weight, color, consistence, position, and connection, of the various organs of the body arranged into groups or systems. Thus, in the special anatomy of the skeleton, the characters of the bones are described; in that of the muscular system, the form, position, and attachment of the muscles are exhibited; in the account of the vascular system, we describe the heart and trace the course of the bloodvessels.

In Topographical Anatomy, the relative position of the organs to one another is examined in the different regions of the body. Thus, in the topographical anatomy of the neck, of the axilla, or of the groin, all the parts in these regions are described in their relation of position with one another. It is also called Regional Anatomy; and on account of its intimate connection with surgery, is likewise named Surgical Anatomy, the regions often being indicated by the affections to which they are liable. Thus you hear of the anatomy of hernia, or of popliteal aneurism, by which is meant the anatomy of the parts concerned.

With the development of the departments whose characters have just been briefly stated, the science of anatomy had its origin, and until a comparatively recent period was almost exclusively confined to them. Their importance to physiology, the practice of medicine, and surgery, has always been conceded, though it is a remarkable fact, that the difficulties attending their cultivation have corresponded in degree with the readiness of concession by mankind of the utility of anatomy to the physician.

Dissection of the dead human body, altogether repulsive to those who have not actually accustomed themselves to it by practice, has always produced an impression of horror and disgust in the mass of mankind; and it is only after a struggle of centuries that we have been enabled to acquire our actual knowledge of anatomy. Partly accomplished by allaying the fears, prejudices, and superstitions of men; partly by appealing to the necessities of the case,—anatomical information has been mainly obtained in secrecy by the curious or benevolent physician, sometimes with the aid of an enlightened government, but more frequently in opposition to a watchful and equally impolitic legislation.

To surgery, anatomical knowledge is so essential that its importance is continually felt; and improvements of the former, constantly attend the advancement of the latter.

To ascertain the nature of fractures, and dislocations, with the displacement of bones and the rupture of the contiguous soft parts, and to determine the method of reduction, and the means for maintaining the bones in their natural position, require a knowledge of the skeleton, the ligaments, and the muscles. The removal of tumors, often involving important bloodvessels, nerves, or other organs; or the removal of urinary calculi, of necrosed bones, and of foreign bodies, demand a knowledge of anatomy of the parts concerned, without which, the most deplorable results are apt to follow. In the stoppage of hemorrhages, in amputations, in the ligature of bloodvessels, and in the detection and treatment of aneurisms, the surgeon finds it essential to be acquainted with the anatomy of the vascular system. The nature and treatment of hernia, of gun-shot wounds, and of injuries to the skull and spinal column, and the nice operations to relieve the many affections to which the eye and ear are liable, require an intimate familiarity with the anatomy of the regions implicated. It may be stated, indeed, as a general proposition, that the success of surgeons has a constant dependence upon their anatomical knowledge; and they have consequently always been among the most zealous cultivators of the science of anatomy.

Though you are taught in an obstetric course that labor is a natural process, in most cases requiring no aid, you will also learn that in many instances the birth of the child, without assistance, is exceedingly difficult, sometimes impossible; and that labor may terminate in the death of both mother and offspring. In such cases a knowledge of the anatomy of the pelvis and its contents, and of the various relations of position of the fœtus in utero, is of the utmost importance in determining the best means of rendering the necessary aid. There are further, in the practice of the obstetrician, many accidents to be met with in connection with childbirth, which can only be understood and properly treated through a knowledge of the anatomy of the parts concerned.

Medicine may be practised as a healing art without anatomical information. This is done by empirics, who have learned by repeated trials the efficacy of certain remedies, in many prominent diseases. The practice of medicine of the ancients was an art, and not a science, and this dignity it did not acquire until it was based on an acquaintance with anatomy and physiology. The importance of anatomical knowledge in the practice of medicine none can hesitate to admit. The ascertainment of the seat of disease and the administration of appropriate remedies to act on particular organs, presuppose a knowledge of the existence and function of the latter, and much of the skill of a medical practitioner will depend on his information in regard to the anatomy and uses of the organs of the body.

The diagnosis of diseases of the heart and respiratory organs, of the alimentary apparatus, the genito-urinary apparatus, of the great nerve centres, and the integument, require more or less acquaintance with the anatomy and functions of the organs involved in disease.

General Anatomy, the character of which remains to be mentioned, and a brief history of which I propose to give you, is that department of anatomy, which is occupied with the investigation of the intimate structure of the different organs of the body, and the determination of their corresponding or homologous elements. It is so named because it concerns the general constitution of the body, and is also frequently called Microscopic Anatomy, for although the general structure of organs in some instances may be readily distinguished with the unaided eye, the microscope is generally needed to accurately determine the form and arrangement of the physical elements of structure. These elements in many cases possess an appearance, recalling to mind that of artificially woven fabrics, from which circumstance they are called tissues. Thus in plants we have wood or ligneous tissue, cellular tissue, and vascular tissue; in animals osseous tissue, fibrous tissue, muscular tissue, and others. From the Greek word ʽΙςτος, signifying a tissue, general anatomy has had the name of histology applied to it, signifying a discourse on the tissues.

Some notions of general anatomy are undoubtedly as old as a knowledge of the existence of the organs of the body, but for many centuries these notions were of the vaguest character. Though the ancient physicians and philosophers recognized in a general manner some of the more striking materials of composition of animal bodies, they frequently confounded together the most incongruous substances, or separated others identical in character. Thus bones, the teeth, shells, and horn were viewed as being composed of the same material; the tendons of muscles, ligaments, and nerves, were equally confounded together; the fat or marrow of bones was viewed as having the same composition as the brain and spinal cord, which latter to this day is also called the spinal marrow. The flesh or muscles of quadrupeds was considered to be different from that of birds, and this again from that of fishes. More or less of this vagueness of knowledge, indeed, existed until within a comparatively very brief period.

As an important branch or department of anatomical science, general anatomy must be considered as belonging to our own day, and the first systematic work on the subject, appeared at the commencement of the present century, through the philosophic French anatomist, M. F. Xavier Bichat, who is viewed as the creator of the department. It may be said that some steps had been taken in advance of its establishment, but this is true of all important discoveries and improvements; which are invariably brought about by a succession of developments through long periods of time.

According to Bichat, animals are composed of an assemblage of organs, each with its own particular function, but all concurring to the preservation of the whole. The organs are so many particular machines belonging to a general machine which constitutes the individual. These particular machines are themselves composed of several tissues of different nature, forming the true elements of the organs. The same kind of tissue may exist in a variety of organs, but wherever met with, it has the same composition, the same vital and physical peculiarities, and the same sympathies. Chemistry, continues Bichat, has its simple bodies, producing by the varied combination of which they are susceptible, the compound bodies: such are caloric, light, hydrogen, oxygen, carbon, nitrogen, phosphorus, &c. In like manner anatomy has its simple tissues, which by their combination form the organs. These tissues are: 1, cellular; 2, nervous tissue of animal life; 3, nervous tissue of organic life; 4, arterial; 5, venous; 6, exhalant; 7, absorbent tissue and its glands; 8, osseous; 9, adipose; 10, cartilaginous; 11, fibrous; 12, fibro-cartilaginous; 13, muscular tissue of animal life; 14, muscular tissue of organic life; 15, mucous; 16, serous; 17, synovial; 18, glandular; 19, dermoid; 20, epidermoid; 21, pilous.

The determination and characters of these tissues, Bichat informs us, are the results of his own labors, through experiments on living animals, through the reaction of chemical agents on the various organs, by dissections, macerations, and post-mortem examinations, and by observations on man in health and disease.

Among the tissues mentioned in the classification of Bichat, there are really few which are simple or homogeneous in character. Thus, with the exception of the osseous, cartilaginous, fibrous, adipose, muscular, and epidermoid tissues, the greater part are organs of a complex character, as the arterial, mucous, serous, glandular, and dermoid tissues. Some of the tissues of this classification which possess the same character are separated from one another, as the arterial, venous, and lymphatic tissues; and the serous and synovial tissues. Other tissues have been lost sight of, as the "elastic" and the "crystalline;" and one of Bichat's tissues, the "exhalant," has no existence whatever.

Many of the errors and faults of the system of Bichat were quickly perceived by his contemporaries, and the classification was variously modified by uniting certain of the tissues, by subdividing others, and by adding new ones. Attempts were further made to group the tissues into several principal classes; thus Meckel divided them into general and simple tissues; Wagner into simple and compound tissues; and Weber into simple, compound, and complex tissues.

The new systems of classification, which were only modifications of that of Bichat, exhibited little progress in a knowledge of general anatomy. The means were inadequate to any advancement of the science, for they consisted only in observations of the general appearance of the structure of organs; of the chemical relationships of the latter; and of their functions. The physical elements of structure of the body, though visible in mass, as before indicated, for the most part, are undistinguishable in their form with the unaided eye. Hence they require to be magnified or enlarged within the scope of vision, and thus the microscope has become the most important means of determining the physical constitution of organs. Many of the latter, which appear simple and homogeneous to the naked eye, are found, when examined microscopically, to be composed of several different elements. Thus, a serous or mucous membrane, which to the unaided vision appears as homogeneous or structureless as a thin plate of glass, is discovered by means of the microscope to consist of one or more layers of epithelial cells, of a basement membrane, and a subjacent fibrous tissue pervaded with a network of capillary bloodvessels, and numerous nerves.

Although the microscope was in use in the time of Bichat, and was known long previously, it was rather employed as an instrument of curiosity or toy, than of scientific research; and it is only within our own generation that it has come to be regarded as a necessary companion of every investigating anatomist, physiologist, and pathologist.

The magnifying power of transparent globular or lenticular bodies was not unknown to the ancients, though we have no evidence of their having employed it for any useful purpose. Such a body, usually formed of glass, constitutes a simple microscope, and is now employed when comparatively low magnifying power is required.

The compound microscope, in which the magnified image from a lens or series of lenses is further amplified, was invented about 250 years ago, in Holland, by Zacharias Jansen. In the original instrument, it is said, the lenses were mounted in a tube of copper, six feet in length and an inch in diameter. Jansen presented one of his microscopes to the archduke, Charles Albert of Austria. This prince gave it to Cornelius Drebbel, a Dutch alchemist and astronomer, at the court of King James the First, of England. Drebbel exhibited the instrument to several of his friends and acquaintances, interested in scientific matters, through whom it soon became generally known; and with sundry modifications it proved to be a source of amusement for persons of leisure. As a means of investigation into the structure of plants and animals, it also attracted some attention, but it appears to have disappointed the expectations of those who used it, partly from the many imperfections in its construction, but mainly from a want of education or of judgment in its employment.

The first person who made use of the instrument with any advantage to science was Anthony Leuwenhoek, of Holland, about the year 1760. Though he followed no particular train or system [i.e. 1660]
of investigation, as he indicates, when he informs us, that one day he examined the tartar of his teeth, the next, the deposit of his wineglass, yet he was led to make many observations of importance in anatomy. He discovered the corpuscles of the blood and chyle, and the spermatozoids of the seminal liquid; he detected the structure of the muscular fibres, and the nerves, and determined very well the constitution of dentine or the ivory portion of the teeth, and the epidermis. The latter structure, he

informs us, is composed of scales so small that a grain of sand will cover several hundreds of them. This observation is the more remarkable, when it is taken into consideration, that anatomists, a century later, generally viewed the epidermis as a sort of unorganized, homogeneous varnish.

Among others of less note, who applied the microscope to the investigation of the structure of animals and vegetables, down to the beginning of the present century, are to be found the names of Hooke, Ledermuller, Malpighi, Muys, Hewson, Ruysch, Della Torre, and Fontana.

Subsequently to the publication of Bichat's work on General Anatomy, Treviranus, a German physiologist, undertook to resolve the tissues of the animal body into their simplest physical elements, as recognizable with the aid of the magnifying power of the microscope. Treviranus and his followers were led to consider the ultimate elementary parts to consist of three kinds, namely: 1st, homogeneous or amorphous matter; 2d, cylinders or fibres; and 3d, globules. These represented the tissues in the classification of Bichat; and in the anatomical works of his time, and even at the present day, we find constantly used such expressions as osseous fibre, muscular fibre, vascular fibre, nervous fibre, instead of osseous tissue, muscular tissue, vascular tissue, and nervous tissue.

During the twenty years next succeeding the promulgation of the views of Bichat, there appeared a number of excellent microscopic observers, among whom are the familiar names of Krause, Lauth, Henle, Müller, Berres, Deutsch, Donné, Dutrochet, Ehrenberg, Purkinje, Valentin, and Wagner. A gradual series of improvements in the construction of the microscope, as its faults, inconveniences, and requirements were discovered, had rendered it admirably adapted for investigation in the hands of persons educated to its use. The results of many observations made it quite clear that a comparatively few simple tissues composed the various organs of the animal body, and that wherever found, the same kind of tissue possessed the same functional character. Thus muscular tissue, whether it is situated in a voluntary muscle, in the heart, in the walls of the stomach, in the duct of a gland, or in the structure of the skin, is always a motor power. Fibrous tissue, whether in the form of a tendon, or a ligament, whether composing the dura mater of the brain, or the sclerotic coat of the eye, or whether it forms the outer tunic of a bloodvessel, or the connective substance of organs, simply answers the mechanical purpose of protecting, strengthening, or conjoining parts.

Microscopic research has however led to other results. In all ages the human mind has exhibited a tendency to reduce the constitution of the universe to a few simple elements, and its phenomena to the regulation of a few simple laws. The ancient philosophers supposed they had found an explanation of the composition of all bodies in four elements: air, water, fire, and earth. Aristotle says these simple elements have simple motions, and thus fire and air have their natural motions upward, and water and earth have their natural motions downward; but besides these motions, there is motion in a circle, which is unnatural to these elements, but which is a more perfect motion than the other, because a circle is a perfect line, and a straight line is not; and there must be something to which this motion is natural. From this it is evident, says Aristotle, that there is some essence of bodies, different from those of the four elements, more divine and superior to them.

Leucippus and Democritus taught that the world consisted of a collection of simple particles or atoms of one kind of matter, which, by their varied configuration and motions, produced all the forms and phenomena of bodies. In modern times the chemist has determined that our earth is composed of about sixty ultimate elementary kinds of matter.

Oken, a Swiss naturalist and philosopher, who died a few years ago, supposed that the higher forms of vegetable and animal beings were composed of exceedingly minute animated creatures, or monads, which for a certain length of time had renounced their independence; and he regarded the spermatozoids of the seminal liquid, and the animalcules of stagnant waters, as true independent monads.

Doellinger, Professor of Anatomy in the University of Munich, considered the solid parts of the animal body to be made up of associated blood-corpuscles, with interstices through which the liquid blood circulated. Ruysch, a Dutch anatomist, at an earlier period, inferred, from the minuteness of his injected preparations, that the body was entirely composed of bloodvessels, and all the liquids of the body were contained therein.

Heusinger, a German anatomist, supposed that all living bodies were originally composed of elementary spherical particles, which formed vesicles by expansion, or fibres when they became attached together in rows. If the vesicles produced by the expansion of particles arranged themselves into rows, and established an intercommunication, canals or vessels were developed. This theory, though singularly approximating the truth, was not established by the author's investigations, and it was supported by badly explained facts. Thus, Heusinger says, the lymphatic vessels are formed through the association and intercommunication of vesicles, and their valves are traces of the original separations of the latter.

Robert Hooke, an Englishman, as early as 1667 discovered the vesicular or cellular structure of plants. In his researches he employed the microscope taken to England, by Drebbel, in 1619. A more accurate account of the cellular constitution of plants, was given, about a dozen years later, by Malpighi, Professor of Anatomy in the University of Bologna, Italy.

Raspail, a chemist and physiologist of France, in 1827, after announcing that he had observed the vesicular development of the human embryo, and of the root, stem, and leaf of plants, adds that, the vesicular theory of development is applicable to all organized beings; and he exclaims:—

"Donnez moi une vesicule dans le sein de laquelle puissent s'elaborer et s'infiltrer à mon gré d'autres vesicules et je vous rendrai le monde organisé." (Give to me a vesicle which shall possess the power of elaborating other vesicles, and I will present to you the organized world.)

Raspail compared organic vesicles to crystals; and he defined organization to be vesicular crystallization.

Dutrochet, a contemporary of Raspail, arrived at the same results as the latter, through a comparison of the structure of animal and vegetable tissues. In his investigations he recognized the vesicular or cellular constitution of the salivary glands, and of the gray matter of the brain. He regarded living beings as made up of elementary utricles, as he names them, filled with liquid; the only solids being the walls of the utricles. The blood he viewed as being composed of disassociated utricles; and he observes that in certain parts of animals, utricles are so feebly associated that it is difficult to know whether they should be considered as liquids or solids. Muscular and other animal fibres he considers to be elongated utricles, such as are found to compose the structure of wood.

Notwithstanding the theories of Raspail and Dutrochet, neither attempted to establish the mode of organic development, and as their observations had been insufficient for the purpose, their peculiar views passed with little notice from others.

In 1831 Robert Brown, a distinguished English botanist, who died only a few months since, discovered in vegetable cells a body to which he gave the name of "the nucleus."

In 1838, Schleiden, Professor of Botany in the University of Jena, demonstrated the fact that all parts of plants were developed from a formless nutritive liquid. In this liquid solid granules first appear, and an association of such granules forms a *nucleolus*, which by further development becomes inclosed in a vesicle, thus constituting the *nucleus*, of Robert Brown. From the nucleus, a vesicular membrane is gradually developed, inclosing the former, and in this manner the vegetable organic cell is produced, through whose transformations all the tissues of plants are constructed.

The existence of a spot or nucleus, in the centre of certain vesicular or cellular structures, did not pass unnoticed by some of the older microscopic observers, but its importance was not understood, and it was viewed simply as a peculiar mark of the particular structure examined. Even the pre-existence of a nucleus, and the gradual development from it of the organic cell, had been demonstrated before the appearance of Schleiden's work, by Valentin in the formation of pigment cells, by Wagner in the ovum, and by Henle in the production of epidermis cells; but upon these observations the authors founded no general principle of development.

Schleiden imparted his discovery to Theodore Schwann, of Berlin, who, in 1839, announced to the world the broader principle, that all vegetable and animal bodies are developed from nucleated organic cells, having the same mode of origin, in a homogeneous, organizable, nutritive liquid.

This principle, supported by many previous observations, and confirmed by the personal researches of Schwann, on the development of the different animal tissues, commanded the ready assent of men of science, and at this day is received as a fundamental one in anatomy and physiology. The brilliant discovery of Schwann gave a new impulse to microscopic investigation, and at the present time most persons who are engaged in anatomical and physiological researches regard the microscope as an indispensable aid, and I think, that I do not venture too much in saying, that to this instrument, together with chemical experiment, is due the comparatively recent rational system of Physiology, which lies at the base of the Institutes of Medicine.

In the gradual advancement and cultivation of general anatomy, as you would infer from the means of investigation, there have been many errors of observation, and much false interpretation of facts, as exhibited through the microscope. The progress of all real knowledge has ever been very slow, and has always been more or less retarded by errors of judgment, illusory semblances of truth, and inferences hastily made, or drawn from insufficient observation.

The many errors into which microscopic observers have fallen, partly from imperfections of their instrument, partly from a want of education of the eye in its use, but mainly from hasty and incorrect explanations of the facts exhibited, have thrown discredit on this mode of investigation, and there are even persons who make the sweeping declaration that it is of no utility in physiological research. A recent writer, in a neighboring city, on the Institutes of Medicine, thus expresses himself:—

"It has already been stated that a knowledge of the minuteness of structure which is supplied by the microscope is practically useless, while the deceptions of that instrument have led to many important errors in physiology and pathology. It cannot be depended upon, especially in exploring soft structures. If it lead to unimportant facts, it is equally liable to betray us into error and fallacious hypotheses. The whole history of that instrument, so far as physiology is concerned, has gone to confirm the foregoing conclusions, which were originally advanced in another work, and has conclusively sustained the opinion of one of the most profound observers of the present age."

In another paragraph he says:—

"When we consider, therefore, the constant deceptions of the microscope, especially in all explorations of soft substances, and the absolute uselessness of any knowledge it may convey as to the recesses of organization, it may be reasonably expected that the time is not distant when all this lumber will be excluded from practical works on physiology, and turned, at least, into a channel by itself."

Thus it will have been perceived that errors of judgment, and a false interpretation of things well exhibited, are misconstrued into "constant deceptions of the microscope."

As well might one denounce the barometer as useless, because in the usual form of the instrument it is made to indicate conditions of the weather which frequently do not follow. As well might one argue against the utility of the scalpel in the study of special anatomy, because for many centuries it led to so little true knowledge of the structure of the body. With all their dissection of animals, the ancients supposed that the arteries conveyed air or vital spirits throughout the body, and that the blood passed to and fro, in a wave-like manner, in the veins. Aristotle states that the trachea conveys air to the heart; and Galen held that the liver was the origin of the veins, and therefore the centre of the movement of the blood. Even after Fabricius discovered valves in the veins, which would permit the blood to flow only in one direction, it did not occur to him that it might pass in the other direction in the arteries. It was left to his pupil, Harvey, to determine the course of the circulation of the blood. But even when Harvey promulgated this doctrine, in his lectures, in London, only 250 years ago, it was laughed at as an absurd and wild theory; and all the philosophical reasoning of its discoverer failed to convince the world of its truth, until it was actually demonstrated by the microscope in the web of a frog's foot.

When you compare the extent and exactness of our present knowledge of physiological anatomy, another name which has been applied to general or microscopic anatomy, with its condition at the commencement of this century, or in the time of Bichat, I think you cannot fail to see and appreciate the great value of the microscope as a means of investigation. Through its aid we have accurately distinguished the differences of organic and inorganic structures, and it has enabled us distinctly to define them. Together with chemical and other experiments, it has led us to determine the characteristic phenomena of life, and it has proved useful in the explanation of many special phenomena observed in living beings. Through its means we have traced the development of plants and animals, of their organs, and of the structure of these from the first moment of their starting into existence. It has contributed to overthrow the doctrine of spontaneous generation, and other false ideas in regard to the origin of living bodies; and has led us accurately to ascertain the laws of generation and reproduction. It has opened to view the course of many pathological changes in the condition of organs, as well as enabled us to ascertain the structural peculiarities of abnormal productions. In brief, no single mode of investigation, I feel convinced, has been of greater service in the establishment of a stand-point for physiological doctrines than the employment of the microscope.

Did time permit, I would present to you many examples of the comparative condition of our knowledge of anatomy with and without the microscope, which I think would not fail to convince you of the inestimable value of the instrument as a means of investigation. Even not to go skin deep in the examination of the human body, let me direct your attention to the difference of knowledge, in regard to the epidermis, as possessed by us at the present time, compared with what it was when taught to the parents who occupied your seats.

Twenty-five years ago it was taught that the skin consisted of three layers, named in succession from the exterior, the epidermis, the rete mucosum, and the cutis vera or dermis.

The epidermis was generally supposed to be an unorganized, homogeneous production, from the cutis vera, acting as a sort of varnish to protect the parts beneath. It was believed to have no power of regeneration in itself, but was reproduced from the cutis as its superficial portions were cast off. It was a much disputed point whether the epidermis possessed pores or openings through it. Experiments were cited to prove that it had none, while observation appeared to indicate that they existed in many positions for the escape of the sweat. It was generally supposed, however, that the sweat escaped by what was termed a species of transudation, just as water penetrates through paper or leather; and most physiologists believed that the bloodvessels on the surface of the cutis had gaping mouths, to which the name of exhalants was given, and from which the sweat escaped. The oily matter, which lubricates the surface of the skin and hairs, was supposed by some anatomists and physiologists to exude from the fatty layer beneath; while Bichat and others supposed it was derived from a set of exhalants distinct from those out of which the sweat escaped. Beneath the epidermis, it was stated that there existed a soft, delicate layer, to which the name of rete mucosum was applied. Upon this rete depended the difference in color of the races; and it [illegible] supposed by many that the coloring matter was secrete[illegible] certain glands, which were suspected to exist. Gaultier [illegible]rench anatomist, taught that the rete mucosum consisted o[illegible] layers, to which he gave the names of the tunica albida sup[illegible]ialis, the gemmula, the tunica albida profunda, and the papillæ sanguineæ.

In the brief account, thus given, of the state of knowledge in the earlier part of the present century, of a portion of the human skin, you will have perceived much vagueness, and very little information of a positive character.

By means of the microscope it has been determined that the epidermis is an organized structure, dependent only on the cutis for a constant renewal of nutritive matter. The epidermis is composed of numerous layers of organic cells, of uniform diameters in the deepest layers, and becoming successively more and more flattened as they approach the free surface, where they assume the appearance of scales. While these scales are constantly being thrown off in the form of scurf skin and dandruff, new cells are constantly reproduced in contact with the cutis. The soft new cells of the epidermis constitute the rete mucosum of former anatomists; and the coloring matter of the races is contained within them. In 1834 it was discovered that there were in the deeper part of the skin several million minute glands, whose office, it has been determined, is to secrete the sweat. This liquid, after reaching the surface of the cutis, is found to make its way, through the epidermis, by means of spiral passages. The oily lubrication, of the skin and hair, has also been determined to originate from several millions of minute oil or sebaceous glands, lodged in the structure of the skin, about the roots of the hairs. Exhalants, or open mouths to bloodvessels, have been positively determined not only not to exist in the skin, but in no other portion of the body.

In addition to the certainty of knowledge thus gained by the microscope, it will have been perceived that, that knowledge is simplified, and not rendered more abstruse and difficult, as might be inferred from the term mi ..., which is often applied to microscopic anatomy.

This department forms ... portant portion of my course, because of my conviction o... eing essential to a knowledge of physiology and the prin... f medical science. When a student myself, its great val... impressed upon my mind in the admirable lectures of o... ghtened and now venerable Professor of the Institutes ... dicine, who has ever been on the alert to take advantage o... he new lights which shed lustre on our profession.

My usual anatomical course opens with an account of the general or ultimate physical structure of all organized bodies, followed with a description of the plan of development of the tissues, together with a classification of these as found in the human body. I afterwards take up in succession the special anatomy of the great systems of the body, as the osseous system, the muscular system, etc., but usually precede them with an account of the general anatomy of the structures concerned in each particular system. Finally, at different periods of the course, as convenience or the advantage of the student may dictate, I describe the topographical anatomy of the important regions.

With every effort on my part to make the instruction simple and clear, aided by ample dissections, a rich museum of natural specimens and of models, and numerous pictorial illustrations and diagrams, I hope to render the course equal to your anticipations and to your zealous desire to acquire a knowledge of human anatomy.