PATHOLOGICAL ANATOMY:

THE NECESSITY FOR ITS STUDY, AND ITS INFLUENCE UPON MEDICINE AS A POSITIVE SCIENCE.

ANNIVERSARY ADDRESS DELIVERED BEFORE THE MEDICAL SOCIETY OF THE STATE OF NEW YORK, AT ITS SIXTY-SIXTH ANNUAL MEETING,

BY

S. OAKLEY VANDERPOEL, A. M., M. D.,

PRESIDENT OF THE SOCIETY.

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PATHOLOGICAL ANATOMY.

Gentlemen of the Society:

In addressing you this evening, I make no apology for stepping somewhat aside from the beaten track, in the selection of my theme. From the fact that the audience is not wholly composed of medical men, it has been customary to select a subject somewhat popular in its character and general in its application. I confess, however, that neither my reading, nor tastes fit me for such an effort, and I shall rather ask your attention to a subject bearing in an intimate manner upon our every-day duties; influencing, in just so much as it is carefully studied, our train of professional thought, and consequently our action with reference to the character and treatment of disease. Not that I shall be indifferent to the interest, and even attention of those whose studies are not strictly such as pertain to medicine; for in all the natural sciences there is a close bond of union, an intermingling of sympathies in thought, which renders any arbitrary line of demarcation impossible; and though I speak to night of a theme, at first mention

wholly unattractive, perhaps repulsive, to all save those whose interest has been instructed, still it will be found to involve practical considerations, and demand the aid of scientific formulæ as intricate perhaps as any other branch of physical science.

Your attention then is invited to considerations upon the necessity of the culture of Pathological Anatomy; its relations to the daily workings of the physician; the influence its cultivation has exercised upon the progress of medicine, and how far its present knowledge advances our appreciation of the intimate workings of disease in the economy.

I am led to this topic from the fact that the general profession are far too indifferent to its *practical* study. Content to received the *ipse dixit* of general text-books, or special treatises upon particular organs, or recalling the necessarily imperfect demonstrations made during the students' curriculum, they pass through life indifferent to, or unmindful of, the rich stores of practical information constantly thrown within their reach. Ever studying disease patiently and assiduously during its active processes, they stop short of verifying the third, and most important, element of the syllogism, the *proof* of the correctness of their labors.

Shall I speak what I know to be true, that there are scores of able, laborious physicians; men whose acute perception, careful observation, and intimate knowledge of disease entitle them to worthy confidence; who yet pass their lives in this almost empiric course, rarely witnessing or making a post mortem for the purpose of verifying a diagnosis, and roused only from this indifference when some startling occasion calls for the verification of doubts and suppositions?

Daily will they listen to the taunts of the want of positivism in medicine as a science; daily will the un-

certainties of their own practice evoke the self-reproaches of conscience; and yet the golden opportunities of solving a doubt, confirming a fear, or establishing a truth pass indifferently from their grasp. If each did but labor for himself in this field, if nature were but systematically and carefully interpreted, too many a boasted diagnosis would prove fallacious, and many hidden ailments be revealed, which imperfect examination, or blind prejudice in preconceived ideas, had clouded from the mental vision. These things are said in no uncharitable spirit. For while recognizing what are conceived to be the deficiencies of the profession at large in this respect, I am by no means unmindful of the obstacles and difficulties which *apparently* surround the practical workings of this branch of study. I say apparent, for I so conceive them chiefly to be, and that the earnest spirit, the faithful interpreter, can dissipate them all, and in the end really be aided by what at first seemed his chief hindrances.

In the larger centres of population, the stimulus arising from the contact of inquiring minds has of late years given a vast impetus to the study of pathological anatomy. Special organizations are created for this purpose, and the interchange of observations, the exhibition of specimens add to the general fund of knowledge. The facilities, too, of gaining autopsies are far greater than in sparsely settled districts. Indeed, I know the remark now rises instinctively to the lips of every physician engaged in country practice, that he has neither the *time* nor the *opportunity* to pursue this study.

I know full well the difficulties and prejudices which surround him, since earliest memories recall the fatigues, anxieties, and wearisome journeyings which are the heritage of the country doctor. Though years have

sped, the untiring labors of a venerated *father*, who for over thirty years responded to every call of sickness and distress, is, though softened, still vivid to the recollection. Our boyhood was initiated into the mysteries of compounding drugs, of venesection, and dentistry; and our introduction to professional labor, with the exhilaration and beauties of a country life, realized also the long pilgrimages by night, the buffetings with winds and storms, the slow progress through the deepening mud or drifted snow.

I too have sat by the bright blaze of the large old fire-place, and listened with childish wonder to the simple legends, mingled with much of superstition and awe, which pass from the old to the young, and know the dread and innate antipathy existing towards everything which seems to desecrate the remains of the dead. And yet with the difficulties arising from exhausting labor on the one hand and superstition on the other, we contend the country practitioner allows to pass too easily from his grasp the opportunities for pathological research. The rich fields which present themselves to his experience lie too often ungarnered and neglected. Fatigue should be forgotten in the zest for research, and prejudice overcome in the earnest claim that death, to the true student in his profession, but opens the portals to those mysterious labyrinths where disease with its protean workings is ever weaving deadly meshes, but where too, by reflected light, he may learn either how calamity may be averted, or at least, procrastinated to the future.

Indifference manifested by the physician to the study of pathological anatomy operates most unfavorably upon the young men commencing the study of medicine. Much as is said of natural gifts and predilections, I am of those who firmly believe most of our

tastes and habits are *acquired*. Very few, I think, pursue the study of any department of natural science from mere intuitive impulse, but rather as the result of some direct attention to the special subject, by which the curiosity, or it may be the thirst for further knowledge is stimulated. Subjects which at first sight are repugnant, may if properly approached, and the zeal awakened, become of special and absorbing interest. This is in a peculiar manner true of morbid anatomy. There is in the experience of every beginner in medicine an instinctive repugnance, which meets him at the very threshhold of his pathological studies. From early childhood he is taught to consider death, and the ever recurring mystery which the transition occasions, with awe. He looks at the body only in its decomposing elements; he feels that the necessary dissections are a violation of respect to the memory of the dead. Added to this is the natural disinclination to handle rapidly decomposing substances, or those from which arise fœtid emanations; he has too the healthy fear impressed upon him to avoid the sæptic poisoning which arises from the absorption of decomposing fluids: and yet it is at this early stage of his studies that the taste for researches of this kind must be acquired, and the habits of exactitude and minute research established. Indeed, if the preceptor is to give special prominence to one branch of medical study rather than another, it should be that of pathological anatomy. In anatomy and physiology his admiration is ever active at the wonderful mechanism and harmony of parts, the ceaseless activity of function, the vital unity which pervades the whole. And even in sickness when function or harmony is interrupted, his attention is readily occupied by the restoring agencies which the skill of the physician applies. In pathological anatomy, however, he has none of these stimuli.

Like the study of the classics in the youthful curriculum, it is approached with a feeling of dread: like them, the subsequent love of their study is an acquired taste; and like too the classics, in being the foundation of solid and thorough education and discipline, so pathological anatomy, in the personal study of each physician, must be the basis from which to explain the morbid phenomena each day's experience presents. I throw then, primarily, the responsibility of acquiring the taste and knowledge of pathological anatomy upon the preceptor.

The great majority of young men commence the study of medicine away from the centres of medical education. A primary discipline, thus acquired, need not be and is not time necessarily lost. The student acquires habits of patient toil and study; of self-reliance and personal observation. Even in the quiet walks of his country home he may from time to time have opportunities of practical demonstration, far superior to those which can be offered in any medical school.

I claim then that the study of pathological anatomy should begin with the commencement of the student's medical course. Even though he is not familiar with the normal appearance and condition of organs and tissues, still the two are always found in juxta-position; for rarely is a whole organ or tissue diseased; and he insensibly acquires that first education of the senses of sight and touch, far more valuable and enduring than the most minute and elaborate description. What would be thought of one commencing the occupation of machinist, who contented himself with reading and studying all that pertained to the theoretical ideas of motion and force, and yet never made himself practically acquainted with the construction of a machine, or the repair of one which was disabled? And yet we

ask our young men to commence the study of the workings of the most delicate of all machinery, its harmonies and irregularities, without the slightest practical experience of how the different parts look or feel, or are related the one to the other. Would you delay this study until the student attends the lectures of some medical school? I answer, such delay is most unfortunate. With the best acknowledged facilities for its study, pathological anatomy can be but imperfectly imparted. How little definite impression is left upon the mind, when to a class of from one to four hundred a pathological specimen is presented, and it may be, carefully described, yet how few are sufficiently near to profit materially? No! Pathological anatomy, like normal, must be studied individually in the quiet of comparative retirement; and the student must make himself practically familiar by sight, by touch, by microscopic research, with the metamorphosis of tissue or the destruction of organs. Rather the study of pathological anatomy at the medical school than none at all; but better far its study under the personal supervision of the instructor.

At this point it may be claimed my position is defective, for there should be a more definite expression as to what is considered the province and limit of this branch of study. Briefly then, pathological anatomy takes cognizance of all alterations in the economy, whether they are the cause or effect of disease. It should tell us which are the elements in organs, that are attacked, what transformations of form, volume, consistence, or composition they undergo. Even here its province does not cease. By comparing a large number of similar lesions of different degrees, we have presented the complete cycle of morbid transformations, in taking each organ in a condition of health and fol-

lowing out all the alterations of which it is susceptible, even to the extreme phase, and then the return to a normal state if such return be possible; at the same time it should indicate what changes are permanent after the cure.

Under this aspect pathological anatomy is allied to pathological physiology by the same relations that anatomy is to physiology. As anatomy studies the different parts of the body in a state of repose, and physiology the action of organs, so does pathological anatomy study the cadaver or the resultant of disease, and pathological physiology the manner in which the diseased portions performed their functions: or in other words shows us how the lesions are allied to each other and how they trouble the normal functions of organs.

With a province and duty so broad, it would seem that the necessity for its cultivation would be universally recognized. Yet there always have been and still are ardent adversaries: minds which cannot bind themselves to study realities, which cannot permit facts to present any obstacles to their speculative abstractions. As ultra vitalists, they see nothing but morbid function, and take no cognizance of the suffering organ; or again they seek to depreciate it, in alleging that it establishes only effects or results of disease. While this is often true, yet have not these very effects their importance? And from these lesions carefully studied in their different states, may we not deduce the successive phases of the malady? Sometimes, indeed, determine the origin and nature? And does it not become often possible so to explain the symptoms, and draw from them practical deductions for diagnosis and treatment? Yes: it is not too much to affirm, that a half century of studies in pathological anatomy has made greater progress in medicine, than ten, fifteen centuries of spec-

ulation upon the nature of diseases, considered at one time as atonic, and at another as excess of action. I affirm that without its study there is no possible verification of opinion, no means of rectifying one which is erroneous. It constitutes the surest foundation of experience, in confirming the physician in his appreciations, if they are justified; or in correcting, if the results show him in the wrong. To-day, the most obscure affections are those in which the anatomical lesions are least known, or even completely ignored.

Without the aid of morbid anatomy joined to clinical observation, what would be our diagnosis of a great number of diseases? Percussion and auscultation would not be recognized, or at least the phenomena, obtained by these important aids of diagnosis, would be only doubtful signs; the same as oppression, pain, cough, &c. The simple recital of some of the principal lesions, the history of which has thus been established, may not be profitless. How, without it, could simple bronchitis be distinguished from tubercular? It teaches to recognize cancer from chronic ulcer of the stomach, having, as they do, many analogies in symptoms, the one of which is however, often curable, and the other always mortal. It teaches, also, how tubercles are curable in their first period, and in their ulterior phases. In revealing the alterations of the kidney in Bright's disease, pathological anatomy has lighted up the causes of several forms of general dropsies, and conducted to more rational therapeutics. The knowledge of venous obstructions explains the mechanism of local dropsies. The discovery of blood-clots in the cavities of the heart reveals the cause of certain sudden deaths. Arterial emboli often explain local gangrene, as also venous emboli and thrombi in the pulmonary vessels, give the key to those sudden oppressions, often mortal, and until this discovery, not understood.

Great as are the benefits it daily renders to the *science* of medicine, they are equally so to the *practice* of the art, constituting one of its most precious resources. A certain malady may, to the vitalist, seem only an enteralgia with trouble of assimilation; but the practitioner who seeks to penetrate the cause, will recognize by the rectal touch, cancer of the intestine. Another, following the Hippocratic course, will diagnose a nervous dyspnea, while the anatomo-pathologist readily discovers pleuritic effusion. Indeed, what are all our aids of examination, such as the ophthalmoscope, laryngoscope, endoscope, but the study of pathological anatomy upon the living organism?

Again, how often do we suppose our remedies cured a patient, when some accident has demonstrated we were entirely wrong? The individual has perhaps died suddenly from some other cause, and on examination the effect we have attributed to our treatment has evidently resulted from natural causes. Or how frequently has it been shown that mere symptoms are deceptive, and that a supposed inflammation is in truth no inflammation at all? Investigations carried out in this manner, with a true spirit, will lead us to criticize carefully our remedies; not, as some assert, induce timidity, but rather show the fallacy of violent measures to cut short or suppress disease, when its positive detection is liable to so many fallacies.

Still, we cannot fail to recognize that pathological anatomy, considered either as a base of scientific investigation, or as a resource in the practical application of the art of medicine, has its limits, and we should not demand of it what it cannot render. We cannot say there is lesion, whenever there is sickness, or suffering, or functional trouble; or that each morbid symptom has for its correlation an anatomical alteration. The

material cause of a functional trouble, may, as in the case of impure air, be wholly without the organism. Restore pure air, and the disease is cured.

It often happens, too, that when the most palpable material lesions are established, they do not reveal what may be really desirable to know of the disease; and though they may explain certain functional troubles observed during life, at other times we are left in uncertainty, or have at best but imperfect notions of the different acts in the pathological drama. Or, again, the lesion we find, may be, as in the ulceration of typhoid fever, but an effect of the disease. But has not this resultant of a morbid act in the organism any practical value? Neglecting an effect, we may have the awakening of a new trouble, in perforation of the intestine. Sometimes the organic trouble ceases, while the lesion, the effect of such trouble, remains. Yet it is none the less a disease. Fibroid tumors of the uterus are the morbid products of a physiological act which ceases at middle age. While the fibroid growth may not therefore increase, still, it is a foreign body, having its importance in the future working of the economy. A calculus forms in the bladder, as a result of an alteration in the constituent properties of the urine. The urine may become normal, still the calculus remains, and becomes thus the essential cause of disease.

Still there are morbid states and pathological acts, of which corresponding organic modifications are inappreciable. Pathological anatomy cannot inform us what constitutes the herpetic, rheumatic or gouty diathesis; nor can it tell us by what mechanism or physical act, the fluxion which exists to-day in the knee, shall disappear, to re-appear to-morrow with the same characters in the shoulder or elbow. These and many other instances which might be multiplied, show us that there

are living forces in the economy which escape the appreciation of the pathological anatomist. We are forced to admit the influence of the vital principle, with its intellectual and moral manifestations. This is not of the domain of physical science, but our researches must always reach this impassable limit. In the condition of disease as in that of health, there are troubles of the living economy of which the natural sciences can give no explanation.

But granting the vital principle, with its modifications from moral and mental conditions, and also troubles from functional causes independent of anatomical lesions, shall we not therefore study where such lesions are incontestable? Besides, who shall say that in a number of diseases, where anatomical researches have not to this time established a lesion, we shall not yet find intimate modifications of structure, which may, owing to our imperfect methods of study, have thus far escaped our observation? It is only necessary to mention in this connection the train of affections of the nervous system, which remain obscure in their changes and results, from the want of proper means of study of this most delicate of all the structures.

Thus far the considerations adduced, have related to the necessity of the culture of pathological anatomy, and the addition it contributes to the sum of positive knowledge in the daily experiences of the physician. There is, however, in its historical aspect a broader field of view, wherein the changes it has wrought, and the influence it has exercised upon the other departments of medicine can be better appreciated. From a mere personal standpoint, one cannot comprehend the results it has accomplished, nor realize the vast progress its study has given towards placing medicine in the rank of a science. We who enjoy the benefits arising from

its study, who receive as axioms the truths it has established, knowing of them no doubt nor wavering, cannot without this survey, realize the uncertainty and chaos which till its study hung over the medical world.

As in history, he who attempts to write of current events, or in biography of immediate actors, fails in the former to appreciate their true philosophy, or in the latter to realize the harmonious workings of character, from too immediate contact with such events and characters; magnifying the one with undue importance, or belittling some trait which is allied to the inner springs of character: or again, as the dweller on the plain, knows not the grandeur and extent of the landscape, familiar to those upon the lofty height, being wholly absorbed with immediate objects; so must we in order to appreciate the scope and influence of pathological anatomy upon the progress of medicine, cast aside immediate impressions, and seek that time when medicine groped without its teachings, and when the ingenuity of speculation, replaced the toil of observation. Fortunately the dividing line is marked and decided. Pathological anatomy is the *younger* sister in the department of medicine. Scarce a century has elapsed since its claims were definitely established, and we could appropriately recognize on this occasion, the centennial of the death of its great founder. Not that medicine as a science did not exist before the study of pathological anatomy, since we presuppose its existence by establishing the influence which it has exercised. Theoretically speaking, we can scarcely conceive, that the science could have been so called when it ignored the laws of organic development, vices of conformation, the reproduction of injured parts, the formation of tissues, analogous and heterologous to the natural, the existence of lacteal and lymphatic vessels, the mechanism of the

circulation, respiration, secretions, &c. Yet historically this is true. Without pathological anatomy, and even before its study, medicine existed and showed remarkable results. Its scientific relations, however, were wholly occupied with diseases in their external appearance, in the study of their physiognomy. It was the period of direct, visible observation, when the tableaux of symptoms shone in all their brightness; a brightness without penetration, which would substitute the glare and glitter of the surface for hidden wealth, unsought and so unrevealed. The advent of a new period was announced by the study of the concealed or internal phenomena of disease. Such progress, however, does not prove the inutility of pathological anatomy, but rather that our science is not a dogma; that it was not born, grown and developed in a day; that, too, like the organic being, the phases of which it studies, it admits of evolutions in its growth, even though the lapse be centuries. Still a review of the progress of medicine up to the middle of the last century, strikes us painfully to see what obstacles routine, prejudice, and especially the pride of *systems* oppose; here it may be by inertia, there by active violence, the establishment of correct principles. Physiology scarcely makes a conquest, ere it is turned into ridicule to be forgotten, or used it may be to serve as a rallying point around which to concentrate all pathology, without inquiring whether previous discoveries did not contradict the hastily drawn conclusions, or thinking if one point is illuminated, many others must still remain in obscurity. Thus at one time chemistry was invoked to explain all; at another mechanism, or possibly vitalism. Or again it was irritability, or it may be stimulation, and even at a comparatively recent period, through Broussais, the dogma of irritation. It was only when the pure and

solid experimental method, which seeking after truth, did not hasten to enunciate laws, but was content to record facts, drawing later from them established principles, was accepted as the basis of scientific research, that pathological anatomy took its inception. This change was by no means instantaneous. The mind like the body requires cycles for its evolution, and the germs of a principle are traced far back of its full development. In reviewing then, the philosophical spirit of the earlier and middle parts of the last century we find it markedly skeptical and materialistic; elements, both of which are absolutely essential for scientific growth. The human mind was heartily sick of the vague and profitless speculation upon generalities. Though, through the labors of Morgagni, this branch of study took at one step its scientific relations, still the student can see a slow, but sure shaping for this method of study. Bacon and Descartes, each in their respective spheres had revolutionized the world of thought. The former taking for guide in the study of natural science, *observation*, *experimentation*, and *induction*, traced the method which assured immense progress to the natural sciences, conducting Harvey, Galvani and Newton to their splendid discoveries: while the latter, in the domain of philosophy and abstract science, no less effectually broke the shackles which the force of ages had riveted on the mind, by admitting nothing except what was demonstrated by *reason* and *experience*.

To Morgagni, of Italy, then, belongs the credit, but little more than a century since, of laying the foundation of scientific pathological anatomy. While in the writings of his immediate predecessors and teachers, Malpighii, Albertini, and Valsalva, we notice the glimmerings of the truth soon to be established by him, yet

he it was, who by patient toil demonstrated the clinical relations of disease with their precise appearances after death. His life is a remarkable example of brilliant genius and untiring perseverance which ripened in the wisdom of maturity. What a lesson to the sunshine workers of our profession!

While yet a youth he excites the admiration of the illustrious savans who were his teachers. A doctor in medicine and philosophy at nineteen, he became prosector to Valsalva, and filled the chair during the absence of his principal. When twenty-four years of age, he published his work, "Adversaria Anatomica," and so placed himself in the front rank among anatomists. Far from being elated with his precocious success, he did not cease to instruct himself. Though occupied ardently with comparative anatomy and chemistry, he did not in the mean time neglect the practice of medicine. When too, we consider the enormous amount of material disposed of by Morgagni, we cannot but admire the wisdom he showed in burying those treasures during all his long career, in order not to give them to the public until he arrived at an advanced age, being almost an octogenarian. His immortal work written in the latter part of his life, "On the Seat and Causes of Diseases," is based upon the examination of more than six hundred cadaver; a number, considerable at all times, enormous for the epoch in which he lived. He joined to his own materials those which had been communicated to him by Valsalva, and those that he found in his manuscripts. But all the documents the works of his predecessors furnished, and even those of his master, lose in their importance, and disappear, before the extent of his own researches. For the first time is seen a man grave and severe, separating himself from the anatomo-pathologists of the times, who were always

seeking for the *wonderful*, and occupying himself with the most elementary questions. His anatomical descriptions are made with an exactitude unknown up to his time. As often as the documents he possesses permits, he confronts the symptoms observed during life with the results of post mortem examinations. He avoided, as far as possible, generalities, and confined himself to the recital of facts. And may we not wonder that the founder of scientific pathological anatomy did so much with so great impartiality. No higher compliment can be paid to his memory, than the words of Cruveilhier, applying to him the cognomen of his great cotemporary, "Haller of pathological anatomy."

It is not proposed in the limits of a discourse, to recite the progress made in the study of pathological anatomy from Morgagni onward. Yet historically it has a great interest. How its study, passing from Italy beyond the Alps, found a ready acceptance in the medical mind from the experimental bias at the time given by Haller to physiological studies. Holland, then as celebrated for her scholars, as she had been for the nurture and the growth of the principles of civil and religious liberty, cherished the infancy of the science during the stormy days of the French revolution, and the early wars of Napoleon. And when at length, after a series of wars running through a whole generation, France, though humbled, yet masculine from the hardihood of her efforts, again sought in the pursuits of peace an emulation for scientific studies, and employment for her genius, we find coming forth that wonderful school of pathologists, whose labors and writings have been the admiration and study of most of those before me; very household gods to the plodding worker in this field of research. The names of Desault, Bichat, Corvisart, Dupuytren, Cruveilhier, Andral, Louis, &c., occur at

once as examples of this untiring and persevering school. England, though later in the field, was not in different to the impulse, and her literature shows many noble proofs of pains-taking and careful research.

While, however, it may not be permitted to follow out, step by step, the progress made in pathological researches, still, it is appropriate to study the influence which its active cultivation exercised upon the science of medicine, and also the impress, still distinct, with which previous systems in turn biased the direction and character of investigations.

The cultivation of pathological anatomy represents, in the history of medicine, its logical development as a science. Though its rise was, as we have said, by no means sudden and unpremeditated, but due to the spirit of experimentation which arose in the sixteenth century, still up to this period, observation was confined almost wholly to external phenomena, visible to the eye. Pathological anatomy opened the study of inner parts, and was thus enabled to give the brilliant symptomatology of Hippocrates a scientific basis, which the dogmatism and empiricism arising from partial systems had failed to contribute. Indeed, looking to the past with the light now afforded, it was these premature efforts to construct systems, which for so many centuries kept medicine debased in its scientific relations. If the reserve of Hippocrates had not been discarded by his successors; if for the rational and experimental basis upon which he fixed the art of medicine, they had not substituted the premature attempts of a scientific organization, then impracticable, perhaps the destinies of medicine, better favored, would have been spared the immense detour, and the long parenthesis of twenty-two centuries before reaching Morgagni; floating, without cessation, during this long interval between in-

complete and fallacious observation; between the Hippocratic doctrine, continued by tradition but obscured by systems, good perhaps, but insufficient, and the attempts at scientific organization even worse, because of their arbitrary character. To the premature efforts at systemization, the most brilliant and useful discoveries were nugatory and profitless, since they failed to conform to the reigning hypothesis.

While the study of pathological anatomy contributed much to the position of medicine as a science, its influence was no less marked in giving renewed impulse, and harmonizing previous labors in the different departments of medicine. Acting as a central study, around which grouped, irresistibly, facts from other departments, it served as a rallying point for observers. Previously each arm of medical science, isolated in its speciality, had, for others, only distant relations. Anatomy, for example, had scarcely any alliance with pathology and therapeutics. Physiology was, so to speak, a stranger to the other two. While they might be called pieces of a grand whole, their relation was that of juxtaposition rather than combination.

Not less evident also was its effect upon the natural sciences; for as soon as some of the laws of abnormal development were discovered, it was recognized that these should be studied in the immense sphere of their activity. Such study alone, by an elevated generalization, could start from the quiet contemplation of phenomena, and extend the application to the utmost limit of creation, in discovering the laws which preside in all vital irregularities. This generalization of principles brought in closer alliance the different branches of science; and these, in turn, acquiring extent by researches, and unity by analogy, became animated by a new philosophic spirit. There seemed to have been something

which acted as a germ to this common fusion and fruitful renovation. That germ was that it compelled the examination of nature herself for supposed facts; and we find the literature of the period, when these researches were the most active, almost exclusively occupied by such discoveries. Few works were published but were inspired by such researches, and few authors but were compelled to discuss and analyze them. Pathological anatomy became thus another link in the fusion of the sciences; and if on the one hand it harmonized medical observations, it was at the same time the common union of all biological studies.

So too, was its influence happy in harmonizing and establishing many isolated truths of the ancients: truths which long observation and experience had established, but which lacking a common bond of unity, had floated with the caprices of dominant systems, and lost to a great degree their significance and their force. Organic studies then, by establishing an alliance between tradition and new discoveries, and making of modern medicine a science, which disregarded nothing in its past annals, which sought truth through all systems, but which, progressive since it had experimentation for guide, served as an active principle to renew quietly all parts, without at the same time disturbing the unity; differing widely in this respect from all past systems, which from exclusive immobility could neither allow addition nor subtraction.

Another result emanating from organic studies, was that it enlarged and is enlarging the field of experimentation. Previous to their cultivation this method of investigation had been confined almost wholly to the verification of normal acts in the economy. The first impulse was to increase studies of this nature, but we soon find the disposition apparent to imitate artificially

phenomena, of which physiological acts gave no explanation. Art attempted to a certain point to group all the conditions and circumstances requisite to study a given fact; for to wait upon the manifestations of nature alone, would ill satisfy the impatience of eager investigation. Nature rarely arranges them in an order suited to the necessities of our mental capacities, and though she follows in her works a regular and determinate march, this path is oftentimes followed so slowly, and by so many circuits, that the observer does not seize the relations of phenomena so distant from each other; or it may be when the phenomena arrive without previous intimation to the observer, he is taken unawares, or ill prepared for their examination; though the intelligence is competent when he can govern such conditions. Experimentation then, to a great degree suggested by pathological anatomy, has since been most assiduously cultivated, and we find in all the large centres of medical instruction special facilities for its encouragement, and the dissemination of its teachings.

There is still another interesting feature connected with the development of pathological studies. However much it materially aided the scientific status of medicine, may have stimulated research in other departments, and enlarged the field of experimentation, it was itself fettered by traditions of the past, and must needs pass by turns, modified it is true by its own reflected light, through the different systems which had for so long a period governed medical thought. These systems, no matter what for the moment was the accepted belief, were always based upon the primary notions either of solidism, humoralism or vitalism. Nor was it strange that in organic studies it should follow a similar cycle. For the attention of anatomo-pathologists was first naturally directed to those alterations, surgi-

cal in character, because external, having reference to the changes of form, volume and relations of organs: when observation was directed internally, it was only to such lesions as were striking and extraordinary, as cancerous tumors, biliary or vesical calculi. Investigation was prompted to determine the *seat* of disease. *Solidism* was then the first fruit of the study of pathological anatomy, and marked the period of Morgagni in pathology, and Haller in physiology; the latter carrying the idea to the extent, that he expected to find the cause of organic formations in the solids of the embryo. It continued through the century to Laennec and Dupuytren, forming as they did a nosological classification upon this theory. Bichat, it is true made an advanced step, in studying not the diseased organs, but rather their component tissues; and while he and later writers recognize to a degree the importance of the liquids, still the study of alterations of the solids, was more or less the principal end of science. We can then safely assert that pathological anatomy at its commencement was wholly solidist.

Investigation could not long remain satisfied with such barren results. The *cause* of disease must also be determined and for this purpose the fluids as well as the solids were to be examined. Andral, in 1825, gave an undoubted impulse to this direction of study. His "*Clinique Médicale*" is a work of science and conscience, to which medicine is indebted for many new truths, and the revival of many forgotten precepts from classical antiquity. A few years later, another eminent pathologist wrote: "The more we study diseases, the more we attempt to determine their immediate seat, the more we are forced to regard the *liquids* as the vehicle of many morbid causes." The insufficiency of the solids, then led to the study of the liquids, as the

insufficiency of the *seat* led to the study of the *cause*. The march of every science is the same. There is a progressive law of doctrines, and morbid anatomy could only reach its position in pathology, by traversing the grand systematic ideas which had ever been upon the medical horizon. From humoralism, to complete the circle, the step was but short to *vitalism*. It was not, however, the vitalism of the ancients, which in its exclusiveness ignored all other causes; nor was it again the superstitious vitalism of Van-Helmont, or the theological of Stahl; but a renewed vitalism, founded on bases which recognized not only the attendants of solids and liquids, but also the modifications of *forces*; and which recognizing the analogies with the general forces of nature, proclaimed also their differences. It was not a vitalism depending upon external influences, but of the organism itself, interwoven with every organ and tissue. Vitalism, thus understood, was the legitimate expression of that period of the study of morbid anatomy when unaided vision and chemical analysis had exhausted research, and when vast orders of morbid phenomena must be ascribed to vital force. "It took cognizance of everything specific, peculiar, or proper to the living being; of everything which not being discovered by the sight, nor the touch, nor any external sense, is not directly observable. It consisted in the study and acquaintance of the acts and conditions of the forces which work in the individual sleeping or waking; which characterize his individuality in the thousand and one modifications of race, of constitution, of temperament, of idiosyncrasies; in the infinite variety of diseases, not less than in their periodicity, which it governs by a pre-established harmony."

In this connection it is interesting to notice by what a long and painful route anatomo-pathologists confirm

the aphorism of Hipprocrates. "That we must consider in man, not only the solids and liquids, but especially the *active* powers, or that which gave them movement." Commencing then in solidism, organic science finished with vitalism, while Hipprocrates, commencing in vitalism ended in the course of centuries by associating organic study, proving at once the failure of any individual theory, and the necessity of reciprocal influence.

For a period of forty years from the commencement of the present century, France maintained a pre-eminence for labors and researches in pathological anatomy, and the literature of the subject during that whole period can be consulted best among writers of that country. All that patient toil, clinical obseration, and chemical analysis could demonstrate, was chiefly elucidated by them. Who that has read the classic productions of Bichat, Laennec, Andral and Cruveilhier, but will cheerfully acknowledge the debt of gratitude which the profession owe to their works of toil and genius? With them pathological anatomy completed its *first* era. Vast as were the accumulation of facts, philosophical and accurate as were their deductions, still we are forced to admit that the study presented little more claims for scientific recognition, than did that of astronomy when Galileo made use of the *telescope;* for in neither had the inner laws of force and motion been developed. Unaided vision had to this time wrought both in healthy and morbid tissue all that could be accomplished. It was reserved for another people to bring to the aid of investigation, mechanical appliances, and a philosophic spirit of research, which to-day makes histological pathology rank high in the pyramid of science. The German mind was wonderfully adapted to the class of labor which devolved upon it. The brilliancy and éclat of the subject, its precise clinical

relations and large generalizations, had been nearly exhausted by the French. Minute and patient toil must replace striking clinical demonstration. Order, method, analysis, must come forth from the chaotic mass which artificial aid brought to bear upon its study. In a word, another era was opening. Previous to the cultivation of pathological anatomy, the theories of the laboratory explained the seat and causes of diseases; subsequent to Morgagni, and up to the period to which we refer, clinical observation had completed her almost perfect work. For who shall describe with greater accuracy and fidelity than Andral and Cruveilhier? Who more methodically than Louis? How much advance upon the auscultation of Laennec, the percussion of Piorry, the cardiac murmurs of Bouilland? Bichat had carried the analysis of tissue as far as the eye and analogy would permit. Modifications of situation, of dimension, of weight, of form, of color, consistences, internal and external aspect, constituted under such conditions the limit of the study. Though such modifications are of extreme importance, yet they cannot reveal the profound microscopic and chemical alterations, comprised in the texture, structure, and composition of parts. Its study must again return to the laboratory; not however, as before, for profitless speculation, but to call the chemical and mechanical aids which would carry investigation to its last analysis.

Not that our immediate predecessors did not vividly feel the importance of such ultimate research. They accomplished with their means all in their power. Even when the microscope was introduced as a recognized aid to study, there were physicians blinded, it may be by prejudice, or bewildered by the immense number of new details introduced into the study of pathological anatomy, who declared that such researches

were almost wholly, if not entirely worthless. We blush to say that even at the present day, one may occasionally be heard to raise the voice of ridicule. And yet is it not closing one's eyes to the light? Is it not declaring one's self deliberately unjust or notoriously ignorant? Pathological histology has had and still has, the same as normal histology, its obscurities, its fluctuations, the necessity to retrace its steps. It is the history of every difficult science during its period of evolution. But who can deny that many questions in pathological anatomy have been definitively illuminated by the intervention of the microscope? Who can deny that this intervention has dissipated uncertainty upon many points, and contrary even to what was formerly its reproach, rendered more simple and easy the study of numerous lesions? Nor are they among the rarer forms, but those of daily occurrence.

The microscopic impulse spread with wonderful rapidity. Investigators were found on every hand, claiming through its use to penetrate the utmost mysteries of nature; enunciating generalizations and laws which subsequent researches showed to be untenable. The reaction which followed, threw, for a season, discredit on this class of researches. In this, however, the new era presented no exception to what experience and daily observation point us in the world of business as well as that of science. The establishment of any successful enterprize draws to its labors all restless, fitful workers, who, for a season, give a false glamour and obscure the real progress of the earnest worker. While the history of microscopic research is cotemporary and familiar to most of my auditors, still a concise review of its growth is necessary to the elaboration of the subject under discussion. The ardor for minute research was first noticed in the department of physiolgy, and the

names of Schultze, Purkinje, Valentin, Wagner and Muller should be especially mentioned for their histological labors at this period. In them, and particularly in the writings of Valentin, we find the first traces of cell doctrines, or the recognition of cells as the basis of all organic forms. He does not, however establish the *nucleus* as the fundamental expression. About 1838, Schleiden and Schwann were simultaneously engaged in studies, the former upon vegetable, the latter upon animal tissues. Schleiden first described in a clear and definite way the formation of cells in vegetable structure according to a single and uniform method. Schwann catching the *unity* of *plan*, applied it to animal tissues, and by the adoption of the *nucleated* cell as the elementary form, gave an individuality and vitality to the anatomical details then collected. He caught the first glimpses of a truth, which, although it then needed verification, was soon to be recognized as the grandest in physiological science. Though this truth was speedily verified and accepted in the physiological world, and histology built upon it the sure foundations of a science, pathologists were comparatively slow in grouping about this genesis, the many and varied formations and fluids which constantly claimed their attention. Yet it seems self-evident that the growth of normal histology, and its relations to physiology, involved, as a necessary sequence, the same relations of pathological histology to pathological anatomy. This sequence now so natural, required years to effect. The first efforts in pathological histology were directed to the study of certain secretions or exudations, and while for nearly fifteen years great industry and perseverance were shown, and many isolated facts collected, there was no central idea to guide or direct observation. It was still the principle of Bichat with reference to anatomy,

studying disease by tissues, only carrying investigation far more minute by the use of microscopic and chemical aids. The writings of Gluge, Hasse, Vogel, Wedl, though constantly mentioning the presence of the cell in the composition of morbid humors and tissues, fail to recognize the unity of plan which had found full acceptance in physiology. Even the grand and almost incomparable work of Rokitausky, which, for faithful description and a generalization based upon the largest experience, must ever make it classic, enters but little into the minute structure of tissue, or the unity of the great law soon to absorb the pathological mind.

We cannot of course in our restricted limits trace the collateral workings of this idea. While distinguished names are noticeable in England and France; in the former Bennett, Paget, Todd and Bowman, in the latter Donné, Robin and many others; still the German mind, then as now, led in all researches demanding patient toil and close analysis.

Pathological histology had still to overcome world-long prejudices. Probably no barrier was more instrumental in retarding the recognition of the *cell* as the initial point in pathology, than the thraldom and prejudices, which *systems* had so long wove around it. Much of the last century was passed in arranging and re-arranging the classification of diseases. Even during the present, many leading minds have found their chief glory in creating a system of pathology, passing from artificial to natural systems. None had, however, constructed one which could be termed scientific, and be accepted as a basis by all physicians. Before a new era could be fully developed, an emancipation must be attained from these systems, and classification in disease must not be deemed essential. Dogmas in every science are the same; when established they are the expression

of general conviction, and become after a time chains which hinder the ulterior development of thought. After years of toil and labor, Virchow comprehended this position. In renouncing all attempts to create a system, he was disembarrassed from the last chains of dogmatism. In reducing disease to its cell life, he could reject the principal theory which governed science, rendering classification necessary, viz.: the unity of diseases; the idea that each malady, constituted, so to speak, a being apart, a particular form of existence, which penetrated into the economy as a *foreign* body, and which should thus be maintained along with the sound parts. Disease and life are now no longer regarded as two things marching together; on the contrary, the true material existence is *found in the cells*, the elements of the body.

Fifteen years have not elapsed since Virchow, in a series of lectures gave the results of his studies to the medical world, and now the doctrine of cellular pathology is universally regarded as the basis from which all morbid manifestations must be studied. Later investigations have modified some of the details of Virchow's teachings. These relate chiefly to the genesis of the *cell* proper, its physical and chemical characters, and the many and varied vital phenomena which originate in it. Such differences of opinion in no way invalidate the fundamental principle of the doctrine. The dogma is accepted that organic life, vegetable or animal, presents as last analysis a particular element, possessing always common characters, viz., the *cell*, characterized by the nucleus, the nucleolus, the contents and enveloping membrane. The presence of each of these elements is necessary to constitute a living cell, and from it all tissues of the organism are formed. Virchow following this accepted truth in relation to the normal condition

of tissues, has shown that it is equally applicable to pathological productions. His words are, "that every pathological production has its analogy in physiological formations. The elements of every pathological formation resemble and may be compared to normal elements preëxisting in the economy."

Discarding the idea of the *specific* character of certain morbid products, he further says "we shall always find a physiological process resembling the march of pathological neoplasms, and admitting of similar classification. Certain pathological productions are composed exclusively of *cells*, as epithelial tissue; or again, those analogous to conjunctive tissue, which besides the cell elements, contain also more or less conjunctive tissue; or there is a third group of morbid tissues, resembling the higher order of organizations, as blood, muscles, nerves, &c. Most morbid organizations belong to the first two classes."

From considerations upon the structure of organizations, he passes to that of function. "Every living element of the human body responds to an excitation in manifesting its activity. This activity is awakened for three different reasons: for the performance of function, of nourishment, and of increase. Hence arise three sorts of irritation: that which augments the organic function; that which accompanies an exaggeration of nutrition; and that which causes the formation of new parts."

On the other hand beside these inflammatory processes in which the cells are *active*, Virchow studies a series of alterations which he calls *passive*. In this latter form the elements may be completely destroyed, as in fatty and amyloid degenerations, or be deprived in a great degree of their activity. Even in these destructive forms he demonstrates physiological analogies. The

normal types of these pathological evolutions, are found in the normal secretions of the sebaceous glands of the skin, in colostrum, and the corpora lutea of the ovary.

Hereafter the studies of normal and pathological histology are indissolubly connected. Starting with the cell as a common initial element, pathology must study it, in its aberrations, based upon an intimate knowledge of its normal characters. Simple as it may seem in principle, yet these aberrations are as infinite and varied as are the forms and intermingling of normal structure. Nor are these revelations made to the indifferent or inexperienced observer. To discover them requires, in most instances, the most delicate manipulation and tact in the use of optical appliances, as well as the many chemical and physical accessories to prepare structures for careful examination. The stimulus for minute research has carried mechanical and optical refinements to the most elaborate scientific formulas. Within a comparatively recent period, the "immersion" lens, by lessening very much the refractive power of light upon the polished surface of the lens, has aided much both in illumination, and penetrating power in the examination of objects.

It is this special tact and education, together with the time requisite for the various manipulations, which have thus far acted as serious hindrances to the spread and general acceptance of cellular pathology. The want too of these has furnished the ready sneer for the cynics in medicine, that one could see whatever he pleased, since there was no way of verifying what was only cognizant to the individual observer. It created, so to speak, an aristocracy in this field of study; and however desirous one might feel to verify in his own researches the truth or falsity of certain descriptions, such verification was impossible, from the barriers which the

subject itself presented. The student must, in most cases, be content with the imperfect representations which an observer's drawings had furnished. The interests of science, however, cannot brook such an obstacle. She has too many resources, readily available, by which this exclusiveness can be overcome. The bonds of union between different departments of science are too intimate, and interlaced by too many affinities to allow any one to fail from want of support. Wherein the microscope cannot popularize, photography must come to its aid, and so perfectly has she already been taught, that the image produced is, in many respects, superior to that which direct microscopic observation reveals. Hereafter, tissue or structure shall be its own delineator. No imperfect description, no vivid imagination, no overwrought theory shall affect the truth of representation. It is a wonderful triumph of art. Tissues, requiring the magnifying power of one thousand diameters, are printed of any size, with all the distinctness and vividness of outline, which the most skillful and delicate manifestations can give to the eye of the observer.

This popularization, so to speak, of the most hidden and minute recesses of nature, is due to the labors of one of our own countrymen. Very properly, too, it originated in that grand museum at Washington, formed and nurtured under the auspices of the Surgeon General of the army, becoming not only the depository of the large experience of our late war, but returning to the profession at large practical benefits, the value of which cannot be estimated.

The experiments in photographing by artificial lights, either electric, magnesian, or oxy-calcium, of microscopic objects under great magnifying power, has first been performed by Dr. J. J. Woodward, of the United States

army. His success has been all that the most ardent student could desire. Not only do his own observations verify those of Cohnheim upon the histology of minute blood vessels, but by a series of photographs, are delineated, not only the epithelial cells of the capillaries with their nuclei, but also the stomata between these cells, said to give exit to the white corpuscles. The bearing of these facts upon the theory of inflammation, is familiar to those who have followed the discussions based upon these discoveries. I regard the practical exemplification which these photographs furnish as the most positive claim which pathological anatomy has thus far presented for scientific recognition. Our studies at once become more interesting and personal, for we know that we reason from the same premises, study the same tissue, which was once the exclusive favor of some skillful observer. The property of one has become the common property of all. Let us hope that the ingenuity of the gentleman who has so far perfected his mechanical appliances, may be further encouraged in his large field of labor. We recognize that he has established an era in the study of pathological anatomy, equivalent to that which marked the application of the microscope as a means of research.

It must not be understood from the tenor of the foregoing remarks, that histological pathology can or will replace studies in clinical medicine. The vast array of facts which this latter has already afforded to the pyramid of positive medicine are too valuable to be discarded or forgotten. Rather does pathological histology perfect the symmetry, fill in the many interstices, and give harmony and symmetry to the structure.

I have thus hurriedly, and necessarily, imperfectly, reviewed the past and the present of pathological anatomy. No attempt has been made to consider its special

relations to tissues, or the different forms of heterologous growths, for the literature of these subjects is ample and accessible. I have rather traced the growth of that idea which originating but a century since, when medicine had scarcely made any material advance in the twenty-two centuries which had elapsed since the wonderful symptomatology of Hippocrates, has since advanced with marvellous strides, and already lays a claim of *exactitude* among the sciences. Pathological anatomy can no longer remain a secondary chapter in the study of pathology, but calling to its aid all the resources of art and science it must take a first position. "It must in studying alterations go back to their origin, determine the producing cause, the modes of termination, elucidate the methods of spontaneous cure, signalize the resources of art. Interrogating morbid phenomena, it will not separate organs one from another, but comprehending all changes, in their connections and reciprocal influences, it will always have in view the entire organism, recognizing at the same time all the physical and moral conditions peculiar to the patient. Studied thus, it will become more and more a science full of interest, furnishing for the art of medicine most useful aid, and constituting a most powerful auxiliary to its practice."