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A BIOGRAPHICAL SKETCH

My Dear Associates:

On this memorable and beautiful occasion I have the cherished honor of having been chosen to perform, as it were, the duties of chronicler, in order that we may all be led to review in our minds the successive steps by which our great leader and master rose to such high distinction and wrought the miracle of giving to medicine a new birth in this country; and in order, also, that our successors, lighting their lamps at the shrine of Pathology and studying the treasures which these precious volumes enclose, may catch a gleam of what manner of man he was who produced them, and who by the vigor of his living example and the charm of a rare personality, as well as by the power of his spoken and written word, in the short span of a lifetime raised medicine in the United States from a beneficent art to an expanding science.

William Henry Welch was born in Norfolk, Connecticut, April 8, 1850. He was the son of William and Emeline (Collin) Welch. His father was a practising physician, as were four of his father's brothers. Moreover, a great grandfather and grandfather were also physicians. When about one year of age, William Henry's mother died; thereafter he was taken care of and brought up by his paternal grandmother, who resided with the father. A contemporary describes the youth as a great favorite in the village, interested in all kinds of sports and athletic exercises. During the Civil War, the youthful William became captain of a company of zouaves, who, dressed in regulation costume and provided with guns, drilled regularly on the village green. When about twelve years old, William was sent to a nearby boarding school at Winchester Centre, conducted by the Reverend Ira W. Pettibone, an uncle by marriage. Here he prepared for Yale College which he entered in 1866, in his sixteenth year, and from which he was graduated in 1870, with the A. B. degree, standing third in his class. During his college period he impressed his teachers and classmates with the possession of the gifts which afterwards distinguished him in so large a measure. After graduation and before entering upon his medical studies, Welch taught school for one year at Norwich, New York.

Thus it was in his twenty-first year that Welch matriculated at the College of Physicians and Surgeons, in New York City. But this first venture into

medicine was very brief. An almost prophetic vision into the future gave him pause and led to his return to New Haven for a year of study in chemistry, which field even at that early date he perceived to hold great future possibilities for the study of medicine. This intermediate year was spent jointly at the Sheffield Scientific School and at the Yale Medical School. In the former, Welch came under the influence of Professor Oscar H. Allen who strongly stimulated his interest in science in general and in chemistry in particular. This rather unconventional and solitary personality, who was not only chemist, but geologist, mineralogist and botanist as well, proved to be an inspiring teacher. At the Yale Medical School the professor of chemistry was George Frederic Barker, afterwards professor of physics at the University of Pennsylvania and a member of the National Academy of Sciences, who was deeply interested at the time in organic chemistry and thus turned his pupil's attention to the writings of Kekulé which were just then exerting a dominant influence on chemical thought. Within the year the student was mastering the concepts of Kekulé in the original German. The breadth of interest of the two able teachers under whom Welch had the good fortune to come during this preparatory year, may well have exercised a directive if latent influence on the gifted and impressionable pupil which at a somewhat distant day was to assert itself in the determination to break with the traditional and alluring career of private and consultative practice, and to embark upon the hazardous one of pathology. This decision was not, however, arrived at immediately or even at the outset of his medical work, but came later as part of a widening knowledge and an enlarging experience.

It was fated also that the two men who, each in his own although different way, were to influence the rise of pathology in the United States, should first come together in the chemical laboratory of the Sheffield Scientific School. T. Mitchell Prudden had gone through the School at about the time when William H. Welch passed through the College; but as in that day the two sets of students—academic and scientific—rarely met and never mingled, the two men were not brought into contact. When Welch entered the laboratory, Prudden was already there, filling a kind of voluntary instructorship; and thus the two men whose paths were to cross and recross in the many subsequent years of sympathy, perfect understanding and common endeavor, first discovered in each other, albeit still in embryo as it were, that devotion to science and its ideals which as the years lengthened was to prove secure against the many and insistent allurements and pecuniary rewards of medical practice.

The year of chemical study over, Welch returned definitely to his medical studies. It will aid us a little later in the understanding of the change about to be wrought in the pursuit of pathology—in the making of advances in

which the then unsuspecting medical student was to play so large a part—if we pause to sketch in broad outline the kind of educational discipline offered the medical student at the College of Physicians and Surgeons, a leading institution, in the period embraced by the years 1872 to 1875.

In 1872, when Welch entered, the College of Physicians and Surgeons had been in operation for sixty-five years and led all its competitors in the number of its students and in teaching facilities. The College occupied a building of its own on Twenty-third Street, regarded as commodious, and was a part of Columbia University. The term of instruction had been extended from four to five months, and three instead of two sessions of attendance upon lectures were required for graduation. The precarious supply of material for dissection and for instruction in operative surgery and the method of obtaining it had been superseded and made fairly adequate by legal enactment. The courses in anatomy and to a less degree those in medical chemistry comprised the entire provision for objective or practical teaching, aside from the out-patient clinic at the College and the clinical lectures given at the New York and Bellevue Hospitals and the Almshouse. A voluntary course of lectures on pathological anatomy with demonstration of organs removed at autopsy was offered during the summer session by Francis Delafield.

While the preceptorial system was still in vogue and the medical student was still expected to obtain the main part of his clinical training during the long interval between sessions, in the office and on the rounds of his preceptor, the few outstanding students could hope to enter Bellevue Hospital for an interneship, which might begin even six months before graduation. But the didactic lecture, of which the instruction still chiefly consisted, was expected to fill the mind of the student with the medical lore of the day, while it served also to impress his imagination with the vigorous personality and high authority of the eminent teachers under whom he sat, in a manner now wholly foreign to the spirit of medical teaching.

But to the able, energetic and ambitious student the plan, imperfect as it was as an educational discipline, admitted of a choice of subject and disposition of effort not contemplated in the system. And thus we find Welch in the early period of his medical studies enticed away from the lecture halls into the more alluring atmosphere of the dissecting room and very soon serving as prosector to the professors of anatomy.

With the curriculum as indicated, it is obvious that no opportunity existed to acquire thorough training in any subject, aside possibly from the grosser aspects of human anatomy. The provision for pathology was extremely meagre. Although a chair of physiology and pathology, filled by Alonzo Clark, had been created in 1847, in the early seventies of the last century,

pathology had not become an independent subject of teaching, but was attached to the chair of medicine, still, as it happened, under Doctor Clark, who had been transferred to the professorship of pathology and clinical medicine.

There is no reason to suppose that Clark treated pathology otherwise than by lectures, with perhaps at most the occasional use of specimens from the deadhouse. On the other hand, Francis Delafield, who had become adjunct professor of pathology and clinical medicine, was already studying assiduously with the microscope the pathological changes in the kidneys in Bright's disease and still other morbid processes, as viewed indeed from the standpoint of the new cellular pathology just struggling into the light. But of opportunity for the student himself to acquire even the rudiments of the technique of the microscopic study of the organs and tissues in health and disease, there was none. It was not, therefore, just at this juncture in Welch's history that his interest in pathology asserted itself.

A compelling circumstance was, however, imminent. Among the prizes offered to students was one provided by Doctor Seguin, then the professor of diseases of the nervous system, for the best report of his clinical and didactic lectures. It consisted of a Varick microscope fitted with superior French triplex lenses. This prize was won by Welch, and it proved indeed to be the spark which ignited the tinder of his latent interest in pathology and caused it to burst into flame. Fortunately Welch now entered in October, 1874, upon his interneship at Bellevue Hospital, where this strongly aroused impulse was to find an abundant field for expression. He now also came more directly under Delafield's influence, and was thrown with the elder Janeway. Much of his time was spent in the deadhouse performing autopsies, first on his own and then on many other cases; and it is a remarkable tribute to his technical skill and acumen of observation, as well as felicity of description, that Delafield invited him to use his special book for recording the protocols of the postmortem examinations, and that he was made a curator of the Wood Museum attached to the Hospital.

Although it was perhaps not clearly perceptible at the time, it now appears that the circumstances surrounding and thus acting upon the sensitive imagination of Welch, the student, were favorable to his development; for notwithstanding the poverty of material resources and of laboratory facilities of the era, he had the good fortune to come under the influence in the medical college of not a few men of remarkable mental vigor and attainments. Besides those already mentioned, there were on the faculty of the College in his day Dalton and Curtis in physiology, St. John and Chandler in chemistry, Edward Curtis in materia medica, Markoe in surgery, Sands and Sabine in anatomy and McLane in obstetrics; weekly clinical lectures

were given by Willard Parker and T. Gaillard Thomas, the prestige of whose strong personalities and eminent careers in surgery and in obstetrics and gynecology respectively must have been potent forces. He was thrown as prosector into close association with Sabine and with the demonstrators of anatomy, John Curtis and McBurney. It was especially at the suggestion of Sabine that Welch wrote his graduating thesis upon goitre, which received the first prize, and in the preparation of which he familiarized himself with medical literature and bibliography at the New York Hospital Library. At Bellevue Hospital his contacts with Delafield and with Janeway became numerous and close, the forerunner, as it chanced, of a relationship destined to become even more intimate and significant at a somewhat later period.

Moreover, the era in which the young student found himself was one of fundamental flux of belief brought about by the new cellular pathology and the discoveries of Pasteur just impending. Into this whirlpool of shifting ideas, which were to move in the next succeeding years with ever-increasing speed, Welch with his eager, open and responsive mind was thrown. That his imagination was powerfully stirred by the intellectual ferment of the time may be assumed. One circumstance is, however, quite clear: at this stage pathology as an independent career had not been seriously before his mind, nor was it so to present itself until a whole new set of experiences had been passed through.

The year and a half's interneship over, Welch is about to take ship for what proved to be for him and us a great adventure. In April, 1876, in company with his friend and fellow townsman, Dr. Frederic S. Dennis, he sailed on the Cunarder "Bothnia" for Liverpool. From Liverpool he went to London where he spent a few days, crossed the channel from Harwich to Rotterdam and made his way leisurely along the flowering Dutch and Belgian fields as the spring was passing into the mild early summer months, toward Strassburg, the first stopping place on the long but important road which was about to fascinate his view.

Welch's European experience begins with Waldeyer, the Director of the Anatomical Institute in Strassburg, with whom he studied normal histology. This subject was of course taken up on account of its fundamental importance as a basis for pathological histology. But it is significant that the interest in chemistry, also as a foundation subject, which carried Welch to New Haven on the very threshold of entrance to his medical studies, had remained alive; hence part of his time was spent in Hoppe-Seyler's laboratory, under the master himself and his assistant Baumann, in working through the former's well-known textbook in physiological chemistry. In addition, time was found to attend von Recklinghausen's autopsies and demonstration course, although at this period no further courses were taken with this master of

pathology and for the reason that Welch concluded that until a grounding in normal histology was secured, it would not be profitable to pursue pathological histology.

The summer semester at an end, Welch left Strassburg for Leipzig, the summer vacation being spent with a friend in a pedestrian tour in Switzerland and northern Italy. It is of interest to inquire just what was the lure of Leipzig. Obviously Waldeyer was the attraction in Strassburg; now it was Heubner and Wagner who drew the student to Leipzig. At that time Heubner had not entered the field of pediatrics in which he afterwards became celebrated, but he was working rather in the field of neurology; and, indeed, it was his important book on the diseases of the blood vessels of the brain,[1] which Welch had read, that determined the choice. If we undertake to penetrate further into the source of Heubner's attraction for Welch, we are led back to the days at the College of Physicians and Surgeons in New York and the lectures of Seguin which had exerted a strong influence on Welch, so that if we had then inquired whither he was tending in medical specialization we should have discovered that he was looking to diseases of the nervous system as the field for practice, while pathology remained his main interest and subject of training in Germany, although he could not then anticipate its pursuit as a means of livelihood on his return to America.

Circumstances were, however, to defeat this consciously worked out program. In due course Welch subscribed for Heubner's course, only to find very quickly that the latter was not then interested in teaching; soon the course began to languish and the students to absent themselves, and it was not long until Welch was looking elsewhere to fill his time. Wagner, who later succeeded Wunderlich in the chair of internal medicine, was at the time professor of pathological anatomy. Welch found Wagner's courses and the opportunities afforded for independent work by his institute admirably adapted for his own purpose. Here he attended autopsies and obtained specimens of tissue for microscopic examination. At first the blocks were given as a favor; but later Wagner's interest having become aroused he would personally select the specimens for examination and for report. In this manner Welch occupied his mornings; the afternoons were, however, still free. He attended Wagner's polyclinic, which kept him in touch with practical medicine.

At this period Ludwig's laboratory was the centre of attraction for the talented men in Germany and also for many foreigners especially interested in physiology. Welch decided to offer himself and was accepted by Ludwig. That the choice was a propitious one is shown by the group of men at that time working with Ludwig and with whom Welch was now associated. The

[1] Heubner. Die luetische Erkrankungen der Hirnarterien, Leipzig, 1874.

first assistant was the gifted and inspiring Kronecker with whom Welch formed an enduring friendship. Among foreign students was Pawlow, and Drechsel and Flechsig were in charge of the chemical and the histological divisions of Ludwig's laboratory. Welch was set by Ludwig to study the ganglia and nerves of the auricular septum of the frog's heart with the gold chloride impregnation method, in the course of which he actually brought into view the ganglionic cells with T-shaped fibres which Ranvier described in detail somewhat later. The semester closed and the usual *"Abschied"* supper was given by Kronecker. Of course Welch was invited and there was characteristically exhibited a model of the ganglion cell with fibres both entering and leaving it—a novel and as we now know a histologically highly important event.

The first year of Welch's European study was now over. It had been spent in preparing himself in normal histology, physiological chemistry, pathological anatomy and physiology; and it may be asked to what purpose and for what ultimate end? The answer is, in order to be ready to study with Virchow, whose institute he had visited during a short stay in Berlin. This expectation was indeed the force back of the concentration on normal histology, the reason for embracing eagerly a histological problem from Ludwig, the motive in following Wagner's autopsy and microscopic courses; and, after all, the wish was to be frustrated and Welch's activities were to be directed along a wholly new direction and into fresh channels.

The new impulse came from Ludwig who did not share the enthusiasm, at least in the overwhelming degree then current, for the cellular pathology of the period. Perhaps this response was the less hearty because he did not have the strong sense, as so many seemed to have, of a great innovation, but rather viewed Virchow's doctrines as the extension, perhaps even the consummation, of the earlier conceptions and discoveries of Schwann, Schleiden, Remak and Reichert; or possibly it was his physiological bias or even a subtler appreciation of the impending influence of the study of function on the growth of pathology, which led him to induce Welch to alter his plans and to offer himself to the brilliant young pathologist Cohnheim to whom he undertook to write urging him to receive Welch and to furnish him with a rewarding (*lohnendes*) theme.

This choice proved highly fortunate. As one reviews Welch's own published work, his immediate influence on his students, or the more general effect which his career has had on medical education, it is now quite obvious that his intellectual temper was of the order called dynamic, and his vigorous responses were to concepts built on facts of function far more than of form and structure. The summer semester of 1877 with Cohnheim in Breslau was perhaps the most delightful and satisfying of all the time Welch spent

abroad; and fortunately we possess a pen picture of him at that particular time, drawn in clear and sympathetic lines.

Salomonsen, afterwards professor of pathology at Copenhagen and the present Nestor of medicine in Denmark, had also come to Breslau for the summer semester. The two foreign students, the first foreigners who studied with Cohnheim, were at once thrown together; there existed, indeed, that subtle quality in the temperaments of the two men that quickly made for close association and then intimate friendship—a rare relation which neither distance nor fleeting years have severed. Salomonsen states that the two men who most influenced his own life were Carl Weigert and William H. Welch. He goes on to enlarge and say that he and Welch had many points of contact: both were sons of physicians, both on return to their own countries hoped to become pathologists to municipal hospitals, and both regarded it as a matter of course that anyone wishing to enter on the career of pathologist should aspire to work under Cohnheim.

The two foreigners were proud of the distinction—what two eager young men would not be?—of being the only foreigners in the laboratory among such present or prospective stars as Weigert, Ehrlich, Lassar, Lichtheim, Albert Neisser, Senftleben and O. Rosenbach. They were always together—from early morning to late afternoon—and they were taken up cordially by their German colleagues of whose intimate circle they made a part. I venture to quote a particularly appropriate paragraph from Salomonsen:

"That by accident I should have found so gifted a man and investigator as Welch in Breslau, I at that time as well as later, regarded as the greatest good luck. Cohnheim knew well how to appreciate Welch, and he recommended him for the professorship of pathology at the Johns Hopkins University where Welch exerted a profound influence on the development of medical education in the United States, and where the present generation of American pathologists calls him master."

It was in this remarkable atmosphere that Welch spent a precious semester. The work of the laboratory was pretty sharply divided between the autopsies conducted mostly by Weigert, and the experimental investigations in which Cohnheim shone ever brighter and brighter. The particular problem which Cohnheim assigned to Welch was the ascertaining of the origin of acute general oedema of the lungs. This is perhaps not the place to go into minutiae of that splendidly conceived and executed piece of experimental work. It was in many ways fortunate that Cohnheim was too preoccupied at the time reflecting on his theory of tumors and in the preparation of his textbook on general pathology to do more than propose the problem which Welch developed largely according to his own notions of logical sequence. Cohnheim, indeed, was greatly surprised when contrary to his preconception

of the process, Welch found the factors involved in it to be mechanical. The masterly paper describing this piece of work as it appears in *Virchows Archiv* was written out by Welch in German and printed quite as he prepared it. Cohnheim seems not to have altered essentially the composition, the mode of presentation or the conclusions arrived at. Unfortunately for future controversy Cohnheim misconstrued the implications of Welch's experiments and in his epochal Lectures on General Pathology he substituted for the term disproportion (*Missverhältniss*) employed by Welch to express the disharmony (often caused by spasm) in action of the two cardiac ventricles, the term paralysis (*Lähmung*), which implies only one form of disharmony.

The by-products of this semester on Welch's development were as important as the direct influences. Salomonsen's studies on tuberculosis of the eye initiated him into the experimental side of the tuberculosis problem. Salomonsen relates an incident showing the great impression made upon the two foreign students by the first example of generalized tuberculosis in the guinea pig which they observed. Their enthusiasm evoked hearty laughter from Cohnheim. It was, moreover, the period of Heidenhain's early brilliant work, of the rich harvest of Cohn, the botanist; and to cap the climax, the occasion of Koch's visit to Breslau to lay before Cohnheim and Cohn the facts of his studies on anthrax, in the demonstration of which all the workers in Cohnheim's laboratory were permitted to share. Finally, Weigert with Ehrlich was just applying the aniline dyes to the staining of tissue elements and bacteria and had recently completed his study of smallpox, in the course of which he demonstrated by staining methods the masses of micrococci within the pustules. Ehrlich also, although not yet graduated, was literally dabbling in the aniline stains and it was a common event to see him with hands covered up to the wrists with dyes of many colors. The close friendship of Welch with Weigert and Ehrlich dates from this period.

It is significant that the spirit of the Institute was favorable to the new bacteriology and that Cohnheim and his associates were all looking to the new science to unlock doors still concealing the origin of the diseases called infectious—an attitude striking in its difference from the skeptical and rather disdainful one of the Virchow school of pathology. Thus on leaving Breslau, Cohnheim sent Welch to Vienna by way of Prague, in order that he might visit Klebs who was engaged in the study of acute endocarditis from the microbiological side. There he spent several stimulating days, during which Klebs showed him through his excellent museum and demonstrated his preparations showing microorganisms (micrococci) in the ulcerative lesions of acute endocarditis. The impression which Klebs made upon Welch was very strong; and in the light of present knowledge, the accuracy and presci-

ence of Klebs' work, well in advance of his period, not only on endocarditis but on diphtheria and experimental syphilis as well, have become clearly apparent.

The next stop in the educational journey was made at Vienna which was still a kind of Mecca for foreign medical students of all nationalities. The immediate objective was a place in Stricker's laboratory, in order to continue his studies in experimental pathology. As an index of the high feelings prevailing at the time it may be mentioned that once Stricker learned that Welch had been with the heterodox Cohnheim who taught that the pus cell was merely an emigrated leukocyte, he was not inclined to receive him as a worker in his laboratory. One purpose of the visit to Vienna was to study embryology under Schenck, but the choice was not fortunate and Schenck was soon forsaken. It is interesting to note that Welch and Prudden found themselves together in Vienna in their search for an opportunity to study embryology.

On the whole, the chief lure of Vienna for the pathologist was its almost inexhaustible store of pathological anatomical material. The reign of Rokitansky was over, and his successor was Heschl, the discoverer of the methyl-violet reaction for amyloid, but a far less significant personality. The greater attraction was the young Chiari who was teaching and working with the vigor which afterwards became so notable and carried him by way of Prague to Strassburg to succeed the eminent von Recklinghausen. To him Welch went, but not to spend his entire time. There survived in his mind, it appears, a residue of distrust that pathology would after all afford him a career in America, or was it the love still for the more immediately practical aspects of medicine which led him to enter upon courses on the skin under Hebra, on neurology and psychiatry under Meynert, on the eye, and other special subjects? But Vienna meant for Welch much more than gross pathology and the medical specialties. The great city with its splendid museums of art, its grand opera and its vivid life introduced features of another order into his experience, feeding that general culture in literature, history, and the fine arts which came to distinguish him quite as much as his many-sided medical attainments. Welch remained in Vienna until the Christmas holidays, when he turned his steps for a second time toward Strassburg, spending a few days *en route* in Würzburg with Rindfleisch and his assistant Ziegler.

The second pilgrimage to Strassburg was the carrying out of a plan formed by Welch at the outset of his European study. He recognized in von Recklinghausen the outstanding representative of the Virchow school of pathologists, and his attendance upon the autopsies at the Pathological Institute, while he was a pupil of Waldeyer, had stimulated his zeal to work directly

under the master. This desire could not be at once appeased, for as we have seen, Welch lacked the preparation in normal histology which he regarded as essential. But now that this requisite was supplied and the work with Ludwig and with Cohnheim had provided a fair foundation for further building, Welch offered himself to von Recklinghausen and was accepted.

As another indication of the commotion which Cohnheim's investigations were making in the placid waters of Virchowian pathology, it may be cited that once von Recklinghausen learned Welch was fresh from the laboratory of that heretical pathologist, he chose as a theme for his special study the inflammation of the cornea of the frog induced by various caustic chemicals. The essential point of difference involved in the contentions of the Virchow and the Cohnheim schools related to the origin of the pus cell. Was it derived by multiplication from the fixed tissue cells, or was it a leukocyte emigrated from the blood? The controversy has long been settled in favor of the latter, or Cohnheim view; but in January, 1878, and for many years thereafter it raged with vigor and even bitterness. The cornea was selected because of its condition of non-vascularity. The novel experimental procedure employed at von Recklinghausen's suggestion by Welch was the excision of the cornea after the injury and immersion in the aqueous humor of the frog or bullock, and observation continued over long hours under the microscope. That cells moved toward the injured spot in the non-vascular specimen was shown beyond peradventure and even that they divided; what was simpler, therefore, than to conclude that migration is not dependent on the presence of the blood, and hence pus cells are not translated leukocytes? This inference, however, was not drawn by Welch, who recognized that the reasoning is fallacious. The full explanation of the observed phenomena waited on later studies and even on recent discoveries. We now know that connective tissue cells, among which the corneal corpuscles and the cells of Descemet's membrane are classed, are motile; and as cells endowed with movement they are attracted by certain stimuli called "chemical," such for example as arise in tissue constituents acted on by chemicals and in other ways. Moreover, as we now know, these fixed tissue cells readily multiply *in vitro,* and thus we arrive at the conclusion that the chemically altered spot in the cornea attracts towards itself neighboring uninjured, motile corneal and other cells, that these cells aggregate about the site of the injury and even multiply there, and thus give what may be called a spurious appearance of a collection of pus cells. For it should be remembered that we are dealing with a period in which tissues were not yet being stained with certain nuclear and other dyes that bring into view brilliant and subtle distinctions of cellular structure; but that the "inflamed" cornea was merely silvered in order that the cell

outlines might become perceptible, and, if desired, was subsequently stained with haematoxylin to show the nuclei.

This practice of putting to the test new discoveries and contentions even under somewhat hostile circumstances was not a poor discipline for the future teacher of pathology in the United States. The experience may indeed be regarded as having brought into play under favoring circumstances a critical faculty inclined perhaps to leniency, while it held up as it were to the mirror of his perceptions in a somewhat summary fashion the facts of the ultimate and ineradicable residue of personal bias in all men, no matter how great. In the long future years during which Welch dispensed knowledge and, what is rarer, wisdom at The Johns Hopkins University and elsewhere, he came as near as it is perhaps possible for a mere mortal to come, in escaping the blemish of preconception and prejudice and in preserving and presenting the ideal of the open though balanced mind.

But it would be wrong to infer that there was not also a constructive side to this period with von Recklinghausen. The pathologist was great in attainments, and stimulating as a teacher. He engaged Welch in discussion of many topics in pathology which were current at the time. One of these related to the origin of tumors, regarding which von Recklinghausen was endeavoring to formulate his views along lines which have since become more familiar. He inclined to the conception that a kind of fertilization, whether by conjugation or otherwise, took place among the cells, leading to the unconstrained multiplication characteristic of cancer and other tumors, in consequence of which irregularities of division arose that were the striking obvious signs of the cellular abnormality. Welch always retained an admiration for von Recklinghausen as a great pathological anatomist.

The first European adventure was now approaching its conclusion and was to receive a suitable ending by a first visit to Paris and a second to London. It is far simpler and more satisfying perhaps to leave to the imagination the picture of Welch in the great and beautiful French city with its wealth of present interests and of historic backgrounds everywhere insistent. The fact may, however, be mentioned that time was found during the two or three weeks of his stay to hear Ranvier, whom he admired greatly and whose book on histology had been his guide, and to visit the main hospitals. In London he heard Lister lecture at Kings College Hospital, and shared in the prevailing excitement which arose from Lister's daring surgical exploit of opening the knee joint. The next was the final act, namely taking ship at Liverpool for the United States.

The arrival in New York in the spring of 1878 brought forward a question which could be permitted to remain in the background in Europe, but now

must be answered. Undoubtedly Welch possessed wares garnered at home and abroad—but to what market were they to be taken? That the practice of medicine would be a necessary corollary to any other ambition he might indulge, seemed never to have been doubted by him. Where else were the necessary pecuniary rewards to come from? There seemed no alternative but to decide immediately whether he should choose New York or Norfolk as a field of operations. In Norfolk his father was still busily, if not very remuneratively, engaged in country practice, in the course of which he dispensed much kindness and, according to tradition, worldly wisdom with his medicines. It strikes one now as very odd that Welch should have hesitated at this juncture in his choice of New York or of Norfolk. The anomaly can best perhaps be explained by taking into account his remarkable modesty. It seems almost impossible of belief that one so gifted and innately so forceful should not be aware in some degree of the part which nature had cast for him. But whatever pangs of indecision he may have suffered were about to be allayed by destiny in the form of Doctor Goldthwaite.

Success in attaining interneships in hospital or appointments to the medical services of the Army and Navy was still determined by the results of competitive examination. To meet this situation the private "quiz" had arisen and operated about the medical schools and upon the aspiring medical students. The practice has now been generally discredited and discontinued; but in 1878 and for many years afterwards the "quiz" if successful was a reputable and a relatively highly remunerative affair. The "quiz" masters adapted the cramming process to the peculiarities and foibles of the individual examiners, which they sedulously set themselves to learn. It is now obvious that on joining Goldthwaite's "quiz" Welch never regarded the undertaking as more than a stop-gap. It should not now surprise us to learn that the combination of Goldthwaite and Welch proved irresistible and soon outdistanced all competitors; it could choose the most promising students and its product gained the prize interneships. Welch endured the "quiz" three years, after which and while it was at the height of its popularity he withdrew. The reason is sufficiently apparent now, but then with the system intrenched as it were, it required insight and force to convict it of its salient defect, namely that of being a bad method, viewed from the standpoint of educational discipline.

The "quiz" was, after all, merely an incident, the main import of which was that it ensured the necessary income, while leaving much of Welch's time for more engrossing pursuits. As a matter of fact, Welch had offered himself for practice and occupied at this period rooms with his friend Dennis at 21 East Twenty-first Street, adjacent to the office of his old teacher, Alonzo

Clark, who would refer occasional patients to the young men. The volume of Welch's practice never became embarrassing, so that he was still free to follow his major bent, which was to teach pathology.

The outlook for pathology in New York in 1878 was not bright. The extent and the nature of the teaching had not changed materially since Welch was a student in the medical college. New York was as much cut off from the strong currents moving in Germany and France along the three main lines of pathology—pathological anatomy, experimental pathology and bacteriology—as if Europe and America were not connected by a common intellectual bond. Welch was, indeed, destined to play the principal part in breaking the barrier of American isolation, but at this time when he was offered by Dr. Francis Delafield the lectures on pathology during the summer semester at the College of Physicians and Surgeons, he declined the opportunity, because it carried with it no chance to set up a laboratory, which was the one essential of Welch's aspiration. But what was denied him at the College of Physicians and Surgeons, was about to be put before him at Bellevue Hospital Medical College. This rival institution proposed to build two small rooms over a hallway, which, added to another room, Welch could turn into a laboratory.

The invitation was accepted at once, and Welch made his first break with the established traditions in New York. For this was the heyday of schism in medical schools and feelings ran high among the several faculties, and the position of his alma mater, the "P. and S.," in the medical hierarchy of the time was regarded as supreme. Certain of Welch's friends were not happy over his choice and even considered that he had made "the mistake of his life." Perhaps there were disadvantages of a kind in a Bellevue connection as contrasted with the far greater prominence of the "P. and S." establishment, but whatever they may have been in general, they were more than compensated for by the laboratory and its proximity to the deadhouse at Bellevue. The new pathological laboratory became at once an influential factor in the medical educational system of New York, and students came there to Welch from all three medical schools.

The leaven worked rapidly, for very soon the College of Physicians and Surgeons awoke to the growing demands of pathology. A part of the faculty had not ceased to view Welch's defection regretfully, and now that the Alumni Association proposed to set up, under Delafield's general direction, a pathological laboratory, its direct conduct was offered to Welch. The invitation was not accepted, but in declining it Welch characteristically, as we should now say, put in another strong stroke for pathology, as the

following letter, which also explains his sense of obligation to the Bellevue College, illustrates:

"New York, October 9, 1878.

"My dear Doctor Prudden:

"A few days ago Professor Delafield told me of the following scheme which the Twenty-third Street Medical College has on foot. A laboratory for histology and pathology is to be established in connection with the college, by means of a fund given for the purpose by the alumni. It is to be taken hold of in an earnest way, for the laboratory is to hold the same relation to the college as the dissecting room does; that is, each student will be obliged during some part of his course to work there before he can take his degree. Doctor Delafield proposed that I should go in as his first assistant and have charge of the histological department, and assist him as much as necessary in the pathological part. The salary was to be five hundred dollars for the first year, and I believe more subsequently. I was naturally delighted with the offer and thought it to be just what I wanted, an opportunity to work in the direction where I had studied most. Upon speaking of the matter, before coming to a decision, with some of the professors at Bellevue, I find that they are reluctant to have me leave there, and even represent it as not the square thing for me to go at present. The latter motive especially has influenced me to stay, as I do not believe it pays to do anything unfair. I feel as if I were relinquishing a great opportunity and do not see any equivalent for it at present at Bellevue, but as there is a feeling there that it would not be right for me to leave, I am going to stay and have so told Doctor Delafield. He asked me if I knew anyone who would be competent for the position, saying there are a great many in New York who think they are, but few who really are.

"I immediately suggested your name and he at once seemed pleased, and deputed me to hunt you up by a letter and communicate the proposal to you. I really think the offer an advantageous one, in fact presenting an opportunity better than any other I know for one with the tastes and resolution which you have formed. I do not know anyone who could do greater justice to the work there than yourself, and it seems to me to present great possibilities for the future. Personally I should like to have you here in New York, for I fear I am going to rust out unless I have someone to talk with and help me on concerning the subject in which we are both interested.

"I do not know whether this letter will even reach you. Will you at least drop me a postal card when you receive it, for if I do not hear from you in a day or two, I am going to resort to further means of hunting you up. I should also like to know how you decide."

With Prudden's installation at the College of Physicians and Surgeons, pathology had come to be recognized as a subject of independent merit and proportions, to be taught practically, by two of the leading medical schools of the country. Prudden was a pupil of Arnold of Heidelberg, under whom he had mastered a precise and delicate pathological histological technique; and later at Vienna, in part alongside Welch, he had imbibed the essence of

the teaching of morbid anatomy. Thus and at last in the persons of Welch and Prudden, American pathology had come to be united with the best sources of its inspiration abroad; and from now on the main task was to widen and diversify this stream in the accomplishment of which purpose Welch's career stands forth preeminent.

Welch was now fairly launched on a career in pathology, but his struggles were not all over. The serious question all along was the economic one. Pathology was not a remunerative profession at the time. The fees from students taking the course were small, the occasional windfall from a private autopsy was precarious. There were, of course, the fees for the examination of specimens for physicians and surgeons, and the possibility existed then as now of turning this practice into considerable income. But Welch shrank from an enterprise which would consume his time and yield no corresponding scientific return. After the abandonment of the "quiz" a way out was found in that he became first, assistant demonstrator and later demonstrator of anatomy at Bellevue, both paid positions; and then he offered himself for practice. That his neighbor and teacher, Alonzo Clark, sent him patients, we have seen; it remains, however, to add that the now elderly gentleman formed the habit of referring his surgical cases to Welch.

This was also the period of Welch's association with the elder Flint, then at the zenith of his prominent career as teacher and consultant. He was professor of medicine and the leading spirit at the Bellevue College, and a great social and professional figure in New York. Flint was engaged at the time in bringing out a new edition of his Practice of Medicine and asked Welch to revise the sections on pathology. Welch "jumped at the chance" and was given a free hand, except for two or three topics which were reserved for his son, Austin Flint, Jr. Anyone today reading Flint's Practice of Medicine will recognize the superior merit of the introductory chapters on general pathology and the sections on the pathology of the special diseases there given, the whole amounting to a textbook on pathology.

It was Flint's habit to precede his lectures on "practice" with a sketch of the pathology of the subject to be presented. Pretty soon these preliminary lectures were turned over to Welch, who lost apparently no opportunity to increase the prestige of pathology in the curriculum. Thus he introduced the class autopsy, which he held once a week in a room filled with students. Notwithstanding these clear indications of Welch's unmistakable bent and trend, Flint assumed all along that Welch would become a consultant and succeed him in the professorship of medicine. Indeed, he took steps by having the faculty elect Welch to the clinical professorship of medicine to make his succession certain. Welch on learning of this action brought about its revocation, first because of the injustice which he considered done

to the then incumbent of the clinical professorship, and next because of his great interest in pathology.

Looking backward it can be perceived that these many shifts and activities were incidental to the laboratory of pathology. First the "quiz," second the demonstratorship in anatomy, third practice—each in turn supplied the necessary income in money to cover living expenses. Each in turn was followed with energy and success, and abandoned as soon as the needed income was available from a source less exacting of the precious time to devote to autopsies and laboratory, or freer from considerations violating fundamental beliefs in sound educational method. Pretty soon his skill in performing autopsies and his eagerness for pathological material brought to Welch privileges from the Babies' Hospital and also from the coroner, with whom Welch stipulated that he was not to testify in court. It is of passing interest to note that none of these were paid positions, but that at this time a small stipend came to Welch from the registrarship of the Woman's Hospital, which position he then held, and where he made the autopsies and studied the specimens, mainly ovarian tumors, removed at operations.

Half a dozen years had passed since his return from the European studies, and Welch had intrenched himself deeply in the medical life of New York. He was the outstanding pathologist and representative of the new pathology, and there came to him to study or to work, the alert and ambitious among the medical students and young practitioners of the day. These years had contained not a little that was pleasant, but much also that was discouraging to one who possessed a deeper feeling for and a wider outlook on medical education. It is true that improvements were creeping into the medical curriculum; the annual sessions at this time were indeed extended from five to seven months and more emphasis was being placed on the laboratory and less on the purely didactic form of instruction; but progress was painfully slow and medical teaching lagged sadly behind that of continental schools. However, a turn in medical affairs was impending which was to transform within a few years the entire educational structure.

The Johns Hopkins Hospital was approaching completion and the thoughts of President Gilman and the boards of trustees of The Johns Hopkins University and Hospital were turning toward the establishment of the medical school provided for in the splendid gift of Johns Hopkins. A leader to guide the new enterprise was sought, and it is quite clear from Salomonsen's statement that President Gilman asked Cohnheim's advice, and doubtless the advice of others at home and abroad. Welch seems to have been the unanimous first choice. Dr. John S. Billings, so intimately associated with the planning of the Hospital, visited Welch at Bellevue, doubtless in this connection, and Welch was invited to become professor of pathology in the

University and pathologist to the Hospital. The great opportunity for which he had waited and labored and toward which his dearest aspirations turned had now come to Welch.

There was no doubt in Welch's mind that the Baltimore venture was full of promise and should be embraced. In the meantime, however, his position in New York had become so important, it is not surprising that a strong effort should be made to retain him. At first Welch's friends failed to see how anyone could exchange the professional opportunities of New York for those of provincial Baltimore. The incidents of the transition from the "P. and S." to Bellevue College were recalled in this almost grotesque adventure. But there was no doubting Welch's seriousness, and hence steps were taken at once to thwart his plans. The fear of losing Welch was the immediate incentive which brought the Carnegie Laboratory into being. Doctor Dennis, an intimate friend and admirer of Welch, obtained a sum of $50,000 from Mr. Carnegie for the erection of the laboratory. But there is reason to believe that Doctor Dennis had in mind, besides the purpose of anchoring Welch to New York, the setting up of the laboratory as an integral part of the medical educational system of the United States.

But the Carnegie Laboratory was, after all, a building only, with such simple and necessary equipment as was demanded by the work of the period in pathological anatomy and in bacteriology, just at its beginnings in the United States. There was no provision made for a paid staff, and there were no funds for daily running expenses. Just what might have happened had these essentials been provided, it is impossible to say, for undoubtedly with the erection of the Carnegie Laboratory the outlook for pathology in New York had suddenly brightened. But the vista opened before Welch's eyes at Baltimore was extremely fascinating, and strong as now may have been the motive to remain in New York, the unprecedented position which The Johns Hopkins University, at the zenith of its great reputation, had attained in fostering science, was a lure not to be resisted. Everything about the opportunity at Baltimore attracted Welch, who wished above all to be free to develop pathology in a manner approaching that which he had come to know in Germany; and fortunately for the history of medical progress in the United States, he yielded to manifest destiny, although in doing so he was breaking with old and devoted friendships and turning his back on a position in New York never yet attained by a devotee of a laboratory branch of medical science.

In the six years which had elapsed since Welch had returned from his first period of foreign study, the center of interest had begun to shift from the purely cellular pathology of Virchow to that of the microbiology of Pasteur and Koch, in which the bacteria appear as the direct incitants of

disease. Here at last, it seemed, were to be discovered the agencies whose actions are the immediate excitants of those organic and cellular changes or lesions constituting the visible reactions of the tissues to the injurious influences taking place in the course of the phenomenal process designated disease. This new direction of development was highly sympathetic to Welch who had been a spectator at Breslau, at the prologue to this swiftly moving drama, when Koch visited Cohn and Cohnheim in order to exhibit his anthrax cultures. Welch desired first-hand knowledge of and experience in the new field, and as The Johns Hopkins Hospital was still in process of construction, we find him setting out again, in the summer of 1884, for Germany.

The new goal was Koch in Berlin. But an interview with him at the *Reichsgesundheitsamt* led Welch on Koch's advice to go to Munich for the autumn to study under Frobenius in Bollinger's laboratory, preparatory to work under the master at a later date. It appears that Koch was soon to leave the *Gesundheitsamt* to be established in the Hygienic Institute under university auspices, near the Alexanderplatz. Frobenius proved a slavish teacher of Koch's technique, which he communicated to his pupils along with such comments as he had gleaned from conversations with Koch. Still, it was a beginning in the new field, and the relatively unfavorable conditions led again, as once before at Leipzig, to connections of great future importance. Here Welch made the acquaintance of Hans Buchner and also of Escherich, Lehmann, Neumann, Celli and others who had come to follow the first course in bacteriology given in a university. Especially with Celli, who had already begun his studies of the malarial parasite, he formed an intimate and enduring friendship. Welch followed at this time Kitt's demonstrations in animal pathology in the veterinary school and worked in von Pettenkofer's institute of hygiene with the master himself and his assistant, Renk. All was grist that came to Welch's mill for in after years the former experience was to bear fruit in his important studies on the swine diseases and the close interest in Theobald Smith's work, and the latter to contribute to that comprehensive grasp of the subject of hygiene now being embodied in the new school of public health at Baltimore, his latest and highly remarkable creation.

Welch did not go at once from Munich to Berlin but acting still under Koch's direction went in January to Göttingen to work under Flügge, who was professor of hygiene and much closer to Koch and being advised by him. This period was in every way advantageous, as Flügge was a far more inspiring and systematic teacher than Frobenius, and his influence proved lasting and valuable. Here again he became acquainted with fellow students gathered in Göttingen for the same purpose, who afterward became distinguished bacteriologists, such as MacFadyen, Nicolaier and Wyssokowitch.

The final touch in Welch's preparation in the new bacteriology was administered by Koch himself—a vivid teacher—who himself conducted the courses, which he had previously organized for military doctors and which had such far-reaching consequences. Fortune again threw Welch and Prudden together, for the latter who had taken over the laboratory at the College of Physicians and Surgeons established by the Alumni Association, was now in Berlin also seeking training in the new science of bacteriology. The course, which was of a few weeks' duration, consisted essentially in the practice of isolating bacterial species by means of Koch's solid culture technique or by passage of them through the animal body, in order to effect separation of virulent from other varieties, and in the consideration of form, staining reactions and physiological and pathogenic propensities. The climax of the course was the study of the bacillus inducing Asiatic cholera. At this period not a little apprehension existed that Europe might again be visited by that scourge. The disease had raged in India and Egypt and the year before had gained a foothold in Europe in certain Mediterranean ports—hence the desirability of mobilizing a small army of trained bacteriologists to combat that plague should it threaten in earnest. Koch himself was deeply impressed with the danger; indeed so appalling did he consider the calamity of an epidemic outbreak of cholera in Europe that he did not trust himself to bring with him to Berlin cultures of the bacillus isolated in India or Egypt, but preferred to destroy them lest by inadvertence they should gain access to food or water. Now, however, that cholera actually existed on European soil and danger of its spread was imminent, the circumstances not only justified but compelled instruction in its bacteriological detection, and for this purpose he went to Toulon to secure anew fresh cultures.

But Koch admonished his pupils not to carry away from the laboratory living cultures of the cholera bacillus. This piece of sound advice, following the end of the course at a *Kneipe* held in honor of the *Geheimrath* led to an amusing incident. The next morning Welch and Prudden met accidentally at an early hour on one of the bridges spanning the Spree, each, as it seems, seeking secrecy. It developed that each had gone to an apothecary's shop and purchased concentrated sulphuric acid (or was it a saturated solution of corrosive sublimate?), which they had poured over the surface of tube cultures of the cholera bacillus originally intended to be taken with them to America and that they now proceeded to drop into the Spree. They expected, of course, to see the tubes sink immediately out of sight, instead of which they had the momentary disquieting experience of observing them bobbing up and down as they slowly floated down stream. The guilty pair hurried away, just, it is said, as a large *Schutzmann* appeared on the scene.

An impression of Koch and the influence of his instruction at the time is given by Prudden:

"Thus the course in the study of bacteria, of one month's duration, in Koch's laboratory was brought to an end, and the writer cannot refrain from remarking that the calm, judicial mind of Doctor Koch—the master worker in his field—his marvelous skill and patience as an experimenter, his wide range of knowledge and his modest, unassuming presentation of his views are all calculated to inspire confidence in the results of his own work, to stimulate his students to personal exertion in this field, and to lend certainty to the already wide-spread hope that ere long through the resources of science we shall be able to cope successfully with those most terrible and fatal enemies of the human race—the acute infectious diseases."[3]

Welch arrived in Baltimore in September, 1885, and there found Councilman at work in pathology. He immediately joined Welch and together they set up a laboratory in a couple of rooms on the top floor of the biological laboratory, offered them by Newell Martin. The two-storied building at the Hospital, designed as a deadhouse, was hurriedly completed and converted into a pathological laboratory. This arrangement was intended merely as a stop-gap in the emergency and until the buildings for the medical school, then expected soon to be organized and constructed, could be provided. As it happened, the consummation of the medical school project was long delayed and the small quarters intended merely for a deadhouse and its essential adjuncts, became the permanent home of the pathological department, as well as indeed the actual physical foundation on which were later erected two additional stories to house temporarily the departments of anatomy and pharmacology of the medical school. When in a few years those two departments secured elsewhere other and more adequate quarters, the pathological department spread through all the vacated space, which, in view of its expanding activities, was sorely needed.

The history of the pathological department of The Johns Hopkins University and Hospital, that was to play so profound a part in the educational progress of the United States, dates from 1886 at which time Welch began to exert the influence which peculiarly distinguishes his career from that of his predecessors in this country and elsewhere. Hitherto there had been abroad departments or institutes of pathology by which was usually meant pathological anatomy and histology, and sometimes experimental pathology or bacteriology. Welch's receptive and constructive mind responded powerfully to the training he received in these several branches of science, so that he became master not of one branch only, but of all. Thus it came about

[3] Prudden, T. M., on Koch's method of studying bacteria. Report to the Connecticut State Board of Health for 1885, pages 225-226.

that in setting up the pathological department in Baltimore he inevitably, and doubtless unconsciously, employed all these resources of knowledge and progress, and in so doing inaugurated a new era. Hereafter pathology, at least in the United States, could hope to develop symmetrically, utilizing for its advancement the materials and methods not of one branch of the science merely but of all branches, main and collateral, which being directed toward it might suffice to render a pathological phenomenon more comprehensible or afford the solution of a problem in medicine otherwise elusive.

The purpose when Welch was called to Baltimore was to proceed immediately with the selection not only of the staff for The Johns Hopkins Hospital but of the faculty of the medical school as well. Unforeseen economic conditions postponed the realization of the latter design; but as the hospital's resources had not been reduced by the unhappy accident which crippled the finances of the University, a clinical faculty was brought together. Welch's part in the choosing in 1888 and 1889 of Doctors Osler, Halsted, and Kelly was conspicuous and decisive, just as later with the opening of the medical school in 1893 it was his acquaintance with their work and his unerring judgment of them as men which added to the distinguished trio Doctors Mall, Howell, and Abel in the completion of the first major faculty of The Johns Hopkins Medical School. But Welch did not await the opening of the hospital or the consummation of the plan for a medical school to start active teaching and to get under way problems of research. Work was begun in an informal manner with medical graduates and advanced students in biology, and the quality of the material and the effects of Welch's influence can be gathered from the list of names of the first group to assemble under him. In it were Councilman, Mall, Nuttall, Abbott, and Bolton. Before long this informal plan was superseded by systematic courses in pathology, including pathological histology and bacteriology, and university lectures. These were not permitted, however, to degenerate merely into short, superficial series of demonstrations, lectures and exercises; but they always carried with them the freshness of the unexpected from the wide variety of activities going on in the laboratory and also the incentive to individual endeavor when any new point arose exciting to someone's curiosity.

With the founding of the medical school along the lines now familiar but none the less at that time novel to the point of revolution, the break with the past was complete and the aspiration which for so long kept Welch a student and a teacher was to be realized, and in full measure. Henceforth medical education in the United States was to be on a basis equalling at least the best continental model. The faculty of the medical school was to lose its local and provincial character and to be representative of the most potent forces in the country, while the young men and women seeking to enter

medicine were to possess a foundation training in physical, chemical and biological science and to be equipped so as to follow in the original tongues the greater scientific medical literatures of the French and the Germans. This was revolution indeed; but like all of Welch's reforming acts it was a programme of construction not of destruction. Welch's career stands forth supreme as a force for advancement, whether in research, education, hospital organization or public health; but one searches in vain his writings or the records of his public utterances for evidence of vehemence or denunciation. His was too understanding and sympathetic a spirit to judge men and things harshly for faults and shortcomings, the origins of which were sunk deeply into a past whose circumstances were so unlike those of the present. He made use rather of the gentler art of persuasion by exposition and example, leavening now here and now there, until the cumulative power of the intellectual and social ferment induced became so great as to be irresistible, and the whole mass was moved forward.

From the outset Welch was the central figure and guiding genius of the medical group. The pathological laboratory became an active centre of research and teaching. Welch's life quickly became filled to overflowing. He conducted investigations of his own, launched others on productive themes, and saw to it that the invaluable pathological specimens from the surgeons and gynecologists were made use of to advance knowledge and train a generation of special pathologists in those important fields. He lectured on special and general subjects in pathology and bacteriology in a manner so learned and fascinating as to produce impressions not only immediately stimulating to his auditors in high degree but of enduring permanence. The suggestiveness of these lectures led frequently to new undertakings in research. Moreover, the autopsies he performed, his demonstrations of gross pathological specimens and his teachings at the microscope stand out as unsurpassable models. He entered also into the medical activities of Baltimore and of the State of Maryland, and became a great influence for betterment in private and public medicine. He was, of course, the first dean of the medical school and guided the policy of the new institution into the productive channels that have so eminently distinguished it. His many talents were therefore called into constant play, and heavily overtaxed as they must often have been there was never indication of exhaustion. When occasion arose he was always ready, eager and able for a new advance, as witness his leading part in the recent development of the full-time system, so-called, in the clinical branches of medical teaching, in establishing a model school of public health and hygiene, and in serving on scientific and philanthropic boards possessing great wealth, for promoting scientific

discovery and for carrying the benefits of medical knowledge to the furthest parts of the world.

The achievements of Welch as an investigator, teacher and reformer in medicine are so many and varied that it is not possible to do justice to them in detail in a mere sketch. This is particularly true of that part of his career covered by the Baltimore and Johns Hopkins period. These three noble volumes of his collected papers and addresses are the best expression of his many-sided activities. And yet precious as they are, they afford no real insight into Welch's almost flawless personality, the depth of his friendship and wealth of his kindness, his faculty of intense application and devotion to the work in hand whether in laboratory or in public interest, his commanding influence and guiding spirit over the work of his associates and many pupils, the stimulating wholesomeness of his public activities, and his rarely unselfish and tolerant nature which led him to shower his great gifts prodigally and far and wide. The recipient of almost every honor in the gift of his colleagues, he fortunately, in time, saw the return of his labors, increased many-fold, enriching science through progress made in education, in deeds performed and discoveries by the men and institutions over whose destinies he had presided. And lastly these volumes fail to show us still another side of Welch's accomplishments as remarkable almost as those of the science we so love to laud in him. I refer to his culture outside the realm of medicine in the field of literature, in which he possesses an almost unerring taste for the best in poetry and prose, and in the domain of the fine arts. His mind is indeed stored with the beautiful creations of other men's minds from ancient times to our own day. It is to all these remarkable qualities, innate and acquired, united in one man, that we owe that thrice rare personality William Henry Welch, master in medicine and beloved of men.

SIMON FLEXNER.