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THE  
TRAINING OF THE SURGEON

THE ANNUAL ADDRESS IN MEDICINE  
DELIVERED AT YALE UNIVERSITY  
JUNE 27, 1904

BY  
WILLIAM STEWART HALSTED, M.D., F.R.C.S. (Hon.)



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## THE TRAINING OF THE SURGEON.<sup>1</sup>

BY WILLIAM STEWART HALSTED,

*Professor of Surgery, The Johns Hopkins University.*

Pain, hemorrhage, infection, the three great evils which [267] had always embittered the practice of surgery and checked its progress, were, in a moment, in a quarter of a century (1846-1873) robbed of their terrors.<sup>2</sup> A new era had dawned; and in the thirty years which have elapsed since the graduation of the class of 1874 from Yale, probably more has been accomplished to place surgery on a truly scientific basis than in all the centuries which had preceded this wondrous period. The *macula levis notæ* clung to surgeons the world over until the beginning of the nineteenth century, although distinguished and scholarly men, as well as charlatans and barbers, have practiced the art in almost unbroken succession from the time of Hippocrates (460-375 B. C.) to the present day. A warning for all time against satisfaction with present achievement and blindness to the possibilities of future development is the imperishable prophecy of the famous French surgeon, Baron Boyer, who over a hundred years ago declared that surgery had then reached almost, if not actually, the highest degree of perfection of which it was capable.<sup>3</sup>

<sup>1</sup> The Annual Address in Medicine delivered at Yale University, June 27, 1904.

<sup>2</sup> Verhandlungen der deutschen Ges. f. Chirurgie, 1896, von Esmarch.

<sup>3</sup> Could Boyer, we ask, have been satisfied with the status of surgery when anæsthesia was undiscovered, when hemorrhage was awkwardly and insufficiently controlled, when infection of wounds was not understood and could not be prevented? And yet I might quote from the writings of distinguished men of our time to show that even to-day some think that surgery is almost complete. Anæsthesia, one of the greatest blessings, is at the same time one of our greatest reproaches, hemorrhage is still awkwardly checked, and of surgical infection once started we

[267] Tempted to belittle by comparisons the performances of our progenitors, we should remember that the condition of surgery has at all times reflected the knowledge and thought of the ablest minds in the profession. We may well recall the admonition so gently given by the highly talented von Volkmann, who was also a popular poet, writing under the pseudonym of Richard Leander,

“Hoch aufhebt Schnee-schimmernd das Haupt in die Wolken  
die Jungfrau,  
Aber sie deckt mit dem Fuss ein unendliches Land.”

Surgery, like other branches of the healing art, has followed in its progress zigzag paths, often difficult to trace. Now it has seemed to advance by orderly steps or through the influence of some master mind even by bounds; again it has stumbled apparently only from error to error, or has [268] even receded; often there has appeared some invention or discovery for which the time was not ripe and which had to await for its fruitful application or perhaps its rediscovery a more favorable period, it might be centuries later.

There is a most intimate interdependence of physiology, pathology and surgery. Without progress in physiology and pathology, surgery could advance but little, and surgery has paid this debt by contributing much to the knowledge of the pathologist and physiologist, never more than at the present time. Harvey's immortal discovery marks an epoch for surgery, as it does for all medicine, for without knowledge of the circulation of the blood only the most primitive kind of surgery is thinkable. And yet there is abundant proof that the ligation of vessels, with the introduction of which Ambrose Paré (1517-90) has until recently been accredited,

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have often little control and then mainly by means of the knife. We have reason to hope that the day will come when hemorrhage will be controlled by a quicker procedure than the awkward, time-consuming ligature; when infections will be controlled by specific products of the laboratory; and when pain will be prevented by a drug which will have an affinity only for the definite sensory cells which it is desirable it should affect. The first of these may be last and the last first. Let us trust that it may, as Gross expresses it, “be a long time before the laws of this department of the healing art will be as immutable as those of the Medes and Persians.”

“Literature,” said Horace Walpole, “has many revolutions; if an author could rise from the dead after a hundred years what would be his surprise at the adventures of his work.” Gross recognized, not altogether without regret, that this was particularly true of scientific works however erudite they may be. “Few survive their authors.”<sup>4</sup>

<sup>4</sup>Gross. Autobiography, Vol. I, p. 140.

was known to the school of Alexandria; carried, it is said, [268] to Rome by Euelpistus, it is mentioned by nearly all surgical writers of importance from Celsus to the Renaissance. The brilliant Fallopius (1523-62), Paré's contemporary, alas a very short-lived one, wrote much about the use of the ligature for the arrest of hemorrhage. Nevertheless, until Harvey demonstrated (1628) the true course of the blood, the principles underlying the control of bleeding by the ligature could not be understood, and surgeons studiously avoided operations which entailed hemorrhage and necessitated its control.

We can hardly understand in these days that surgeons who were at the same time anatomists and physiologists could have accepted for so many centuries, almost without remonstrance, Galen's views. Our inability to comprehend their state of mind with reference to this problem illustrates particularly well the difficulty experienced when we attempt to transport ourselves to other times, to obtain the point of view which subjugated our forefathers of centuries ago. It is now, as it was then and as it may ever be; conceptions from the past blind us to facts which almost slap us in the face. The blood which spurted from the divided artery was believed to come not from the left heart, but in some mysterious and indirect way from the veins, in which it was supposed to flow and ebb to and from the right heart. Harvey knew nothing of the paths by which the arterial and venous systems communicate, and his discovery was not made complete until Malpighi in 1661 demonstrated by the microscope the capillaries.

How bewildering hemorrhage must have been when a wound suddenly filled with blood from a source unknown, and when sometimes, with little bleeding, a patient suddenly died from aspiration of air into the veins! What more natural than to pack quickly the wound, as Heliodorus and others were wont to do, with compresses of lint or sponge, to ligate large masses of tissue by circumvection, to draw the bleeding edges of a wound tightly together by stitches, as is still sometimes done, or to sear the bleeding surfaces with the cautery or with boiling oil! Imagine the terror and

[268] suffering of the patient, the desperation and haste of the surgeon, conditions not suited to the tranquil pursuit of physiological knowledge.

In all times, even to the present day, the surgeon's chief concern during an operation has been the management of the blood vessels. The fear of death on the table from hemorrhage has deterred many a charlatan and incompetent surgeon from performing otherwise perilous operations. The care exercised in the control of hemorrhage may constitute the chief difference between a rapid and a slow operator. This was eminently the case in the days within my experience when two or three artery clamps were considered abundant for operations which now require one or even two hundred.

The five things declared by Paré, usually designated as the father of French surgery, as proper to the duty of a surgeon may serve to indicate how restricted was the field of surgery before the course travelled by the blood was determined:

1. To take away that which is superfluous, as in amputations.
2. To restore to their places such things as are displaced, as in hernias.
3. To separate those things which are joined together, as in parts rendered adherent by burns.
4. To join parts which are separated, as in stitching up a wound.
5. To supply the defects of nature, as in setting an eye, an ear, a nose, or one or more teeth; filling up the hollowness of a defective palate with a gold or silver plate.

The studies of Hunter, born just one hundred years after Harvey published (1628) his demonstration of the circulation of the blood, and about seventy years after Malpighi discovered the capillaries, on the healing of wounds, on inflammation, on the ligation of arteries, were made possible by the discoveries of these great investigators. John Hunter's (1728-1793) name is eclipsed by that of no other surgeon, and for the fame of his contributions, particularly to biology and physiology, an inextinguishable lamp will forever burn.

Let us remain with him, if only for a moment, for he is an [268] inspiration and a teacher for us all, as great perhaps for his time as the world has seen or will ever see again.

How fascinating to follow the groping in the dark and the searching for the light of a great mind! How refreshing and what a lesson is his honest doubt! "I am not able under such circumstances," he writes,<sup>5</sup> "decidedly to say which is the best practice, whether to leave the slough to separate, or to make a small opening and allow the blood to escape slowly from the cavity." And again, speaking of that common class of injuries in which the wound communicates externally and the blood has formed a scab over the breach, he says:<sup>6</sup> "But this operation of nature reduces the injury to the state of a mere superficial wound, and the blood which is continued from the scab to the more deeply seated parts, *retaining its living principle* [italics mine], just as the natural parts do at the bottom of a superficial wound, the skin [269] is formed under the scab in the one case as in the other; yet if the scab should either irritate or a part underneath lose its uniting powers, then inflammation and even sometimes sup-  
puration may be produced." Here Hunter recognizes facts which have been fully appreciated only in recent years, that there is a power for good in the blood, that the blood clot has a value and should be undisturbed, and that the dry scab usually desirable is sometimes harmful.

Under the conditions existing until the time of Hunter near the end of the eighteenth century, it was doubtless right that the practising surgeon should have been sharply differentiated in social position and professional standing from the physician proper, the latter being equipped with all the academic knowledge of the time, the former an apprentice of the barber shops. "The reasoning of the army surgeons endured as butter in the sun," wrote Abraham a Gehema in 1690, and the army commanded the services of the best surgeons. Nevertheless, it is often refreshing to find records of sound personal observations in the writings of the old surgeons, who, rude and unlettered though they might be, were

<sup>5</sup> Hunter, Palmer's ed., Vol. III, p. 247.

<sup>6</sup> Op. cit., p. 252.



[269] dealing with realities at a time when the minds of physicians were buried in scholastic subtleties and fruitless speculations. In the German universities, when chairs of surgery were first created, it was considered beneath the dignity of the physician who taught the doctrines of this art actually to practise it. Thus Haller (1708-77) about the middle of the eighteenth century taught, among other things, surgery both in Goettingen and Berne, but never demeaned himself to perform an operation. Billroth,<sup>7</sup> commenting on this arrangement, says: "That Albrecht von Haller in Berne should for many years have lectured on surgery without ever having touched a single human creature with the knife is for us, in these days, hard to comprehend." How different apparently from Haller's was the attitude of mind at that time of John Hunter (1728-93) in England, whose practice yielded a yearly income of six thousand guineas; and yet in spirit perhaps not so different after all, as exemplified by the remark to an assistant, "Well, Lynn, I must go and earn this damn guinea, or I shall be sure to want it to-morrow."

Even in America a little more than a hundred years ago a definite stigma still adhered to the exercise of the surgeon's art. Thus writes the eminent Dr. John Morgan, founder of the Medical Department of the College of Philadelphia, later the University of Pennsylvania, in a letter from London, November 10, 1764, to Dr. Cullen, after a long period of study abroad: "I am now preparing for America to see whether, after fourteen years of devotion to medicine, I can get my living without turning apothecary or practitioner of surgery."<sup>8</sup>

It was not until the year 1800 that the Royal College of Surgeons received its charter, and then only with great difficulty. Parliament had again and again refused to grant a new charter to the disbanded "Company of Surgeons." Lord Thurlow is reported to have said in the House of Lords when the bill had passed the Commons: "There is no more science in surgery than in butchering," and it was only when the Court of Examiners, a body still in existence, decided to

<sup>7</sup> Lehren u. Lernen, p. 45. Wien, 1876.

<sup>8</sup> Packard, *The History of Medicine in the United States*, p. 191.

appeal to the Crown, to King George III, that the charter [269] was ultimately obtained. From the days of the great Hohenstaufen, Frederick II, who in 1231 commanded the teachers at Salernum diligently to cultivate the art of dissection, up to the present time medicine has repeatedly been aided and advanced by the enlightened intervention of kings and rulers. When Maria Theresa brought Gerhard van Swieten from Leyden to Vienna in the face of great opposition from the profession, she laid the foundations of the fame of the medical school of Vienna and she placed to her credit an achievement from which Austria and Germany still profit. In Prussia medicine has enjoyed the support of the Crown without interruption from the time of Frederick I to the present day. The splendid new equipment of the surgical department of the University of Berlin is largely the result of Emperor William II's wisdom and liberality. "A king or a privileged class," writes President Hadley,<sup>9</sup> "ruling in accordance with traditions and trying to act for the interests of the people, will give a much larger measure of real freedom than is possible under a democracy whose members have no respect for the past and no higher aim than their own selfish advancement."

The founding of the Academy of Surgery in Paris, in 1731, has been referred to as the turning stake in the history of surgery, as the starting line of its scientific labors and of its true career, and the French regard the five anatomical demonstrations made a few years before by the surgeon La Peyronie in the College of St. Côme as the inauguration of the new epoch. Von Bergmann reminds us that a *Theatrum Anatomicum* for students of surgery was erected in Berlin in 1713, but this exerted no such wide influence as the Paris Academy. The development of clinical teaching can be traced by unbroken tradition directly to Boerhaave, professor at the University of Leyden in the early part of the eighteenth century, and a teacher of unsurpassed influence and renown. His pupils carried the new methods to Austria, to Germany, to Edinburgh, and their descendants in the faith were the founders of the early medical schools in this

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<sup>9</sup> Arthur T. Hadley, *The Relations between Freedom and Responsibility in the Evolution of Democratic Government*. Chas. Scribner's Sons, 1903.

[269] country. In its influence upon the development of medical teaching the University of Leyden occupies historically the first position.

The relation of surgery to general medicine at the end of the eighteenth century was in Germany much less satisfactory than in Great Britain and in France. Under the teacher of clinical medicine was a surgeon who demonstrated the surgical cases. When Reil was called from Halle to Berlin in 1810 as professor of medicine, he naturally expected that the customary relations would be preserved and that Carl Ferdinand Graefe, a young protégé of Wilhelm v. Humboldt, [270] would operate under his direction. But by a mandate from the throne the independence of Graefe and of surgery was established. Graefe was given a responsible post as army surgeon, and his services in war were of such a high order and so greatly esteemed by the King that an independent surgical clinic was soon established and entrusted to him. The first equipment of this clinic was a very modest one, conforming to the straightened condition of the state's exchequer. Five times in the first nine years of its existence his hospital of ten beds was obliged to seek new quarters, but in 1818 it was located at the site of the present surgical clinic of the University of Berlin. Philipp v. Walther, his illustrious contemporary, gives his impressions of Graefe's clinic, which he visited in 1834: "A remarkable, splendid spectacle, conducted in a dauntless and highly gifted manner is Graefe's clinic in Berlin; we have no prototype of it either in France, England, North Italy or Holland. Its disposition is entirely national, purely German." "What changes have taken place in a single generation," writes von Bergmann,<sup>10</sup> "changes brought about by the same indefatigable activity of the German clinical teachers and by their absolute devotion to their work, the devotion springing from innermost convictions which made it possible for Graefe after fifteen years of clinical toil to win such testimonials from his fellows."

In the year 1876, the year when I first walked the wards of Bellevue Hospital, New York, the dawn of modern surgery

<sup>10</sup> Die Entwicklung des chirurgischen Unterrichts in Preussen. Berlin, 1893.

in America had hardly begun, and it may be of interest to [270] note some of its characteristics at that time. The discovery of ether was not so old as to have obliterated all traces of the old surgical rule, "Cito, tuto, jucunde," but the rapid method of operating was gradually giving place to the safer one. Conservative surgery was made possible by general anæsthesia, as was illustrated particularly well in the exsection of joints and the subperiosteal resection of bone. The discovery of the ophthalmoscope, an invention of incalculable importance, had led to the establishment of the specialized eye surgeon, and it soon proved a great boon to general surgery, leading as it did to the adoption of innumerable specula and mirrors for the examination of hitherto unexplored regions. As a result of a reaction against bleeding and against the reckless waste of blood at operations, there developed a fondness, almost a mania, for bloodless operations, for styptics and the actual cautery, for *écrasement linéaire* (Chassaignac), for galvano-puncture and electrolysis. To the employment of galvano-puncture in the treatment of arterial angiomata is due the introduction by Pravaz of the hypodermic syringe, which it is interesting to note was originally designed solely for the purpose of conveying to these growths a substance (solution of chloride of iron) capable of producing coagulation. This little instrument, destined soon to play a part so useful, so indispensable, entitles its inventor to the lasting gratitude of mankind.

None of these methods for the bloodless division of tissues was destined to supplant the knife, so that surgeons became interested in devising better means for the prevention of loss of blood. In 1873, at the German Congress of Surgeons, in Berlin, von Esmarch gave to the world his method of producing artificial bloodlessness ("die künstliche Blutlehre").<sup>11</sup>

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<sup>11</sup> Verhandlungen der deutschen Ges. f. Chirurgie, 1896. (The Jubilee Congress.)

Von Esmarch is one of the very few surgeons living who, even as a student, can recall the days before anæsthesia. He maintains that he who was not a participant of those times cannot picture to himself the enthusiasm which took possession of every physician, and particularly of the students in the surgical clinic. Whereas before the introduction of ether, the operating rooms were filled with the groans and shrieks of the unfortunate victims, the appalling spectacle causing many students to faint, now, of a sudden, absolute quiet reigns, a stillness almost supernatural, broken

[270] But no truly great and essential progress in fundamental surgical principles had been made since Hunter's time, until the monumental labors of Pasteur opened the vista through which for a time only the eyes of Lister could peer. It is hard to realize that forty years have passed since Lister and Pasteur made to surgery a contribution rivalled only by Harvey's in importance. It was in 1867 that Lister first made known the almost incredible results of his experiments with carbolic acid in the treatment of wounds. The great merit of Lister lies in his clear recognition of the significance of Pasteur's discoveries in revealing the underlying causes of the infection of wounds and in the adoption of measures fitted to prevent and combat such infection. This merit will remain whatever changes may be made in the details of anti-septic and aseptic surgical procedures.

It was not, however, until 1875 that even in Germany

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occasionally by the senseless chattering or joyous singing of the patient.

Familiarity with the use of cocaine in surgery has robbed somewhat the pre-anæsthesia days of their interest to the surgeon. We used to admire and wonder at the courage of the old-day surgeons who could inflict such torture for such small rewards, but we know now that certain operations can be performed with very little pain even without the employment of a local anæsthetic. It is often unnecessary to do more than anæsthetize the skin to perform a very considerable operation, in the neck for example. From cocaine we learned in one year (1885) more about the relative sensitiveness of the various tissues and organs than from all the literature of our forefathers. The skin being anæsthetized and incised, we were surprised to find that the underlying parts were comparatively insensitive to handling and, for the most part, even to cutting. The accidental cutting or crushing of nerves caused the most exquisite pain, and we noticed that the nerve supply of the blood vessels<sup>12</sup> is so abundant that the severing or clamping of even very small bleeding points usually startled a cry of some sort of remonstrance from the patient; and now after many years of experience with cocaine we interpret an unexpected moan as signifying an insult to some small unseen blood vessel or nerve. These facts learned, I say, in one year, perhaps in six months of experimentation with cocaine, were not clearly revealed by all the previous ages of surgery. The explanation undoubtedly lies in the facts that in olden times the first cut through the skin so unnerved the patient and perhaps the surgeon that differentiation was impossible, and that the operation was performed in such haste as to preclude careful observation. I fear that so much practice with cocaine as an anæsthetic has obtunded to some extent our sensitiveness to pain in others. Formerly it taxed one severely to employ cocaine in certain operations which we now perform with equanimity; we are in danger perhaps of acquiring the kind of immunity (it is not indifference) which it seems to me dentists possess or have cultivated to such a high degree. Briefly, then, the story of the surgery of pre-anæsthesia days has become less interesting because it has been robbed of its terrors by the lessons which cocaine has taught us. If the surgeon of the past could only have known what it seems to the modern surgeon he should have known better than all else, namely, the relative sensitiveness of the various tissues, he could hardly have failed to discover methods of producing anæsthesia of the skin. That one could deliberately divide a nerve of the size of the sciatic or ulnar or even the minutest filaments visible without exhausting his ingenuity to find something to deaden the exquisite or agonizing pain seems inconceivable. How blind we are and how blind we ever shall be.

<sup>12</sup> John Hunter recognized the fact that parts richly supplied with blood were much more sensitive than the comparatively bloodless parts.

Listerism obtained a substantial foothold. How I should [270] like to tell the true story of this period in this country and abroad, to do full justice to Lister and his few faithful disciples in the United States and Great Britain, who for nearly twenty years contended with prejudice and parried the almost venomous thrusts of the skeptical and the envious.

Why was Germany the country first to adopt antiseptic [271] surgery? Why did almost every surgeon in every German university eagerly embrace Lister's system almost at the same moment and as soon as it was clearly presented? The answers to these questions are, I believe, to be sought mainly in the character of the scientific and practical training of surgeons in Germany, and it is especially upon the question of the training of surgeons that I wish to dwell in the remainder of this address. What I shall have to say relates not so much to the mere teaching of surgery in the undergraduate curriculum, as to the requirements for the training of those who desire to fit themselves for a career in surgery.

Thirty years ago as I sat upon the benches, often seven hours a day, listening to medical lectures, I was so impressed with the characters and lives of some of my teachers that I believed they represented all that was most advanced in medicine. But a day in Halle, at the clinic of Volkmann, was a revelation to me. There I heard by one of the young assistants at the early morning clinic an impromptu discourse on epithelioma at which I marvelled. At home the whole subject of tumors had been treated of in one lecture, in one hour, in the "tumor lecture." Attending the Congress of German surgeons, which each year takes place at Eastertide in Berlin, I heard the subject of hip joint tuberculosis discussed. One surgeon alone reported on six hundred cases, more or less, some of which he had observed twenty years or longer and most of which he had been able to follow. His methods of observation were new to me; his knowledge was inspiring; I was thrilled by his masterful exposition. Within two weeks, by a strange coincidence, I found myself attending in America a meeting of a very superior "surgical society" in one

[271] of our large cities, at which the same subject, "morbus coxarius," was under consideration. Only one of the surgeons had had an experience of as many as twenty-eight cases, and of the subsequent history of most of these he knew very little. The contrast was not only in the knowledge and presentation of and interest in the subject, but in the audience. The Deutsche Gesellschaft für Chirurgie admits to its fellowship any reputable surgeon of any country of the world, and its halls at each Congress are filled and overflowing. The membership of the select "surgical society" was limited to twenty and the average attendance was less than this number.

It may be that the rise and multiplication of proprietary schools of medicine without organic connection with a university was a necessary incident in the rapid growth of a new country, but it is absurd to expect them to yield results in the education of physicians and in the advancement of knowledge comparable with those of the well-supported medical departments of European universities. It is difficult to free either the educated public or our universities from the reproach that they remained so long indifferent to the needs of higher medical education. The times are changing, and we have learned in our own time, indeed within a decade, how superior in all respects is the endowed university medical school to the old-time proprietary school. Who would have believed that one or two well-utilized endowments could have achieved in so short a time so much? It was not only because some of the best men in this country were attracted to the university medical schools, fortunate enough to be so endowed, that the great progress was made; it was also because the further development of these men was made possible by the opportunities which they proffered and the atmosphere which they developed. The influence of these men, comparatively little before, almost at once, under the new auspices, was felt, not only in this country, but abroad. The growth of these men and of these schools has been so great that they are already well known and honored in all civilized

countries. Much of what Welch foretold here in 1888 and [271] in Cleveland in 1894<sup>13</sup> has already come to pass.

Although we now have in the United States several (five or six) moderately well-endowed medical schools with a university connection, the problem of the education of our surgeons is still unsolved. Our present methods do not by any means suffice for their training. Do we require stronger proof of the inadequacy of these methods in producing young surgeons than is presented by the so-called sacrifices which our young men to-day are willing, nay, most eager, to make in order to obtain a training which seems even to them not only desirable but absolutely essential for success of a high order? Here I may be permitted to instance conditions which have evolved in a natural way at the Johns Hopkins Hospital, where the plan of organization of the staff differs from that which obtains elsewhere in this country.<sup>14</sup> The average term of service for the interne on the surgical side who succeeds to the house surgeonship in this hospital is at present eight years—six years as assistant, in preparation for the position, and two years of service as actual house surgeon. Adding to these the four years in the medical school and the junior and

<sup>13</sup> W. H. Welch, Some of the Advantages of the Union of Medical School and University. *New Englander and Yale Review*, Sept., 1888.

Higher Medical Education and the Need of its Endowment. *Medical News*, July 21, 1894.

<sup>14</sup> The surgical staff consists of nine men, eight internes and one externe. The externe is an assistant in surgical pathology, he attends operations whenever it seems desirable in order to do with a clearer understanding the pathological work, to take charge of and describe<sup>15</sup> the pathological material obtained at operations and to keep in touch, for his own benefit, as well as for the sake of the surgical department, with the clinical work. Four of the internes serve for one year, only the honor men of each class at graduation being entitled to these positions; but the *permanent staff*, so-called, consists of four men, the house surgeon and three in line of preference. Men from any part of the country, if they have had the proper training, are eligible for the permanent positions. Great care is exercised in the filling of the vacancy on the permanent staff, which occurs once in two or three years, and advancement is not guaranteed to the appointee. The House Surgeon's term of service is still optional. He receives a salary; the other assistants are not paid. The assistants are expected in addition to their ward and operating room duties, to prosecute original investigations and to keep in close touch with the work in surgical pathology, bacteriology and, so far as possible, physiology.

<sup>15</sup> I am sure that much of the material for surgical pathology can be correctly described only when it is perfectly fresh. It cannot be painted because in less than a minute, in a few seconds often, the appearance of a freshly cut surface is greatly changed. Only those who are well trained as macroscopic pathologists, who have naturally a discriminating eye for color, a good sense for form and some talent for expression can properly describe the fresh material. Many, if not most, of the descriptions are worthless or at best serve only as reminders to those who can distinctly recall the case. The descriptions, by two trained men, of ordinary fresh material may differ so greatly that one could not believe they pertained to the same specimen. Color photography might be employed, it seems to me, with great benefit, for recording the appearance of fresh specimens.



[271] senior years in college, which in some colleges may well in considerable part be devoted to branches introductory to the study of medicine, the prospective house surgeon has to contemplate twelve or fourteen years of hard work, very hard [272] work, in order to secure this prize to which in this country of necessity only a very few at present attain. Thus far the success of the three or four men who have received, approximately, this training is so convincing that the very best graduates of our own and other schools are eager for the opportunity to be tested as to their fitness to rise to the position; and I know from applications which have been made to me this year that men of the desired quality would gladly serve ten years on the surgical staff in order to obtain the experience which the house surgeons and the training leading to it affords. The number of years which an interne who has become house surgeon is expected to serve with us is not and never has been prescribed.

It will be objected that this is too long an apprenticeship, that the young surgeon will be stale, his enthusiasm gone before he has completed his arduous term of service. These positions are not for those who so soon weary of the study of their profession, and it is a fact that the zeal and industry of these young assistants seem to increase as they advance in years and as their knowledge and responsibilities become greater. Nowhere certainly can a surgeon in a given period acquire so much, mature so rapidly, as in a hospital with an active and properly-conducted service. The time devoted to the training in surgery of those who hope to be teachers should not be curtailed, but young men contemplating the study of surgery should as early in life as possible seek to acquire knowledge of the subjects fundamental to the study of their profession.

It was our intention originally to adopt as closely as feasible the German plan, which, in the main, is the same for all the principal clinics of the German universities. The house surgeon, or first assistant, as he is called in Germany, is selected, after several years of service, from a number of well-tried assistants. There is no regular advancement from

the bottom to the top of the staff of resident assistants. [272]

Only a small proportion of these venture to entertain the hope of becoming first assistant. Occasionally an assistant from another clinic may immediately, or almost at once after transfer, succeed to this position over the heads of those who have served many years. This admirable system, which undoubtedly has its disadvantages, is possible only in a country where like conditions prevail and a close affiliation exists between the universities or where some great inducement exists for the making of assistants of the highest possible order. The professor of surgery, or the surgical chief, desires to secure as his first assistant or chief of staff a man of great promise, not only because of the obvious immediate advantage to the clinic, but because such an assistant is likely to have tendered him, ultimately, the chair of surgery in some smaller university. It is a matter of great satisfaction and pride to a professor of surgery to have supplied from his staff one or more university chairs. So, too, it is a great disappointment and sometimes a keen sorrow to the professor of surgery when his scholarly, highly-trained and devoted first assistant after a service with him of eight or nine years is compelled to resign himself to an instructorship, to content himself with the title "Privat-Docent." This occurs often, in fact is usually the case, because there are so many more retiring first assistants than there are vacant chairs of surgery in the twenty German Universities. Whenever, consequently, there occurs by the death or voluntary retirement of a professor of surgery, a vacancy in a university, there are possibly twenty first assistants and perhaps as many Privat-Docents hoping for promotion, not necessarily to this particular university, for the vacancy, unless it is in one of the smallest universities, is usually filled by the professor in a still smaller one.

What are the inducements which make it worth while for the young men in Germany to devote so many years to preparation for the practice of surgery, what the careers to which they aspire, and what manner of men are they who furnish by their example and by their achievements the great stimulus?

[272] Not only the first assistants but all the members of the surgical staff of one of the great university clinics in Germany enjoy almost ideal facilities for learning surgery and for prosecuting researches. The amount of clinical material is great. The operative work begins early in the morning and often does not cease till late in the afternoon. The out-patient department is controlled by the chief surgeon and is conducted by his assistants; a patient when discharged is consequently not referred to some dispensary or other and lost sight of. The pathological material obtained at operation is carefully worked up in the special laboratories for surgery and, if need be, is preserved in the museum, which should always be an important feature of the surgical department of a university. Every facility and the greatest encouragement is given each member of the staff to do work of research.

Although during the eight to twelve years of hospital service as assistant in some large university clinic he has laid the foundation of his reputation, the real life work of a German surgeon begins when he is invited to fill a professorial chair. He now longs to prove himself worthy of the new position, he has the incentive to inspire others to achieve, he measures himself by a new standard, and there is born in him the desire to rise higher, to sow the seed which will produce a bloom worthy of the greatest universities, possibly even of Berlin. In European countries no effort, no amount of time, few sacrifices would be considered too great if thereby the chair of surgery in a university might be secured. In Germany the prestige of the position is something that we in the United States who have not lived abroad cannot truly comprehend. In each university the chair has its imperishable traditions, its long line of famous surgeons, whose names are cherished and revered for their services to science, to their universities, to their country and to their fellows. In the nineteenth century, to mention only some of those who have passed to the majority, in the University of Berlin, were v. Graefe, Dieffenbach, v. Langenbeck; in Vienna, Vincenz v. Kern, Billroth, Albert; in Heidelberg, v. Chelius, Carl

Otto Weber,<sup>16</sup> Gustav Simon; in my student days there were [273] in Leipzig, Thiersch; in Halle, v. Volkmann; in Bonn, Busch; in Tübingen, Victor v. Bruns; in Munich, v. Nussbaum; in Strassburg, Lücke; men of great renown, every one. To enroll one's name with such as these, to inherit something of their skill, their knowledge, their zeal, their honor, their sense of duty, is not this worth while? The professor of surgery in Germany is usually a man of great influence and power. His affiliations, his responsibilities, his knowledge of surgery and the allied sciences, and often of art, of music, of literature and of the world's affairs, produce a type of man which his country may well contemplate with pride.

America, too, in spite of discouraging circumstances, has produced great surgeons, but it is to be deplored that here conditions prevail which hitherto have not encouraged, if they have not actually prohibited, such special development as I have outlined. I have known professorial chairs in one of the principal medical schools of this country to go actually a-begging—a-begging, of course, only of men who would adorn the position. Recently I asked a prominent surgeon, to whom a chair in one of our chief universities had been offered, why he had not accepted it. He replied that his practice was a large and lucrative one and that he had neither

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<sup>16</sup> Weber. It is interesting to note that Weber, professor of pathological anatomy at Bonn, at the instigation of Helmholtz, was called (1865) after long deliberation to succeed Joseph von Chelius in Heidelberg. Much astonishment was naturally expressed that a pathologist should be invited to take a surgical chair, but the choice proved a most happy one, and although Weber lived to teach surgery only five semesters, he left in Heidelberg ineffaceable impressions of his great activity and learning.

In the days when operations the world over were few and far between, and when little was known of surgical pathology, it was natural and reasonable that particular stress should be laid upon a careful training in anatomy in preparation for the practice of surgery; but now when time is so short and the art of surgery so long and the operative material so abundant, the prospective surgeon's work in anatomy should be very much curtailed to give time for a very thorough training in pathology and also in physiology. The more definite the knowledge of a subject becomes, the more easily it is acquired. The surgeon should quickly master the anatomy which he requires, and gross pathology will soon be for him an easily explored field; he already looks to physiology for his particular field of research. The value to the surgeon of patient dissection of many injected and hardened cadavers is very much overestimated. The general topography of a part can be quickly and sufficiently recalled by reference to an illustration; it is a knowledge of the fasciae that the surgeon who wishes to perform an operation deftly and neatly requires, and this can be acquired only by rapid dissection of perfectly fresh material, or better still, of course, by frequent repetition of the particular operation. A hundred dissections of the embalmed neck would not shed much light upon the operations for the removal of goitre nor even of the ganglia of the sympathetic. I am speaking from the standpoint not of the student, but of him who wishes to operate artistically.

[273] the time nor the inclination to prepare and deliver one hundred lectures, more or less, a year. Young men are naturally only too glad and eager to secure a professorship which would insure a good living and a certain distinction, but older men who are already well known and with an assured income have no inclination to undertake teaching of a prescribed kind for which they are not trained and for which the rewards are not in their opinion proportionate to the labor. Even to those who have held the chairs of surgery for years the work sometimes becomes so irksome that they seek to abandon it as soon as directly or indirectly it ceases to yield a sufficient return.

The faults of our system of educating surgeons begin almost at the bottom and continue to the very top. I am considering only the training of the best men, those who aspire to the higher career in surgery. On graduation they become hospital internes, but their term in the hospital is only one and a half, occasionally two years, only a little longer than the term of hospital service required in Germany of every applicant for the medical degree and not so long, on the average, as that required of each medical graduate of the University of Tokio. The interne suffers not only from inexperience, but also from over-experience. He has in his short term of service responsibilities which are too great for him; he becomes accustomed to act without preparation, and he acquires a confidence in himself and a self-complacency which may be useful in time of emergency, but which tend to blind him to his inadequacy and to warp his career. A surgeon should find his greatest stimulus and support in his assistants with whom he spends or should spend many hours a day; but this is only possible when they have had opportunities for sufficient development.

Think of the labor of breaking in two new house surgeons each year and of the incompleteness of their work. "I thought I had instructed you to examine the vocal chords after every goitre operation," complains the attending surgeon; "No, it must have been my predecessor or some other house surgeon whom you so enjoined," replies the interne.

It is a grave mistake, it is a shame to check suddenly the [273] advance of these superior young men who are tense with enthusiasm, who rejoice in the work to which they hope to be able to dedicate their lives. It is from these men, we must not forget, that our teachers of surgery are made.

But much as the interne suffers from the brevity of his hospital experience, the hospital suffers more and the surgeon most. Every important hospital should have on its resident staff of surgeons at least one who is well able to deal not only with any emergency that may arise and to perform any operation known to surgery, but also to recognize the gross appearances of all the ordinary pathological tissues and lesions.<sup>17</sup> But the interne leaves the hospital unequipped; eventually, it may be, he secures the position of attending surgeon to some hospital and then he is expected to teach others to perform operations which he himself has not learned to do, and to pronounce at the operating table upon conditions with which he is not familiar and which possibly he has never seen nor heard of.

We need a system, and we shall surely have it, which will produce not only surgeons but surgeons of the highest type, men who will stimulate the first youths of our country to study surgery and to devote their energies and their lives to raising the standard of surgical science. Reforms, the need of which must be apparent to every teacher of surgery in this country, must come on the side both of the hospital and of the university, and it is natural to look to our newer institutions, unhampered by traditions and provided with adequate endowment, for the inception of such reforms. It is eminently desirable, if not absolutely essential, that the medical school should control a hospital of its own. There should be such an organization of the hospital staff as I have indicated, [274] providing the requisite opportunities for the prolonged and thorough training of those preparing for the higher careers in medicine and surgery, and permitting the establishment of close and mutually stimulating relations between chief and assistants.

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<sup>17</sup> The internes should be encouraged and afforded every facility for the prosecution of work in research.

[274] The professors of medicine and surgery occupy a peculiar position. They are teachers in the universities and at the same time teachers in the technical schools, the hospitals, which in this country are in only one or two instances, unfortunately, under the control of the university. As university instructors it is still a question just how much of the technical they shall teach, and as workers in the technical school, the hospital and in private practice, how much time they shall devote to laboratory investigation. It is doubtful if an ideal adjustment, if there were such a thing, could always be preserved, because in one individual there reigns a passion for laboratory pursuits, in another the love of the practical and the rewards which practice may bring. Barker has recently, in his memorable address,<sup>18</sup> mooted this subject. Emphasizing the evils of the proprietary school and the inadequateness of what he designates as the "pseudo-university school," he proposes the name "semi-university school" for the "six or eight best medical schools in the United States," for the reason that only the subjects of the first two years are taught by men (university professors) "who do not engage in the private practice of medicine" and "who give their whole time and energies to the teaching and investigation of the sciences which they represent." It is to be noted that the true "university medical school," in the sense in which this designation is used by Barker, exists nowhere and probably never has existed.

The professors who teach in the departments of the last two years "are either not paid at all or are paid small sums, almost always less than the remuneration which pertains to a university chair, and almost always too little to provide the professor with a living income." "It is obvious," Barker continues, "that if those who teach the clinical subjects have to make their living from private practice, they will be compelled to direct their activities so as not to interfere with that practice." And further, he says, "I should like to see

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<sup>18</sup> *Medicine and the Universities*. An address delivered before the Western Alumni of the Johns Hopkins University, at the meeting in Chicago, Feb., 1902. *American Medicine*, July 26, 1902.

what the result would be if men with these capacities were [274] bred to university careers, were placed in charge of hospitals especially constructed and endowed for university purposes and were sufficiently paid to permit them to give up private practice entirely and to devote their whole time and strength to teaching and investigating in such hospitals." Time permits only the very briefest consideration of this proposition, with which I am in the fullest sympathy, and which for a long time, perhaps for twenty years or more, I have seriously debated. Certain objections may nevertheless, I believe, with great propriety be urged against prohibiting the acceptance of fees by professors of surgery in universities.

1. To be an impressive teacher of surgery, to attract important cases in large numbers, to exert an influence far and wide as a surgeon, to know his subject thoroughly, the surgeon must operate every day and always. A very considerable part of the surgeon's time must be spent in the operating room; more and more, it would seem, as time advances, for the number and variety of operations which a general surgeon performs each year is prodigiously increasing.<sup>19</sup>

2. With a fixed salary the surgeon may devote himself to the work of his choice, whatever that may be. If his tendencies are in the direction of research, he will neglect his operative work; if he is a natural operator, he will chafe

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<sup>19</sup> Professor von Mikulicz writes me from Breslau "When I was a student in Vienna there were days, particularly in winter, when not a single operation occurred in the University clinic, so scarce was the operative material. To-day the number of cases for operation is so great in the large German clinics that even when operations are conducted simultaneously on two tables we find that three or more hours of intense work is required almost every day." Through the kindness of friends in Boston and New York I am able to append the reports which testify to the great increase in the number of operations performed in a year in the Massachusetts General, the Boston City, the Roosevelt and the New York Hospitals. The statistics furnished by the venerable Massachusetts General Hospital are particularly instructive. In the entire decennium prior to the discovery of anæsthesia only 385 operations were performed in the hospital, an average of 38.5 operations a year. In the first decade subsequent to the employment of ether 1893 operations were performed, an average of 189 per year. In the decade preceding Lister's visit (1876) to this country, from 1868 to 1878, 7696 operations were performed. In the next decade only 10,119 operations were performed in this hospital; but from 1894 to 1904, 24,270 were performed; and in the year 1903, over three thousand operations were performed in the Massachusetts General Hospital.

The other hospitals mentioned show an increase in similar proportions. It may surprise some that the decade following the introduction of antiseptic surgery, from 1878 to 1888, should show such a slight increase.



[274] under the restrictions which prohibit the acceptance of fees so easily within his reach.

I know of one or two men to-day occupying important chairs of surgery in Germany, to whom operating is less agreeable than teaching, and whose clinics, in consequence, suffer greatly from want of surgical material. Billroth had comparatively and actually little operating to do when in the days of sepsis he was most earnestly engaged in his mi-  
[275] croscopical studies and laboratory pursuits; and Thiersch, although one of the greatest names in surgery, was not a great operator and had small operative material even for his day.

3. An able and successful surgeon probably would not for the sake of fame merely and the usual professor's or any feasible salary be content to operate so constantly and to incur the anxieties attendant upon a large surgical practice. Indeed, he probably could not relinquish all fees if he would, for the exigencies of his family and his tastes would prohibit his doing so. Young and comparatively untried men could,

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This may be taken as an indication of what is true, viz., that the majority of the operations which are done to-day were not only not attempted, but were not known fifteen years ago. Indeed many of them were unthinkable before the introduction of antiseptic surgery.

*Massachusetts General Hospital.*

Number of operations performed in decade previous to discovery of ether 385.

Number of operations performed in decade subsequent to discovery of ether 1893.

Number of operations performed in decade previous to use of antiseptics in this country (1878) 7696.

Number of operations performed in decade subsequent to use of antiseptics 10,119.

Number of operations performed during last ten years (1894-1904) 24,270.

Number of operations performed during year 1903 3109.

*Boston City Hospital.*

In 1878 316 operations were performed.

From 1878 to 1887, inclusive, 5882 operations were performed.

From 1893 to 1902, inclusive, 16,269 operations were performed.

In 1902 1923 operations were performed.

*Roosevelt Hospital, New York.*

In 1878 132 operations were performed.

From 1878 to 1887, inclusive, 4060 operations were performed.

From 1894 to 1903, inclusive, 18,181 operations were performed.

In 1903 2719 operations were performed.

Operations in the Gynæcological division are included.

*New York Hospital.*

In 1878 142 operations were performed.

From 1878 to 1887, inclusive, 2706 operations were performed.

From 1894 to 1903, inclusive, 13,002 operations were performed.

In 1903 1680 operations were performed.

of course, be induced to take the position, and some of these [275] would undoubtedly regret the compact.

4. Barker proposes, if necessary, to give the professors of the practical branches (technical professors we may call them) a larger salary than the others; but this would at once place the purely scientific men in an awkward position; it would pave the way for discontent among the chemists and physicists and others, who might with propriety claim that their salaries should be increased because they, too, might make a fortune if they were allowed to turn their ideas or discoveries to commercial account. As a matter of fact professors of chemistry and physics accept fees, and all professors are at liberty to do so.

5. After all, the hospital, the operating room and the wards should be laboratories, laboratories of the highest order, and we know from experience that where this conception prevails not only is the cause of higher education and of medical science best served, but also the welfare of the patient is best promoted. It remains with the teachers of medicine and surgery to make them so. The surgeon and the physician should be equipped and should be expected to carry on work of research; they hold positions which should make them fertile in suggesting lines of investigation to their assistants and associates; they should not only be productive themselves, but should serve as a constant stimulus to others.

I should like to see the plan which Dr. Barker advocates carried out to the letter, and if it should succeed no one would rejoice more than I. But I would not advocate giving the surgeon or physician a larger salary than the others. The salaries of all must eventually be increased at least two or three-fold. There is, however, a compromise which even at present is altogether feasible. Let the surgeon be permitted to accept remuneration for services to certain patients operated upon in the hospital which the university provides or controls. His consultations and operations should all take place at the hospital. He might under only very exceptional circumstances be permitted to visit a patient in his town or

[275] State. Under special circumstances he might well be permitted to visit a patient in another State, if it were impossible for that patient to come to him. Private patients in a hospital need consume little or no more of the chief surgeon's time than the patients in the public wards.

While it has been my main purpose in this address to call attention to certain defects in the existing methods of medical education, especially in the opportunities for the advanced training of surgeons in this country, I would not be understood to minimize or to decry the great achievements of American surgery. Courage, ingenuity, dexterity, resourcefulness are such prominent characteristics of our countrymen that it would have been surprising if from the labors of her many earnest and devoted teachers and practitioners there had not resulted contributions to the science and art of surgery which have carried the fame of American surgery throughout the civilized world. The names of your own Nathan Smith and Jonathan Knight will always be treasured not only by this university, but wherever the history of surgery is cultivated. There is barely time for even the briefest reference to the recent contributions of America's surgeons to their art and science, but I should do my countrymen scant justice did I fail to emphasize the importance of at least one monumental contribution, which, I believe, redounds more to the glory of American surgery than any achievement of the past. It is hardly possible to overestimate the value of the modern work on the subject of appendicitis nor to attribute to it too great a share in stimulating and clearing the way for the great strides made in the entire field of abdominal surgery in the past twelve or fourteen years. It is convincing testimony to the advanced character of this epochal work that continental surgeons were for several years unable fully to comprehend and accept the teachings of their co-workers in the new country. As operators some of our surgeons are not surpassed by any I have seen; there are, I believe, few operations in surgery which cannot be performed as well in this country as anywhere in the world, and not a few operations are best performed by the surgeons of America.

A loyal son of Yale, I have rejoiced in the increasing prosper- [275]  
perity of the Medical Department of Yale University during  
these recent years. Especially gratifying have been the man-  
ifestations of interest on the part of the University in the  
advancement of this Department and in general in the cause  
of higher medical education. I may be permitted to express  
my appreciation, and I believe I may add that of all con-  
cerned with these important problems, of President Hadley's  
valuable contributions to the discussion of this pressing topic.

It need hardly be said that the Yale Medical Department  
is hampered by inadequate resources. I am confident that  
during the past year no gift to the University has been more  
usefully and worthily bestowed than Mrs. Farnam's gener-  
ous bequest to the Medical Department. With still larger  
additions to its endowment there is every reason to believe  
that the Yale Medical School will maintain a prominent  
position in the forward movement of medical education and  
research, and be one of the chief ornaments of this great uni-  
versity, receiving and conferring the stimulus of lofty ideals,  
of large achievements, of high renown.

