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A NEW BUILDING AND NEW RESEARCH GROUPS IN SURGERY AND DERMATOLOGY

Good judgement is usually the result of experience, and experience is frequently the result of bad judgment.

Lovett

Every age has its myths and calls them higher truths.

Anonymous

Within a short time after the medical faculty moved to its new facilities west of the Schuylkill River in the 1870s, they realized that both the Hospital of the University of Pennsylvania and Medical Hall were inadequate for teaching the recent medical advances. Just as the University was moving westward, experimental medicine—bacteriology and gross and microscopic pathology—was developing in Europe. Other changes were in the wings. For one thing, lengthening the medical curriculum strained space. For another, asepsis was being increasingly accepted and the surgical amphitheaters of the University Hospital, constructed of wood, were therefore not easily adaptable to use of the new aseptic surgical techniques. And even though, when Medical Hall was opened in 1877, it contained more laboratory space than Penn physicians had ever enjoyed and was the most advanced facility for medical teaching in the United States, its usefulness was clearly already limited.

Pushed, in part, by competition at Johns Hopkins and elsewhere, the medical faculty persuaded the trustees to construct new research
and teaching space, which opened in 1904 as the Medical Laboratories Building (renamed the John Morgan Building in 1987). It had four large lecture halls; physiology and pharmacology settled in on the first floor, and pathology and bacteriology on the second. It proved adequate until 1929, when a wing for anatomy and chemistry was added. From the move west until then, those subjects were housed in the Laboratory (Hare) Building, built in 1879. Separating anatomy and chemistry from the other sciences maintained a Penn medical tradition that had existed since Shippen taught anatomy in the shed on his father's property and Woodhouse taught and experimented in chemistry in a laboratory in Surgeon's Hall.

The requirements for aseptic surgery and orthopedic surgery were met by the construction of the Agnew Pavilion, opened in 1897, which contained tile operating rooms with steel amphitheaters and modern orthopedic facilities.

SURGICAL RESEARCH

Over the years, J. William White, who had fought for reform with Agnew and Pepper, had become more conservative. He feared that the University's demand for full-time salaries would prevent it from recruiting the ablest physicians. Ironically he could have easily served under the provost's plan because he was independently wealthy. But he was perceived as one of those who defeated Harrison, and he was elected to the board of trustees.

Yet White was far from being an enemy of the direction Dean Frazier wanted for the school. He fully realized the importance of research, and when the Medical Laboratories were constructed in 1904, White funded a laboratory for surgical research which was located in four rooms on the second floor at the southern end of the pathology laboratory. He also outfitted a suite in the tower over the main entrance of the new building for his administrative offices.

In 1906, White invited J. Edwin Sweet of the Rockefeller Institute to join the Department of Surgery with the title of associate in experimental surgery; thus was begun America's first surgical-research department. Sweet had earlier served in Penn's Laboratory of Hygiene. After his return to Philadelphia, his research was productive in such areas as the use of Eck's fistula, gastric pouches, experimental colitis, the influence of extracts of ductless glands (including the adrenal gland).
The New Medical Laboratories Building (John Morgan Building). TOP: sketch of the new laboratories from the program of the opening exercises; BOTTOM: plan of the interior of the Medical Laboratories. (Archives of the University of Pennsylvania.)
on pancreatic function, the effects of tension on steel plates to fix
fractures, surgery on blood vessels, and the influence of diet on the
growth of experimental tumors. In 1917 he entered the Army and studied
the effectiveness of dichloramine-T on wound healing and the patho-
genesis and treatment of trench foot. After the war he resumed his work
on the pancreas and initiated studies on the pathogenesis of renal
infection and the physiology of the gall bladder.8

Much of his experimentation was conducted on dogs. In fact, an
increasing amount of research across the nation made use of animals,
a legacy of the renewed recognition and reorganization of basic sciences
at the beginning of the century. That trend was fought by antivivisec-
tionists, who lobbied state legislatures to outlaw research on animals.
In the Commonwealth of Pennsylvania, the medical schools of Phila-
delphia sent a delegation, which included Reisman, Stengel, and Tay-
lor, to argue against the bill. The bill was defeated, as was a similar
one in New York.9

The antivivisectionists then tried direct legal action against scien-
tists. Sweet was vulnerable. He was in charge of the animal house as
well as the Laboratory of Experimental Surgery.10 To care for the animals
and maintain the animals' quarters, Sweet brought Samuel Geyer, an
experienced animal caretaker, from the Rockefeller Institute. For some
time Geyer had complained to Sweet that the table scraps from the
hospital kitchen, which he was feeding to the dogs, were little more
than garbage and an unfit diet for any animal, much less dogs conva-
lescing from surgical procedures. Geyer also told Sweet that researchers
in other departments did not care for their animals properly. Although
Sweet promised to speak to the dean about the deplorable conditions,
he always reminded Geyer that there was no money for improvements.11

Geyer also procured the dogs. Since he knew these animals were
for the most part obtained by doubtful means, Geyer usually held the
dogs for two weeks or so to allow time for the owners of stolen pets to
retrieve them. He ended up with a large number of dogs, some of which
he sold to supplement his salary.12 In 1911, Henrietta and Bertha
Ogden, who were sisters, began buying dogs from Geyer for $.50 to $1
each to save them from experimentation. After about two years, they
gained Geyer's confidence, and he took them through the animal house,
showing them dogs recovering from surgery.13 The Ogden's also entered
on their own during the night through loose boards in the fence of the
medical department; they made their own unguided inspections with a
"pocket electric light."14
As a result of the Ogdens' investigations, the Women's Society for Prevention of Cruelty to Animals secured magistrate's warrants against Sweet and five other professors, whom a grand jury charged with “wanton cruelty” to animals.\textsuperscript{15}

Sweet was brought to trial on April 15, 1914. Evidence was generally polarized.\textsuperscript{16} The prosecutor brought up an experiment in which, as he described it, a weight was dropped with a gibbet on the back of unanesthetized dogs to break their spines. In defense of the work, Frazier testified that the dogs were anesthetized and their spines were
not fractured. The spinal cord was exposed by a laminectomy and injured by the dropped weight, he said; the purpose was to see whether permanent spinal injury could be prevented by decompressing the swelling of the injured region with an appropriate incision.\textsuperscript{17}

The three-day trial was intense. Henrietta Ogden collapsed and Bertha Ogden broke down under the defense attorney's interrogation.\textsuperscript{18} Three women were ejected for disorder in the court room, and one man was hailed to the bar for hissing at a lawyer. The newspapers felt that the judge had predisposed the jury by stating that "any physician whose experiment caused pain or discomfort was guilty of a crime." Not all of the jurors were convinced by him. The jury could not reach a verdict, remaining hung after being sent back three times.\textsuperscript{19} The case was dismissed. Sweet was not retried, nor were the other professors brought to trial.\textsuperscript{20}

After his stint in the Army, Sweet returned to his Penn work. In 1926 he was about to step into the White chair when he accepted a comparable post at the Cornell University Medical School.\textsuperscript{21} He had soured on Frazier's attitude toward research; as Sweet reportedly put it, "Frazier thinks you can grab a research problem by the seat of the pants and shove it into print."\textsuperscript{22}

\section*{THE HARRISON DEPARTMENT OF SURGICAL RESEARCH}

I. S. Ravdin, who had started as a junior fellow in the department, rose to the White chair and head of surgical research.\textsuperscript{23} But the department lacked an endowment until 1935, when George Leib Harrison, a chemical manufacturer, left a $2.24 million bequest to Penn. Harrison had already been a generous friend to Penn medicine.\textsuperscript{24} He was one of three donors who helped raise money for the Red Cross Base Hospital No. 20, which was staffed by volunteers from the University Hospital and Graduate Hospital during World War I. Private subscription was necessary because the government provided no funds for such units. The head of one of the two surgical divisions of the unit was John Berton Carnett, who became a close friend of Harrison as well as his personal physician. As a token of his appreciation of Carnett's services, Harrison
left his fortune (if no other heirs were surviving) to the University of Pennsylvania to support Carnett's research.

However, Carnett died before Mr. Harrison. When the terms of Harrison's will were announced in the papers the University suddenly found it had received a huge bequest of which it had been unaware, to be managed by the professors of surgery of the University of Pennsylvania.25

I. S. Ravdin reacted promptly to the news, met with the trustee in charge of medical affairs, and informed his chief Frazier of the windfall. Frazier advised Ravdin to "keep in touch with the probation of the Harrison bequest and see that we are not euchred out of our just share."26 Ravdin did his work so well that top University officials agreed to put control of the funds "in the hands of those individuals interested in the truly academic phase of surgery." The upshot was that the endowment was earmarked for the Department of Research Surgery,
John Berton Carnett, Professor of Surgery in the Graduate School, chief of a surgical division of the Red Cross Base Hospital No. 20 in France in World War I, and physician of George Leib Harrison. The money for a research department was bequeathed to John Berton Carnett, but when he predeceased Mr. Harrison the bequest became the responsibility of the Professor of Surgery of the University of Pennsylvania. (Archives of the University of Pennsylvania.)
which received income to pay not only for scientific investigations but also for fellows, an artist, a statistician, and support staff. The department was renamed for Harrison and his wife, Emily McMichael Harrison. A surgical professorship bearing their names was also established, but the word research in the chair was deliberately avoided “to establish the conviction . . . that surgical research does not necessarily imply dog surgery.”

Ravdin was named to the chair. His original group of fellows turned out to be choice. Among them Jonathan E. Rhoads was instrumental in introducing total intravenous feeding. He eventually became (as, in fact, did Ravdin as well) the John Rhea Barton Professor of Surgery and president of the American College of Surgeons. Julian Johnson became chief of thoracic surgery at Penn’s hospital. John Gibbon developed the heart-lung machine at Jefferson Medical College. Norman Freeman later headed neurosurgery at the University of California. And Robert B. Brown became Surgeon General of the Navy.

RESEARCH MEDICINE

A few years after surgical research started, Penn established the first Department of Research Medicine. The school wanted to extend the function of the Pepper Laboratory. The medical faculty realized the need to apply scientific methods to the study of the alterations that disease produces in the body’s physiology and chemistry. It was also felt that a trained researcher on the hospital wards and clinics, with sufficient assistants, would not only make important discoveries but also stimulate the spirit of investigation throughout the faculty.

John Herr Musser, a clinical professor of medicine, was in a position to help implement the idea. An 1877 Penn medical graduate, he contributed regularly to medical journals, and various memoirs call him one of the most beloved and distinguished physicians of his day. He had a patient and friend, Harriet C. Prevost, the wife of a railroad executive, who wanted to pay tribute to him. He persuaded her to give money to the new project. She gave $100,000 at the time and promised to give an equal amount later for a professorship.

She imposed so many stipulations on her gift that the University worried that, in the future, they would be “conditions difficult of ful-
For one thing, she specified both the diseases which the department should concentrate on and the means it should use:

> the application of the methods of bacteriology, pathology, physiology, chemistry, and pharmacology in the investigation of diseases of the kidneys, gout, rheumatism, and of conditions of the environment and of disorders of the organism which have any bearing on the case, the nature, mode or recognition, and the treatment of these diseases.

She also directed that lectures and publications disseminate the discoveries and ordered that Musser direct the department until he stepped aside or died. When Musser died in 1912, the trustees renegotiated the conditions of her gift to better fit the policies of the University. At first, the site of the department was in the Medical Laboratories Building. It was moved to the Maloney Clinic when that facility opened in 1929, thus physically moving closer to yet one more aim of the benefactor, who expressly wanted the research to benefit patients.

Richard M. Pearce, Musser’s son-in-law, was the first John Herr Musser Professor of Research Medicine. A Harvard University medical graduate, he had served under Simon Flexner’s direction at Penn from 1900 to 1903 until leaving for various appointments in New York State.

 Pearce was one of America’s early experimental pathologists, and not long after he returned to Penn, he was indicted in the animal-research trial. The experience disturbed him because of the problems he felt it would cause for medical science. He developed a lecture, later published as “The Arguments For and Against Experimentation on Animals.” In it, he stated:

> Scientific men are under definite obligation to experiment upon animals so far as that is the alternative to random and possibly harmful experimentation upon human beings, and so far as such experimentation is a means of saving human life and of increasing human vigor and efficiency. Opponents reply [that] . . . animal experimentation is useless and . . . has not added to our knowledge [and is] . . . therefore indefensible. If, therefore, it can be shown even in a single instance that life has been saved or human happiness . . . increased as the result of such experimentation, the basic moral issue is settled in the affirmative.

 Pearce then recited a brief history of medicine which, in case after case, emphasized the benefits of animal research to humans. Pearce’s own research interests were varied. He wrote papers on diseases of the spleen, hemolytic jaundice, anemia, the nature of anaphylactic reaction,
pancreatitis, nephritis, and the value of renal-function tests. But his studies did not lead directly to new discoveries. His contributions lay in establishing the investigation of clinical disease as a scientific discipline and in improvements to medical education.

He left Penn to direct medical education at the Rockefeller Institute in 1922 and was succeeded by J. Harold Austin, who had come from that institute. An expert statistician and clinical chemist, Austin improved techniques for studying blood and urine in disease. In 1941 he moved on to head the Pepper Laboratory.

WILLIAM C. STADIE

William C. Stadie also came from the Rockefeller Institute, in 1924, and worked with Austin until he succeeded him as the Musser Professor. Trained in chemistry, engineering, and mathematics as well as medicine, Stadie specialized in the transportation of blood gases. He was not reluctant to use himself as a test object, after a procedure had been tested on dogs but before human volunteers were enlisted. His quantitative studies were the first to relate anoxemia to decreased arterial oxygen and to demonstrate that cyanosis was caused by the dark red color of unsaturated blood.

To study the effects of oxygen on the anoxemia of patients with pneumonia, Stadie designed and built a chamber in which he could manage patients in an atmosphere that controlled oxygen and carbon dioxide. His was one of the first uses of an oxygen chamber for the treatment of respiratory diseases.

At Penn, Stadie did important work on the buffering capacity of hemoglobin. He collaborated with Helen O'Brien in 1932 to purify an enzyme from red blood cells that speeded up the carbon dioxide hydration reaction. They reported its properties, and shortly thereafter, Andrew N. Meldrum and F. J. W. Roughton reported that they isolated the same enzyme and named it carbonic anhydrase. This discovery explained how bicarbonate was formed at rates that agreed with in vivo observations. Stadie also helped explain the role of carbamino compounds in the transportation of carbon dioxide from the tissues to the lung.

He continued to invent or enhance instruments. He designed and built a controllable, sensitive, and stable electron-tube potentiometer, which improved on the colorimetric methods of measuring pH then in
use. Elements of his original principles were modified and used in instruments developed by others and can be found, modified even further, in pH meters today.\textsuperscript{39}

As World War II approached, Stadie turned his attention to the new field of cell physiology, especially in examining the biochemical mechanism of oxygen toxicity. Stadie and his colleagues looked at slices of brain tissue and found that high oxygen pressure inactivated enzymes that contained sulphydryl groups. They also demonstrated that high pressure did not interfere with the function of cytochrome oxidase; thus it did not destroy itself as well as other enzymes by generating active oxygen radicals, as had been once supposed. Stadie's main goal in this work eluded him—the mechanism of oxygen toxicity remains unexplained to this day—but he and a colleague are memorialized in the Stadie-Riggs tissue slicer, which not only facilitates the cutting of tissue but standardizes the slices.\textsuperscript{40}

Stadie's final major project involved the mechanism of insulin action. He and Ella and Niels Haugaard used radioisotope labeling to learn that insulin bound to cells in close association with tissue enzymes that
metabolize carbohydrate or fat. They speculated that, when insulin binding took place, a new system was formed, qualitatively and quantitatively altering the metabolic activity.41

Stadie was succeeded by Colin M. MacLeod, a Canadian. He worked with Oswald T. Avery, whose laboratory at the Rockefeller Institute was studying pneumococci and trying to develop vaccines to treat pneumonia. MacLeod was one of the first to test the effectiveness of sulfa-pyridine as a chemotherapeutic agent. But all of this work was done prior to his coming to Penn in 1956 from New York University.42

When he returned there in 1960, Robert Austrian succeeded him as the Musser Professor. Austrian was trained at Johns Hopkins and became involved in the work on pneumococci when he served on MacLeod’s service at New York University. At Penn, Austrian made the first general vaccine for pneumonia, utilizing the body’s immune system to prevent bacterial infection rather than relying on chemotherapy for treatment.43

DERMATOLOGICAL RESEARCH

Penn’s Laboratory of Dermatological Research was the first in the country to devote its entire effort to skin diseases. Duhring provided for it in his will (and for much more: his bequest of $910,000 was the largest single gift the University had received up to 1913, when he died), but not specifically. He had left money for free beds in the University hospital to treat “cutaneous, cancerous, and allied diseases and for a system of baths and general hydropathic treatment.” His other gift to his professional field was an equal amount to the “Department of Cutaneous Medicine” (as it was then called) for the study and treatment of skin diseases.44

Milton Bixby Hartzell, who had succeeded Duhring as department chairman in 1910, decided as early as 1916 that the money should be applied to a research laboratory.45 The laboratory received $260,000 from Duhring’s bequest and space, four flights up, in the tower of the Medical Laboratories Building; it officially opened on July 1, 1917. Hartzell was the director.46 Frederick D. Weidman, an expert on animal parasitology, was hired as assistant director. He had served as an instructor in Penn’s pathology department and as pathologist at the
Philadelphia Zoological Society. World War I interrupted his new duties. He took over as acting chairman of pathology when the chairman, Allen J. Smith, was called into the service.\textsuperscript{47}

The dermatological laboratory was restarted in 1919. As his first project Weidman collected, classified, and filed the dermatologic material at Penn: Duhring’s papers, photographic negatives of skin diseases, and pathological slides and specimens, as well as pertinent material in the histological section of the Department of Surgical Pathology.\textsuperscript{48} Henry Stelwagon had a significant collection, too, and it was added to the laboratory when he died. Weidman never stopped cataloging fungi that caused dermatoses. His work was aided when Raymond Sabourad gave the laboratory his type-culture collection of cutaneous fungi. By the time Weidman retired in 1946, the laboratory had a descriptive file of more than 5,000 histological studies and mycological preparations. It maintained the Joan collection of slides used by candidates preparing for certification by the American Board of Dermatology until the Armed Forces Medical Museum took over this duty.

Hartzell, an excellent pathologist, made photomicrographs of pathological-histological sections. He took all of the classic photomicrographs that illustrate his dermatology textbook. One of his secrets was to use a Welsbach gas lamp to illuminate the slides. Since the lamp had low intensity, long exposures were needed. To overcome boredom and prevent shortening the exposure time through impatience, Hartzell took walks timed to the length of the exposures.\textsuperscript{49}

He and Weidman worked well together, but Hartzell was a clinician rather than a scientist. At one point he complained to his assistant director, “Isn’t it time that you were having publications from this department?” Weidman, astounded by the remark, replied, “There’s been no time.” Allen Smith witnessed this exchange and replied characteristically, “I think, Milton, the proper order of things is that the work must precede the publication. Give your man time, and you will get the output you’re asking for.”\textsuperscript{50}

Nevertheless, Weidman understood his superior’s point. The first publication from the laboratory followed shortly thereafter; it was a paper on pemphigus in an orangutan—based on work Weidman had done at the zoo, before he came to Penn.

Weidman did provide the output Hartzell expected, but Hartzell was not present to appreciate it. He suffered a stroke in 1921 and resigned in June of that year. Weidman was appointed professor of research
dermatology and director of the laboratory, becoming the first American dermatologist to devote his full time to research.51

From the outset Weidman was interested in classifying and studying fungi that produced skin lesions, and he extended the work to cover various yellow dermatoses or xanthomas, published in 1941 as the pioneering monograph Xanthoma and Other Dyslipoidoses.52

In other work, Weidman, with Stanley Chambers, noted that many saprophytic fungi over-grow ringworm growing in culture tubes. It happened so often that they wondered whether organisms living on normal skin might act as biological protectors against ringworm infection. In an extensive study Weidman and Chambers concluded that *Bacillus subtilis* was frequently found on normal skin; growth of 11 species of fungi, including *Trichophyte interdigitale*, were completely inhibited by the bacillus in culture; and clinical trials in which the bacillus was applied to toes infected with ringworm showed sufficient promise to warrant further trials. Subsequently, however, they could never obtain preparations that were therapeutically reliable.53

Weidman and White studied epidermal hyperplasia that occurred in chronic skin ulcers, the first systematic work on this problem. They found that every gradation of hyperplasia, as well as early epithelioma or cancerous degeneration, was present in the regenerating skin of these ulcers. They distinguished some of these changes from those of a developing epithelioma and felt that proliferative changes should not be assumed to be malignant unless they had infiltrated the dermis to the level of the sweat glands. In their papers they pointed out that careful evaluation of the changes prior to radical surgery for leg ulcers would avoid many destructive surgical procedures.54

When Hartzell resigned early in Weidman's career in the laboratory, Dean Pepper knew that Weidman was not interested in heading a clinical department. He broke with tradition by appointing John Hinchman Stokes from the Mayo Clinic and the University of Minnesota. Furthermore, the dean took the unusual step of offering him a larger full-time salary than most chairmen had in order to protect his income when he moved his practice to Philadelphia.55

Stokes assumed the chairmanship in 1924 and began to reorganize the department. At first he tried to coordinate clinical activities with those of Weidman's laboratory; he placed a small research laboratory in his hospital clinic and assigned departmental assistants to the laboratory. The start was friendly, but the two groups gradually drifted apart.
Weidman began looking to Philadelphia General Hospital and Graduate Hospital for his clinical material.

For his part, Stokes could not afford the research because the expenses of his clinic absorbed the hospital's share of the Duhring bequest. To seek other avenues of support, he organized the Institute for the Study of Venereal Disease, which drew grants from government and other agencies. The new institute integrated the work of other departments—for instance, bacteriology and neurology—related to dermatology and syphilology. But by the 1930s, the medical school was somewhat embarrassed by having two divisions in one department, led by two men with contrasting personalities and different aims. 56

Syphilis was Stokes's major focus. 57 When he entered the field, most practitioners felt that the major advances in understanding and treating the disease had already been made. But Stokes defied this conventional thinking from the start. His first book was called Modern Clinical Syphilology; in 1,200 pages, he emphasized the fact that physicians could neither diagnose nor treat syphilis intelligently by relying on laboratory studies alone. They had to study the patient carefully as an individual and know the biology of the infection in humans. This book established Penn as the primary clinic for syphilis therapy. 58

When penicillin first became available, Stokes helped evaluate it. When it became the treatment of choice for syphilis, he converted a small red-brick building, located behind the hospital and known affectionately as the "pest house," into a treatment center. During World War II Stokes kept the activities of this clinic secret because he did not want the public to know that penicillin was being used to treat syphilis rather than the wounds of soldiers overseas. 59

Stokes also studied the relationship of psychogenic factors to skin diseases. Patients with asthma, eczema, and hay fever had a personality he called the "tension frame of mind," and he went on to describe their tremendous drive, restlessness, and overambition. Dermal and eczematoid eruptions on the hand, he and some associates felt, clearly illustrated the importance of psychogenic factors in a complex that included dermatitis, allergy, and infection.

Stokes was a superb dermatologist in general. He felt that a skin disease could be managed only by considering the medical condition of the patient as a whole. His first step with patients was to stop all previous medications and use the simplest soaks until he could appraise their problems. Because he was persuaded that many skin diseases had
psychological origins, he tried to evaluate the emotional status of his patients. He insisted on a good history, and generations of his students praised his skill in taking one.

Radiation therapy was so dangerous, Stokes felt, that he used it only to treat some inoperable skin cancers. He was sensitive toward possible litigation and took cautious therapeutic approaches and avoided experiments on patients, even any treatment that could be construed as an experiment.  

His classes reportedly drew students “in complete force, in sickness, in health, in fair weather and foul. The reading assignments were prodigious, and the class requirements rigid,” according to Clarence Livingood, one of his students. Stokes was also a creative instructor. He knew that serious and lasting complications could result from intra-
venous arsphenamine if the drug escaped into tissue or was injected outside the vein; yet novices could not learn the procedure without practice. So he and Herman Beerman, his assistant, developed manikins for students to practice intramuscular as well as intravenous injections. Three dollars’ worth of plaster of paris, rubber tubes, gauze, cotton, water colored amaranth red, and some clever tucks were fashioned into “a more or less attractive arm,” Livingood reported. He added, “No student in Stokes’s class failed to learn a great deal, and none of them has forgotten the experience, because he had served under an incomparable but unrelenting taskmaster.”

The rivals Stokes and Weidman retired within a year of each other. Donald M. Pillsbury succeeded Stokes as chairman in 1945. By this time, federal funds had enabled the department to establish laboratories devoted to bacteriology, histochemistry, histology, mycology, pathology, and virology. Weidman retired in 1946, and Pillsbury discontinued the Laboratory of Dermatological Research the next year. He consolidated the various research areas under the name of the Duhring Laboratory. It was located at first in the penicillin treatment center, then was moved to elegant quarters on the second floor of the new Clinical Research Building.

NOTES


2. Minutes of the Medical Faculty, b. 12, pp. 533, 535, 536, 537, 538, 539, 541; Program of the Opening of the Medical Laboratories in 1904.


6. According to R. L. Gilman, “The History of the Laboratory of Dermatological Research, University of Pennsylvania,” in R. Friedman’s *A History of Dermatology in Philadelphia* (Fort Pierce, Fla.: Froben Press, 1955). The administrative offices of Prof. J. William White were located in the Tower of the Medical Laboratories over the main entrance. This space was subsequently the apartment of Alonzo Taylor, Benjamin Rush Professor of Physiological Chemistry. In 1917, the Laboratory of Dermatological Research moved into this small suite of rooms. Julian Johnson stated to the author that J. Edwin Sweet was brought from the Rockefeller Institute in 1906 as an associate in experimental surgery by J. William White. Space for his work was provided in a group
of four rooms located at the southern end of the hall that passes through the pathology museum at the end of the western wing of the new Medical Laboritories.


10. Ibid., p. 242.
11. Transcript of Antivivisectionist trial, pp. 118–19.
12. Ibid., pp. 7–9.
14. Ibid., p. 11.
15. Transcript, p. 73.
17. Transcript, p. 115.
18. Ibid., pp. 184–86.
22. Ibid., p. 273; concerning Frazier's understanding of science, personal conversation of David Y. Cooper with Jonathan E. Rhoads.
23. Corner, pp. 275–76.
25. Ravdin Papers, found in a file in the Harrison Department, which include the correspondence between Dr. I. S. Ravdin and the medical trustees concerning the probatation of the George L. Harrison will and the setting up of the George and Emily McMichael Harrison Department of Surgical Research. From Ravdin's justification for using the bequest to support the research already in progress, it is evident that it had been difficult for him to obtain funds. The picture of George Leib Harrison on the Annual Report of the Harrison Department of Surgical Research, July 1, 1964–June 30, 1965 is not the picture of the department's benefactor. George Leib Harrison (1836–1935) was one of two George Leib Harrisons, both of whom lived on Locust Street. The other George L. Harrison (1811–1885) is the one whose picture is on the cover of the annual report of the Harrison Department. A picture of the donor of the money that formed the Harrison Department of Surgical Research is found in a History of the 20th Base Hospital. When George L. Harrison died on March 6, 1935 he was ninety-nine years old, and for several years prior to his death he was blind. In order to get around his home without being constantly aided by his servants, he had wires suspended from the ceilings which led from his chair in the living room to important chambers in his house—the bedroom, the toilet, the dining room, and the hall. When he wanted to go to these areas, he hooked the handle of his cane over the appropriate wire and thus was guided to where he wished to go (personal conversation with J. E. Rhoads).
26. Ravdin Papers, letter from Dr. Charles Harrison Frazier to I. S. Ravdin, dated Friday.
27. Ravdin Papers, Dr. Ravdin's notes on a conversation with Mr. John Zimmerman; Minutes of the Executive Board of the Trustees for Medical Affairs of the University of Pennsylvania, November 8, 1935; Minutes of the Executive Board, December 9, 1935; Board of Medical Affairs, Trustees of the University of Pennsylvania, March 23, 1936; Board of Medical Affairs, March 23, 1936; Board of Medical Affairs Minutes, April 13, 1936. Appendix regarding The George and Emily McMichael Harrison
Foundation; Ravdin Papers, Minutes April 7, 1938, Two typewritten pages dictated by "AS" (Alfred Stengel) and typed by ECS (Stengel's secretary); Board of Medical Affairs, April 13, 1936; Minutes Board of Medical Affairs, April 13, 1936; Minutes Board of Medical Affairs, April 13, 1936; Ravdin papers, letter from Mr. John Zimmerman to I. S. Ravdin.

28. Ravdin papers, Budget of Harrison Department of Surgical Research.


31. Trustees Minutes, p. 605.

32. Obituary Richard M. Pearce, folder Archives of the University of Pennsylvania.


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45. Ibid., p. 281.


48. Ibid.


51. Ibid., p. 452.

52. Ibid., p. 456.


56. Ibid., p. 45–46.


59. Ibid.

60. Ibid.


THE START OF SEVERAL MODERN DEPARTMENTS

Inveniemus viam aut faciemus [Find a way or make one]
Inscription over the gate between Williams Hall and Houston Hall on Spruce Street, University of Pennsylvania

After the move to West Philadelphia, the medical department began a transition into what we recognize as a modern medical school. Scientific medicine took hold. Specialties in medicine and surgery were introduced, and clinical laboratories established. The lecture halls, the hospital wards, the surgical amphitheaters, and new laboratories were populated by some remarkable people.

WILLIAM OSLER

Scarcely anyone enhanced the reputation of American medicine more than the Canadian-born William Osler. He was chosen to fill the chair of clinical medicine, vacated when William Pepper succeeded Alfred Stillé in the senior medical chair. Osler revolutionized clinical teaching: he popularized bringing medical students to the patients’ bedsides and teaching them there.

Penn considered Osler for the post only as an afterthought. According to Harvey Cushing, the medical members of Penn’s board of trustees had drawn up a list of internal candidates; but the editorial staff of the Medical News was chagrined that a “wider view” had not been taken, especially mentioning Osler, then practicing in Montreal. Dean Tyson, one of the editors, felt that it was too late, but was convinced to move on it nonetheless.
Horatio C. Wood traveled to Montreal to learn more about Osler. As Cushing put it, "He went first . . . to the French hospitals and found that, among the French physicians, everyone spoke of him in highest terms; he then went to the Montreal General Hospital where he encountered such a degree of enthusiasm . . . he became himself a convert and returned home without interviewing any of Osler's colleagues on the faculty."³

Wood's report convinced the search committee to recommend Osler. Osler was visiting in Europe when the crucial next steps, including the famous examination by cherry-pit, occurred. They are described by Osler:

On June 17 a coin was flipped at 14c Terch Street, Leipzig, which fell heads [deciding for Philadelphia]. . . Dr. [Weir] Mitchell cabled me to meet him in London, as he and his good wife were commissioned to "look me over," particularly with regard to my personal habits. Dr. Mitchell had said there was only one way in which the breeding of a man for such a position, in such a city as Philadelphia, could be tested: give him cherry pie and see how he disposes of the stones. I had read of this trick before and disposed of them genteelly in my spoon and got the chair.⁴

Osler came to Philadelphia in October 1884.⁵ He was an immediate contrast to his predecessor Pepper, who arrived in the amphitheater with great dignity and, still in the process of removing his gloves, might begin a brilliant dissertation on a topic, not always the one prescribed. Osler could be dignified and serious, but his mischievous, playful nature would break through the solemn mask of the medical teacher. His formal lectures required careful, extensive preparation, and he clearly was more at home on the wards. It was there, as he used patients to describe the history of their disease and pointed out changes in the physical signs of the disease, that he conveyed to students a relaxed feeling of confidence, a sense of a professor who wanted to teach them something useful.⁶

Within a short time students flocked to the wards where Osler was found every morning. They knew nothing about clinical research, and even if they had an interest in it, there were no facilities for laboratory studies on patients at the University hospital. Osler changed that, too. He outfitted a primitive laboratory under the hospital's amphitheater. In surroundings resembling a cloakroom, he stimulated the students to conduct laboratory studies on their assigned patients.⁷
Osler’s lack of interest in building a large private practice mystified his Penn colleagues. He limited his outside work to consultations; and instead of devoting his afternoons to office hours or house calls, he went over to Philadelphia Hospital, affectionately called Old Blockley, where he gathered a group of students in the “dead house” and conducted postmortem examinations. “A breath of fresh air,” one student observed, referring to Osler’s teaching. Osler left Penn for Johns Hopkins in 1888 and concluded his career at Oxford. He left his mark on every institution at which he served.

LOUIS DUHRING

What Osler did for clinical medicine, Louis Duhring did for dermatology. He established this new specialty in America. A native Philadelphian and a Penn medical graduate, Duhring was drawn to skin diseases after hearing Francis Fontaine Maury lecture on managing skin lesions at the Jefferson Medical College in the 1860s. As a resident at Philadelphia Hospital, young Duhring showed such interest in the dermatological cases he saw that the hospital authorities granted him a room to study and care for the patients. This room soon became known as “the diseases of the skin ward,” and from this modest start American dermatology began.

Duhring extended his knowledge by studying in Europe, mostly in the Vienna clinic of Ferdinand Hans von Hebra. On his return he opened the Dispensary for Skin Diseases on 11th Street; he eventually turned it over to one of his associates.

His success in treating skin diseases led the medical school to form a dermatology department, which he headed from 1875 to 1910, a period the specialty still refers to as the “era of Duhring.”

Duhring’s great Atlas of Dermatology first appeared in 1876; additional sections appeared at six- to seven-month intervals until it included nine sections containing 36 color plates. His worldwide fame, however, stemmed from 18 papers published between 1884 and 1891 on the disease or group of diseases he called dermatitis herpetiformis, subsequently known as “Duhring’s disease.” He showed that various cutaneous conditions previously described as different diseases were actually manifestations of one disease. He demonstrated that the
symptoms, though variable, are generally chronic with occasional remissions. They are also characterized by pruritis which is often intense, herpetiformity, and a symmetrical distribution of lesions. It usually follows profound psychological shock or nervous exhaustion.

Duhring was a bachelor and inherited considerable wealth from his family. These circumstances, plus a self-denying lifestyle, a remunerative practice, and judicious stock investments, led him to accumulate an estate worth over $1.5 million at the time of his death; he left the bulk of it to Penn and the College of Physicians of Philadelphia.10

HORATIO C. WOOD

Penn also spurred the work of several basic scientists who fostered experimental biological research in the United States. Horatio C. Wood was one of these.11 He succeeded Joseph Carson as professor of materia
medica. In addition to therapeutics, he was interested in neurology, and he held that chair as well. He also served the United States Pharmacopoeia for more than three decades.

Wood represented the ninth generation of an old English Quaker family who had come to Pennsylvania with William Penn. At an early age, he was attracted to natural science and was encouraged in it by Joseph Leidy, whom he met at the Philadelphia Academy of Natural Sciences. He graduated from Penn’s medical school and served in a unit of the Army medical corps headed by Harrison Allen. His first position at Penn, in 1866, was as quizmaster and private teacher in the medical department.

Wood’s early writings on myripoda attracted the attention of Louis Agassiz. Agassiz, who had recently acquired a collection of Brazilian myripods, put it at Wood’s disposal for classification. Wood made two expeditions for specimens on behalf of the Smithsonian Institution; on the second trip, he became one of the first white men on record to see the Grand Canyon. In 1877 the Smithsonian published his 270-page work on fresh water algae; the book contained nineteen colored and two uncolored plates of 360 drawings Wood had made from microscopic slides.

Eventually Wood published more than three hundred papers on topics as varied as the action of atropine, veratrum, amyl nitrite, the oxytocic action of quinine, the vasomotor action of ergot, the action of alcohol on the circulation, and the biological action and behavior of ethyl bromide, strontium, chloramine, the volatile oils, and the anesthetics. His most important papers—on American hemp and hyoscine—were the first to appear on these subjects.

His monumental work was his book A Treatise on Therapeutics. In it, he revolted against empiricism, or as he harshly put it, against “clinical experience.” In his introduction he wrote, “Empiricism is said to be the mother of wisdom. Verily she has been in medicine rather a blind leader of the blind.” Instead, he aimed “to make the physiological action of remedies the principal point in discussion, not secondary, as had been the custom in preceding works on therapeutics.”

HARRISON ALLEN

Harrison Allen, also descended from a Quaker Philadelphia family, studied dentistry after high school before entering medicine. After
army service during the Civil War, he practiced surgery at Saint Joseph's Hospital and at Philadelphia Hospital. He was considered technically skilled, but failed as a clinical surgeon because of his extraordinary fondness for detail; his power of intellectual perspective was lost in his study of the details. Yet this mental trait helped his research.

Although Allen regarded his time spent on dentistry as wasted, his familiarity with the anatomy of the mouth, as well as the head and neck, led to his studies on this part of the body. His papers describe the anatomy of the teeth, deformities of the face, and the importance of alveolar bone in preventing the loss of teeth.

He became an authority on diseases of the mouth. In one experiment he devised a method to measure the motions of the soft palate during speech. In a dramatic surgical success, he cured a case of epilepsy by extracting a tooth that remained over an impacted tooth. Allen extended his interest to include the nose, leading to his reputation as the father of rhinology. In 1874 he published his Analysis of Life Forms in Art.

In 1878 the medical faculty offered Allen the chair in physiology, although it knew that his interest was largely in anatomy. Allen accepted because there were no prospects of a position in his field of expertise. Later, he collaborated with Eadweard Muybridge in the photographer's experiments on animal motion. His career was short; he retired in 1885 because of failing health.

EDWIN TYSON REICHERT

Allen's successor was Edward Tyson Reichert, who devoted much of a long career to validating chemically Darwin's theory of the origin of species. He carried out extensive projects, first on hemoglobin and later on plant starches, to devise a chemical classification of animals and plants. At this time physiologists believed that the active substance of all living things was the same. Reichert disagreed. He showed that different species of animals and plants could be distinguished positively by tracing their protoplasmic-chemical composition, which varied widely.

In 1911 he published the results of his systematic work on the properties of hemoglobin crystals of 107 representative animals of various species. He pointed out that the hemoglobins of six species of
baboons were similar in structure to man's—the nearest any scientist had come to offering chemical proof of Darwin's theory of evolution.\textsuperscript{15}

Reichert had other research interests, too. He studied snake venom with S. Weir Mitchell. They crystallized a number of venoms and described their chemical nature. They showed that snake venoms are proteins and demonstrated experimentally some of their poisonous effects on blood and nervous tissue. In physiology he studied the centers of the brain that control thermoregulation; and in pharmacology he studied the physiological action of such drugs as caffeine, amyl nitrite, brucine, and strychnine.

Reichert was known for his interest in instrumentation, and he equipped his laboratory with the most modern instruments available, using them effectively to teach students as well as to conduct original research. His contributions were significant, and his tenure as physiology professor stretched to thirty-four years. Yet he had a retiring character and left less imprint on the medical school than might be expected.\textsuperscript{16}

THEODORE G. WORMLEY

Theodore G. Wormley, a Pennsylvanian who had migrated to Ohio, was elected in 1877 to fill the chair of chemistry vacated by Robert E. Rogers when he resigned. Wormley was an M.D. who received his medical degree from the Philadelphia Medical College in 1849. After practicing medicine for a year he finally settled in Columbus, Ohio and remained there for 27 years. Here he became interested in the use of the microscope to study the properties of chemicals and the products formed during chemical reactions. This work led to his becoming America's first microchemist, following in the footsteps of Louis Pasteur. The micro-analytical techniques he developed became particularly important in the identification of poisons, thus Wormley was one of America's first toxicologists. His precise chemical analysis defining the chemical reaction conditions, reactant and product concentrations, limits of accuracy, and solubilities of each alkaloid did much to establish the field of microchemistry as a quantitative science in America.\textsuperscript{17}

His experience using the microscope in chemistry and the procedures he developed were summarized in his textbook, \textit{The Microchemistry of Poisons}.\textsuperscript{18} After he had completed his text and it had been accepted for publication the publisher informed him he could find no one with
the skill required to make the steel engravings of his drawings of 
crystals. To insure that the publication of this work would not be delayed 
and that the crystals would be properly illustrated, his wife learned the 
art of steel engraving and made nearly one hundred plates to illustrate 
her husband’s chemical classic.\textsuperscript{19}

**PATHOLOGY IN THE MEDICAL DEPARTMENT** 
**FROM THE 1870s TO THE TURN OF THE CENTURY**

Until the William Pepper Laboratory was built in 1895, most of the 
studies in pathology—clinical morbid anatomy—were carried out at 
Pennsylvania and Philadelphia Hospitals. For most of the century, 
pathology had not achieved independence as a discipline; it was a 
stepping stone to clinical medicine. William Pepper, Jr. served as 
curator of the Pathological Museum at Pennsylvania Hospital and later 
became a distinguished clinician because of his wide knowledge of the 
morbid anatomy of diseases.\textsuperscript{20} James Tyson was Penn’s first professor 
of general pathology, but even he moved on to become clinical professor 
of medicine, succeeding William Osler.

A change in attitude occurred in 1889, when Juan Guiteras, a 
graduate of Penn’s medical school, was chosen to succeed Tyson as 
professor of general pathology and morbid anatomy.\textsuperscript{21} Guiteras organized 
a more systematic course in the subject. He delivered lectures himself 
and established laboratory work for which the class was broken into 
groups conducted by “demonstrators” to study gross and microscopic 
specimens of diseased organs. He also introduced lectures on bacteri­
ology.

Guiteras resigned and returned to his native Cuba when the Spanish­
American War broke out in 1898. The position was offered to William 
H. Welch of Johns Hopkins. He turned it down but recommended his 
assistant, Simon Flexner.\textsuperscript{22}

**SIMON FLEXNER**

Flexner had just returned from the Philippines, then a United States 
protectorate.\textsuperscript{23} While studying dysentery among the soldiers stationed 
there, he discovered the bacillus that bears his name, *Shigella flexneri*. 
He came to Penn in 1899 as professor of pathology (a title shortened from general pathology and morbid anatomy) and proceeded to organize the first full-time Department of Pathology at Penn. He complained about "the discomfort and disadvantages of inadequate quarters for teaching and research in the old building"—that is, Medical Hall—and he looked forward to the completion of the Medical Laboratories in 1904. Little wonder, considering the activity he generated, as recollected by Eugene Opie:

Flexner continued his studies of toxalbumin and the reactions of the immunized animal to them. He directed [Hideyo] Noguchi to a highly successful study of the nature of snake venoms. He made experimental studies of pancreatic disease, begun in Baltimore and later continued in New York. He demonstrated a fat-splitting enzyme in foci of fat necrosis. He undertook experiments to define the conditions under which hemorrhagic necrosis of the pancreas is produced, and he showed later that the necrosis which develops when bile is introduced into the pancreatic ducts is referable to bile salts. He described hitherto unrecognized thrombi produced by agglutinization of red corpuscles. . . .24

Flexner also organized the Ayer Clinical Laboratory at Pennsylvania Hospital and served as its first director. His skills in both administration and research led to an offer to direct the Rockefeller Institute, and he left Penn for that institution in 1903. He went on to contribute significantly to research on poliomyelitis.25

HIDEYO NOGUCHI

Hideyo Noguchi was unintentionally recruited for Penn’s Department of Pathology.26 Flexner visited the Kitasato Institute of Infectious Diseases in Tokyo while en route to the Philippines. Noguchi, talking to Flexner, mentioned that he would like to come to the United States. Flexner answered this presumably casual remark by saying, “That would be fine.” Noguchi, naive about American idioms, considered this response a formal invitation to work in Flexner’s laboratory. After a slight delay due to shortage of funds, Noguchi obtained a steerage passage to San Francisco and arrived in Philadelphia in 1899. Flexner enjoyed recalling that Noguchi arrived “out of the blue, with many Japanese gifts, and wreathed in smiles.”
The faculty helped Noguchi find a research project. Weir Mitchell wanted to extend his own work on snake venoms by applying newly developed techniques to the complex proteins that he and Reichert had found in venoms. Mitchell granted Noguchi funds to study them. Noguchi accepted the work but had problems. He knew nothing of the chemistry or immunology of snake venoms. Worse, he had great difficulty communicating with his colleagues and adjusted slowly to American customs and a Western scientific laboratory. Fortunately for him, Flexner's assistants educated him daily. It was evident that their pupil was catching on when the sign "No-touchi, No-guchi" appeared over one of his experiments. He produced significant work. He and Flexner described in detail the hemolysis produced by the venom as well as the specific damage to the endothelium caused by the action of the toxin.

Noguchi followed Flexner to the Rockefeller Institute, where he devised culture techniques to grow the spirochete of syphilis; he demonstrated its presence in brain tissue, thus explaining the well-known neurological symptoms of this disease. He died of yellow fever in 1928 while carrying out research on the disease in Africa.

ALLEN JOHN SMITH

Allen John Smith succeeded Flexner as head of pathology. He was a native Pennsylvanian who had graduated from Penn's medical school and assisted Juan Guiteras. He was also the brother of Edgar Fahs Smith, Penn's distinguished chemistry professor. Allen Smith was ambitious in his own right. He had gone to the University of Texas in Galveston, where he virtually formed the medical school, serving as its dean and primary lecturer in nearly all subjects taught; he also had one of the few microscopes available there.

Smith was a parasitologist. In Texas he found ova of hookworm in an unidentified fecal specimen and then identified the parasite's ova in an Australian sailor. Because he recognized the difference between Old World and New World worms, Smith is credited with establishing the fact that hookworm disease is endemic in the United States. He studied leprosy and was led to evidence that bedbugs conveyed the disease. He made other discoveries as well, publishing his findings in more than 125 papers in journals, some of which he helped found. He translated
Otto von Furth’s *Problems of the Physiological Chemistry of Metabolism.* This translation influenced the pioneering work in nutrition of Layafette Mendel and Graham Lusk at Yale University, research later brought to the University of Pennsylvania by Harry M. Vars, who was instrumental in developing intravenous nutrition.

Students gave Smith exceptional respect, and they often stayed past the class hour to hear him elaborate on the relationship between changes in the pathologic anatomy and the function of the organ and the patient’s symptoms.

**THE FIRST X-RAY PICTURE—ARTHUR W. GOODSPEED, WILLIAM N. JENNINGS, J. WILLIAM WHITE, AND CHARLES LESTER LEONARD**

In 1895 Wilhelm Konrad Roentgen, professor of physics at the University of Würzburg, held his hand between a Hittorf tube and a fluorescent screen and became the first person to see the bones of his own hand. But he did not make the first X ray. That had been done five years earlier in a Penn laboratory. Unfortunately the accomplishment was not recognized until Roentgen published his work and a Penn scientist went back to examine what he and a visiting friend had stumbled upon.

It was February 22, 1890, and Arthur W. Goodspeed, a Penn physics professor, was conducting experiments with his guest, William N. Jennings, a British-born photographer. They had been studying the photographic effects of light emitted by the discharge of high-voltage cells. Goodspeed had the equipment ready: the spark gap and the induction coil that amplified voltage for the Crookes tubes used to demonstrate cathode rays to students. Goodspeed connected the coil to the spark gap, and Jennings made a series of photographs of coins, rings, and other small objects with the light from the spark. The evening’s planned work completed and the night still young, their conversation turned to other science.

Goodspeed explained to Jennings that the induction coil was usually used to burn Crookes tubes, devices named for Sir William Crookes, who had experimented with them extensively in the 1870s. They consisted of two metal electrodes in a vacuum-sealed glass bulb, which was beautifully pear-shaped. When the negative terminal of a high-voltage supply, as from an induction coil, was attached to one of the
electrodes (the cathode) and the positive terminal to another (the anode),
the cathode rays (later identified as electrons) were emitted and the
glass tube fluoresced.33

The physics professor demonstrated the properties of several types
of Crookes tubes in Penn's collection and then the properties of the
cathode-ray tube. A stack of unexposed photographic plates from the
photographic experiments stood nearby; on top of it were two coins
Jennings had taken from his pocket for his Woodland Avenue trolley
fare. After the demonstrations were finished, Jennings went home,
carrying both his exposed and unexposed plates.34 Several days later,
Jennings reported to Goodspeed that some of the unexposed plates were
badly fogged, even though they were tightly wrapped in lightproof paper.
Furthermore, one of the developed plates was marked with the image
of two mysterious discs. Jennings could not offer an explanation. Neither
could Goodspeed. They forgot the matter, but Jennings was sufficiently
impressed by the disc-shaped shadows that he stored the plate safely
away.35

In 1895 Goodspeed read Roentgen's report describing X rays, and
he immediately tried to obtain deliberate X-ray images of the kind he
and Jennings had accidentally secured nearly six years earlier. He was
not successful until February 5, 1896. He reported his results in the
February 14 issue of Science. Goodspeed described how he made his
February 5 picture: "A small strip of glass and a piece of sheet lead
together with a wedge of wood were held in place upon a sensitive
photographic plate by elastic bands. This object was placed horizontally
upon a table eight to ten centimeters below the Crookes tube." After he
turned on the current, "an exposure of twenty minutes produced upon
development a sharp impression of the object. The sight was startling
at first, as every experimenter who gets results for the first time can
testify." Goodspeed immediately saw the implications for medicine:
"Impressions of surgical cases, including deformed fingers, fractures,
etc., have been successfully produced."36

The same issue of Science contains a translation of Roentgen's
original report and papers showing X-ray pictures of various objects by
Michael Pupin of Columbia University and E. H. Frost of New Hamp-
shire as well as Goodspeed. Goodspeed gave a more detailed report on
the X rays to the American Philosophical Society on February 21.

Goodspeed disclosed "Plate 1," as the 1890 X-ray plate by him and
Jennings is called. And he was balanced about the circumstances: "The
First X-ray picture. The picture of William Jennings’s coin for his Woodland Avenue trolley fare, which he laid on the photographic plate exposed to the rays from the Crookes tube Arthur Goodspeed was demonstrating to Jennings in the physics department in 1890. Although Goodspeed failed to realize this picture’s importance, it is the first X-ray picture taken. (Brecher and Brecher.)

writer and his associate [Jennings] wish to claim no credit for the interesting accident, but the fact remains, without a doubt, the first Roentgen picture was produced on February 22, 1890, in the physics lecture room at the University of Pennsylvania."

Goodspeed went on to make other contributions. He gave the record produced by the rays the name radiograph because he realized that the image was produced by some type of electromagnetic radiation. Furthermore, he also made extensive studies on the optimal working conditions for the induction coil. He and John Carbutt also produced the first photographic plate designed for X-ray work. The techniques he
developed helped him obtain high-quality radiographs of the thorax and abdomen. By February of 1896, Goodspeed had called J. William White, John Rhea Barton Professor of Surgery, about the possibility of using X rays in surgery. He asked White for patients. White, in turn, enlisted the help of Charles Lester Leonard, a photographer who then was an instructor on the University Hospital’s surgical service. Leonard had earlier worked in the Pepper Laboratory on methods of improving photomicrography. He had developed an electrically operated shutter-and-lens system, with which he was able to photograph microorganisms at various stages of their life cycle.

Leonard immediately sensed the possibilities of using Roentgen rays in clinical medicine. He withdrew from his surgical training and began investigating the new science. Shortly he was appointed the hospital’s first skiagraper, or roentgenologist.

It was amazing that he could do anything, considering his facilities. At first, he carried out his X-ray work on an upper floor of the Pepper Laboratory. This site, however, was inaccessible to patients on litters, so he moved his modest equipment to a room partitioned off from the surgical outpatient waiting room on the ground floor of the Agnew Memorial Pavilion. The space was only twenty feet by ten feet, dark, and poorly ventilated, and no bed could be moved through the door. Leonard’s darkroom for developing and loading plates was a small closet under the seats of the general surgical amphitheater, two floors above the room containing the X ray. It had a light, a sink with running water, two shelves, and space just sufficient to accommodate Leonard’s body.

With these marginal facilities and a 20-volt primary induction coil operated by storage batteries, Leonard was the first person in the United States to demonstrate the presence of stones in the kidney and other parts of the urinary tract. Leonard continued to work under these primitive conditions until he resigned in 1902 to become director of laboratories at other hospitals.

But he had virtually given his life to his work, unaware, like so many early radiographers, of the dangers of X rays and radiation. By the time he left Penn, his hands were so severely burned that his finger had to be amputated, later his hand, and finally his arm. He died in 1923 from a squamous cell cancer produced by X rays in one of his burned fingers.

Like his early colleagues, Leonard believed that tissue damage was caused by the electric magnetic field set up around the electron discharge.
in the X-ray tube. To reduce exposure to him and to the patient, he shielded his X-ray tubes with aluminum. This offered no protection from the X rays, which Leonard observed as his radiation dermatitis grew progressively worse. Finally he realized that the rays were causing the damage. Prior to his death, he wrote extensively, warning radiologists about the dangers of X rays and urging them to protect themselves with lead shielding.

THE DEPARTMENT OF RADIOLOGY

In his memoir of Henry K. Pancoast, Eugene Pendergrass states that, on the basis of evidence he could find, the Department of Radiology at the Hospital of the University of Pennsylvania began in 1896 and is the first such department established in the United States. When Charles Lester Leonard left the university in 1902, J. William White, chairman of the Department of Surgery, asked Henry K. Pancoast to take the position of skiagrapher. After consulting with Arthur Good-speed, Pancoast accepted the position.

In 1912 Pancoast became the first professor of roentgenology appointed in the United States. Subsequently this title was changed to professor of radiology to conform with the recommendations of the American Medical Association.

During his thirty-seven-year tenure in this position, Henry Pancoast was a pioneer in developing radiology at Pennsylvania as well as in the United States. He was one of the early radiologists who associated the development of leukemia with exposure to X-ray radiation and a pioneer in using X rays to treat leukemia and Hodgkin’s disease. His work for the American Tuberculosis Association established the X-ray picture of the healthy chest. His continued interest in dusty lungs resulted in detailed X-ray studies on pneumoconiosis and silicosis, work that led to the realization that these conditions were industrial hazards. Today he is remembered for pointing out the importance of X rays in the early diagnosis of superior sulcus tumors by the eponym they bear, Pancoast’s tumors.

When Pancoast died in 1939, his assistant Eugene Pendergrass succeeded him as professor of radiology. Pendergrass accepted this position only on the condition that radiology be separated from surgery. Thus radiology became an independent department at this time.
JOHN GOODRICH CLARK

When the medical school at Johns Hopkins University was founded, two of its first four faculty members came from Penn: William Osler and Howard A. Kelly. One of the first gifts Penn received in return was John Goodrich Clark. Clark was a Penn graduate who intended to join Osler’s service at Hopkins, but when he arrived, he found that his position had been given to someone else. In desperation he went to Kelly, who happened to have an opening. Thus by mere chance Clark became a gynecologist; he turned out to be a creative physician in both the laboratory and the clinics.

As a resident at Hopkins, Clark began an anatomical study of the ovarian cycle as it progressed from follicle to corpus luteum to the corpora albicantia. He continued his studies in the laboratory of Werner Spalteholz and Wilhelm His at the University of Leipzig. There he demonstrated that the ovary has a single supply of blood, through its pedicle, unlike the male testis, which has a second, peripheral supply. Clark deduced that the sole blood supply, combined with the ovarian scarring from cyclic changes of follicular growth, ovulation, and formation of corpora albicantia, provided a self-destructing system; to Clark, this explained why ovarian function ceased earlier in life than testicular function.47

Also while he was in Leipzig, Clark studied the blood supply of the uterus. His findings caused Spalteholz to change his anatomical drawings of the uterus. Clark went on to study under Hans Chiari in Prague. His work on the ovary was published in Archiv für Anatomie in 1898 and immediately established him as the world authority on that organ.

Clark came to the University of Pennsylvania in 1899. He was a handsome, powerful man with enormous drive. He worked and played with equal intensity. His enthusiasm and pleasant personality stimulated his colleagues to work together and run the excellent gynecological clinic for which he was noted. “Give the credit to my team, not to me,” he often said to compliments.48

But much was due to him and his acute observations. As early as his days at Hopkins, he noticed that the onset of uterine and cervical malignancies was silent and that many pelvic tumors were well advanced—and therefore inoperable—by the time the gynecologist saw them. Early detection became one of Clark’s lifelong projects. To inform the public, he used his subsequent position as chairman of the American
John G. Clark conducting his gynecology clinic. Clark had the history and physical finding written on the blackboard. The patient was prepared and draped behind a screen. When the patient was ready for the operation and the case presentation and discussion had been completed the screen was opened and the operation commenced. (Archives of the University of Pennsylvania.)
Medical Association's committee on cancer of the uterus. He published a pamphlet describing the early signs and symptoms of uterine cancer and mailed it to all physicians in the United States.

It was also during his residency that Clark realized that, contrary to conventional practice, a simple amputation of the cervix or the usual hysterectomy was inadequate in controlling pelvic cancer. He observed that tumor cells remained even when the uterus, cervix, tubes, and ovaries were removed. He felt that a more radical operation would excise the remaining cells.49

In 1895 Emil Reis of Chicago developed a radical abdominal operation in which he removed pelvic lymph nodes by dissection, in addition to removing the uterus, cervix, tubes, and ovaries. Reis, however, tried the operation only on animals and cadavers.

Clark introduced a new procedure on women in April 1895. That year he reported on his first two cases, and he pointed out his innovative surgical steps:

first the introduction of the bougies; second the ligation of the upper portion of the broad ligaments, including the round ligament and ovarian arteries, cutting them close to the pelvic walls, opening the two layers before excising any tissue; and excision of a larger portion of the vagina than usual.50

Four years later, Ernst Wertheim of Vienna published articles on an extensive series of cases in which he used essentially the same procedure described by Clark. Wertheim popularized the operation in Europe and, to some extent, the United States. For this reason, the radical hysterectomy is usually called Wertheim's operation, although Clark preceded him.51

Clark had success with the first fifteen patients he treated with this procedure; but postoperative reports—his own as well as those from Wertheim and others—were not so cheery. Surgical mortality was high, and the cure rate disappointing. To improve the treatment, Clark, along with Charles C. Norris, a junior member of his service, investigated the use of radium to treat the more advanced tumors. After five years, they concluded that radium was better for advanced cases and that surgery should be reserved for early cases.

Clark was also an innovative teacher. To stimulate research by medical students, he organized the Undergraduate Medical Association;
each spring, all regular classes were suspended for a day so that students could read and discuss their basic and clinical research at a symposium sponsored by the organization.

Formal lectures were not Clark’s style. He replaced them with conferences and clinical studies, which he enriched by employing lantern slides, anecdotes, reminiscences, blackboard drawings, and anatomical sculptures modeled in plasticine clay. For his surgical clinics, he designed an operating room in which observers were separated from the operating area by a partition that could be raised or lowered. Preparations for the operation were completed behind the closed partition while the audience was given an abstract of the case history, illustrated by slides or a demonstration of the operative steps to follow. The partition was then raised, and the operation began. Such efficiency impressed visiting clinicians from all over the world.\textsuperscript{52}

His wife helped him develop Ward K as a model for the postoperative care and convalescence of gynecological patients. He designed cubicles that separated patients according to their stage of recovery. The ward was tastefully decorated, airy, and bright, and always had fresh flowers and recent magazines and books on hand. Ward K is now called the Clark Unit, a tribute from his patients and friends.

SURGERY FOR THE CURE OF PAIN

William G. Spiller, Penn professor of neurology from 1915 to 1932, was the most distinguished American neurologist of his time.\textsuperscript{53} Born in Baltimore, he received his medical degree from Penn, then went to Europe for four years, carrying out special studies in medicine and then in pathology. When he returned, he conducted neuropathological research in the William Pepper Laboratory. At the turn of the century, he was appointed to the neurology staff at the Philadelphia Polyclinic Hospital, maintaining a close connection with the Pepper Laboratory.

As time passed he became a fast friend of Charles K. Mills, dean of American neurologists, the two holding frequent sessions to discuss informally new developments in their field. When Mills’s vision began to fail, Spiller loyally kept his friend informed by reading important articles to his colleague.

Spiller succeeded Mills and eventually accumulated more than two hundred fifty articles on neurological problems. His source material was
his large pathological collection and records of cases he had seen at Philadelphia General Hospital.

Spiller was a pioneer in vascular occlusion of the brain stem; he was the first to postulate the medullary syndrome resulting from anterior spinal artery occlusion. He also became an expert on disorders of conjugate extraocular muscle movement.

His patients described him as polite, cool, and abrupt, complaining that he knew them only by their neurological disease. Indeed, Spiller was serious and quiet, without a sense of humor. He was stooped when he walked, and on each side of his large round head the temporal arteries appeared as twin pulsating snakes. He dressed carelessly, and his office was as bare as the cell of an ascetic monk. A frugal man, Spiller never bought a newspaper but searched for one that might be left on the ward or thrown away in the trash. His only interest was neurology, and he knew little of other medical fields. One day he asked a colleague about a new thing called a protein; he mispronounced the word as well.
Spiller did not get along well with Charles Harrison Frazier, the neurosurgeon, even though professionally their paths inevitably crossed. William Erb recalled the stinging inquisition Spiller directed at him when, at the end of his internship, he sought Spiller’s advice on specializing in neurosurgery. As Erb had done well on Spiller’s service, he felt he could discuss his decision with his teacher and ask for a recommendation. Erb broached the subject. Spiller was silent for a moment, then inquired, “Erb, are you sure you want to be a neurosurgeon?” Erb said yes. Spiller asked, “You know Frazier?” Erb said yes. “You know [Francis] Grant [a distinguished Frazier protégé]?” Again yes. Then Spiller said, “You want to be like them?” Erb became a prominent general surgeon.

Yet Spiller’s and Frazier’s names have been linked in treatments based on the former’s research and the latter’s surgical skill. The facial pain known as “tic douloureux,” or trigeminal neuralgia, probably was described, albeit vaguely, by early Greek and Roman physicians. But it was not until the nineteenth century that the fifth nerve was implicated as the source of the pain, and then surgeons resected the entire gasserian ganglion of the fifth nerve. The operation was difficult, and postoperative complications, keratitis, and motor defects were common.

In 1901 Spiller showed that the sensory root of the gasserian ganglion did not reunite after its fibers were divided. Frazier advanced that idea by showing that retroresection of the ganglion was not only technically possible but easier to perform than ganglionectomy. The Spiller-Frazier solution was used throughout the world for twenty years to treat the problem; it has since been modified, but the principle is the same.

Spiller and Frazier are also linked in the relief of intractable pain by cordotomy. From the 1880s, posterior rhizotomies were usually done, but, according to a critical review by Frazier in 1918, they gave relief to only 19 percent of the patients. The problem basically was that surgeons could not pinpoint the pain tracts because the functional anatomy of the spinal cord was not known.

Spiller provided the earliest clear understanding of the location of the pain tracts. He reported a case in which a patient lost pain and temperature sensation in the lower part of the body without losing motor or bowel function. Spiller determined that the patient had bilateral tubercular abscesses of the lower spinal cord at the area of the anterolateral spinothalamic tracts. This brilliant diagnosis was confirmed by autopsy. Other neurologists later observed that those tracts carried pain...
impulses to the brain. Spiller suggested to Frazier that the neurosurgeon could relieve lower-body pain by cutting the anterolateral tracts. Frazier did not believe it and refused to attempt such an experimental operation.

Undeterred, Spiller went over Frazier's head and persuaded Edward Martin, John Rhea Barton Professor of Surgery and chairman of the department, to do the procedure. Martin performed the first cordotomy in January 1911. Frazier subsequently took it up and developed it. In 1920 he reported that he had found the optimal site for section of the spinothalamic tract in the upper thoracic region. 57

At the start of his career, Charles Harrison Frazier studied pathology and neurology in Europe. He was especially influenced by Rudolf Virchow and Ernst G. von Bergmann, from whom he learned the new aseptic and surgical techniques then being developed.

He started at Penn as an instructor in surgical pathology in 1896, was elevated to clinical professor of surgery in 1901, then succeeded John B. Deaver as the John Rhea Barton Professor of Surgery in 1922. He was always interested in surgery of the central nervous system. He not only trained himself in the field but is also one of a small group of pioneers who created neurosurgery as a branch of surgery. During World War I, he gained experience treating soldiers who had suffered wounds to their nervous systems. 58

Frazier was also one of the first thyroid surgeons in the United States. He conceived of the idea of a thyroid clinic at the University hospital, staffed by surgery, radiology (then a division of surgery), and medicine. By 1936, knowledge of the management of endocrine diseases had so advanced that the clinic was expanded to cover general endocrine disorders.

The tension of neurosurgery impelled physicians who conducted it to take on less stressful surgery as well. Frazier's interest in the thyroid apparently originated in some departmental vindictiveness. As I. S. Ravdin told the story, Deaver did not like Frazier because the younger colleague had once tried to improve the medical school by reforming the clinical faculty. When Deaver became the Barton Professor in 1915, he held a meeting at which he assigned the parts of the body upon which each member of the department was permitted to operate. Deaver assigned the peripheral parts and fractures to younger members of the staff and kept the more desirable general surgery for himself. He might have preferred to close Frazier out altogether, but could not because of Frazier's clinical appointment as well as his strong political and family
ties to Penn. (Frazier’s uncle Charles C. Harrison was the University provost from 1894 to 1912.) But Deaver made it clear to Frazier that he could not operate on anything below the clavicle. Frazier obeyed the order until operating only on the brain and spinal cord began to get on his nerves. He went to Deaver and requested that he be allowed to operate on other parts of the body. Deaver relented and allowed Frazier to operate on the thyroid—within the boundary originally assigned. 59

Frazier was sturdily built and had a ruddy complexion. His piercing blue-gray eyes stared from under a full head of hair arranged as orderly as he was precise. He had a fiery temper; his resounding voice and commanding disposition struck fear in many colleagues as well as interns and residents, who considered him autocratic and tyrannical. Some who knew him more intimately feel that he was only superficially harsh; they describe him as a gentleman who was gracious, charitable, and helpful. Before his death Julian Johnson wrote in a letter that Frazier could be an S.O.B. in the operating room but otherwise he was very nice and concluded that was where he learned some of his habits. 60

Throughout his career he had deep concern for the academic reputation of Penn’s medical school. He established and edited the University of Pennsylvania Medical Magazine and established one of the first laboratories of surgical pathology in the country. He reorganized the

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J. William White giving an anatomy lecture in Medical Hall. (Nadine Landis.)
surgery department, bringing clinical and research activities closer together, and stressed the importance of applying the principles of physiology, physiological chemistry, and pathological physiology to the management of surgical patients. He trained a number of neurosurgeons who went on to occupy important chairs at Penn and elsewhere.61

Determined throughout his life, Frazier operated to the end, even though, when he developed his final illness, he had to be strapped to the operating table to keep from falling.62

NOTES

3. Ibid., p. 221.
4. Ibid., p. 222.
5. Ibid., p. 233.
6. Ibid., p. 235.
8. Ibid., pp. 237; 296–97; 683–85.
13. History of the American Physiological Society, 1887–1937 (Baltimore, 1938); newspaper obituary, University of Pennsylvania Archives.


19. MacNevin, "Theodore Wormley:"


32. Ibid., p. 3.

33. Ibid., pp. 4–5.

34. Ibid., p. 3.

35. Ibid., pp. 4–5.


41. Ibid., pp. 9–16.


47. Mikuta, “Clark, Tribute”.


49. Ibid., p. 154.


51. Ibid.,

52. Mikuta, “Clark, Tribute.”


54. Personal conversations with Edward Rose, William Erb, and Julian Johnson.


60. Lewey, “Charles Harrison Frazier.”


A CHAIR FOR SURGERY

The good surgeon is a physician and something else.

I. S. Ravdin

The John Rhea Barton Professorship of Surgery, established in 1877, was the first fully endowed surgical chair in America. Permanent endowments answered an increasingly important question as the nineteenth century progressed: how to support an improved faculty. During this period, the status of surgeons advanced. Scientific discoveries led to new surgical techniques that decreased both the suffering of patients and the rate of death due to either surgery or disease.

At the same time, the medical school budget was strained. There was an increasing demand for research facilities, equipment, and personnel. The medical school admitted greater numbers of students, but course fees, traditionally paid directly to the teacher, did not suffice. And surgeons engaged in research could not readily supplement their incomes by private practice, as they once had.¹

Thus $50,000 given by Sarah Rittenhouse Barton, widow of John Rhea Barton, was a timely blessing.² Barton himself never held a position on the Penn faculty, although both his uncle Benjamin Smith Barton and his brother William P. C. Barton were Penn professors. John Rhea graduated from the medical school in 1818. He served first as surgeon at the Philadelphia Almshouse and in 1823 joined the surgical staff at Pennsylvania Hospital, where he worked for the remainder of his long career.³

He developed what is still known as the Barton head bandage, a strip of muslin two inches wide and five yards long, tied in a figure-eight design around the head and under the jaw to support an injured mandible and to cover other head injuries.⁴ He also described and
developed the treatment of the fracture of the distal end of the radius, called the Barton fracture. In addition, he devised an ingenious operation for treatment of ankylosis by intentionally forming artificial joints. He divided the femur near its upper part with a saw. After placing it in a straightened position, he moved the lower portion to prevent union of the bone and to establish a false joint. The operation enabled a previously bedridden patient to stand and walk. He went on to treat ankylosis of other joints successfully. The surgery was an amazing accomplishment because it was done without anesthesia or antibiotics. It was also a brilliant example of surgical reasoning. In devising the operation, Barton anticipated every problem that such a procedure would present. No structures later required to support the pseudoarthrosis were damaged by the incisions.

D. HAYES AGNEW

The first incumbent of the Barton chair was D. Hayes Agnew, a master surgeon who entered the specialty after mastering anatomy. The son of a Lancaster, Pennsylvania, physician, Agnew received an M.D. degree from Penn in 1838. He spent much of his student time carrying out anatomical investigations in a rented, private dissecting room. After practicing medicine briefly near Noblesville, Pennsylvania, then unsuccessfully entering the iron foundry business of his late father-in-law, Agnew set up a medical practice in Cochransville, in Chester County. His zeal to learn anatomy and surgery led him to a rather desperate scheme. He purchased bodies in Philadelphia, had them delivered to a dissecting room at his home, then engaged a farmer to sink the remains in a local pond, where the eels finished the dissection and prepared perfect bone specimens. The eels were said to be noted locally for their flavor, size, and snappiness—until the secret got out.

Agnew finally found his calling in 1853. He purchased the Philadelphia Anatomical School from Jonathan M. Allen for $600. He toiled diligently to teach the medical students anatomy, keeping his rooms open twelve to eighteen hours a day. In 1854 he opened the Philadelphia School of Operative Surgery on the third floor of his building so that he could demonstrate new procedures on cadavers. Agnew sold the school in 1862.

Reputed as an anatomist and teacher, Agnew joined the staff of Philadelphia Hospital and shortly afterwards was appointed a surgeon
there. In 1863 he was appointed as a demonstrator in anatomy, subordinate to Joseph Leidy, at Penn. He brought with him many of his paying anatomical students. After six years without a promotion, he threatened to quit unless he was given faculty status. University officials feared that Agnew and his pedagogical flair, along with his students, would decamp to Jefferson. They appointed him professor of clinical surgery with the additional title of demonstrative surgeon, so that he could continue to teach his course in cadaver surgery. In 1871 he succeeded to the senior chair and stepped into the Barton professorship in 1877.

Among his surgical innovations, Agnew devised operations for dividing webbed fingers and for repairing vesicovaginal fistulae; he also improved several amputation techniques. Among surgical instruments, he invented clamps that made surgical procedures easier or possible for the first time; his most important device was the artery forceps. He also carried out experiments on animals, especially to observe the behavior of clots and the healing of bone, which he noted were similar in humans.

Bone fractures, he reported, formed callus in a sequence of stages. At first, the body "brooded quietly" over the disorder for up to thirty-six hours. Then a reactionary period of inflammation set in, "an increase of determination of blood to the part. . . ." After a period of "vascularity, . . . the real work of repair begins, that in which the true fibrogenous matter, swarming with cellular elements, assumes the appearance of order." Finally, "the differentiation of this constructive material into cartilage or fibro-cartilage and intracellular substance and the subsequent deposition of the bone salts, ultimately permeating the mass and imparting solidity to the bone, are the work of four to five weeks." The cellular processes involved in bone healing have been explained more accurately since then, but many of Agnew's ideas remain valid.

Agnew's most famous patient was President James A. Garfield, shot by a madman on July 2, 1881. Garfield rallied despite his own physicians' failure to remove the bullet with their fingers and long forceps. By the time Agnew was summoned, the damage had been done, so he recommended conservative management. Garfield died of infection on September 19.

The medical class of 1889 commissioned Thomas Eakins to paint Agnew to honor him at Commencement in 1889, on his seventieth birthday. Eakins had painted Samuel Gross of Jefferson fourteen years
earlier. In the intervening time, advances in surgical asepsis made the latter work seem several generations ahead of its predecessor. Blood was still part of the scene, however, and Eakins painted Agnew accordingly. When Agnew complained about the bloody hands and gowns, protesting that he did not want his operations so depicted, Eakins reluctantly complied with his subject's revisions.14

J. WILLIAM WHITE

J. William White, the third incumbent of the Barton chair, was independently wealthy and brought to his field the fiery, aggressive spirit of the growing industrial nation.15 Although primarily a clinical surgeon, he understood the importance of research in surgery. In 1906 he appointed J. Edwin Sweet as an associate in experimental surgery, the first such position in the world. And in his will he provided funds to endow a professorship in research surgery.16

White received both a Ph.D. and an M.D. from Penn in 1871. He explored the waters of the South Atlantic with a Harvard naturalist before accepting posts, successively, at Philadelphia Hospital, then Eastern State Penitentiary, and then with the First City Troop.17 His temper gained him national notoriety as a participant in the last pistol duel in America. Fortunately it was bloodless. White insisted that he should be permitted to wear the uniform of the First City Troop, but he was challenged by a Trooper Adams. At fifteen paces on the Delaware-Maryland border, White shot in the air, Adams's gun missed White, and the principals shook hands.18 White liked fairness. He helped relocate the riot-prone Army-Navy football game to the neutral ground of Franklin Field in 1899.19

His career on the Penn faculty began in genitourinary surgery, where he made two advances. One was his use of X-rays to detect fractures and bone deformities.20 The other was his treatment of prostatic enlargement by orchectomy. He had observed that uterine fibroids as well as the uterus became atrophied after an ovariectomy. Reasoning that the prostate and testicular function were similarly related, he proposed removing the testes to reduce prostatic enlargements and relieve urinary obstructions. It worked in dogs. In humans, White reported dramatic relief of the obstruction in some cases, but felt that surgical mortality was higher than it should be. Unfortunately, as he did not examine the
prostatic tissues of these cases at autopsy to determine whether cancer had caused the hypertrophy, it was impossible to evaluate his therapy. Not for forty years would orchidectomy be shown to be effective in treating carcinoma of the prostate.  

EDWARD B. MARTIN

Edward Martin succeeded White in the Barton chair. He was a handsome Hicksite Quaker who graduated from Swarthmore College and then from Penn's medical school. He had an early interest in aviation and before the Wright brothers' accomplishments conducted experiments that proved heavier-than-air flight was possible.

As a surgeon Martin was the first to use morphine to relieve postoperative pain at the University hospital. He also introduced breathing exercises and carbon dioxide inhalation to combat the respiratory depression associated with the use of narcotics. He published original papers on such topics as ambulatory treatment of fractures of the lower extremity, occlusive dressings for war wounds, the use of adrenaline to treat shock, and acacia as a blood substitute. In the classroom, Martin introduced motion pictures to add to lantern slides as pedagogical devices. Martin's legacy is not exclusively medical. Debonair and married, he fancied himself a ladies' man and admitted female admirers to the hospital for long stays. The director of the hospital entered Martin's office one day and shot him in the back for philandering with his wife. The episode is recorded in Martin's inkstand, which was perforated by a stray bullet; the inkstand is part of the permanent historical exhibition in the John Morgan Building. Later in life, when his vanity was scarred by carcinoma of the left lower part of his nose, Martin ordered a gelatin prosthesis that was renewed from time to time and tinted to match his skin to disguise the deformity.

JOHN BLAIR DEAVER

Martin unexpectedly resigned the Barton chair in 1918, and John B. Deaver succeeded him. Deaver probably operated more than any surgeon in Philadelphia. Scheduling eighteen to twenty-four cases in a single day was not unusual for him. His clinic was well organized, and
there were few delays, even though he did not use his assistants to their full capabilities. He felt that his obligation to the patient and the referring physician required his performing the operation himself. Late in life he allowed his residents to do more, but he still held a tight rein. In hysterectomies the resident was not permitted to begin the operation until Deaver had safely placed the clamps alongside the uterus so that the ureters would not be cut. He called a Caesarean section "his" operation. 

John B. Deaver's Clinic at Lankenau Hospital. (Historical Collections of the College of Physicians of Philadelphia.)
With the scalpel Deaver was rapid and impatient, a "great slasher." He may have lacked the patience for fine dissections; but in the abdomen, where meticulousness is less critical, he was confident and met accidents with perfect poise. He also expressed contempt for pathology, seeming to doubt a science of disease. At the operating table he challenged others by demanding, "What is the pathology?" or "Demonstrate the pathology!" as if it either could be shown at once on a tray or else did not exist.\[29\]

His name is associated with a retractor whose use can make anyone seem clumsy. Every intern, resident, or surgical assistant has been rebuked by an operating surgeon for not holding the Deaver properly. Something about this instrument contains the spirit of its inventor.\[30\]

As a teacher, Deaver established operative clinics on Saturday afternoons, drawing medical students and students of surgery from all over the world. He played to his large audiences. He would exclaim, "What this case needs is the aseptic scalpel at the earliest possible moment!" and then lay open an abdomen with a single stroke.\[31\] He had a formula for the length of incision, the duration of an operation, and the period of a hospital stay for an appendectomy: "an inch and a half, a minute and a half, and a week and a half." To remind students that surgical treatment, unlike medical management, was definitive, he insisted, "Sew well, get well, stay well." If residents were too vigorous with patients, he advised, "Let the patient get well."\[32\]

NOTES

1. Minutes of the Faculty Meeting (the guarantee).


9. Ibid., pp. 84–92.

10. Ibid., pp. 136–40.


12. Ibid., pp. 182–92.

13. Ibid., pp. 220–49.


17. Ivy, Personal Recollections of Holders of John Rhea Barton Chair, p. 245; Repplier, J. William White, pp. 8–28.


19. G. Schoor, The Army and Navy Game—A Treatise of the Football Classic (New York: Dodd and Mead, 1967), pp. 401–403; [game statistics, 415; riot described, 421; last game played at Annapolis; Philadelphia Inquirer, Dec. 3, 1982 statement that this would probably be the last game between the academies because of injuries to players and time diverted from studies; Repplier, J. William White, pp. 87–89.


23. Ibid., p. 99.


29. Ibid.

30. Ibid.

31. Ibid.

32. Ibid.
8

SPECIALIZED INSTITUTES

If "Ye shall know the truth, the truth shall set you free," not from change or from grief, or from final passage beyond the vail but free from careless fears, from useless labor; and this is a part of wisdom "which passeth and goeth through all things."

John Shaw Billings
Address at the Opening of the School of Hygiene, 1892

The development of cities in an industrialized America brought new problems to the attention of this country's physicians. Infectious diseases required not only cures but also greater understanding of how diseases spread and how to prevent them through clean water supplies, adequate waste and sewage disposal, and good housing and food. European clinics had begun systematic scientific studies of diseases, which produced important advances in understanding and treatment. Penn was the site of some of the first American institutes to mass a large frontal attack on particular health problems.¹

THE SCHOOL OF HYGIENE

An early example was the School of Hygiene. The single course that had begun in 1865 in the Auxiliary School of Medicine was hardly sufficient for the material two decades later, when the University hospital's facilities were steadily increasing. Plans for a school were discussed in the spring of 1888, shortly after a fire destroyed most of the fourth floor of Medical Hall. Provost Pepper was surveying the damage with Henry C. Lea, the wealthy publisher and philanthropist, and learned of Lea's interest in public health. Lea offered $10,000 to promote the study of hygiene.²

Pepper's flair for fund-raising was aroused. He began negotiating
with John Shaw Billings from Johns Hopkins Hospital to direct the new department. Then he approached Lea, who increased his proposal to $50,000 for a laboratory if Billings would come and if an additional $250,000 was secured for equipment and an endowment; Lea also insisted that hygiene be made a required course.

Pepper started by subscribing $10,000 and made his estate "personally responsible for the entire amount." Within four hours he had five other donors, but then his march to success slowed. Pepper was $60,000 short as Lea's deadline approached. Pepper wrote: "I felt a sense of anxiety that I cannot overstate. It seemed to me that my health must break down under the strain. At this time a near relative . . . at my earnest solicitation inserted in his will a clause leaving $60,000 to the University for the establishment of a professorship. . . ."3

Billings and Lea jointly oversaw the design and construction of the building; and the school, on 34th Street north of Spruce Street, was formally opened on February 22, 1892. It did not escape Billings that externally the building was plain compared to the unusual library building, designed by Frank Furness, which Lea had given to Penn three years earlier. At the dedication, Billings noted that the hygiene building had been "planned from within outward, which is the reason why it looks like a laboratory and not like a castle or cathedral. . . . It is fit and proper that it should be so. The library represents the garnered experience and wisdom of the past: the laboratory is the workshop of the future. One is fruit, the other is seed."4

Bad seed, however, had already been sown. In bringing Billings to Philadelphia, Pepper hurt the ambitions and the feelings of Samuel G. Dixon, who was already teaching hygiene. Dixon was a practicing attorney when, because of his health, he turned to medicine. He earned a degree from Penn in 1886 and then traveled to Europe to study bacteriology. When he received his professorial appointment, he opened a small laboratory in Medical Hall, the first in the United States devoted to hygiene.

In 1889 Dixon wrote to Pepper that Billings's appointment in effect abolished his own professorship, and Dixon left Penn. He transferred his research to the city's Academy of Natural Sciences and eventually became its president. In addition, he had a distinguished career in city and state public health.5

When Billings came, he brought Alexander C. Abbott, M.D., a bacteriologist who had helped William H. Welch at Hopkins both teach
in the school and organize and run it.\textsuperscript{6} Billings taught “practical hygiene,” covering such subjects as water supplies, garbage disposal, house drainage, methods of ventilating and heating homes, food inspection and adulteration, “offensive and dangerous trades,” and “sanitary jurisprudence.”

In bacteriology, Abbott covered methods of isolating pure colonies of bacteria, techniques of the microscope, immunity, disinfection, antisepsis and asepsis, and bacteriological investigations of air, sewer, and water.\textsuperscript{7} Within four years, Billings’s enrollment dwindled to almost zero, while the size of Abbott’s classes steadily rose. Abbott was so successful that by 1896 bacteriology was required for all Penn medical students.\textsuperscript{8} Bacteriology in the School of Hygiene was considered practical or applied rather than the pure science it was in the medical school; there, it was included in Tyson’s Department of Pathology and taught by Juan Guiteras, who held one class a week in the subject.
When Simon Flexner became head of pathology in 1899, he wanted bacteriology to be taught by a pure scientist. He brought Abbott into the medical school. A new wing, containing an improved student laboratory and a lecture hall, was added to the school. 9

Even by the mid-1890s, Billings felt frustrated. He resigned and went to New York, where he created the New York Public Library. 10 His departure discouraged Lea, who abandoned his plans to support an enlargement of the school. Abbott was named head of the school, but because he knew little about public health and preventive medicine, the institution languished. 11 In 1898 a vain effort was made to offer the services of the school to communities in the Commonwealth of Pennsylvania. The provost wrote to mayors of 160 municipalities describing the laboratory’s services. Only eight replied, of whom two accepted the offer. 12

In 1903 the school received another blow when Abbott became head of the city’s Bureau of Health. He stayed on as director of the school and taught hygiene for the few who enrolled. 13 Subsequently the course was taught by faculty members from various University departments. In 1914, on Abbott’s recommendation, the director’s title was discontinued and the school was officially incorporated as a division of the medical school.

A few years later, the Rockefeller Foundation decided to establish a fully equipped school of public health at a leading medical school. Harvard, Hopkins, and Penn were the front-runners, but Penn’s case was substantially weakened because of the wavering support it seemed to give the subject. Hopkins was chosen—Welch’s revenge, perhaps, for having his earlier plans interrupted when Pepper recruited Billings and Abbott. 14

Penn’s trustees responded to the Rockefeller rebuff by designating Abbott’s course in hygiene the School of Hygiene and Public Health. All but three of the faculty of the so-called school were members of Abbott’s department. This effort at organizing a separate entity ended with Abbott’s resignation in 1928. 15

There was little stability. In 1931, the medical-school administration formally separated bacteriology and hygiene. Stuart Mudd was appointed as chief and professor of bacteriology. In retrospect, the most important contribution of the Pepper-Lea endeavor was introducing this subject to Penn. 16

But the professorship of hygiene was left vacant through the 1930s
until 1939, when it was renamed the George S. Pepper Professorship of Public Health and Preventive Medicine. The department’s name was changed accordingly, and the University conferred its first degree in public health. In 1967 the name was changed once more, to the Department of Community Medicine, but soon afterward the department was phased out completely. Its chaired professor remains, and its endowment has been incorporated into the Department of Human Genetics.

THE WISTAR INSTITUTE

The same year that the School of Hygiene opened its doors, the Wistar Institute for Anatomy and Biology was opened at 36th and Spruce Streets, bounded on the north by the diagonal slant of Woodland Avenue as it traveled west. The institute began as a museum for Caspar Wistar’s anatomical collection; the museum had been expanded by Horner and Leidy as a teaching and research resource. It was given new life by General Isaac J. Wistar.

Wistar was prodded by James Tyson, dean of the medical school, to found the institute, chiefly to display the Caspar Wistar collection. Wistar responded by establishing a trust fund of $20,000, to which he added $125,000 at Pepper’s behest. The resulting structure was the first fire-proof building in the United States. The institute is independent from Penn but the University trustees elect its board of managers; one of the nine managers must be the oldest and nearest male heir of Caspar Wistar, and two must be members of the city’s Academy of Natural Sciences.

In its first decade, the institute improved the museum and organized a machine shop. In 1905, Milton Jay Greenman became its third director. He wanted it to become a research institute, and the board agreed. Its initial work focused on embryology, neurology, and comparative anatomy. Between 1906 and 1914, the brains of some 250 people, Presidents and Supreme Court justices among them, were collected and studied at Wistar. In 1908 the institute acquired a printing press and shortly became a publisher of learned biological and anatomical journals.

The institute became the medium for the dissemination of the albino rat as the main laboratory animal throughout the world. The rat came
to the institute in 1906 with Henry Donaldson, the institute’s first scientific director. Donaldson was a professor of neurology and dean of the Ogden School of Science at the University of Chicago, when Greenman called him to Philadelphia. Donaldson brought with him Shinkishi Hatai, a research associate with whom he had studied the rat. Four albino rats came to the institute as well.

They were descended from an albino mutant of *Epimys norvegicus*, a brown or gray rat originating in Asia. The brown or gray ones were used for baiting with trained terriers, a popular sport in France and England that spread to America before being stopped in 1870 or so. The sport required the capture of hundreds of rats, which were held in pounds until their contest. Albino rats appeared from time to time; they were removed from the colony and kept for show or breeding and tamed by frequent handling. Specimens had likely been transported by the
Swiss zoologist Adolf Meyer when he joined Donaldson’s department at Chicago in 1890.24

When Donaldson arrived at the Wistar Institute, he carried out what was for that time a huge research program on the development of the albino rat. Donaldson noted that “the nervous system of the rat grows in the same manner as that of man, only 30 times as fast.” In addition, from birth to death, the rat’s development is equivalent to that of a human of the same age, so that “observations on the nervous system of the rat can be transferred to man and tested.”25

From the first, the institute maintained a randomly bred colony in addition to one maintained by strict brother-sister matings. The latter was carried through the 135th generation and became known as the King albino. The former served as the commercial stock sold to other research institutions. Serious losses of the animals to toxicity, respiratory infections, and infectious diseases spurred development of breeding facilities made of brick, concrete, steel, and glass, materials that did not harbor dirt and could be easily cleaned. Diets advanced from local
restaurant scraps to recipes for "wheat and peas with milk" and "hominy grits, vegetables, and eggs" until dry dog and fox diets became available in 1950. Many books on the rats grew from the institute's research program. The seminal one was Eunice Chase Green's *Anatomy of the Rat.*

Edmund J. Farris succeeded Greenman as acting director in 1937. He served for 20 years in that capacity and distinguished himself through fertility studies. Hilary Koprowsky, a virologist at Lederle Laboratories, was appointed director in 1957.

Koprowsky initiated the institute's current interest in cell biology, cancer research, and immunology. A pioneer in the development of polio vaccines, Koprowsky developed an improved vaccine against rabies. In other research, a vaccine that protects a pregnant mother from rubella has been developed and successfully tested by Stanley A. Plotkin, who is currently developing a vaccine against cytomegalovirus, another producer of birth defects.

**THE HENRY PHIPPS INSTITUTE**

The Henry Phipps Institute, like the School of Hygiene and the Wistar Institute, was founded by a wealthy benefactor who gave building and research monies. The Phipps Institute, which opened in 1903, targeted its effort at the contemporary health crisis of tuberculosis; it was the first institution organized solely for treating and studying a single disease. Ironically its scientific success led it to close its doors 76 years later.

In 1901 Andrew Carnegie sold his steel firm and overnight created several multimillionaires, including Henry Phipps Jr. of Pittsburgh. Influenced by Carnegie's philanthropy, Phipps turned to supporting charitable causes. He heard of the work of Lawrence Flick at the White Haven Sanatorium in Pennsylvania. After meeting with Flick, he decided to found a dispensary. The two traveled abroad in 1902 to see how tuberculosis was managed in Europe. The next year, the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis formally opened under Flick's directorship. Phipps gave $50,000 a year for seven years to support the institute. In 1910 he secured its future by having it affiliate with Penn. He gave $54,000 a year until
1916, then, in a final gesture, gave $500,000 in 1926 to establish an endowment fund for the institute.  

The institute was first located in the 200 block of Pine Street, in ordinary townhouses converted into a hospital complete with an autopsy room, laboratory, and nurses' training school. Eventually it moved to one of the most degraded spots in Philadelphia, at Seventh and Lombard Streets. Flick chose the location because he wanted to place there an institution consecrated to uplifting human beings. Flick was evangelistic in his fight against tuberculosis. He assembled a competent staff of clinicians, pathologists, and bacteriologists, most of them working part-time. The staff devised and practiced rigid rules for the care of the patients. To find competent nurses, Flick hired women who had been patients at the White Haven Sanatorium and showed signs of improvement; then he trained them in his own school. This method of recruiting
became common practice. The recruits were eager for the activity and the opportunity to defray some of their expenses, even though the salary was low. Flick was a better director of clinical work than of research. Impetuous and lacking a research background, he had difficulty finding and maintaining competent scientific investigators, because he did not realize that research cannot be hurried.

MAZYCK PORCHER RAVENEL

The major scientist of the institute’s early period was Mazyck Porcher Ravenel, a bacteriologist at Penn’s School of Veterinary Medicine. He and his Phipps Institute colleagues demonstrated the ineffectiveness of an anti-TB serum prepared by Edoardo Maragliano.

But Ravenel’s main interest was in tracing the route of the bovine strain of the bacillus into humans. In the 1800s, Robert Koch discovered the tubercle bacillus. Koch thought that infection of humans from cattle was so insignificant that cattle inspection was not necessary (the most common route of infection was the respiratory tract). At an international TB congress in 1908, Ravenel challenged Koch’s opinion about the cattle but without proof. He created a stir; eight years later, he was able to publish evidence that children frequently acquired the bacillus through the alimentary tract.

PAUL A. LEWIS

Paul A. Lewis, a graduate of the medical school and professor of experimental pathology, was the first director of the institute’s laboratories after it came under University control in 1910. Lewis’s studies focused on hereditary factors in guinea pigs that are associated with the resistance of animals to TB. He also made other experimental contributions. With John Auer he demonstrated that acute anaphylactic death in guinea pigs is caused by severe broncho-constriction, which reduces air exchange in the lungs and produces asphyxia. Lewis and Simon Flexner found that experimental poliomyelitis could be transferred from monkey to monkey for generations by a filterable virus—thus further establishing polio’s viral origin.
EUGENE L. OPIE

Eugene L. Opie succeeded Lewis as director of the Phipps Institute laboratories in 1923. Over the next nine years, he and his associates proved that the “spread of tuberculosis occurs in large part by long, drawn-out family or household epidemics in which the disease is slowly transmitted from one generation to the next.” He also found that the bodies of persons who had died following “galloping consumption” did not show evidence of having tuberculous infections in childhood. With this knowledge of how the disease spread, Opie began studying the prevalent strain of TB in rural black Jamaicans who had not been exposed to tuberculosis until they flocked to crowded towns for work. Having no immunity, they contracted virulent tuberculosis and died about three times as rapidly as the white population. Opie also carried out extensive studies on the nature of the tuberculosis antigen and other sensitivity reactions.

ESMOND R. LONG

Esmond R. Long succeeded Opie in 1932. He had contracted the disease in 1913 while a medical student at the University of Chicago. When his active tuberculosis was arrested, he traveled to Prague where, under Anton Gohn, he studied the primary lesions of tuberculosis, called Gohn’s complex.

At Chicago, he had begun collaborative research with biochemist Florence Seibert, and they were reunited at the Phipps Institute, where they continued their work on the chemical nature of TB. Correctly reasoning that Koch’s earlier infection tests of tuberculin extracted from tubercle bacilli were unreliable because the active principle of the extracts was not known, they set out to isolate the active principle. By 1926 Long and Seibert had determined that tuberculin was a protein.

Seibert eventually purified and crystallized tuberculin to such a degree that it could be standardized and used clinically. This protein, prepared from Koch’s “old tuberculin,” was called the purified protein derivative of tuberculin (PPD). In 1952, after further purification, PPD became the official standard of the United States Public Health Service. The availability of PPD gave means to standardize a TB test for the first time.
Esmond R. Long, Director of the Phipps Institute. He and Florence Seibert purified the antigen of the tubercle bacillus (purified protein derivative, PPD) thereby making the PPD test more specific as a screening procedure for tuberculosis. (Historical Collections of the College of Physicians of Philadelphia.)

Long's retirement in 1955 signaled the end of tuberculosis research in Philadelphia. Streptomycin, the first specific therapeutic agent for the disease, had been introduced in the late 1940s. Such chemotherapeutic agents as isoniazid, rifampin, and ethambutol followed quickly. There was no further need for prolonged rest and major surgical procedures—or for research in this field.

In the late 1960s the Phipps Institute was directed toward supporting community medicine. The old buildings were sold and a smaller institute built at 42nd Street and Chester Avenue. This attempt met with limited success, and in 1979 the trustees applied the assets of the Henry Phipps Trust Fund—amounting to more than $1.5 million—to research in human genetics. The facility was sold to the City of Philadelphia for use as a health-care and counseling center.
NOTES

8. Corner, p. 182.
9. Announcement of the Course of Instruction in the Laboratory (of Hygiene), February 1, 1892. In folder containing the program of the opening exercises of the School of Hygiene, College of Physicians of Philadelphia.


36. *Ibid*.


40. Kidd, Celebration and Presentation of Academy Medal to Opie, p. 233.

American universities are not properly constructed. They should be built like Hagenbeck’s Tiergarten in Hamburg: with large enclosures in which the professors are placed so they can roar to their hearts’ content and not bite each other.

Otto Rosenthal

In 1906, national concern over the quality of education stimulated the formation of the Carnegie Foundation for the Advancement of Teaching. The foundation began by investigating medicine with a survey headed by Abraham Flexner, the brother of Penn’s former pathology chairman. Flexner’s committee visited every medical school in the United States and Canada and issued its report in 1910.¹

A sense of urgency was real. Medical education nationwide varied widely. Admission requirements were low; many students entered medical school immediately after graduating from high school. Curricula had little uniformity and fewer standards.

The report’s assessment of Penn was not negative. But, it pointed out, other schools had more stringent admissions requirements, better facilities, a greater percentage of full-time, preclinical laboratory instructors, and more established research scientists. What especially galled the Penn faculty was that the Johns Hopkins School of Medicine received higher ratings in all of the categories evaluated in the report.²

Penn was certainly alert to a potential problem even before the Flexner group began its survey. In 1907, Daniel J. McCarthy, a neurologist, and C. Y. White, a pathologist to Children’s and Episcopal Hospitals, gathered nine other physicians and formed the John Morgan Society to stimulate faculty research. The members also discussed research in formal meetings twice a year in order to promote interaction
between younger and older members of the faculty. In addition they held an annual dinner to promote conviviality. Some compulsion to meet the goals of the group was imposed by fines: for instance, members were fined $30 if they failed to publish two papers a year or $5 for missing a business meeting and $25 for missing the annual meeting. Membership was so exclusive at first that the society grew slowly. Eventually entry was liberalized, and more recently even interested clinicians on the hospital staff have joined. 3

Such an organization, needless to say, was not a deep solution to such a pervasive problem. Penn, of course, did have some stellar research initiatives. Moreover some of the foundation’s complaint applied to medical academe generally, not to Penn alone. Yet the perception in some quarters was that the University had indeed fallen behind, that its malaise was self-inflicted. In 1919 William Ashton wrote in the Alumni Register:

Forty years ago Philadelphia was the center of medicine and surgery in America. . . . But forty years ago Philadelphia fell asleep; and while she slept, peacefully dreaming of her past achievements, the great modern impulse of scientific thought and practice was gradually making itself felt throughout the world. 4

The problems of medicine at Penn can be encapsulated in two events, unique in its history, which validated the sense that even the august University could stand for reform.

One event was a cheating scandal. It suggested that the goal of at least some medical students was the degree to practice rather than a knowledge of medicine. 5 Fifteen members of the class of 1899 paid an employee of the medical department $175 to let them submit fraudulent answer books. The usual arrangement was that students took their exams in Medical Hall, after which the employee carried the papers to the professors’ residences for grading. The guilty fifteen persuaded the courier to substitute papers written outside the examination room for those they had written inside. The answers substituted were on operative and clinical surgery by E. R. Kirby (formerly J. William White’s assistant and the individual giving the anesthetic in Thomas Eakins’s painting The Agnew Clinic) and on medicine and clinical medicine by John D. Target and George Robinson, 1898 Penn graduates. 6

The ruse succeeded, and graduation took place in June. Some time later in the month, a member of the graduating class informed J. William
White of the conspiracy. White reported it to Dean John Marshall. Marshall confronted the accused students, but they denied they had cheated. In the fall, however, one of them apparently had a fit of conscience and confessed. The others then broke as well, and the faculty revoked their degrees.\footnote{7}

The faculty had its own expression of turmoil, instigated by a reform drive that preceded the issuance of the Flexner report. The University administration had already been shaken up when Charles C. Harrison succeeded William Pepper as University provost. As an M.D., Pepper enjoyed a congenial working relationship with Dean Marshall. Harrison was a businessman, so successful in his sugar refinery that he was able to retire at the age of 42 and devote himself to philanthropy. He was appointed acting provost when Pepper stepped down in 1894, and some early accomplishments led the trustees to make the appointment permanent.\footnote{8} But Marshall had difficulty working with him.

Nor did Marshall like the growing influence of Harrison’s aggressive nephew, the surgeon Charles Harrison Frazier. Frazier encouraged his uncle to foster original experimental work at Penn and, along the way, to reorganize the medical faculty. Marshall resigned in 1902, and Frazier succeeded him.\footnote{9}

Frazier proceeded to preempt any concerns the Carnegie Foundation, still years away from birth, might have had about standards at Penn. He upgraded entrance examinations, stimulated scientific research, sought out new practitioners for positions on the clinical faculty, and kept his uncle aware of developments in the profession generally. As it was provocatively put, Frazier was intent on “dragging the medical school out of the atmosphere of self-satisfied complacency and scientific stagnation.”\footnote{10}

Some members of the faculty opposed Frazier, fearing that professors more oriented toward science would displace what they considered an excellent tradition in clinical practice and teaching. Thus the faculty were already disposed to fall into opposing factions when the so-called Edsall affair occurred.\footnote{11}

This episode began when David L. Edsall, the professor of pharmacology, was offered the chair of medicine at Washington University in St. Louis in 1910. A petition signed by five hundred Penn alumni urged the administration to keep him at Penn. Meanwhile, Frazier drew up a reorganization plan of the faculty, and Harrison concurred with it. Edsall, who benefited from the plan, was so pleased with it and with
the likelihood of its being implemented that he declined the call to St. Louis.12

Harrison took action by getting the trustees to approve the changes, skirting steps in the consultative process that even the self-interested Frazier and Edsall would have taken. On March 25, Harrison convened the medical faculty and announced the reorganization as a fait accompli. James Tyson would retire from the chair of medicine and Edsall would succeed him—a must if Penn were to keep Edsall. Further, it was expected that the professor of medicine would devote half of his time solely to the work of the school; other clinical faculty members were expected to do the same.13 A. N. Richards was brought from Northwestern University to fill the pharmacology chair vacated by Edsall; of all the new faces, Richards's turned out to be the most significant.14

In addition, Marshall, under threat of demotion and a 25 percent salary cut, would retire from the chemistry chair. Alonzo E. Taylor, recruited from the University of California, would head a new Department of Physiological Chemistry (Harrison announced that he had received $100,000 from an anonymous donor to establish a chair in this field).

Allen John Smith would move from pathology to comparative pathology; he was being groomed as the dean to succeed Frazier. Howard Taylor Ricketts, a biologist from Chicago, was appointed to succeed Smith, but Ricketts died of typhus in Mexico City just weeks after accepting the Penn offer. Harrison offered the chair to George H. Whipple, but was so overly cautious (he made the appointment only probationary) that Whipple declined; he later won the Nobel Prize. Richard Pearce, who had been at Penn but left for the Rockefeller Institute, returned to take the position temporarily. It might be supposed that Louis Duhring was untouchable; indeed, White, in his usual flamboyant way, announced that if the distinguished dermatologist were removed, there would be dire consequences. Duhring was not removed, but his health was failing, and he was persuaded to retire within a year, to be replaced by Milton Bixby Hartzell.15

In some circles Edsall was persona non grata. When he tried to take over the hospital service under his new post, he was told with "considerable violence" that he had been assigned no hospital beds at all and that he was requested to keep out of the wards until the hospital's board of managers acted upon the matter. This issue was settled in time, but a more painful one emerged. He asked Alfred Stengel, the director of
the Pepper Laboratory, to supply him with space and equipment for his research projects. This request should have caused no problem, because the laboratory director serves under the professor of medicine. But Stengel had old-guard ties. He was the cousin of William Pepper Jr., and he did not see fit to fulfill Edsall’s request.  

Edsall was so discouraged by this treatment that he did not teach in the fall of 1910. Moreover, he lost his chief support. Harrison bore heavily the mounting criticism by the faculty and resigned suddenly. Weir Mitchell, who was eighty-two years old, resigned four months later; he wrote to Osler that he was tired “of constant hot water in the faculty.” Edsall had had enough. He accepted the offer from Washington University. Curiously, he stepped into another seething cauldron there and then, in 1912, went to Harvard, where he had a distinguished career.  

To succeed Harrison, the trustees appointed Edgar Fahs Smith, who

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Howard Taylor Ricketts, the pathologist for whom Rickettsia are named. In 1906, he settled the problem of the transmission of Rocky Mountain spotted fever by demonstrating it could be transferred from one guinea pig to another by a tick. A few weeks after accepting his call to Philadelphia, he died from typhus in Mexico City. (Archives of the University of Pennsylvania.)
was the vice provost. "The things which had been done in the medical school were undone," he was able to state shortly; for one, he reappointed his brother Allen John Smith to the pathology chair.¹⁸

In a letter to Simon Flexner in 1912, Edsall wrote:

Pennsylvania is doing badly enough. They have legislated Pearce and Taylor out of the Medical Council by making a new executive faculty, thus eliminating all of the "Young Turk" element except Richards, who is not aggressive; and they split Dr. Musser's chair between Riesman and Sailer, after vainly trying to get Thayer. The latter act they have kept quiet. . . . That act of Edgar Smith's was, however, the only suggestion of the recognition of the need of regeneration I have heard of. They all seem outwardly deeply satisfied with themselves.¹⁹

No doubt Penn's medical faculty lost a valuable academician in Edsall, but their erstwhile colleague may have been too eager to write their epitaph. Academic medicine was changing; Penn was able to change with it, often leading the way.

NOTES

2. Corner, Two Centuries of Medicine, pp. 229-32.
3. A. N. Richards, An address given November 8, 1957 at the fiftieth meeting of the John Morgan Society held in the Lenape Club, University of Pennsylvania.
5. Minutes of the Medical Faculty, book 10, 1898, pp. 158, 176 (hereafter MFM).  
6. MFM, January 8, 1900, book 11, pp. 22-42, describes events associated with the cheating scandal.  
7. MFM, pp. 40-42.  
9. Corner, Two Centuries of Medicine, pp. 196, 210-11.  
10. Ibid., pp. 211-12.  
11. Ibid., p. 219.  
12. Ibid., p. 223; Aub, Pioneer in Modern Medicine, pp. 80-83.  
14. Ibid., p. 89.
15. Ibid., pp. 87–88; Corner, *Two Centuries of Medicine*, 225.