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STIRRINGS OF ORGANIZED MEDICAL EDUCATION

These are deeds which should not pass away and names that must not wither.

Edgar Fahs Smith

Settling new colonies was, as Benjamin Franklin called it, “drudgery.” Only after a country passed that phase would a sufficient number of inhabitants have, again in his words, the “ease and . . . leisure to cultivate the fine arts and improve the common stock of knowledge.”¹

By the fourth decade of the eighteenth century, Franklin deemed, the American colonists had reached that stage. He, of course, was their premier example because of the wide variety of organizations he started and his scientific work, especially in electricity. His electrical experiments not only had scientific value but also represented the spread of Baconian science: the idea that knowledge is power, that it could free humankind from dogmas of any sort.² The success of Franklin’s experiments suggested more: that it was one’s duty to investigate the environment and that understanding how it functioned would itself be a means for attaining freedom. His clear description of the behavior of electrical fire dispelled the two-fluid theory of electricity and won the respect of scientists in France and England. It made the statement that American science had arrived.³

Medically, Franklin helped promote the first American hospital. He put forth the idea in The Pennsylvania Gazette, started the subscription for funds, and persuaded the Pennsylvania Assembly to grant matching funds to the £2,000 of private gifts. The result was the Pennsylvania
Hospital, which was granted its charter in 1751 and opened its door to patients the next year.4

Franklin expected that the new hospital would provide medical training, as European hospitals did. Hospitals were ideal sites for instruction, he pointed out, because they treated a “multitude and variety of cases” and because instruction could be “speedy and effective,” especially for students from afar who intended to return home.

Shortly after the Pennsylvania Hospital opened, students began visiting the wards. Most were apprentices to members of the hospital staff or to consultants of the hospital. After they finished their clinical service, they were given a certificate drawn up by Thomas Bond to acknowledge this training.

Such an enlightened environment inspired apprentices in many fields. One of the most apt pupils of the era, in activity, ambition, and breadth, was John Morgan, the son of a Philadelphia shopkeeper.5 At the age of fifteen, he began a six-year apprenticeship with Dr. John Redman, one of the founders of the Pennsylvania Hospital. While he was learning, Morgan served as the hospital’s apothecary, and in his spare time, cataloged a gift of fifty books presented to the hospital by the sister of Dr. Benjamin Morris. Morgan’s bibliographic effort was eight years before the Pennsylvania Hospital’s library was officially founded by the Managers in 1763.6

During his apprenticeship he responded to an advertisement for students to the Academy of Philadelphia—the institution that would become the University of Pennsylvania. Morgan finished his college studies in 1756 and graduated in the first class of the new college in 1757.7

Armed in both medicine and liberal arts, Morgan left Pennsylvania Hospital to become regimental surgeon of the Pennsylvania provincial troop.8 Here he had the opportunity to watch English surgeons operate. They repeatedly told him that if he wanted to reach the top of his profession he must have a European medical degree—an opinion corroborated by the Philadelphia physicians he esteemed, who had studied abroad. His decision to study in Europe was hastened when the Pennsylvania troop was disbanded.9

Another ambitious pupil of the times was William Shippen, Jr. A great-grandson of a Philadelphia mayor and a nephew of the Chief Justice of Pennsylvania, he had graduated from the College of New Jersey (later Princeton University) and spent a four-year apprenticeship
with his father, a physician. Shippen’s father packed him off to Europe “to gain all the knowledge he can in anatomy, physic, and surgery,” especially to observe dissections and a wider variety of operations than were available at home.

Shippen indeed had a grand tour. In addition to pursuing an active social life, he enrolled in John and William Hunter’s famous school of anatomy and lived at their home for eight months. He studied midwifery with Colin Mackenzie, the leading teacher of the discipline, and attended deliveries at Mackenzie’s lying-in home. Shippen visited the major hospitals and observed operations by the noted surgeon Percival Potts. He traveled to Scotland, where he heard lectures of William Cullen, the country’s most distinguished physician, and Alexander Monro, the anatomist. Shippen received his medical degree from the University of Edinburgh in 1761; two years later, Morgan received his medical degree from the school.

Although no documents exist to prove who first proposed a medical school in Philadelphia, discussions of establishing one evidently took place at the home of Dr. John Fothergill, a busy London practitioner who welcomed every American medical visitor warmly. Fothergill’s father and brother were eminent Quaker preachers who had traveled through most of the American colonies. Although he never visited America, Fothergill, better than almost any other Englishman, understood the colonists’ needs. He had recognized the importance of Franklin’s electricity experiments and ushered Franklin’s small book describing them through the press.

Shippen breakfasted with Fothergill frequently and informed his host about the Pennsylvania Hospital, the practice of every notable practitioner in the city, and the training of medical apprentices—pointing out, finally, the crying need for more formal medical teaching in the colonies.

The first recorded mention of any such plan appears in a letter from Fothergill to Dr. James Pemberton, a Philadelphian. Fothergill wrote that he “recommended . . . to Dr. Shippen to give a course to such as may attend.” He also mentioned that Shippen “will soon be followed by an amiable assistant Dr. Morgan.” Both of them, with the aid of the legislature, might “erect a school for physic” to furnish students “with a better idea of the rudiments of their profession than they have at present on your side of the water.”

In the early part of 1761 Morgan and Shippen were in London
together, so they had ample time to discuss with Fothergill and each other their plans to found a medical school in America. They reached an agreement to start classes with Shippen as professor of anatomy and midwifery and Morgan as professor of physic.

Their plans were hardly private. Samuel Bard, a New Yorker studying in Edinburgh, wrote to his father in 1762 about Shippen’s anatomical class in Philadelphia and Morgan’s plans to lecture on the theory and practice of physic when he graduated. Admitting his own ambition to start a school at the College of New York (later Columbia University), Bard wrote, “I own I feel a little jealous of the Philadelphians.”

The course Bard referred to was opened in the autumn of 1762, just after Shippen returned to Philadelphia. Shippen initiated it with an introductory lecture in the State House on November 16, an impressive occasion attended by many laymen as well as medical students.

Shippen clearly intended his anatomy class to expand into something larger. Described by an unknown student, Shippen, in the introductory lecture,

inform’d his audience with the method he intended to pursue in his instruction of his pupils. He would begin with that great & material part the Blood, then the bones, &c: afterwards with Dissection and Bandages, and between whiles would introduce a small Part of Physiology, but upon the arrival of his friend & fellow citizen John Morgan, he would readily resign that Branch & refer his pupils to his further instruction.

Meanwhile, Fothergill had hoped that the new school would have institutional connections. He assembled a collection of anatomical material for illustrating lectures and had it sent, along with a cash gift, to the Pennsylvania Hospital. The material included a human skeleton, a fetus, three cases of anatomical models in plaster, and a set of 18 crayon drawings by Jan van Rymsdyk, the celebrated medical artist who had illustrated the dissections of the London anatomist Charles Nicholas Jentry.

Pennsylvania Hospital’s board of managers, strapped for funds despite Fothergill’s donation, did not start a school but offered the instructional material to Shippen, who used it in special sessions and charged a separate fee to benefit the hospital.

Shippen’s courses in anatomy and midwifery were the first systematic teaching of medical subjects approaching an academic level in the American colonies. In January of 1765 he advertised in The Pennsylvania Gazette a course of twenty lectures on midwifery open to both
sexes, to train physicians as well as midwives. To provide his students with patients, Shippen arranged lodging for a few poor women who were ready to deliver; he also employed a matron acquainted with the problems of lying-in.¹⁶

For his regular course Shippen charged each student five pistoles (about $20) and that sum again for seeing subjects prepared for lectures or for learning the “art of displaying blood vessels by colored injections.”

The school gained more pupils each year, despite increasing opposition from a public which abhorred dissection and accused Shippen of grave-robbing. One jingle declared,

Don’t go and weep upon my grave
And think that there I be;
They haven’t left an atom there
Of my anatomie!¹⁷

Shippen was not always let off so lightly. On one occasion, the windows of his dissecting room were smashed. On another, he had to run for his life through an alley while his carriage was pelted with bricks and stones and perforated by a musket ball. Shippen finally settled the disturbance by assuring the public that he was not raiding cemeteries but using bodies of executed criminals and suicides given to him by municipal authorities.

It is not known whether Shippen ever intended to affiliate his private enterprise with Pennsylvania Hospital or with the College of Philadelphia. In either case, he could have enlisted the help of his father, who served on the boards of both. Perhaps those institutions, young and cautious, discouraged close ties, noting the public’s objection to anatomical teaching and feeling that training male physicians in obstetrical practice was too risky.

Later, Shippen said that he delayed because he was waiting for John Morgan to return from Europe. But he may not have been up to the rigors of putting together an entire school. Despite being an excellent teacher and physician, he showed himself to be a poor organizer in his subsequent career; and he apparently dissipated time by indulging in the good things of life. In any case, he left the field to the far more aggressive Morgan.¹⁸

NOTES

Chapter 1


6. *Ibid.*., p. 27; Pennsylvania Hospital Minutes, 3 mo. 29, 12 mo. 29, 1755.


17. J. F. Watson, *Annals of Philadelphia* (Philadelphia: Cary and Hart, 1830), pp. 607–8; W. L. Turner "The Charity School, the Academy, and the College Fourth and Arch Streets," in *Historic Philadelphia*, ed. Luther P. Eisenhardt, issued as vol. 43, part 1 of *The Transactions of the American Philosophical Society*, 1952, and reprinted 1980, pp. 179–86. Turner gives a description of early buildings of the University of Pennsylvania. The colored map included shows the location of William Shippen Sr.'s property at Fourth above High Street. William Shippen, Jr., lived at the southwest corner of Fourth and Prune Streets (now the Shippen Wistar House, sold to Caspar Wistar in 1798—an early location of the famous Wistar Parties). There is some confusion in various accounts that state Shippen's Anatomical School was at the Prune Street location. Watson's annals and a map prepared by the American Philosophical Society both show that Shippen's school and his later anatomical lectures in the Medical Department were given at Fourth above High Street, a little over a block from the Philadelphia College.

Thomas Morris wrote in his diary that Shippen, accused by a mob of exhuming a body for dissection, was pelted by bricks and stones on December 20, 1787 in the alley near his father's home on Second Street. Thomas Morris's diary is in the document collection of the Hagley Museum, Greenville, Delaware.

EARLY TEACHERS AND SCIENTISTS

It is often said the master word of medicine is work. Of course this is true in one sense of the word work. But I don't like masters and I don't like work—in the other sense. The best that I can wish—is that you will find in medicine not a master, but a mistress: charming, intelligent, amusing, arousing love, passion, and a desire to serve.

O.H. Perry Pepper, M.D.
Address to the Senior Class, University of Pennsylvania School of Medicine, Spring 1955

Commencement, 1765, at the College of Philadelphia. John Morgan, M.D., was the speaker, but his talk was too long to fit within the ceremony's allotted time; the audience adjourned and returned the next day for the conclusion.¹

In his speech, Morgan drew a shocking picture of his medical colleagues and the state of medical knowledge in the colonies. The physician, he argued, usually has a contracted view of medicine that “limits him to a few partial indications in the cure of disease—he repeats over and over again his round of prescriptions.” Physic has arrived at a certain “degree of perfection,” he continued, but it would be too much to expect any one “untutored in this art” to learn it by himself. Thus his plan “for transplanting Medical Science into this seminary and for the improvement of every branch of the healing art.”

Morgan tugged at the heart. As for the physician, who ought to welcome deeper education: “If not past all feelings of humanity, what compunctions of conscience, what remorse would not fill his breast from practicing at random and in the dark; not knowing whether his prescription might prove a wholesome remedy, or a destructive poison.”

Morgan encouraged special training for surgery, pharmacy, and mid-
wifery. He suggested that Philadelphia was an ideal location for formal medical training because of the city's financial wealth and critical mass of physicians and natural philosophers. In addition, he recommended that Philadelphia physicians follow the London and Edinburgh model of separating the practices of apothecary and medicine, rather than charging one fee for their advice and their drugs. To offset popular misunderstanding, Morgan explained his ideas in a 26-page Apology included as the preface to his Discourse when it was published later in 1765.²

Morgan had instigated the Commencement address on his own. Within a few days of his return from his European studies, he approached the College of Philadelphia trustees and disclosed his plan to found a medical school under their guidance and patronage. He also asked them to elect him professor of the theory and practice of physic. Impressed by his presentation and the honors he had gathered in Europe, the trustees acceded to his requests, approving the plan for the medical course of study on May 3, 1765.³

During the summer Morgan alone made plans for his course, which would begin in the fall. He did not approach, nor was he approached by, his former colleague and co-strategist Shippen.⁴

Shippen, for his part, was irritated at Morgan's initiative and the trustees' actions. A bitter feud developed between Morgan and Shippen and continued throughout their lifetimes. Nonetheless, on September 17, Shippen applied successfully to the trustees for an appointment as professor of anatomy, surgery, and midwifery in the college. The Pennsylvania Gazette carried the announcement, signed by both Morgan and Shippen, that their medical lectures would begin on September 26.⁵

On November 14, Shippen delivered his first lecture in his anatomical rooms near the college buildings. Four days later, Morgan began his course in materia medica in the college's lecture hall. Over the next four months, Morgan gave about forty-eight lectures, Shippen sixty. Morgan's fee was four pistoles, about $16; Shippen's six pistoles. Students also paid the college a dollar each to purchase books for a medical library. Morgan attracted about twenty students; it is not known how many attended Shippen's course.⁶

No pretense was made that these two courses constituted a complete medical curriculum; as the Gazette announcement stated, the course would be helpful to those attending the practice at Pennsylvania Hospital. Other courses were added over the next few years.⁷ Provost
William Smith lectured on natural and experimental philosophy. Ebenezer Kinnersly talked about electricity. Thomas Bond, a founder of Pennsylvania Hospital, reinforced the medical teaching by initiating a course of clinical lectures at the hospital.\textsuperscript{8}

In 1767, after two years of medical courses, the medical members of the board—the medical professor and Provost Smith—formed a set of rules for the new offerings. They established a bachelor's degree in physic. Courses in anatomy, materia medica, chemistry, and the theory and practice of physic were required. So were a knowledge of Latin and "such branches of mathematics, natural and experimental philosophy as shall be judged requisite to a medical education." Also required were the clinical lectures, a year of practice at Pennsylvania Hospital, a knowledge of pharmacy, and an apprenticeship "to some reputable practitioner in physic."\textsuperscript{9}

The bachelor's degree in medicine was apparently an English custom. Oxford and Cambridge Universities granted the M.D. only after the candidate had done further clinical or research work. On the other hand, the University of Edinburgh issued an M.D. without the M.B. prerequisite. Judging that the new Philadelphia school did not offer a medical education equivalent in quality to that of Edinburgh, the trustees of the College of Philadelphia initially adopted the English system.\textsuperscript{10}

Still, they provided for the advanced doctor’s degree in physic, stipulating that the candidate have earned a bachelor’s degree at least three years previously, be at least twenty-four years old, and write and defend a thesis publicly.\textsuperscript{11}

The first medical diplomas were awarded in 1768 to John Archer, David Cowell, Samuel Duffield, Jonathan Elmer, Humphrey Fullerton, David Jackson, John Lawrence, Jonathan Potts, James Tilton, and Nicholas Way. In 1771, Elmer, Potts, Tilton, and Way returned to their alma mater, defended their Latin theses, and received their M.D. degrees. But they were not the first in the American colonies to earn that distinction. Samuel Bard, who earlier had felt outdone by Morgan and Shippen, had started a medical school at King's College in New York (now Columbia University) in 1768. Its sole degree was an M.D., which it granted to two candidates in 1770.\textsuperscript{12}

The medical faculty began to expand in 1768, when Adam Kuhn was appointed professor of botany and materia medica. Kuhn had picked up some medical training from his father, a Swabian doctor in Lancaster, Pennsylvania, then traveled to Sweden to study under the world-famous
Carolus Linnaeus. Kuhn's work in Sweden was so well regarded that Linnaeus named an American variety of the thistle after him. Kuhn may not have been particularly imaginative—his lectures were said to have merely revised those he heard from Cullen in Scotland—but he had a profound talent for observation and systematization of details and was credited as a competent practitioner. Kuhn's subject matter represented an important advance in the curriculum, for students gained from him a better understanding of herbs and plants and the drugs that could be prepared from them.13

Chemistry was added in 1769, when Benjamin Rush was elected to the first chair of chemistry in America.14 Rush was born in Philadelphia and raised by his mother, a greengrocer. He completed an apprenticeship with John Redman, attended the University of Edinburgh, and stayed a few months in London dissecting and observing anatomical procedures with the Hunters.

But his career started with more emotion and impetuosity than a
bare description suggests. Rush was one of the ten students in Shippen’s first anatomical course.

He was also a student in the first medical class of the College of Philadelphia when Morgan singled him out as a candidate for the chemistry chair. As Rush was planning to earn his M.D. from Edinburgh, Morgan suggested that Rush prepare himself instead for this subject by giving special attention to the lectures of Joseph Black, the famous chemist. Redman, wary of Morgan’s taking too much into his own hands, advised Rush to be certain that the position promised by Morgan would be offered when he returned.

Rush went to Edinburgh, attended Black’s lectures for two years in succession (in those days, students could repeat a course for cumulative credit), obtained his M.D. degree, and wrote a thesis on the chemistry of digestion; he dedicated the work to Black, Morgan, Shippen, and Benjamin Franklin. Furthermore, Rush persuaded John Fothergill to recommend him to Thomas Penn, the proprietor of Pennsylvania province, as “a very expert chemist” and to have Penn purchase a set of chemical apparatus and send it to the college in Rush’s care. He was appointed to the chemistry chair three weeks after his return to America.

Morgan ceased active involvement in the medical school in 1775, when he was appointed director general and chief physician of the Continental Army. In 1777, he was dismissed from this office because of complaints of incompetence from troops under his care and because of vicious attacks by Shippen. He was replaced by Shippen, who was later court-martialed, charged with dishonesty and incompetence. By one vote the court dismissed the charges against Shippen for lack of proof. Subsequently, after being reappointed Director of Hospitals, Shippen was compelled to resign.15

Morgan never recovered from his dismissal from the Army. He spent his remaining years writing articles defending his Army service and attacking Shippen. His life ended in this sad scene described by Rush on October 15, 1789:

This afternoon I was called to visit Dr. Morgan, but found him dead in a small hovel surrounded with books and papers on a light dirty bed. He was attended by a washerwoman, one of his tenants. His niece Polly Gordon came in time enough to see him draw his last. His disorder was influenza but he had been previously debilitated by many disorders. What a change
William Shippen, Jr. Portrait attributed to Gilbert Stuart. Original is in possession of the Wistar Institute. (Archives of the University of Pennsylvania.)

John Morgan, founder and Professor of the Theory and Practice of Physic. Painted about 1787 (two years before his death) by Thomas Spencer Duche. Original is in the possession of the Historical Society of Pennsylvania.
from his former rank and prospects! The man who once filled half the world with his name, had now scarcely friends enough to bury him.\textsuperscript{16}

For good and ill, Benjamin Rush probably attracted the greatest attention among Pennsylvania’s early physician-teachers.\textsuperscript{17} By the time he died in 1813, he was considered one of the world’s outstanding doctors, known chiefly for his studies of mental diseases.

When Rush joined the staff of the Pennsylvania Hospital in 1783, he was drawn to the two dozen insane patients there. Ever since the hospital opened, it had housed a section for the care of the insane, but Rush immediately found it inadequate. The cells, he complained to the hospital’s managers, were damp in winter and too hot in summer and failed to circulate air; patients caught cold easily and several died of consumption. Rush also lobbied the legislature, which in 1792 appropriated $15,000 to construct an insane ward, a “mad house” in the parlance of the day. Patients moved into the new wing in 1796. Rush pleaded for even further improvements, and rooms with warm and cold baths were eventually added.\textsuperscript{18}

Rush had advanced notions of treating the mentally ill, especially in assigning them definite tasks or occupations. He kept careful clinical records of his patients. (One of his patients was his son John, who was confined to the hospital for twenty-seven years after the turn of the century; John’s constant pacing back and forth in a room on the ground floor wore grooves in the wooden flooring which became known as Rush’s Walk.\textsuperscript{19}

Rush used the occasion of his institutes of medicine lectures to teach his ideas on the psychology of the mind and the mechanism of its functions. Rush incorporated his long study and notes in his epoch-making \textit{Medical Inquiries and Observations Upon Diseases of the Mind}, published in 1812.\textsuperscript{20}

He evidently was an earnest if rigidly patterned instructor. During his lectures he seldom rose from his chair, reading slowly and distinctly what he had fully written out in little pamphlets.\textsuperscript{21} He singled out students whom he thought receptive to his ideas and invited them to his home. He administered frequent quizzes in order to convince his classes to accept without question his speculations and medical theories.\textsuperscript{22}

His inflexibility made him infamous during Philadelphia’s yellow fever epidemic in 1793. Rush stubbornly held to a pet theory that all
diseases were caused by "irregular convulsive or wrong action in the system affected." He also thought that the human body contained about 12 quarts of blood, twice the actual amount. Together, these notions led him to a treatment of yellow fever through bloodletting and purging, in which he removed up to a quart of blood at intervals of forty-eight to seventy-two hours. His colleagues claimed that at least 40 percent of his patients died from his prescription.

Later in his life, Rush overcame the criticism and enjoyed fame. He served as the medical school dean and was known as a reformer for freedom and health on all fronts. He was a staunch republican and abolitionist and tried to relieve the tyranny of crime and poverty. Much of his medical practice was devoted to care of the poor, and he helped establish the first public dispensary in the United States. He was so vehemently opposed to the excessive use of alcohol that many regard him as the originator of the temperance movement. He opposed capital punishment. He favored education for women and proposed a series of colleges that would pyramid to a national university.

Samuel Powell Griffiths, a 1781 graduate, was the first alumnus of the medical school to join the faculty, but he stayed for only six sessions, teaching materia medica and pharmacy. Although his lectures were praised for substance and organization, being a lecturer "was not altogether congenial to his feelings." He founded the Philadelphia Dispensary and served it for forty years. He also encouraged the establishment of a national pharmacopoeia and, after a long dormant period, helped the College of Physicians of Philadelphia formulate it.

Benjamin Smith Barton became professor of natural history and botany in 1789; previously botany had been taught as part of materia medica by Kuhn. The college created the chair in natural history—the first in America—in order to secure Barton's talents. His dissertation, on *Hyoscyamus Niger* of Linnaeus, written at the University of Edinburgh, had already earned him renown; and he was known as much for his capabilities in illustration as for his investigation of plants.

He was an early collector of botanical specimens from various regions of the American continent. And in 1804 he founded *The Philadelphia Medical and Physical Journal*, one of the first periodicals in the city, which was chiefly devoted to natural history.

Although Barton's course was not required, his enthusiasm for the
subject and his well-illustrated lectures drew students in sufficient numbers to support him. As a teacher he was described as “eloquent, instructive”; in temperament, he was called “irritable and even choleric, though in his gentle moods he was kind, tender, and intelligent.”

As a Quaker, Caspar Wistar refused to enlist in the Revolution, instead offering his services for the care of the wounded in Germantown. That stint convinced him to enter medicine.

During the institutional split that briefly created simultaneously a college and a university, Wistar joined the faculty of the college as professor of chemistry and of the institutes of medicine. The latter name identified a subject new to the American medical curriculum, a subject recommended by Wistar to the trustees just prior to his appointment. The name derived from the book *Institutiones Medicae* by Hermann Boerhaave, published in Leyden in 1707. In it Boerhaave outlined the functions of the body, which he treated as a separate scientific discipline—as such, a forerunner of physiology. The lawyerly resonance of the name derived from *Institutiones Gaii* and *Institutiones Justiniani*, Roman legal treatises in which *institutiones* signifies “principles” or “elements.” In using the name, the college trustees followed the precedent of the University of Edinburgh. Thus Wistar was the first to hold a chair of physiology in America.

When the college and university were reunited, he became adjunct professor of anatomy under Shippen. Upon Shippen’s death, he moved into the chair, which included midwifery; midwifery was separated from anatomy in 1810, and Wistar thereafter focused on his specialty.

Despite his vast knowledge of his subject, Wistar felt insecure before audiences and came across as a poor teacher. But he studiously overcame his difficulties, eventually becoming one of the greatest speakers of his time. He illustrated his lectures with actual dissections of the human body as well as with splendid wooden models of small anatomical parts, items carved for him by William Rush, a sculptor of ship figureheads. In 1811 Wistar published *A System of Anatomy*, the country’s first textbook on this subject. His most significant original contribution was a description of extensions of the roof of the nasal bone, called the “Wistar pyramids.” He pointed out that the structures, though distinct in infancy and early childhood, later become cellular and grow into the sphenoid bone, forming the medial wall of the sphenoid sinus.
His name is also associated with the “Wistar parties,” Sunday soirees over tea, coffee, wine, and cake, although the menu gradually expanded. Usually the guests invited numbered about fifteen and included the faculty of the medical school, local “literati,” members of the Board of Trustees, and distinguished visitors to Philadelphia—Baron Von Humboldt, James Madison, Abbé José Francisco Correa da Serra (a scientist and the first Portuguese ambassador to the United States), and others.\(^{39}\) (In a substantially different form, these parties, under the name of the Wistar Association—made up of some members of the American Philosophical Society—have continued to this day.) He is also remembered by the flowering vine, *Wisteria sinensis* (*W. chinensis*), Chinese Wisteria, which his friend Thomas Nuttall brought back from China and named for him.\(^{40}\)

Wistar became one of Philadelphia’s most beloved and distinguished physicians. He was one of the few physicians who remained in the city during the yellow fever epidemic in 1793. His gentle personality, combined with caution and care of his patients, brought him a large practice. His medical fees were extremely low; and once when he was very ill, he asked his sister to destroy his records so that no one would owe his estate any money after he died. His patients took to sending him gifts anonymously so that he could not return them. In January 1818, he was seized with a high fever and died from malignant endocarditis.\(^{41}\)

James Woodhouse became the most celebrated American chemist of his era, but not for his lectures.\(^{42}\) They were called “dull and monotonous” and were considered too short because they rarely exceeded forty minutes in length. Brevity was a principle with him because, he said once when asked about it, “no man could dwell, in discussion, on a single topic more than five minutes without talking nonsense.”\(^{43}\)

He did much better in his small laboratory, which he set up in the first floor of Surgeon’s Hall. He prepared demonstrations for his classes and conducted original chemical investigations. Although a close friend with Joseph Priestley, who discovered oxygen, he did not believe, as Priestley did, that burning material during combustion releases as flame a hypothetical substance called phlogiston. Rather, Woodhouse was a strong admirer of the French chemists, and was the first in America to support Antoine Laurent Lavoisier, who realized that during combustion (or oxidation) oxygen combines with the material being oxidized and increases its molecular weight.
In his 1919 book *Chemistry in Old Philadelphia*, Edgar Fahs Smith credits Woodhouse with being the first to isolate potassium. Smith says that Woodhouse purified it by heating potash with soot in an iron vessel as early as 1804, about the same time as Joseph Louis Gay-Lussac and Louis Jacque Thénard succeeded in purifying it. Yet Woodhouse received no acclaim for that important work.⁴⁴

John Redman Coxe, professor of chemistry and later of materia medica, contributed to the reputation of the young medical school through his experiments and writings.⁴⁵ His interest in using the static electric machine in chemistry led to his improving the apparatus. He conceived of a telegraph for conveying messages during emergencies, and he described this communication system in a paper published in the *Emporium of Arts and Sciences* in 1812.⁴⁶ He also designed an apparatus to mix gases efficiently with water in flow-through systems.⁴⁷

Coxe helped introduce vaccination in Philadelphia. He obtained some smallpox vaccine from Thomas Jefferson, who had procured it from the Boston physician Benjamin Waterhouse to inoculate his slaves. On the day it arrived, Coxe vaccinated himself and four others. Subsequently he vaccinated many more, including his oldest child and the children of his friends Benjamin Rush and Charles Willson Peale. To test the “full efficacy of this procedure,” he gave smallpox to his son, whom he had named Edward Jenner Coxe after the discoverer of the vaccine. The success of this experiment helped convince Coxe’s medical colleagues of the vaccine’s protective powers.⁴⁸

Even when one of his projects fell through, Coxe made an important contribution. He tried to organize pharmacy education in Philadelphia, but his efforts were rebuffed; as a direct result, the Philadelphia College of Pharmacy, America’s first such institution, was founded in 1821.⁴⁹

Coxe wrote widely, producing, among much else, *The Importance and Respectability of the Science of Medicine* and the *Philadelphia Medical Dictionary*. He also edited the six-volume *Philadelphia Medical Museum* and the five-volume *Emporium of Arts and Sciences*.

He served as the medical school’s dean, but his classroom days came to an untimely end. He was considered so pedantic that students, some armed with daggers, shouted him down in 1835. He was formally dismissed after that, but continued his scholarly work until he died in 1864 at the age of 91.⁵⁰
Among other early contributors was Thomas Chalkley James. He held the chair of midwifery after it was separated from anatomy in 1810. About this time, he presented details of his most significant contribution—artificially inducing premature labor in a patient with a contracted pelvis. Both the mother and child survived, in what was called the first case in America of delivering a baby prematurely while it was still small enough to pass through the birth canal.\[51\]

One medical advance in this early period was credited to a student, John Richardson Young, whose thesis for the M.D. degree was completed just seven months after he entered medical school.\[52\] He demonstrated how the stomach digests food, a significant step in understanding the physiology and chemistry of digestion.

The digestive process supposedly worked (to mention a few theories) by concoction, by fermentation, by patrefaction, by material effervescence, or by a contracting force equivalent to 400,000 pounds of pressure. Young used frogs to prove the powerful action of gastric juices on ingested substances. Then he devised a “living principle” to explain why the process does not work on living material, including the frogs’ own stomachs. Most important, he concluded that acid was required for gastric processes (but wrongly concluded that gastric juice contained phosphoric acid).

Young died in 1805 when he was twenty-two years old. His thesis was reprinted in *Medical Theses* of that year. Like much scientific work in those times, it escaped the attention of anyone qualified to appreciate its importance. Not until 1908 was his work rediscovered in the University of Pennsylvania library; then it received belated acclaim.

In addition to being the first medical school, Penn’s was the only one of America’s eighteenth-century medical schools whose founding was motivated chiefly by its academic connection. Columbia’s medical school, founded in 1768, and Harvard’s, founded in 1782, originated from medical societies concerned with regulating and controlling medicine in their respective cities. Pennsylvania can rightly claim a more intellectual foundation, traceable to the influence of Benjamin Franklin. It was this tradition that contributed to its being a center of medical learning for most of the nineteenth century.

Even so, there was much settling of the sands. Professorships were allotted and reallocated ingeniously. The curriculum fluctuated; botany
was discontinued as a degree requirement. The bachelor of medicine degree was dropped and the M.D. alone conferred, according to the practice of the University of Edinburgh.

Some appointments were abruptly cut off, exemplified by James H. Hutchinson's short term of two years. At the time of the Revolution, he had hastened home from his studies in Europe. The ship carrying him was captured by the British. He escaped in an open boat but lost a fine library that he had assembled in France and England. Serving as a university trustee during the institutional split, he worked to lessen the hard feelings between the separate faculties; in fact he refused two professorships until the rights of the college were restored. When Hutchinson died in the yellow fever epidemic of 1793, the chemistry professorship remained unfilled until James Woodhouse accepted it in 1795; but he died suddenly in 1809.

In one sense there had been continuity in the chair. All incumbents after Rush had been his students. But Rush had always tried in his lectures to relate chemistry to medical problems. Woodhouse had not followed this tradition faithfully. His death raised a problem that would plague the University of Pennsylvania until the 1850s: who should teach chemistry, already a distinct discipline, to medical classes—a chemist without a medical background or a physician with inclinations toward the field?

Many practicing physicians questioned whether the chair of chemistry belonged to the medical faculty at all. But Rush and other medical professors had no doubts; furthermore, they demanded that appointments to the medical department be filled exclusively by men of the medical profession. Rush successfully promoted the election of his own student, John Redman Coxe.

When Coxe moved from chemistry to materia medica in 1818, the controversy over the need for chemistry in the medical curriculum arose again. Rush and Wistar were no longer alive to defend the old, cultivated, scientifically oriented physician from the new medical instructor who wanted to teach only practical medicine. Nevertheless, the trustees declined the pressure to abolish or transfer the chair of chemistry and elected Robert Hare to the post. The appointment signified the solidity of the basic departmental divisions in the medical curriculum. These divisions have not changed substantially since then, although they have evolved, some of their names have changed, and their scope of knowledge has expanded exponentially.
Adam Kuhn, Professor of Material Medica and Pharmacy. From a painting that hangs in the Portrait Hall of the School of Medicine of the University of Pennsylvania. (Archives of the University of Pennsylvania.)

Benjamin Rush, first Professor of Chemistry in America. Painting by Thomas Sully that hangs at the American Philosophical Society. (Copied from a photograph in the Archives of the University of Pennsylvania.)
By 1818 the infancy of the Penn medical school had ended. All of the original faculty were dead. The school weathered the difficult period of starting up and even the jealousies and arguments inevitable among its faculty. Significantly it was an established source of new and competent physicians and of original investigations that deserved worldwide recognition.

NOTES

2. J. Morgan, A Discourse Upon the Institution of Medical Schools in America (Philadelphia, 1765). A fascimile was published by the Johns Hopkins University Press in 1937 (introduction by Simon Flexner) and by the University of Pennsylvania in 1965.
5. Ibid., pp. 132–33.
6. Ibid., p. 134; Corner, Two Centuries of Medicine, pp. 23–24; Carson, History of the Medical Department, pp. 56–57.
7. Corner, Two Centuries of Medicine, p. 23.
8. Bell, John Morgan, pp. 146–47.
9. Minutes of the Faculty of the Medical College, Philadelphia College, May 1768; Carson, History of the Medical Department, pp. 65–66.
10. Carson, History of the Medical Department. pp. 69–72; Corner, Two Centuries of Medicine, pp. 27–28.
11. Carson, pp. 75–76.
12. Corner, Two Centuries of Medicine, p. 31. Benjamin Cowell's name is listed in the hall of the Medical Laboratories as David Cowell and the name on the photostat of his diploma in the Archives of the University is also given as David Cowell.
Chapter 2

ington, February 25, 1778, pp. 200–4; to Daniel Roberdeau, March 9, 1778, pp. 204–8; to William Henry Drayton, Samuel Huntington, and John Banister, April 20, 1778; to John Morgan, June? 1779, pp. 225–29; to William Shippen, November 18, 1780, pp. 256–60; Bell, John Morgan, pp. 229–36, 238.

16. Bell, John Morgan, pp. 263–64.


22. Ibid., pp. 15–17; Caldwell, Autobiography, pp. 146–47.


25. Ibid., pp. 48–49.

26. Ibid., pp. 272–73, 298; Binger, Revolutionary Doctor, pp. 197–98.

27. Goodman, pp. 274–79.


29. Carson, History of the Medical Department, pp. 102–3.


32. Carson, History of the Medical Department, pp. 93–94.

33. Corner, Two Centuries of Medicine, p. 40; Carlson, Wollock, and Noel, Benjamin Rush’s Lectures on the Mind, pp. 17–18.

34. Carson, History of the Medical Department, p. 97; Corner, Two Centuries of Medicine, pp. 41–44.


40. W. J. Bell, Jr., “Caspar Wistar,” in Dictionary of Scientific Biography, ed. C. C. Gillispie, A. E. Verrill, and J. Zwelfer, vol. XIV. pp. 456–57. (Bell states that although Nuttall named the plant for Caspar Wistar, he spelled it Wister, the name of the other branch of the family in Philadelphia, therefore the name of this plant should
be spelled wistaria); M. Meyerson and D. P. Winegrad, *Gladly Learn and Gladly Teach* (Philadelphia: University of Pennsylvania Press, 1978), p. 43. A portrait of Abbé José Francisco Correa da Serra, the first Portuguese ambassador to the United States, that previously hung in the front hall of the Wistar Institute bears the inscription stating he classified the vine *glicinea*. He was a guest at many Wistar parties, and named the plant for his friend Caspar Wistar.


47. Smith, *Chemistry in Old Philadelphia*, p. 57.


49. Corner, *Two Centuries of Medicine*, pp. 72–73.

50. Corner, pp. 80–85.

51. Kelley and Burrrage, pp. 646–47.

The business of a professor is to place before students in full light, at their first entrance upon any study, the true object of that study and to ascertain their proper pursuit. . . . He thus points out the road that leads to science. . . . He confirms [the student’s] steps, smooths the rugged path he has to tread, assists him in climbing the steep ascent, and before dismissal informs him how to conduct himself in order to reach at length the summit of his profession.

John Morgan
A Discourse

The turmoil associated with the outbreak of the American Revolution brought the College of Philadelphia and its medical curriculum to the brink of disaster. In 1777, the school was closed for a period because British troops were billeted in its buildings. Worse, the school was perceived as Anglican, aristocratic, and Tory by the radical Constitutional Party that had seized power in the state; the upshot was that the legislature suspended the powers of the trustees. Power was restored in 1779, but not to the old trustees. They and the college faculty were dismissed in favor of a new board with its own faculty, and the college’s name was changed to the University of the State of Pennsylvania.¹

The new board appointed Shippen to evaluate the medical curriculum and present a plan “for establishing the school on the most respectable footing.”² This resolution is the first time the group of medical courses was referred to as a “school.”³

The board also appointed the medical professors of the old college to the new university, but at first Shippen was the only one to accept. By 1783 Rush, Kuhn, and Bond had returned to the faculty. Courses were shortened from four to three months to accommodate students from surrounding states who could not afford longer stays away from home.
TOP: University of Pennsylvania at 9th Street between Market and Chestnut Streets. The large house was built as a residence for the President of the United States. The addition, designed by Benjamin Latrobe, containing a lecture room and the anatomical amphitheater was built in 1807. Drawing by William Strickland. (Archives of the University of Pennsylvania.) Bottom: William Strickland's proposed renovation of Medical Hall showing the original lecture hall and the anatomical amphitheater. Strickland proposed to build a new anatomical amphitheater on the third floor and convert the existing one to a second lecture hall. (Archives of the University of Pennsylvania.)
TOP: Medical Hall after renovation in 1817. (Archives of the University of Pennsylvania.)
Bottom: Interior of Medical Hall reconstructed in 1817. From an engraving in the American Medical Recorder, frontispiece, vol. 1, 1818. (Historical Collections of the College of Physicians of Philadelphia.)
Even in the best light, medical lectures during this period of reorganization were irregular, as was the awarding of degrees: in 1781, two students received M.B.s; in 1782, eight.4

In 1788 conservatives returned to power in the Pennsylvania legislature, promptly restoring the privileges and property of the College of Philadelphia.5 From 1789 to 1791, the school existed as two institutions. Since the college regained its buildings, the university moved to Philosophical Hall, the new building of the American Philosophical Society.6 In 1889 Rush was elected to the chair of Theory and Practice of Medicine in the College and Kuhn resigned his professorship and took the medical chair in the University. Naturally rivalry developed between the two faculties, which was “singular from the fact of an inosculation existing in the person of Dr. Shippen, who held professorships in both.”7

In 1791, the legislature united the college and university under the university’s name.8 Rush was so ecstatic over the reunion that he prefaced his introductory lecture in the fall with his rapturous approval.

When the college and university were reunited, the lease of the rooms at Philosophical Hall was dropped, and the medical classes were held in the academy and in Anatomical, or Surgeon’s, Hall.9

The name Surgeon’s Hall no doubt stems from the famous medical building of the same name at the University of Edinburgh. Its American namesake was the first building in the new country used exclusively for medical teaching. The anatomy and chemistry lectures of both college and university were held there during the institutional division. It was located on Fifth Street north of Walnut Street.10

Most of Surgeon’s Hall’s history prior to 1792 is obscure. Classes were first held in it sometime between 1775 and 1779, and the university referred to it as “the laboratory.” By the time the schools rejoined in 1791, the structure sorely needed repairs, which Shippen and Wistar funded from their own estates. Among the renovations were the installation of a stove in the anatomical amphitheater and the building of a second story. A winding stair led to a cupola, an octagonal structure with glazed windows that served to illuminate the anatomical dissecting room. One of William Birch’s famous lithographs of Philadelphia, executed in the 1790s, shows it as a narrow structure with its distinctive cupola.

In 1800, the university bought the mansion at Ninth and Market Streets that the Commonwealth of Pennsylvania had built for President
John Adams. The medical faculty applied for accommodations there. In 1802 the committee on the “new Building” offered them the West Bow room on the second floor and space for a chemistry laboratory on the first floor. Facilities for dissection and anatomy classes were not offered. These arrangements were not satisfactory, so the medical faculty stayed in “the laboratory.” In 1804 they asked to use the old academy buildings on Fourth Street, but the trustees refused. In 1806 the physicians had a new proposal: to build an addition to the mansion and to accept responsibility for the interest on the cost. The trustees approved. A new Medical Hall was designed by Benjamin Latrobe and completed in time for classes in 1807.

Within a decade, these facilities, too, were insufficient. They were renovated and enlarged by Latrobe’s student William Strickland. But by 1828 even these quarters were outgrown. The trustees decided to demolish all of the structures on this site and build two new buildings, one for the medical school and one for the University. William Strickland was hired as the architect for this project as well.

The result for Medical Hall was described in an 1844 report. The central location was praised, since students could live nearby. In addition, “the large space around it allows of the free circulation of air which is especially necessary, in an establishment of this kind, to comfort and preservation of health.” There were three 600-seat lecture rooms, one dedicated to chemistry, “in its extent and arrangement as a laboratory nowhere surpassed.”

Another was reserved for “other demonstrative branches” and built under the supervision of the anatomy professor, who provided for both maximum light and proximity of the students. William Horner wrote about the innovative seating in his report from the surgical service at the Philadelphia Hospital:

The seats are elevated on the plane of an inverted cone (not like a funnel, as is common in amphitheatres), whereby every row of students has the same angle of demonstration over the row in front (an idea first carried into execution by myself so far as I know).

Sports arenas and theaters today employ this principle of amphitheater construction.

The medical course was taught over a four-month period and lengthened by two weeks in the early 1840s. The faculty favored demonstra-
TOP: Medical Hall of the University of Pennsylvania, designed by William Strickland, erected in 1829. (Archives of the University of Pennsylvania.) Bottom: William Strickland’s original sketch for the new Medical Hall. The diagram was glued in the Minutes of the Medical Faculty when the proposed new building was planned. (Archives of the University of Pennsylvania.)
tions whenever possible, illustrating their lectures with carefully made anatomical dissections and representative pathological specimens of disease removed during surgery or at autopsy. Teachers of institutes of medicine and materia medica—disciplines which did not lend themselves to biological material—used, instead, accurate models, oil paintings, dried plants, and diagrams obtained from Europe. 19

EXAMINATION OF THE MEDICAL STUDENTS IN THE "GREEN BOX"

As other medical schools opened, competition for students grew—not only among schools but among professors, who wanted to attract large classes to sell more tickets and thereby increase their income and prestige. Some students, and professors as well, accused the university examiners of favoring their own students by asking them easy questions while directing hard questions at rival students.

To make the examinations fair, the faculty decided in 1810 to examine candidates behind a screen. 20 And so the "rules governing examinations" declared that the candidate be placed behind a screen and the examination be so conducted that no professor but the dean of the faculty should know the candidate. For nine years, a green baize frame enclosed all students sitting for examination. In 1819, some students petitioned that the so-called Green Box be discontinued; they felt it was demeaning and stressful. Others wished to continue the procedure, however; thus for the next two years, students were given an option of sitting directly before the faculty or behind the screen. In 1821 the faculty finally agreed that the Green Box should be "altogether abolished."

CLINICAL TEACHING

There is no doubt that a thorough medical training requires direct contact of students with patients. Apprenticeship traditionally provided that contact, but the advent of medical schools demanded a new relationship. Although schools, as Morgan anticipated, easily eclipsed the amount of knowledge that previously could be passed on to new gen-
erations of physicians, they tended to distance students from actual disease cases.

A new arrangement was quick in coming. In 1766, Thomas Bond initiated clinical instruction for the medical students by taking them to the wards of Pennsylvania Hospital. A few years later, Bond and an associate began clinical obstetrics by allowing students of "good character" to attend cases of labor at the Philadelphia Almshouse.

As the numbers of medical students attracted to Philadelphia increased, the professors solicited the almshouse's Board of Guardians "to extend the convenience of the house for accommodating the students." The first step was to increase the number of medical officers there; Gerardus Clarkson, Adam Kuhn, and Benjamin Rush were among the initial additions.

In 1803 Thomas C. James and John Church offered their services to the lying-in wards if they could be accompanied by a pupil from their private obstetrics school for each case. Their request was granted, as was that of Charles Caldwell, who instructed a class of twenty, and later
forty, students on the medical wards. By 1806 lectures were being given in the dead house, too.

In 1811 the almshouse surgeons asked the board for room suitable for conducting operations on patients in front of the medical classes, arguing that the separate space would “remove from the wards a source of mischief to the other sick.” The board had a second floor added to the dye-and-wash house and installed a lecture room with adjoining wards. In 1811 the almshouse surgeons asked the board for room suitable for conducting operations on patients in front of the medical classes, arguing that the separate space would “remove from the wards a source of mischief to the other sick.” The board had a second floor added to the dye-and-wash house and installed a lecture room with adjoining wards.

The board had its own restrictions on access to the almshouse patients. It disqualified members of the Pennsylvania Hospital staff from holding staff positions in the almshouse. After 1805, it also required students to purchase tickets to attend the clinics; a ticket was $8, and the purchase of two tickets gave “perpetual attendance privileges.”

In 1812, Pennsylvania Hospital instituted a ticket policy. To compete, the almshouse board allowed students with the hospital’s ticket to attend a case of labor. When this proposal was advertised in the newspaper, a protest arose over the indiscriminate opening of the lying-in ward. Protestors also complained about the board’s exclusion of the Pennsylvania Hospital staff. The board was forced to rescind both policies. (When the Jefferson Medical College petitioned the board in 1827 for equal status with Penn in the almshouse, however, Penn objected—successfully.)

The almshouse moved to new buildings in Blockley Township in 1834. For the students, “transportation was no inconsiderable item,” wrote D. Hayes Agnew years later as he looked back on his medical-school days. But he recalled the rewards: “more invigorating air,” for one; for another, “the most capacious and finely arranged amphitheater in the country, and capable of seating seven to 800 persons”; and most of all, the hospital itself, “the great clinic school of the country, annually opening its exhaustless treasures of disease to crowds of educated, zealous inquirers of medical knowledge.”

But tensions arose periodically between the almshouse’s stewards and the resident physicians and their students. The stewards complained about the students’ inexperience in treating the patients, the constant staff changes, and the lack of student supervision. In 1845, in particular, the board learned that some of the bodies of dead patients had been disposed of improperly after autopsy. In June of that year, a complete split occurred. The precipitating event, according to Agnew,
centered on a cockroach "which had rashly taken a near cut across the table instead of going around." The table in question was the steward's, at which the resident physicians boarded. The insect was squashed, but the physicians demanded to board at the matron's table. Rebuffed, they resigned and took the students with them.

The Board of Guardians submitted a different account. It determined that the physicians were angry at the steward for allowing a resident physician whose term had recently expired to remain at the table. The board decided that the steward's permissiveness was improper but ordered the physicians to resume boarding at his table.

In September, the board established four specific positions for physicians. The almshouse stayed closed to the medical students until 1854, however, when Henry Hollingsworth Smith and John Livingston Ludlow visited every member of the board, which was persuaded to reinstall the students.

The next few years were unstable. In 1856 the chief medical officer was accused of improper management and dismissed (and his position abrogated). The new position was that of chief resident. The first incumbent resigned in June of 1857 when the board arbitrarily decided to discontinue student instruction. It might have reversed itself before the new academic year began, but the new chief resident created a new problem. He had formulated some "family medicines," whose ingredients he kept secret. When he failed to disclose them, his staff accused him of quackery and resigned, closing off clinical education for a year. In October 1858 the students petitioned the board, "praying" for it to reestablish instruction at the almshouse. The board listened and consented. From then until the mid-1970s, when the hospital (by then called Philadelphia General Hospital) was permanently closed and demolished, it remained open for medical students.

SAINT JOSEPH’S HOSPITAL

Penn students also received training at Saint Joseph's Hospital, founded in 1849 for the care of poor Irish immigrants. Many physicians on the Penn faculty had appointments on its staff, and they brought their students there until the 1870s, when the Hospital of the University of
Pennsylvania was founded and the medical department moved to West Philadelphia.

THE ANATOMICAL SCHOOLS AND CHAPMAN'S ACADEMY

Students had additional ways of obtaining information, even back in the days when Morgan, Shippen, Kuhn, and Rush dominated medical training. In pre-Revolution Philadelphia, Abraham Chevat (Chovet), not a member of the faculty, taught anatomy in his house, where he became known for wax anatomical models. Many students no doubt attended his lectures and visited his museum. His collection later became part of the collection at the Wistar Institute and was used by Penn professors well into the 19th century.34

Subsequently students could learn in proprietary institutions run by their own instructors. When the medical school moved out of “the laboratory,” the building was rented to faculty members Thomas Chalkley James and Nathaniel Chapman, who taught extra medical courses there privately as Chapman's Medical Academy.35

Far from usurping the functions of such schools, formal medical education stimulated them. For most of the nineteenth century, medical classes were large, containing between four hundred and five hundred students—numbers necessary to maintain the faculty’s income and support the medical department. Classes of this size, however, could be taught only by lectures illustrated by demonstrations, preserved specimens, wax models, and table experiments. Medical Hall had no student laboratories and limited space for anatomical dissection.

For practical dissecting experience, then, students enrolled in a proprietary school, much like their European counterparts, who filled such establishments as William Hunter’s Great Windmill Street School of London. One of the more enduring in Philadelphia was the Philadelphia School of Anatomy, opened in 1820 by James Valentine O’Brion Lawrence. It had no charter, granted no degrees, and operated “without a well-known faculty.” Still, it stood for fifty-five years, outlasting many larger and more prestigious competitors, partly because of its ideal location near both Penn and Jefferson.

In 1838 James McClintock started a dissecting room on the corner
of Eighth and Walnut Streets, but his neighbors complained bitterly about both the odors that emanated from it and the nature of the work. He then moved the school to the building next to the Philadelphia Dissecting Rooms. After several changes of hands over time, Agnew bought it for $600 in 1852.

Agnew was an enthusiastic teacher of anatomy. His rooms were open twelve to eighteen hours each day, and he lectured five evenings a week during the school year, three evenings a week during summers. James Edmund Garretson, Samuel David Gross, Richard J. Levis, and William Williams Keen were among his many demonstrators. His enrollment grew from 9 to 250 students, culled from Penn, Jefferson, and the Pennsylvania Dental College; students from Hahnemann and Women’s Medical College were not accepted. In 1854 he opened a floor to demonstrate current operative procedures on cadavers. Agnew sold the school in 1862 to Garretson for the same amount he paid for it.36

FOUNDING OF THE AMERICAN MEDICAL ASSOCIATION

Because the level of quality (not to mention the prejudices) of private schools was so haphazard and student involvement was voluntary, the quality of a young person’s medical education depended largely upon the individual’s own ambition.

Because the new medical schools were successful, a large number of new schools were founded between 1820 and 1845. Faculties of the established institutions worried that students would flock to the least expensive schools and those with the lowest admission requirements.

In response, talk circulated about the “failure” of the American system of medical education, and reform was bruited as early as 1839. An attempt at a national convention in 1840, sponsored by the New York State Medical Society, failed because no medical society or faculty accepted the invitation.37

Medical societies replied more positively to a meeting held in New York in 1846, but only about one-third of the schools sent delegates; Penn was not among them. Among the reforms proposed was improvement of the preliminary preparation and office training of apprentices; lengthening of lecture courses from four to six months; and the creation of state licensing boards to control those who practice.
At that meeting, a convention was set for Philadelphia in 1847 to found the American Medical Association. It met at the Academy of Science in May; Penn was one of twenty-eight schools (out of some thirty-six) to send delegates. It came away with the chief officers: Chapman as president, Alfred Stillé as one of two secretaries, and Isaac Hayes as treasurer. As one reformer noted, Chapman's election "was not based on any of his services to organizing the movement but on his personal standing as one of the oldest and most eminent teachers in the Union, he stood appropriately at the head of the whole profession."38

The Penn faculty moved to alter its curriculum along the lines recommended at the convention, despite the fact that its courses, five and a half months long, were already longer than those at most schools. Two weeks of preliminary lectures began in October; then the regular courses began, ending on the last day of March. Course fees were reduced from $20 each to $15 and the graduation fee from $40 to $30. No other medical school in the city responded to the advice of the convention, however; by 1853 Penn's faculty reverted to a term of nineteen weeks.39

As for other proposed reforms, control of licensing was left to the state legislature. The Penn professors noted that the preliminary training of students depended on the cooperation of physicians who chose them. That, of course, was only part of the educational problem. More stringent solutions remained elusive as long as the competence of the practitioners who gave hands-on experience could not be monitored, and as long as professorial salaries were set by the number of students in each medical class. Another twenty years would pass before reform reached these areas.

NOTES
2. Corner, Two Centuries of Medicine, p. 36; Carson, History of the Medical Department, pp. 89–90.
4. Carson, History of the Medical Department, p. 91; Corner, Two Centuries of Medicine, p. 37.
7. Carson, p. 93.
8. Carson, p. 97; Corner, *Two Centuries of Medicine*, pp. 41–44.
13. Carson, p. 208; Corner, *Two Centuries of Medicine*, p. 50.
15. Corner, p. 68; Carson, p. 209.
16. Corner, p. 79; Carson, p. 209; Minutes of the Faculty of the Medical Department, Archives of the University of Pennsylvania.
17. *Medical Department of the University of Pennsylvania* (Philadelphia, 1844). (A history of the Medical Department authorized by the medical professors of the University of Pennsylvania.)
20. Corner, *Two Centuries of Medicine*, pp. 61–62; Minutes of the Faculty of the Medical Department, Archives of the University of Pennsylvania.
31. Minutes of the Board of Guardians of the Poor of the City of Philadelphia, Archives of the City of Philadelphia, 1845.
32. Crosky, pp. 40–42.
and Incidents of the City and its Inhabitants from the Days of the Pilgrim Founders (Philadelphia, 1830), p. 609.


THE FIRST WAVE OF NINETEENTH-CENTURY LUMINARIES

It is true that the history of science is very different from the science of history—we are not—attempting to study the working of blind forces—operating on crowds of obscure people. The men whose names are found in the history of science are not hypothetical constituents of a crowd. We recognize them as men like ourselves and their actions and thoughts, being more free from the influence of passion and recorded more accurately than those of other men are better material for the study of the calmer parts of human nature.

James Clerk Maxwell

PHILIP SYNG PHYSICK

Throughout the nineteenth century, the medical school was distinguished by its professors of anatomy and surgery. At about the time the University was beginning its move to Ninth and Market Streets, one member of its faculty, Philip Syng Physick, was becoming a world-prominent surgeon. Retiring and soft-spoken, a relentless experimenter and inventor, he joined Benjamin Rush as one of the first of the New World physicians to gain a reputation among his European counterparts.

Born in Philadelphia in the year of the medical school’s first graduation, Physick, in his youth, appeared unlikely to become known as the father of American surgery. After graduating from the College of Philadelphia, under his father’s advice, he began a preceptorship with Adam Kuhn and attended lectures at the medical school. Without obtaining his medical degree, however, he embarked for London with his father to further his medical training.

Shortly after arriving, the elder Physick not only obtained a position
for his son with John Hunter but also persuaded the famous surgeon and anatomist to let Philip live at his home. When the father asked what books his son would need for his studies, Hunter took him to the dissecting room, pointed to the cadavers, and said, "These are the textbooks. The printed ones are fit for very little.""

Philip availed himself of the opportunities in the dissecting room. He also studied surgery at Saint George's Hospital and attended lectures on midwifery by John Clark and William Osborne. He eventually took a medical degree at the University of Edinburgh.

In September 1792, Physick returned to the United States and opened a surgical practice. Few patients came, and he fell into debt, becoming disillusioned with surgery. His financial distress was relieved during the yellow fever epidemic of 1793 when he was one of four young physicians appointed to attend the sick at Bush Hill Hospital, which had been opened for care of the stricken poor.

Physick allied himself with Rush in the arguments on treating yellow fever, and Rush helped him gain appointment to Pennsylvania Hospital. For the remainder of his career, Physick was loyal to Rush's ideas. He remained an ardent believer in bleeding and refrained from joining the College of Physicians of Philadelphia, from which Rush had resigned in the controversy over that form of treatment.

With his staff position secure, Physick applied his ingenuity to a host of surgical problems. He designed and made novel instruments to treat the urinary tract. He developed a procedure for making bougies with "bees wax and fine new linen," which he attached to the end of catheters to serve as a filiform guide. For more difficult urethral strictures, he invented a device that contained a lancet in a tube, with which he could cut the constriction. He improved the gorget used to enter the bladder in lithotomy. (One of his patients was Chief Justice John Marshall, from whom Physick successfully removed more than a thousand stones.)

While performing his first lithotomy, Physick accidentally divided the internal pudendal artery. He controlled the profuse bleeding by compressing the artery with his left hand while passing a hooked instrument under the artery. Then he cast a ligature around it and tied it off. He stopped the bleeding, but too much of the surrounding tissue was damaged by the tie. To reduce the amount of tissue included, he designed his celebrated forceps for carrying ligatures under deep-seated vessels.
For some prostatic obstructions, he used a catheter to which he tied a pouch made from sheep intestines. After he inserted the instrument into the bladder, he filled it with tepid water, plugged it, and then retracted it. The effect repressed the enlarged prostate and gave patients months of relief by making it easier for them to urinate.\footnote{15}

One of Physick’s most impressive accomplishments was the closure of an artificial anus (abdominal fistula). In 1809, nearly twenty years before a similar operation was described in France, he fused the two ends of the bowel to each other like the two barrels of a shotgun. When he was satisfied that the ends of the colon adhered to each other, he passed a needle with a ligature from one part of the intestine into the other, “through the sides which were in contact.” In three weeks the septum between the two ends of bowel had broken down. Now feces passed through the intestine and the patient had normal bowel move-
ments. He covered the abdominal opening with a lint bandage held in place with a truss.\textsuperscript{16}

With Dr. Alexander Monroe (secundus) of Edinburgh, Physick shares the honor of being the first to wash out the stomach and actively lavage it using a large flexible tube and pewter syringe. Physick was called to treat three-year-old twins whose mother had mistakenly given them an overdose of laudanum. The children had convulsed after the dose and become comatose with a pulse that had almost ceased when Physick arrived. The children could not swallow, so Physick introduced his gum elastic tube into their stomachs and injected ipecac mixed with water. He repeated the procedure until he had emptied their stomachs. By this time, “all signs of animation in both children had ceased.” Determined to save them, Physick injected some spirits mixed with water and vinegar into their stomachs through the tube while administering external stimuli. In a few moments the pulse and respiration returned to each child. Through this procedure he managed to save one of the twins.\textsuperscript{17}

Physick developed a double-wire snare passed through a tube or cannula for removing scirrhous tonsils and for removing hemorrhoids.\textsuperscript{18} And he improved methods of treating fractures and developed new ones to treat fractures. He stimulated bone growth in nonunited fractures by passing a seton through the fracture line.\textsuperscript{19}

Probably his greatest and most lasting contribution to surgery was his work on absorbable sutures. He noticed that ordinary ligatures of silk or flax prevented wounds from healing; they were customarily left in wounds for weeks or even months, causing painful inflammation and drainage and pain. Physick proposed the use of animal ligatures to secure an artery long enough to cause the obliteration of the vessel. In 1816 he described how the idea occurred to him and how it worked:

Several years ago, recollecting how completely leather straps spread with adhesive plaster and applied over wounds for the purpose of keeping the sides in contact were dissolved by the fluids discharged from the wound, it appeared to me that ligatures might be made of leather or some animal substance [he used thin leather strips cut from kid gloves] with which the sides of blood vessels could be compressed for a sufficient time to prevent hemorrhage; that such ligatures would be dissolved in a few days and would be evacuated with the discharge from the cavity of the wound.\textsuperscript{20}

From this point, Physick used animal ligatures, even though other
surgeons did not pick up the technique rapidly—perhaps because they did not take the time to prepare the animal tissue in advance.

Until 1800 surgery had been taught by the professor of anatomy. At this time the students petitioned Physick by letter, asking him to lecture to them on surgery. His initial lecture, given at Pennsylvania Hospital and attended by his supporter Rush, was judged a huge success. From this time, Physick's reputation as a teacher of surgery grew among his colleagues to such an extent that a separate chair of surgery was created for him in 1805. He held it until 1818, when John Syng Dorsey, the anatomy professor, died. Then Physick shifted to the anatomy professorship, which he held until his retirement in 1831.

WILLIAM E. HORNER

As professor of anatomy, Physick was assisted by William E. Horner, a polite, retiring, deeply religious Virginian. Although considered by some colleagues to be a mediocre scholar, through 'sheer force of will and indomitable purpose' Horner exceeded the accomplishments of his critics as a teacher, scientist, and administrator.

Horner was best known for his anatomical observations of the eye. He first described the function of the tensor tarsi muscle, whose structure had been described some 75 years earlier. The tensor tarsi keeps the edges of the eyelids properly adjusted to the ball and helps the gathering of tears; it is called "Horner's muscle." Horner wrote that he had been primed for the discovery, in part, by observing how the lower eyelids of Caspar Wistar fell from his eyeballs in a fainting spell during his last illness.

Horner also devised the Z-plasty, an operation still used today, to revise wound scars. He used this procedure to correct the ectropion of the eye of a patient at the Philadelphia Hospital. Previously V-shaped and Y-shaped incisions had been used. Horner's simpler operation became the more useful procedure when the plastic surgeon J. Stage Davis reintroduced it in the early 1900s.

Horner made two other significant contributions to surgery. In one, he, along with Physick, suggested the extraperitoneal approach for a Caesarean section. In the other, he described the first successful repair of a ruptured Achilles tendon. He passed a thin ribbon through the
torn ends of the tendon, and removed the ribbon when the wound began to suppurate. (This principle of stimulating growth with a seton was the same as that used by Physick to heal nonunited fractures.)

It was in the wards of Philadelphia Hospital, where he practiced surgery, that Horner and his colleagues William Gibson and Joseph Pancoast were among the first in Philadelphia to use ether anesthesia successfully, about a year after the 1847 demonstration of the technique at Massachusetts General Hospital. 31

Because of his expertise in anatomy as well as surgery, Horner was frequently called upon to perform autopsies on the patients of his colleagues in addition to those he did on his own. He summarized the knowledge accumulated in these cases in his 1829 Treatise of Pathological Anatomy, the first textbook of pathology published in the United States. 32

Horner also made original clinical contributions in pathology. During
the city’s cholera epidemic of 1832, he made microscopic studies of the colons of cholera patients. He concluded that the intestinal tract had an area greater than that of a large dining-room table filled with glandular structures. He reasoned that large volumes of fluid could readily be lost from this large intestinal surface. He explained correctly that the rice-water stools of cholera were formed when this huge fluid volume washed the mucus secreted by the irritated intestinal glands from the surface of the intestinal lumen as it rushed from the colon as a diarrheal stool.33

He also wrote Lessons in Practical Anatomy for the Use of Dissectors (1823), which went into five editions.34 And he published his lecture notes as Treatise on Special and General Anatomy (1826), a textbook that went through eight editions; the final three revisions reflect his appreciation of the importance of the achromatic and astigmatic microscope, introduced about 1830.35

Among his other anatomical discoveries, Horner described the membrane that lined the larynx, which he called the vocal membrane. He also clarified how the epiglottis defends the tracheae from fluids and food particles. He showed that the larynx is closed by being pulled up into the base of the epiglottis rather than by pulling the epiglottis down over it.36 He was especially pleased at this discovery, because it explained a famous French case at the time—why Baron Larrey’s patient who had had the upper part of his epiglottis destroyed by a musket ball could swallow food without aspirating it.

Horner was appointed dean in 1822 and stayed in that post for thirty years. He required students to take 704 hours of instruction, the highest standard of medical education at the time. Lengthy study tended to reduce enrollment, which in turn reduced the income of the faculty and the school, but the trustees supported his policies: three years of study, a course in clinical instruction, and a faculty-approved thesis free of bad spelling and grammar. He was also praised for able handling of the school’s finances.37

Horner was also active in the city’s medical community, helping to found Saint Joseph’s Hospital in 1849, and he was made the first president of its medical board.38 He left his books and surgical instruments to Saint Joseph’s. He left his dissecting instruments and anatomical collection to the Wistar Museum, to which his name was added until the Wistar Institute was established at the end of the century.39
JOSEPH LEIDY

Joseph Leidy, who dominated the chair of anatomy for most of the second half of the century, differed from the earlier Penn anatomists because he was a naturalist, not a surgeon. He received his M.D. degree from Penn in 1844 after presenting his thesis on "The Comparative Anatomy of the Eye of Vertebrate Animals." He abandoned a short-lived private practice to travel with Horner to Europe in 1848, then became professor of anatomy upon Horner's death in 1852. He was lively, expressive, and animated in lectures, unceremonious, and good-natured to the point of avoiding controversy of all kinds; his friends even mocked him as being an "invertebrate."

Leidy made advances and discoveries in botany, comparative anatomy, mineralogy, paleontology, and many areas of medicine that affected public health. It was Leidy who first determined that America was the ancestral home of the horse. In addition, his profound knowledge of osteology enabled him to identify a fragment of a fossilized tooth found in Nebraska as that of a rhinoceros. Skeptical contemporary naturalists dropped their doubts about his theory when, coincidentally, a skull, unmistakably that of a rhinoceros, was found in the same region of Nebraska. Embedded in its jaw were the remains of the very tooth Leidy had identified.

Years ahead of Louis Pasteur and Charles Darwin, Leidy discussed the questions of spontaneous generation and the origins of life. In a paper with the interesting title "Monas, Vibrio, Euglena, Volvox, Leucophys, Paramecium, Valecella, etc.,” he asserted his belief in evolution:

An attentive study of geology proves that there was a time when no living bodies existed on the earth. Living beings, characterized by a peculiar structure and series of phenomena, appeared upon the earth at a definite though very remote period. Composed of the same ultimate elements which constitute the earth, they originated in the pre-existing materials of their structure. . . . The study of the earth’s crust teaches us that very many species of plants and animals became extinct at successive periods, while other races originated to occupy their places. This probably was the result in many cases of a change in exterior conditions incompatible with life of a certain species and favorable to the primitive production of others. Living beings did not live on earth prior to their indispensable conditions of action but wherever these have been brought into operation concomitantly, the former originated. Of the life present everywhere, with its indispensable
conditions and coeval in its origin with them, what was the eminent cause? It could not have existed upon earth prior to its essential conditions, and is it therefore the result of these? There appear to be but trifling steps from the oscillating particle of organic matter to a Bacterium; from this to a Vibrio, then to a Monad, and so gradually up to the highest orders of life. The most ancient rocks containing remains of living beings indicate the contemporaneous existence of the more complex as well as the simplest organic forms; but nevertheless, life may have been ushered upon earth through oceans of the lowest type long previously to the deposits of the oldest Palaeozoic rocks known to us. . . . Probably every species has a definite course to run in consequence of a general law, an origin, an increase, a decline, and an extinction. 43

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*Joseph Leidy lecturing in the Anatomical Amphitheater of Medical Hall. (Archives of the University of Pennsylvania.)*
This paper was published six years before Darwin published *The Origin of Species* but produced no significant response in the scientific world.

One of Leidy's most practical contributions to medical science came early in his career, in 1846, when he reported that he had found *Trichina spiralis* in the superficial thigh muscle of pigs. In keeping with his keen sense of observation and curiosity, he had noted minute white specks in a piece of ham served to him at his breakfast table. Under the microscope they proved to be *Trichina spiralis*. Leidy knew such parasites occurred in human muscle, for they had been discovered previously by Sir James Paget and studied in detail by Richard Owen, who gave them their name. Prior to Leidy's discovery, however, no one had suspected that pork was the source of this dangerous infestation in humans. Fourteen years later, the epidemiological significance of Leidy's discovery was provided by Friedrich Albert Zenker in Dresden. Zenker related the muscular and intestinal forms in humans to a single organism in whose life cycle the pig played an intrinsic part.

Leidy also advanced ideas on hookworms before their time. In 1886 he reported an autochthonous infestation of hookworm in cats. Although now the cat is considered only an experimental host for this parasite, his early finding raised interest in Europe and the United States in the distribution of hookworm. Leidy's reports reinforced the growing suspicion that hookworms are a cause of anemia. Early on, Leidy investigated flies as transmitters of disease at a time when cleanliness was only beginning to seem important in medicine. Some time elapsed before his understanding of bacterial parasites in disease was fully appreciated.

**WILLIAM GIBSON**

William Gibson, born in Baltimore, studied medicine there, in Scotland, and at Pennsylvania. He boasted to his Penn classmates that he would replace the "old man"—Physick—in the chair of surgery. He did, indeed, in 1819, after Physick took the chair of anatomy.

Gibson helped care for casualties at the Battle of Waterloo, where he, too, was wounded. He had already made a mark as the first surgeon to tie off a common iliac artery when he tried to stop the bleeding
caused by a gunshot wound. The patient died, nonetheless, from loss of blood. Evidently he was a graphic teacher, according to this description by a student:

In teaching gunshot wounds, he illustrates all that is said by showing us the character of such injuries by shooting the different parts of a subject, tracing the ball, and exhibiting the peculiarities of the wound to the class. The superiority of this method over that of simply talking on a subject is at once evident to all. He does not content himself with giving abstract notions of dislocations by merely showing dry bones displaced; but by having the joints opened and dividing the ligaments, he displaces the bones in the various ways that we know to result from accident. Thus it has very nearly the exact appearance that the real injury would present.\(^\text{47}\)

**ROBERT HARE**

While Physick and Horner were advancing anatomy and surgery, Robert Hare was assuring Penn first rank in chemistry.\(^\text{48}\) He had a significant hand in planning the facilities. Having taught in the renovated Medical Hall of 1819, he knew its limitations for teaching and experimentation. When the faculty decided to build a new facility, Hare consulted with Strickland, the architect; the result was one of the most modern and best-equipped chemical laboratories of its time.

It was an all-purpose structure that could be used for lecture demonstrations, original experimentation, and student benches. Hare provided for high-temperature furnaces, electrical apparati, a sand-and-water bath to heat and distill flammable chemicals, as well as for storage of expensive glass and other devices. The design incorporated proper heating and ventilation and allowed for the safe use of highly combustible materials.\(^\text{49}\) He insisted that one side of the lab have a southern exposure to ensure adequate light in winter for demonstrating the development of precipitates and the colors of solutions.

Hare was a student of James Woodhouse, but for the most part he taught himself chemistry.\(^\text{50}\) A fellow student at the same boarding house was Benjamin Silliman. They persuaded their landlady to let them convert a small cellar kitchen into a laboratory. Here the two worked together, extending their education far beyond what they learned from Woodhouse, whom Silliman thought a poor teacher. Silliman went on to a distinguished career at Yale University. He and Hare remained close
friends and exchanged their scientific ideas in long letters until they died.

Hare never received his M.D. degree and so was deemed less than ideal to teach medicinal chemistry. The faculty delayed his election to the chemistry chair until 1818. By this date, Rush and others were no longer present to block the appointment of a nonmedical instructor. Still, the prejudice against his education persisted, and Hare was looked on as a second-class member of the faculty. When he was first appointed, he was not permitted to examine students, sign diplomas, or participate in faculty decisions involving medical affairs. He did not fret, however, over his restricted authority; it freed him from routine administrative duties and allowed him to get on with his chemistry.

He did get on with it. He was considered America’s foremost chemist, the equal of America’s foremost physicist, Joseph Henry, at Princeton. Both these early American scientists were interested in the

Robert Hare. (Archives of the University of Pennsylvania.)
same problem: finding a means to generate large electrical currents. Since one was a physicist and the other a chemist they employed different methods to attain their goal. Henry generated electricity by induction with electromagnets while Hare produced large currents with chemical reactions, using batteries.

Hare was only twenty years old when the Chemical Society of Philadelphia appointed him to a committee to discover how a “greater concentration of heat might be obtained from chemical processes.” Much more oxygen, the committee determined, would have to be introduced into any combustion procedure. Hare wrote that he had already made a machine to do it. It was his oxygen-hydrogen blowpipe, and he was invited to demonstrate it before the society.

He reported that he had been readily able to fuse heavy spar, alumina, silica, lime, and magnesia, while platinum, gold, and silver “were thrown into a state of ebullition.” He repeated the demonstration for the American Philosophical Society, which was so impressed that it elected him to membership. The blowpipe was the forerunner of oxygen acetylene welding as well as the basis for the fuel system of rocket motors in space exploration. 53

Hare extended his experiments to the use of electricity to generate intense heat. In 1818 he revealed a calorimotor, in which he wired, in parallel, larger copper and zinc plates than had been used previously. When they were dipped into sulfuric acid, they generated currents sufficient to burn iron rods and even to fuse them. 54

He also invented the “deflagrator,” another galvanic instrument that generated even stronger currents. When zinc and copper plates were immersed in acid solutions, Hare noted, the current generated was greatest instantly after immersion; a few seconds later, the current fell to low equilibrium levels. Accordingly, he constructed a rack that held a number of large copper and zinc plates. The rack could be immediately immersed into or removed from an acid bath. Just after the rack of plates was immersed, intense electrical currents arced between the tips of iron rods placed close to each other and fused them when they touched one other. Producing a heat capable of fusing metals was the origin of electric welding. 55

Hare held the chemistry chair for twenty-nine years. Although he may not have been the best of teachers, there is ample testimony that he was a master demonstrator of chemical experiments and adequately explained their rationale. 56
Still, he inspired discovery in others. In 1839 Paul B. Goddard, one of Hare’s students, developed the bromine sensitizing method which made practical the photographic process invented by Daguerre. Prior to Goddard’s discovery, portraiture required exposure times of minutes. His method increased the sensitivity of Daguerre’s iodine procedure and reduced the exposure time required for good photographs to seconds. (John Goddard—no relation—described the method independently in England in 1840.)

Paul Goddard was assisted in his experiments by Hare and Professor Martin Boye. He was also associated with Robert Cornelius, whose self-portrait, taken in November 1839, is probably the earliest photograph of a human being. Goddard’s view of Philadelphia, also taken in 1839 and preserved at the Franklin Institute, is the earliest instantaneously exposed photograph. Goddard later joined Penn’s anatomy department and became a prolific medical writer.

Upon Hare’s retirement in 1855, Pennsylvania’s trustees hoped that Henry would take the chemistry chair. Henry, however, had been invited to head the new Smithsonian Institution, and he went to Washington. Hare’s treasured chemical apparatus followed; Hare donated it to the new museum, hoping that Henry would arrange to preserve it. For a time it was set up for display as well as used in a room across from Henry’s office. Subsequently it was dismantled and stored. It was destroyed in a fire early in the twentieth century.

The only piece of Hare’s equipment that remained at Penn was the small cannon he used to demonstrate to students the forces created by combustion. Edgar Fahs Smith used the cannon for this purpose in his chemistry lectures until he retired.

NATHANIEL CHAPMAN

Nathaniel Chapman held the chair of the theory and practice of physic from 1816 to 1850. He also held the chair of the institutes of medicine until 1835, when Samuel Jackson took over that responsibility. Chapman was elegant and flamboyant, a persuasive teacher who eclipsed the precise teaching styles of Physick, Horner, and Hare, despite a nasal voice resulting from a defect in his palate produced by a childhood injury. His most important contribution may have been founding the Philadelphia Journal of Medical and Physical Sciences in 1820; later it
was called the *American Journal of Medical Sciences* and was considered one of the country's foremost medical periodicals. Chapman himself was ever embroiled in controversies yet always remained popular with his colleagues—as was indicated by his election as the first president of the American Medical Association when the organization was founded in Philadelphia in 1847. He was called, variously, Philadelphia's "brightest ornament," "a man of irreversible mind," and an "intellectual bankrupt" who refused to accept scientific advances. Chapman, a Virginian, studied medicine under Elisha Cullen Dick, who treated George Washington in his final illness. He came to Philadelphia in 1797, worked in Rush's office, and attended Pennsylvania's medical lectures, graduating in 1800 after writing a thesis on hydrophobia. After foreign training, he settled in Philadelphia and from the outset aimed to succeed Rush as professor of theory and practice of physic. He joined the staff of the Philadelphia Almshouse when Charles Caldwell was forced to resign involuntarily following a violent dispute with Thomas C. James. Chapman broke with Rush and jeopardized his chances to assume his chair. Although Rush signed the younger physician's application for membership in the Philadelphia Medical Society, he blocked his appointment to the staff of Pennsylvania Hospital. Chapman, though, had many ways to cultivate the city's proper people. In 1808 he advanced his career by joining with James to teach a popular, independent course on midwifery. He managed after all to connect himself with the prestigious hospital despite Rush. In 1807, the physicians of the hospital appointed two doctors to visit all poor patients with disease; they placed John Syng Dorsey in charge of the city's northern district and Chapman in charge of the southern. Those two became the first of many distinguished physicians to occupy these posts until 1818, when the city opened two dispensaries. When Rush died in 1813, Benjamin S. Barton succeeded him, but Chapman was not overlooked. He was given Barton's former post as professor of materia medica. When Barton died in 1815, Chapman gained the chair he wanted.

In the 1820s he overcame an unpleasant association with an elixir named Swaim's Panacea, made by a New York harness maker or bookbinder. Its ingredient was essentially sarsaparilla syrup mixed with oil of wintergreen flavoring. Chapman and other physicians heartily endorsed the concoction, and Swaim prospered. As rumors began to circulate that some batches of the remedy contained mercuric chloride,
a poisonous compound, the physicians worried about Swaim’s use of their testimonials. The Philadelphia Medical Society investigated it and other specifics. It also asked the physicians who seemed to support it whether their endorsements were being used as they intended. Chapman was one of the first to recant. (Though Swaim was proclaimed a quack, the remedy continued to be used into the twentieth century.)\(^3\)

**WILLIAM WOOD GERHARD**

The first doctor of physic to advance clinical medicine was William Wood Gerhard.\(^7\) After earning his Penn medical degree, he traveled to Paris, then the medical center of the world. He was one of the so-called American Argonauts, who included George W. Norris, Caspar W. Pennock, and Alfred Stillé from Philadelphia, and Oliver Wendell Holmes, James Jackson, Jr., and George C. Shattuck from Boston.\(^7\) He was still in France in 1832 when he joined Pennock in publishing an article on cholera. At that time typhus was prevalent in Paris. There was also a similar disease to which one of Gerhard’s teachers, Pierre-Charles-Alexandre Louis, had given the name typhoid. Gerhard observed that French clinicians confused the two, and when he visited the British Isles in 1833, he noticed that physicians there also confused them. On his return to Philadelphia, Gerhard served as resident physician at the Pennsylvania Hospital and was elected to the staff of the Philadelphia Almshouse in 1835. While working on the almshouse wards, he, along with his colleagues Pennock and Stillé, established that the disease called “spotted fever” in Philadelphia was identical to the disease Louis had called typhoid. Gerhard widened his studies to include patients at the hospital. In more than fifty autopsies, he found many cases without the enlarged spleen and the ulcerations of the lymphoid follicles of the intestines characteristic of typhoid, although they had a skin rash similar to that caused by typhus. He proved that typhus was characterized by an absence of an enlarged spleen or intestinal lesions.\(^7\) The honor of first distinguishing the two diseases has been given to many, including Gerhard and Pennock, Lemuel Shattuck of Boston, Robert Perry of Glasgow, and Lombard of Geneva. But Gerhard’s 1837 papers in *The American Journal of Medical Sciences* are the first clear descriptions of the clinical and anatomical distinctions
between the diseases. In *Principles and Practice of Medicine* (1892), William Osler awards the laurels to Gerhard.\(^7\)

Gerhard contracted typhoid fever in 1837 at the age of 30. He recovered, but his health was permanently damaged. He subsequently withdrew from investigating infectious diseases and confined his practice to Pennsylvania Hospital and the almshouse and to teaching the institutes of medicine at Pennsylvania Hospital.

**HENRY HOLLINGSWORTH SMITH**

Henry Hollingsworth Smith succeeded William Gibson as professor of surgery.\(^7\) Smith had worked in the department of anatomy and aided his father-in-law, William E. Horner, in his duties as dean; Horner paid Smith $150.00, half the dean’s salary.

As a surgeon, Smith became interested in methods to treat false

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*William Wood Gerhard. (Historical Collections of the College of Physicians of Philadelphia.)*
joints (pseudarthrosis or nonunited fractures).\textsuperscript{79} In 1855 he wrote that he urged

the advantage of pressure and motion as obtained by means of a soft artificial limb, and experience has hence shown no case of failure even when the union of the bone did not ensue.\textsuperscript{80}

Smith displayed his organizational capabilities during the Civil War. He devised the plan for removing the wounded from the battlefield after the Battle of Winchester to major hospitals in Reading, Philadelphia, Harrisburg, and other large cities in the region. As an administrator-surgeon in the Union Army, he established the practice of embalming the dead on the battlefield, facilitating their removal and return to their families. He organized and directed a corps of surgeons and used a steamer as a floating hospital to treat the wounded at the siege of Yorktown and managed the treatment of wounded in the Seven Day Battles around Richmond.\textsuperscript{81}

During his productive career Smith wrote a textbook of surgery, an atlas of anatomy with Horner, and numerous works on the treatment of fractures.\textsuperscript{82}

NOTES

5. Randolph, pp. 18, 19, 21, 22, 28, 29.
20. P. S. Physick, Letter to the editor, Medical and Philosophical Intelligence for The Eclectic Repertory. “The Editors are pleased to have it in the interesting communications from Dr. Physick, which has just been handed to them. Had it been sooner received it would have occupied a more appropriate place in the number.” Eclectic Repertory 6 (1816): 389–90.


31. *American Medical Association, Transactions* 1(1848):188–89, 220–21; report (by H. H. Smith) of cases in which ether and chloroform were used in the surgical clinic of the University of Pennsylvania in the session of 1847–1848. I. Parrish, "Annual Report on Surgery," *Transactions of the College of Physicians of Philadelphia, Summary* 2 (1846–49):156; describes William Gibson's amputating a medical student's finger successfully under ether anesthesia; in the case of Horner, amputation of a breast had to be discontinued and was considered unsuccessful; both cases occurred May 1847. Horner later that year successfully used ether anesthesia to operate on anal fistula.


41. Osborne, p. 337.

42. Ibid., pp. 338–39.

43. Ibid., pp. 367–68.


51. Ibid., pp. 493–503.


55. R. Hare, “A memoir on some new modification of galvanic apparatus with observations in support of his new theory of galvanism,” *Philadelphia Journal of Medical and Physical Sciences* 1(1820):270–85; Smith, *Chemistry in America*, p. 188.


61. Ibid., pp. 119–23.

62. Ibid., pp. 21–22.

63. Ibid., pp. 1–8, 105.

64. Ibid., pp. 21–22.

65. Ibid., pp. 24–25.

66. Ibid., pp. 64–65.

67. Ibid., pp. 45–46.

68. Ibid., pp. 64, 62–63.

69. Ibid., pp. 64–65.

70. Ibid.

71. Ibid., p. 64.

72. Ibid., pp. 69–70.

73. Ibid., pp. 134–38.

75. W. R. Steiner, “Some Distinguished American Medical Students of Pierre-
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76. W. W. Gerhard, “On Typhus Fever, which occurred in Philadelphia in the
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77. W. Osler, The Principles and Practice of Medicine (New York: D. Appleton and

78. Kelley and Burrage, p. 1127.

79. Account Book of the Department of Anatomy by W. E. Horner, unpublished,
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80. H. H. Smith, On the treatment of ununited fractures by means of artificial
limbs, which combine the principle of pressure and motion at the seat of pressure, and
lead to the formation of an ensheathing callus (Philadelphia: Collins, 1855).

81. Kelley and Burrage, p. 1127.

82. H. H. Smith, Minor Surgery: or Hints on the Everyday Duties of the Surgeon
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and Comprising a Bibliographical Index and Historical Record of Many of their Opera­tions During the Period of Two Hundred Years (Philadelphia: Lippincott, 1852); H. H.
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Dissectors, 1st ed. (Philadelphia: Cary, 1823); H. H. Smith, Principles and Practice of
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Surgical Writers from the Year 1783 to 1860 Arranged for the Use of Students (Phila­delphia: Lippincott, 1863).
CREATING A CHANGE OR REACTING TO IT

Enough if something from the hands have power
To live and serve the future hour.

William Wordsworth

Except for the loss of the Southern students, the Civil War did not significantly impinge on the activities of the medical department as it ended its first century. Nor did it bring forth major advances in medical science. It did, however, lead indirectly to improvements in medicine.

Joseph Leidy, colleague Robert Rogers, and future trustee S. Weir Mitchell joined Smith in the local military hospitals. Treating the wounded soldiers taught them and other medical officers much about the management of fractures, use of anesthesia, and hospital design. And they learned the value of specialized hospitals. In *Gunshot Wounds and Other Injuries of Nerves*, Mitchell, George R. Morehouse, and W. W. Keens described the advantages at the United States Hospital for Diseases of the Nervous System, organized in May 1863. At first, the authors stated, they encountered many "difficulties and embarrassments" but eventually gained by focusing on "a limited class of cases":

No sooner did the class of patients begin to fill our wards than we perceived that a new and interesting field of observation was opened to view. . . . Among them were representatives of every conceivable form of nerve injury—from shot and shell, from saber cuts, contusions and dislocations.¹

Physicians at such hospitals learned the importance of obtaining special knowledge of diseases of the various organ systems; such lessons eventually contributed to medical specialization.
Other lessons from the war would modify medical education. Maintaining the health of masses of soldiers boosted the importance of public health, leading to new hygiene courses in Pennsylvania's post-war curriculum. Medical teachers observed how the sick and wounded were improperly managed both on the battlefield and in military hospitals and led a drive to improve instruction in patient management.²

Surgical inexperience added to the battlefield tragedies, as William S. Forbes, a Philadelphia anatomy teacher, observed, "because of a want of practical anatomy on the part of many surgeons." Schools could not give their students proper experience, he felt, because they lacked an adequate supply of human cadavers for dissection. In response to this need, Forbes drew up an anatomical bill that provided a legal mechanism for medical schools to use unclaimed bodies. Although initially defeated, the bill passed in 1867, after lobbying by a committee appointed by the College of Physicians of Philadelphia.³

At Penn, the ever-lasting struggle between a curriculum too oriented to practical medicine and one well-rounded in sciences auxiliary to medicine emerged again in 1865. One of the reformers was George B. Wood, a trustee, who felt that the curriculum had become stagnant in practicality. Wood persuaded his fellow members of the board to bring back the study of such natural sciences as botany, comparative anatomy, and zoology and to introduce a course in hygiene. Wood backed his proposals by donating $50,000 to the University for establishing the Auxiliary School of Medicine.⁴

The school was a step toward eliminating the archaic method of obtaining academic salaries through the sale of lecture tickets. Lecturers teaching the basic sciences in the new school could not be supported by the lecture fees, so they were paid fixed salaries for their part-time work.⁵ The first faculty consisted of Harrison Allen as professor of comparative anatomy and zoology, Henry Hartshorn as professor of hygiene, Ferdinand V. Hayden as professor of geology and mineralogy, John J. Reese as professor of medical jurisprudence, and Horatio C. Wood (nephew of George B. Wood) as professor of botany. Only Hayden was not a Penn graduate.⁶

Hartshorn was Penn's first hygiene professor, but neither he nor his successor for one year, Horace Binney Hare, had special training in the discipline. In 1877 Joseph G. Richardson, a microscopist and pathologist, took over the course until 1887, when the chair was given to Samuel G. Dixon, who organized the first hygiene laboratory in America.⁷
Beginning in 1866 the five teachers of the auxiliary school each delivered thirty-four lectures during April, May, and June, after the regular medical course was completed. Wood's endowment allowed any student or graduate of the medical department to attend free; others were charged $10 for one course or $35 for all five. In the first year the school enrolled one hundred students, expanding to more than 400 within a decade. 

The teaching was by didactic lectures with no opportunity for laboratory work. Unfortunately, most of the students had already finished much of their medical work, so knowing the basic sciences could not help them study medicine. But it did broaden their education; later, these courses would be offered first in the regular curriculum.

At first, no degree was awarded for this extra work, but in 1872 the faculty petitioned the trustees to give a second degree when two courses and proper examinations were completed. They suggested the German title of doctor of philosophy, Ph.D., a degree practically unknown in

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S. Weir Mitchell. (Historical Collections of the College of Physicians of Philadelphia.)
England and the United States. They argued that attending the auxiliary courses taught some general culture to add to the technical skills of the medical courses—analogous to the practice that students studying for degrees in history and philosophy were required to take courses in natural science.10

The trustees agreed, making these Ph.D.s the first awarded by the University of Pennsylvania. (Mary Alice Bennett, a graduate of Women’s Medical College, was the first woman to earn the degree, in 1880.) But later in the decade, the trustees had second thoughts. The new Johns Hopkins University began granting the Ph.D. for advanced study in 1876.11 Its course of study was closer to the German model, considerably more rigorous than Penn’s. So the Penn trustees reduced their degree to bachelor of science, although they permitted those already enrolled for the higher degree to receive it.

The faculty made further attempts to improve the curriculum by lengthening it. In 1868 it instituted an “autumn” course to be given by lecturers not on the faculty.12 The first teachers were James Tyson in microscopy, Edward Rhodes in physical diagnosis, D. Hayes Agnew in regional anatomy, H. Lenox Hodge, Jr., in skin diseases, and William Pepper, Jr., in morbid anatomy. In 1872, the Summer Medical Association of the University was organized; its teachers, faculty and non-faculty alike, represented almost all of the disciplines. This summer course replaced the “autumn” course.13 Later the “Summer Association” course was replaced by the spring course which was given in April, May, and June, and what previously had been called the autumn course was renamed the “preliminary” course.14

In the 1893–94 school year, the regular curriculum was lengthened to four years, and the spring and preliminary courses were discontinued. Two of the auxiliary courses were dropped in 1895 and the school was disbanded in 1898.15

FOUNDING OF THE HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA

The weakest link in medical education was the recurring shortage of patients for clinical instruction. Penn’s connections to the Philadelphia Almshouse and Pennsylvania Hospital were unofficial, maintained by
the faculty who were members of those hospitals' staffs. Lay boards of prominent Philadelphians governed both hospitals, and access of Penn students to the wards was periodically restricted, making Saint Joseph's Hospital a major location for clinical teaching.\textsuperscript{16} The fragile ties led to the organization of a University hospital whose staff and faculty could be controlled by the medical faculty and the Penn trustees.

Leadership came from William Pepper, Jr.\textsuperscript{17} He was a tall, handsome man with a pleasant voice and a persuasive manner with which he convinced his many friends to contribute to the building of Penn's medical school. He generously gave monies from his personal estate when matching funds were required for public or private grants. Under Pepper's leadership the medical school moved to West Philadelphia, where it organized and built the first university hospital and clinical pathology laboratory in the United States.

The University began discussing moving to West Philadelphia in the late 1860s. Older medical faculty objected; the prospective location was inconvenient, distant from hospitals. Younger faculty were enthusiastic, especially young Pepper, recently appointed a lecturer in clinical medicine, who realized that existing facilities were antiquated and cramped, with no room for expansion at the Ninth and Market Streets location.

Most important, Pepper reasoned that the most serious objections to the move could be overcome by building a new hospital west of the Schuykill River near the proposed medical department. The idea of a hospital available exclusively to medical students and faculty, linked directly to the University, was new for its time, and it required the proper presentation for acceptance.\textsuperscript{18}

Pepper dropped a hint of his intended project at the annual dinner of the alumni society in 1870. In response to a toast to the medical department, Pepper praised the medical school for having "the best and most complete system of dispensary clinical teaching" in the country; but he went on to regret that American medical students, unlike their European counterparts, lacked thorough clinical instruction in specialized branches of medicine. He declared that a change was due.\textsuperscript{19}

Change was at work within months, when construction of a University hospital was openly discussed. The trustees appointed a feasibility committee chaired by Morton McMichael, owner and editor of the \textit{North American}, the oldest newspaper in the country; his endorsement of a new hospital was strong assurance that the idea would succeed. Indeed,
the committee urged that a new hospital be built. It was joined by a committee of the medical faculty, and the groups campaigned together for public funds.²⁰

Pepper wrote an appeal for the enterprise and collected endorsements from 109 prominent citizens of the city. Pepper argued that the hospital would improve medical education, serve the city with more beds, and provide material advantage to the community. He also collected data showing that Philadelphia’s hospital facilities were inadequate compared to those of other cities, including New York.²¹

University alumni were exhorted to urge their legislative representatives for support, and in April 1872 the legislature granted $100,000 for the project, on condition that the University match it with $250,000.²²

A month later, the trustees designated, as a site for the hospital, newly acquired property north of Spruce Street, near the plot where
Houston Hall would later be built. If a more desirable location could be found, they added, it could be used. Pepper concluded that the ten acres granted for the new campus was inadequate, so he petitioned the city to grant to the trustees the ground between Spruce Street on the north, Pine Street on the south, 34th Street on the east, and 36th Street on the west. After considerable negotiation, on May 18, 1872, the city sold the land to Penn for $500 with the following stipulations: The hospital building must be completed within five years; the hospital must perpetually maintain no fewer than fifty free beds for use by the city, and the trustees must report annually to the city on the condition of the institution. Pepper solicited his influential friends. He urged lawyers to suggest to clients drawing up wills and arranging to dispose of their property that they consider a gift to the hospital: $5,000 endowed a free bed in the donor’s name and would give relief to an average of twelve persons a year. “In no way,” he stated simply, “can the same amount of good be done by the same money.” The success of Pepper’s tactic may be measured by the many memorial plaques on the walls of the hospital.

By November 1872 the $250,000 required by the state had been secured. But more was needed, and Pepper worked zealously to obtain another matching grant—$100,000 if private subscription could raise $100,000. The legislature approved, and that money was soon in hand.

The hospital was designed by T. W. Richards, drawing instructor at the University. The style of “university Gothic” matched his design of College Hall, completed in 1872. Funds, however, could cover only the central and western wings of Richards’s original plans. Shortly after the hospital opened on June 4, 1874, Pepper again appealed to the legislature for a grant to erect the eastern wing of the plan. But he soon discovered that he had taught other institutions how to obtain state monies. The legislature was so deluged by similar petitions that his request was denied. The eastern wing was never completed, and seventeen years passed before the University again applied for funds from the state.

Once founded, the Hospital of the University of Pennsylvania prospered and grew. In 1883 the Gibson Pavilion, funded by a gift from Henry Gibson of Baltimore, was opened. Through the efforts of Mrs. Richard D. Wood, the nurses’ home was opened in 1886. A maternity ward was opened in 1889, followed by a maternity wing in 1894.
T. W. Richards's plan for the Hospital of the University of Pennsylvania. Only the central building (Administration) and west ward wing of this plan were erected. Opening Exercises of the Hospital of the University of Pennsylvania. The pamphlet containing the Hospital's plan is bound in the Annual Reports of the Hospital of the University of Pennsylvania (Annual Reports of the Hospital of the University of Pennsylvania.)
Medical Hall. TOP: T. W. Richards drawing of the Exterior. BOTTOM: Plan of the interior of Medical Hall showing the lecture hall and anatomical amphitheater. (Archives of the University of Pennsylvania.)
William Pepper Laboratory, which Pepper Jr. erected in memory of his father, was completed in 1894. The last structure added in the nineteenth century was the Agnew wing, which opened in 1897. It contained four operating amphitheaters, wards for surgical patients (men, women, and children), and gynecological patients, and a children's orthopedic ward. In the basement was a shop for making artificial limbs and other orthopedic appliances as well as a gymnasium fitted with equipment for strengthening limbs weakened by surgery or disease.

RELATIONSHIP BETWEEN THE MEDICAL FACULTY AND THE CLINICAL (HOSPITAL) FACULTY

From the moment a University hospital was suggested, the medical faculty questioned the relationship between itself and the hospital staff, particularly about control of hospital policies. It rejected an initial proposal, made by George B. Wood, that the hospital be staffed by clinical professors alone. It agreed to a revised plan that placed the medical faculty in senior chairs over the clinical professorships.

The first staff, as of February 1874, consisted of Alfred Stillé as professor of the theory and practice of medicine and clinical medicine, and William Pepper, Jr., as clinical professor of medicine; D. Hayes Agnew as professor and clinical professor of surgery and John Neil as associate clinical professor of surgery; R.A.F. Penrose as professor of obstetrics and the diseases of women and children and William Goodell as clinical professor of the diseases of women and children; William F. Norris as clinical professor of diseases of the eye; and George Strawbridge as clinical professor of diseases of the ear.

REFORM OF THE CURRICULUM

These changes stemmed from forty years earlier when the American Medical Association was founded, partly, on the program of raising standards of medical education. Pennsylvania was one of the few institutions that responded by lengthening its medical course, but the reform failed when student enrollment declined; in the mid-1850s the faculty voted to return to the shorter course.
Reform became a serious topic again at the urging of Alfred Stillé.\textsuperscript{35} An 1836 M.D. graduate, Stillé worked with Gerhard and Pennock on distinguishing typhoid fever from typhus and wrote independent papers on his observations of the symptoms of the two diseases. He also wrote important papers on cerebral meningitis and cholera as well as on dysentery and erysipelas. He became revered as an excellent clinician and teacher and served as president of the American Medical Association.\textsuperscript{36}

At the alumni society meeting in 1873, Stillé spoke on the need to base a school on its merits, not the number of students. Competition for students, he charged, forced professors "to keep down the value of their wares and furnish them at a price as their rivals charged." Schools had to be independent "so that the earnest and true shall not be held back by the apathetic and incompetent." He favored an endowment to remove payment-by-lecture, a lengthened term, and a graded curriculum.\textsuperscript{37}

Another major struggle between the medical faculty and the hospital staff erupted over the issue of improving the medical curriculum. In 1875, the medical faculty wrote to the trustees that

\begin{quote}
the vast acquisition of medical and surgical knowledge which have been gained within the last quarter of a century \ldots so enlarged the domain of the profession that the brief period allotted to medical instruction \ldots is entirely inadequate. \ldots\textsuperscript{38}
\end{quote}

A meeting was arranged among the medical faculty, a committee from the hospital staff, and the trustees—the implication being that the presence of the trustees made any decisions final.\textsuperscript{39} The medical faculty were infuriated, feeling that the clinical professors had overstepped their bounds. Informal conciliatory meetings followed, but no changes were made in medical education.\textsuperscript{40}

In 1876 the trustees appointed four new professors to the medical faculty. The medical faculty then moved to delay this action by writing a "communication" to the entire board of trustees, which was printed to be certain that it reached each member. One of the new professors appointed was William Pepper Jr.—evidence that the old guard in the medical faculty had lost its fight to retain control of the department.\textsuperscript{41}

Four days later, long-sought administrative changes were made. Among the changes was installation of the three-year course, grading
of the courses, and the guarantee of annual professorial salaries of $3,000.\textsuperscript{42} Such sums were met mostly by tuition fees and aided by a gift of $50,000 from Mrs. John Rhea Barton, who endowed a chair of surgery in her husband’s name.\textsuperscript{43} In addition, the names of some chairs were altered: institutes of medicine became physiology, diseases of women and children became gynecology, and general therapeutics was added to materia medica and pharmacy.\textsuperscript{44}

Since there was still some misunderstanding in 1877 about the status of the new professors, the trustees spelled it out: the clinical professors of medicine, surgery, pathology and morbid anatomy, and obstetrics and diseases of women and children would be full professors with the right to examine students, sign diplomas, share in the award of prizes, and deliver introductory and valedictory addresses.\textsuperscript{45}

This action of the trustees was too much for Robert Rogers, who resigned the deanship on May 7, 1877.\textsuperscript{46}

**EXPLOITATION OF THE NEW ACADEMIC REQUIREMENTS**

Some students found and exploited a loophole in the new requirements. They left school before second-year examinations, took summer (and easier) courses at another institution, then returned for their Penn degree in the third year.\textsuperscript{47} The abuse surfaced publicly in an editorial in the *Philadelphia Evening Bulletin* in 1883, and the medical faculty responded by requiring readmission exams of returning students.\textsuperscript{48}

**THE FOUR-YEAR COURSE**

When John Marshall became dean in 1892, the first problem he faced was the extension of the medical course to four years. Provost Pepper had begun to press for a four-year course in 1877. At first the medical faculty resisted adding an additional year by proposing that the curriculum be rearranged by placing the basic science courses in the first and second years and the clinical courses in the second and third. In 1891 Pepper proposed raising a guarantee to support the four-year curriculum. In 1892 he was able to announce that finally through a personal subscription of $10,000 from his estate and generous gifts from D. Hayes Agnew, J. William White, and Horatio C. Wood that
the sum required for the guarantee—$20,000 a year for five years—had been raised.49

The four-year course which began in the school year of 1893–95 was essentially the same as the voluntary four-year course that had been available but little used since 1883. What was most important was that the four-year course provided additional time for studies in the clinical specialties.

Shortly after this announcement, through the efforts of S. Weir Mitchell and others of the medical faculty the school year was lengthened by beginning in October and ending in June, yielding an academic year of about eight months.50 When the school year was lengthened in 1894 the autumn (preliminary) and spring courses were discontinued.

ENTRANCE EXAMINATIONS

Inauguration of the four-year course on October 2, 1893 was distinguished by the inaugural address of Dr. William Pepper dealing with the same subject he had addressed sixteen years earlier: Higher Medical Education the True Interest of the Public and the Profession. In this famous address he began by stating that in 1877 he had urged the faculty to institute these reforms: preparatory examinations for entrance to medical school, the lengthening of the annual term of studies; the grading of the course, clinical and laboratory instruction for the student; and the establishment of fixed salaries for professors rather than the old system of selling lecture tickets. The inauguration of the four-year course accomplished all of these high goals except the introduction of an entrance examination. Pepper started this drive for he knew as well as the faculty that the entrance requirements were still those of 1880, which permitted enrollment of a large number of ill prepared students to the study of medicine.51

The requirement of entrance examinations was inaugurated in 1896 when the faculty announced the minimal entrance requirement would be a high school diploma or its equivalent, proven by written test. As the faculty feared, enrollment plummeted, from a high of 926 students in 1896–97 to 472 in 1902–1903.52

THE WILLIAM PEPPER, SR. LABORATORY

As the academic changes developed, Pepper began the movement to establish a laboratory of pathology that would be a department of the
medical school and the hospital. He combined a legislative grant of $100,000, $50,000 of his own money, and $30,000 of other subscriptions; and in 1895 the William Pepper Laboratory of Clinical Medicine was formally dedicated. The laboratory aimed to help the hospital’s patients “by prosecution of minute clinical studies and original research, and to advance the interest of science by publication of the results of such work.”

R.A.F. PENROSE

In 1872 the professorship of midwifery and the diseases of women and children was divided into two services. R. A. F. Penrose continued as the professor of midwifery. He was rated as a superb teacher; as one of his students put it,

Who can forget the account of the essential scientific facts then known in regard to fertilization of the ovum in the guise of a charming fairy tale in which the spermatozoa figures as the prince and the ovum as his captive lady love awaiting liberation from the enchanted cell, the Graffian follicle. A Psyche to be awakened by Cupid’s kiss?

One of Penrose’s most dramatic demonstrations was his “delivery” of a baby from the manikin dubbed Mrs. O’Flaherty, which he performed with all of the skill of a pantomime artist. Although Penrose died in 1908, Mrs. O’Flaherty was alive many decades later, memorialized by I. S. Ravdin when he reminded his residents to deal with their private and ward patients equally, stating “Treat them all like Mrs. O’Flaherty.”

WILLIAM GOODELL

When the chair was divided, William Goodell was chosen as professor of the diseases of women and children. He had gained a distinguished reputation as the director of the Preston Retreat, a unique hospital that revolutionized midwifery, or obstetrics, in the United States. He also developed the Goodell dilator for the cervix, which is still in use. Goodell identified infection as the cause of childbirth fever (puerperal sepsis) and developed effective methods to prevent it. He was the first...
American obstetrician to apply the doctrine of antisepsis and asepsis in institutional practice. His work proved that large numbers of patients could be treated safely in a public institution, a feat which altered obstetrical practice in the United States. His methods were based on those set forth originally by the Philadelphia College of Physicians in 1836, some seven years before Oliver W. Holmes published his famous paper accusing physicians of spreading childbirth fever and, in effect, murdering patients. In 1860, the Hungarian obstetrician Ignaz Semmelweiss published his famous paper on "The Etiology, Concept, and Prophylaxis of Childbirth Fever" and was still trying to get his ideas

William Goodell's clinic in the large amphitheater in the second and third floors of the Administration Building of the Hospital of the University of Pennsylvania. (Archives of the University of Pennsylvania.)
accepted in Europe when the Preston Retreat opened in 1866, using
the hygienic precautions he recommended.57

EADWEARD MUYBRIDGE—STUDIES OF ANIMAL
MOTION

One of the more unusual research activities in the medical department
was conducted by the experimental photographer Eadweard Muybridge,
who devised methods to show animal motion, an important step in the
development of motion pictures.58 Muybridge had immigrated from En-
gland in 1851, when he was twenty-two years old. He went West and
in 1872 was commissioned to photograph the horse of Leland Stanford
to settle an argument: did a running horse have all four feet off the
ground at any single instant? Muybridge produced a photograph that
stopped the horse's motion, but he did not have the equipment to take
sequential photographs of the horse's strides. In 1877 he managed to
arrange a series of cameras, trip wires, electromagnets, and a white screen that reflected sunlight correctly; and he proved that a running or trotting horse always has one foot on the ground.

In 1883 Muybridge came to Philadelphia to lecture. Pepper heard him. He and others contributed to establishing a studio for Muybridge in space behind the Hospital of the University of Pennsylvania and the Philadelphia Hospital, just east of the newly opened veterinary school.59

Muybridge began using his new studio in the spring of 1884 and

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Muybridge's photographs of human motion. (E. Muybridge, The Human Figure in Motion [London: Chapman and Hall, 1901].)
worked there into 1886. Three members of the medical faculty became involved in his work. Harrison Allen, from physiology, studied the motion of normal male and female subjects and wrote on it in Muybridge’s book Animal Locomotion. His departmental colleague Edward Tyson Reichert had his own photographic facilities; he had Muybridge photograph the movements of an animal heart and make pictures of normal subjects, but most of this work was never published.  

Neurologist Francis X. Dercum asked Muybridge to photograph patients from the neurology clinics of the University hospital and Philadelphia Hospital. Dercum had devised a method to produce convulsions by muscle constraint using the patient’s outstretched arm; he also studied hypnotism. He helped Muybridge assemble, classify, and describe his plates; Muybridge’s studies, with comments by Dercum and Allen, were published in 1888 as The Muybridge Work at the University of Pennsylvania: The Method and the Result.  

NOTES

4. Corner, Two Centuries of Medicine, pp. 126–27.
5. Ibid., p. 128.
6. Minutes of the Medical Faculty, April 25, 1865, Archives of the University of Pennsylvania.
7. Corner, p. 128.
8. Ibid.
9. Ibid., p. 127.
10. Ibid., p. 126.
12. Minutes of the Medical Faculty, Archives of the University of Pennsylvania.
13. Ibid.
14. Ibid.
15. Ibid.
18. Ibid., p. 42.
19. Ibid., pp. 42–43.
20. Ibid., pp. 43–44.


30. Program of the Opening Exercises of the D. Hayes Agnew Wing of the Hospital of the University of Pennsylvania.

31. Minutes of the Medical Faculty Meeting [hereafter abbreviated as “MFM”], June, 1873, Archives of the University of Pennsylvania.

32. MFM, January, 1874

33. MFM, February, 1874.

34. MFM, February, 1874.


38. MFM, June 18,1875.

39. MFM, November 4, 1875.

40. MFM, November 11, 1875; November 18, 1875.

41. MFM, March 25, 1876.

42. Report of the Special Committee on the Medical Department, presented March 28, 1876. [Printed for the use of the Board of Trustees, Guarantee of the Trustees, MFM, 1896].


44. MFM, May 28, 1887.

45. MFM, April 4, 1877.

46. MFM, May 7, 1877.

47. MFM, 1883.

48. MFM, 1892.

49. MFM, book 9, 1893, p. 127.


51. William Pepper, Jr., “Higher Medical Education the True Interest of the Public and Profession,” Inaugural Address at the Opening of the Four Year Course of Medical Study in the University of Pennsylvania, October 2, 1893.

52. MFM, book 10, p. 15.


57. W. R. Penman, “Charles Delucina Meigs, M.D.: An Assessment of His Role


59. G. Nitzsche, Muybridge's Method and Apparatus, unpublished manuscript, Archives of the University of Pennsylvania; G. Nitzsche, Muybridge Moving Picture Experiments at the University of Pennsylvania, unpublished manuscript, Archives of the University of Pennsylvania; Francis X. Dercum, Letter to G. Nitzsche, May 10, 1929, describing his collaboration with Eadweard Muybridge. Archives of the University of Pennsylvania.

60. E. T. Reichert, no address, letter describing his collaboration with Eadweard Muybridge, Archives of the University of Pennsylvania.