American students abroad

In the last part of the 18th century American students flocked to Edinburgh to study medicine; in the first half of the 19th century they went to Paris; from 1870 to 1914 they went to the German universities -- Göttingen, Heidelberg, Strassburg, Leipzig, Breslau, Munich, Würzburg, Freiburg, Berlin, and Vienna. At least half of the best known men and women in American medicine of that era received some part of their training in a German-speaking university.

The larger group of Americans to go abroad to study medicine was composed of those with American degrees who sought postgraduate training in Europe. By far the majority of these postgraduate students wished to perfect their knowledge or skill in a clinical specialty. For them, Vienna and later Berlin, with their special short courses and their abundance of clinical and experimental material, were the ideal places for advanced training.

A minority of the American physicians abroad concentrated their attention on the fundamental medical sciences. Their subsequent influence and reputation, however, is out of all proportion to their numbers. This was the group that spent long periods of quiet, intensive study and patient investigation in the smaller universities of Germany. They preferred the anatomical, physiological, biochemical and pathological laboratories of such universities as Leipzig or Heidelberg to the crowded clinics of Vienna and Berlin. It was from this tiny band that the faculties of Johns Hopkins, Harvard, Michigan, Yale, and Cornell drew the men who were to establish America's reputation in scientific medicine.

-from

W 18 / B716a / 1963
The rise of modern medicine is inseparably connected with Rudolph VIRCHOW (1821-1902), the founder of cellular pathology. Virchow graduated at Berlin in 1843, served as prosector at the Berlin Charité, and in 1847 began publishing his Archiv für pathologische Anatomie. In 1848 Virchow was sent by the Prussian government to investigate an epidemic of typhus -- "famine" fever -- then raging in Upper Silesia. His exhaustive account of what he saw included recommendations not only on hygienic measures but also for democracy and social reform. This and his bold pronouncements in his semipolitical periodical, Die medizinische Reform (1848-9), soon got Virchow in trouble with the authorities. In 1849 he took the chair of pathologic anatomy at the University of Würzburg, and seven years later was duly installed as professor of pathology at the University of Berlin, at the same time assuming directorship of the Pathological Institute which had been erected for him. Here he entered on a career of almost unparalleled activity in many directions. He was a man of wide culture and deepest human interests, and he soon became known everywhere as anatomist and pathologist, epidemiologist and sanitaryian, anthropologist and archeologist (he excavated at Troy with Schliemann), editor and teacher, and old parliamentary hand. From 1880 until 1893 he served in the Reichstag as a faithful and reliable representative of the rights of the people, and as an opponent of Bismarck. In 1899 he dedicated the Pathological Museum in Berlin, to which he gave his private collection of 23,066 preparations, each of which had been prepared, labeled, and placed on the shelves by his own hand.

Virchow derived the inspiration for his life-work from Johannes Müller, and what he accomplished was in every way worthy of his great teacher. In pathology he had only Morgagni (organs) and Bichat (tissues) as possible competitors before him; his Cellular-Pathologie (1858) set in motion a new way of looking at the body -- that cell development is not discontinuous (as Schleiden and Schwann had supposed), and that there are no specific cells in disease, but only modifications of physiologic types. This morphologic view -- a new growth of cells presupposes already existing cells -- was the basis of his work on tumors, Die krankhaften Geschwülste (1863-7).
Virchow was the first to observe and define leukocytosis, and in 1845 he was the first to describe leukemia. Between 1846 and 1856 he studied embolic phenomena, and was the first to recognize the cerebral and pulmonary varieties. He studied trichinosis, pointed out the relationship between lupus and tuberculosis, and described leontiasis ossium and spina bifida occulta. In histology, he made two important discoveries — the neuroglia (1846) and the special lymphatic sheaths of the cerebral arteries (1851). To medical history he contributed valuable monographs on prehistoric syphilis, tattooing, and leprosaria in the middle ages; he wrote biographical studies of Morgagni, Müller, and Schönlein, and was the first to write upon medicine in its relation to the fine arts (1861).

Virchow was something of a martinet in the morgue or lecture hall, often transfixeding inattention or incompetence with a flash of sarcasm. Yet he was generous, whole-souled, and broad-minded withal. In extreme old age, Virchow who had always been liberal in politics became reactionary in science; he rejected Laennec's unitary view of tuberculosis, he opposed the Darwinian theory, and he thought the new views of Koch and Behring on toxins and antitoxins were hardly acceptable.

'Above all, he was, in respect to civic courage, an ideal modern man. He did not believe in a characterless, stock-jobbing bourgeoisie, but warmly espoused the cause of those who labor...His lifelong championship of the rights of industrial humanity, valiantly upheld in the very stronghold of the Prussian military government, shows the kind of fiber he was made of.'

- Garrison

(the best biography of Virchow is

Erwin Ackerknecht, Rudolph Virchow, doctor, statesman, anthropologist.
University of Wisconsin Press, 1953. WZ 100 / V813A / 1953)
The founder of scientific medicine in Germany was Johannes MÜLLER (1801-58), the greatest German physiologist of his time, and like Haller and John Hunter, one of the great all-round medical naturalists. He was equally eminent in biology, comparative morphology, physiologic chemistry, psychology, and pathology, and through his best pupils -- Schwann, Henle, Kölliker, Virchow, DuBois Reymond, Helmholtz, and Brücke --- the main currents of modern medicine can be traced. Müller's *Handbuch der Physiologie des Menschen* (1834-40) was a rich mine of novel facts and ideas, and introduced two new elements into physiology -- the comparative and the psychologic.

Müller investigated neural transmission, color sensations, and the structural relations of myxinoid and ganoid fishes. He isolated chondrin and glutin. His name comes down to us associated with the discovery of the Müllerian duct (1825). He worked out the whole finer anatomy of the glandular and cartilaginous tissues, grouped the connective tissues, and thus cleared the ground for the cell theory of his pupil SCHWANN. In pathology he was one of the first to make use of the microscope, notably in his monumental work on tumors (1838). He corresponded with Goethe on the phenomena of eidetics. His work, along with the embryological investigations of Karl von BAER (1792-1876), the improvement of the achromatic microscope, and the development of the cell theory, brought about fundamental changes in the direction of medical research.
The pioneer of experimental physiology in France was François MAGENDIE (1783 - 1855), who employed both physical and chemical procedures in his investigations, and may be regarded as the founder of experimental pharmacology. He regarded medicine as 'a science in the making'; he compared himself to a ragpicker who wanders through the domain of science collecting whatever he finds. He was an ardent protagonist of experimentation on living animals, and became the particular aversion of the anti-vivisection movement; unfortunately, there is little doubt that many of his experiments were without aim and needlessly cruel.

Before Magendie's time, physiology was made up of what Claude Bernard called 'reveries systematiques'; Magendie's efforts ended that epoque. He gave experimental proof to and further illuminated the discovery of Charles Bell that the anterior roots of the spinal nerves are motor, the posterior sensory in function (1822). He made important investigations of the mechanisms of deglutition and vomiting, and the circus movement obtained by section of the optic thalamus. He demonstrated the absorption of fluids by the blood vessels, as well as by the lymphatics. His investigations in pharmacology introduced bromine, iodine compounds, and the alkaloids strychnine, morphine, veratrine, brucine, piperine, and emetine into medical practice. His proof that secondary or subsequent injections of egg albumin cause death in rabbits tolerant to an initial injection was the first experiment in anaphylaxis.

- Garrison
Claude BERNARD

Claude BERNARD (1813-78), the founder of experimental medicine, was a native of the Beaujolais countryside of France, where his father was a vine-grower. He first became a pharmacist's assistant at Lyons. Sharing the romantic aspirations of the youth of his time, he turned his attention to literature and wrote *La Rose du Rhone*, a vaudeville comedy which was produced with some small success in Paris. Consulting a drama critic, he was advised to study medicine. This brought him into close contact with Magendie, who was one of the few to recognize and promote his talents.

Bernard's many achievements included
- clarification of the role of pancreatic juice in digestion
- discovery of the glycogenic function of the liver
- demonstration of the effects of curare
- exposition of the vasomotor innervation
- propounding the concepts of 'internal secretions' and the constancy of the 'milieu interieur'

Perhaps his greatest contribution was his *Introduction to the study of experimental medicine* (1865), an attempt to formulate a philosophy of scientific research as applied to medicine. Bernard was the first to undertake the task of analyzing the philosophical basis of the scientific method and to discuss its application to experimentation in living beings. Bernard documented practically all of his reasoning with examples taken from his own researches, giving the work unusual freshness as well as great authority, in language of the utmost clarity. Lawrence Henderson said of it: 'We have here an honest and successful analysis of himself by one of the most intelligent of modern scientists, a man of genius and a great physiologist.' Reading it is an unforgettable experience, and a source of inspiration.

"Bernard considered Magendie's extreme empiricism as too exclusive and insisted on the importance of ideas and reasoning in scientific research. For Bernard science is built with well-observed facts, but reasoning is needed for their interpretation. His position is well summarized by the following quotation: 'Empiricism may serve to accumulate facts, but it will never build science. The experimenter who does not know what he is looking for will not understand what he finds.' This advice is relevant for us today. With the increasing power that modern instrumentation has given us, we are apt to forget that the human mind, human reason, is the most important tool in scientific research."

(Francisco Grande, 1967)

(the best biography of Bernard is that by J. M. D. Olmsted, 1938.)