

Biog

a history of medicine in pictures

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painting by Robert A. Thom

Virchow and Cellular Pathology

FOR twenty centuries, the theory of humoral pathology, in one form or another, influenced the thinking of medical men. According to this philosophy, the body was controlled by four humors and sickness resulted from an imbalance of those humors. Effects of imbalance were thought to encompass the entire body, until Morgagni in 1761 convinced many of his contemporaries that disease usually gained foothold in one or more specific organs; and Bichat, in 1800, drew finer lines and argued that tissues which made up organs were focal points of morbid changes. It remained for Rudolf Virchow in 1855 to develop understanding that the basic units of life are self-reproducing cells of living bodies, and that pathologic conditions result primarily from changes in life processes of cells, due to external influences and irritations. The principles of "cellular pathology," based upon Virchow's scientific research, have dominated biology and pathology ever since; and they finally laid to rest remnants of the old humoral theories to which some medical men still clung in the nineteenth century.

Virchow also was to take a forward position among German medical scientists who, in the mid-nineteenth century, were to wrest leadership of world medicine from the Paris school, dominant since the turn of that century. Though men trained in Paris had advanced



their profession tremendously, their methods, stressing physical examination and autopsy, were self-limiting. The future was to go with those who understood and could apply new scientific tools to clinical medicine: microscopy, experimental physiology, and chemistry. In these fields, the Germans were to excel for many decades.

Rudolf Ludwig Carl Virchow was born in the small Eastern Pomeranian city of Schivelbein, October 13, 1821, the only child of a minor city official and farmer. Virchow seems never to have forgotten his rural beginnings. Early in life he revealed an unusual aptitude for the sciences, combined with a wide range of interests, including Arabic poetry, classics, and French, English, Hebrew and Italian languages. In October, 1839, Virchow entered the medical school of the Friedrich-Wilhelms Institut, in Berlin. Primarily an institution offering free medical education to gifted boys from the poorer classes in return for future service as military physicians, the Institute turned out other nineteenth century luminaries, including Helmholtz, Löffler, and Behring.

At the time Virchow began his studies, the position of German medicine was still at a very low level, due to the influence of romantic philosophies among physicians; but the Berlin university had two of the more magnetic teachers of the time: Johannes Müller, physiologist, comparative anatomist, embryologist, and pathologist; and Johann Lucas Schönlein, outstanding German clinician. These men influenced Virchow: he entered upon research activities while still an undergraduate, and he readily developed abilities to apply exact laboratory methods to investigation of biologic and pathologic questions. In 1843, he presented his thesis on "Rheumatic Disease, Particularly of the Cornea," and received his doctorate in medicine.

As a young student and resident physician, the man who was soon to rise to national and international prominence in several fields presented anything but an imposing figure. Short, thin, blond, dark-eyed, he was accorded the friendly nickname, *der kleine Doktor* (the little doctor). Evidently his stature was a point of personal sensitivity: in Würzburg, he had constructed a special low desk with an adjustable center section, to deemphasize his short stature.

In 1843, Virchow was appointed "company surgeon," similar to a rotating internship, in Berlin's Charité Hospital. There he began advanced work in biochemistry and in microscopy, a field in which he was to succeed his teacher, Robert Froriep, only three years later, in 1846. From Froriep, too, he was to gain his interest in writing and in editing. In 1845, he began publishing papers on his first two discoveries: embolism, and leukemia. This marked the beginning of an almost continuous flow of papers and other publications for more than half a century. Meantime, things medical did not prevent Virchow's mind from being alert in other fields, including politics, especially as his Pomeranian homeland was involved.

In that same year, 1846, Virchow also began to give courses in pathologic anatomy, and in the following year, at the age of 26, Virchow became a *Privatdozent*, or instructor. In 1847, also, with Benno Reinhardt, Virchow launched the first volume of *Archives for Pathological Anatomy and Physiology and Clinical Medicine*, a periodical which he was to edit until 1902, and which is still being published.

Virchow in later life was to regard the year 1848 as the most decisive in his life: he was able at that time to crystallize his previous critical and constructive

ideas in politics and in science into one consistent philosophy. Sent on an official mission to study an epidemic of typhus fever in famine-ridden Upper Silesia, a Prussian province occupied by a Polish minority, Virchow returned preaching political therapeutics (education, freedom, and prosperity for all). He was as audacious in criticism of his government as he was of his medical elders.

When revolution broke out in Berlin in March, 1848, Virchow was among those who fought on the barricades; and in a weekly publication of his own, *Medical Reform*, he discussed changes he believed were needed both in administrative and in medical practices.

Reactionary persecutions following the revolutionaries' defeat led to Virchow's dismissal from his academic position in Berlin, and induced him in 1849 to accept the position of Professor of Pathology at the University of Würzburg. There he entered upon seven of the most creative years of his life. His new professorship at Würzburg was the first chair in pathologic anatomy in Germany. Also, recent improvements in compound microscopes extended the field and the accuracy of the probing curiosity of "der kleine Doktor." "Learn to see microscopically!" became one of his persistent admonitions to students.

Among Virchow's discoveries while engaged in teaching, in writing, in editing, and in research during his Würzburg years, were chemical substances, such as myelin, and amyloid; demonstration that connective tissues are composed of cells; and that granulated cells are in a degenerative, not a formative, state. He continued studies related to public health and began work on physical anthropology. But of greatest significance was formulation and exposition of the basic biologic law: *Each cell stems from another cell*.

In 1838, another pupil of Johannes Müller, Theodor Schwann, had introduced his theory that the elementary unit of all animals and of all plants is the cell. This was not the first cell theory, but better microscopes had made cellular observation more accurate and convincing. Schwann, however, believed that cells were spontaneously created from an amorphous substance called "blastema." Virchow ex-

pressed doubt of the spontaneous generation theory as early as 1845; but in Würzburg he proceeded to disprove this concept by demonstrating conclusively that cells multiply by division. Disease, Virchow taught, is not located basically in organs, tissues, vessels, or nerves, but in cells; and this more specific concept became the basis of instruction in pathology. He coined the term, "cellular pathology" in 1855, and his book on the subject was published in 1858.

Virchow was not the first man to look for pathologic changes in cells; nor was he the first to claim that cells originate only from cells. He was first, however, to systematize the theory of cellular pathology, and to give medicine again a common denominator for all diseases—something it had lost in giving up older medical philosophies. Probably the bases of Virchow's greater success than earlier observers had had lay in the soundness of his research, the prolificacy of his publishing, the crusader-like quality of his zeal, and the growth of his influence upon medicine.

Already internationally famous for his teaching in Würzburg, Virchow was called back to Berlin in 1856. Johannes Müller wanted Virchow to succeed him as teacher of pathologic anatomy. One of Virchow's conditions for return was erection of a special building for an Institute in Pathology. This building was to be used during the entire 46 years Virchow was to spend in Berlin.

The importance of "der kleine Doktor" in his field continued to grow: in Berlin, he wrote his great book on tumors; he worked on fungi; and he did important work on trichinosis. Though some writers have claimed that Virchow was an enemy of bacteriology, the facts deny the claim. He was an early participant in the trend toward knowledge of etiology through microbiology. His assistant, Obermeier, discovered the spirilla of relapsing fever; and Virchow was first to publish, in his *Archives*, the discoveries of Bravell, Hansen, and Loesch. He exercised healthy skepticism toward many "new organisms" reported to have been discovered; and frequently his skepticism was justified by later findings. He did make blunders in his views regarding tubercu-

the picture Just past his thirty-fourth year, in 1855, Dr. Rudolf Virchow, while professor at Würzburg University, Germany, propounded his theory of cellular pathology. Lecturing and demonstrating at his specially-made desk in the Würzburg Krankenhaus, the slight, short, fiery professor used microscopes to convince students that cells reproduced from other cells, and taught that disease results from disturbance of cells by injury or irritants. Later, in Berlin, Virchow continued to lead international medical thought, and to teach, to engage in research, to write, to edit, to explore new fields, and to serve his community politically, until his death in 1902.

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losis and diphtheria; however, his basic positions were sound: that disease cause and disease process should not be confused; that bacterial toxins might exist and might be important; and that there are social and constitutional factors as well as bacteriologic factors to be considered in management of infectious diseases.

In Berlin, too, Virchow became involved in municipal and in national politics. In 1859, he was elected to the Berlin city council; and he served as a member of that body continuously thereafter until his death. His studies in public health and his growing influence permitted him to bring about construction of better sewerage for Berlin, to build new hospitals, and to bring about improved hygienic conditions in schools and in other municipal institutions. In 1861, Virchow was elected to the Prussian diet (legislative body) in which he led a desperate fight against Otto von Bismarck's internal dictatorship and external policies of "blood and iron." This was one of the few times Virchow failed to get what he wanted. Bismarck's ambition to "unify" Germany was fulfilled following three campaigns which took place during 1864, 1866, and 1870. Bismarck became so annoyed with "der kleine Doktor" that at one point he challenged Virchow to a duel, but this never came about.

Virchow now had friends, pupils, and admirers in every country. Among students who studied under him were many whose names were to become famous in medical research and in medicine's progress, who were to add impetus to the tremendous advances in world medicine during the latter half of the nineteenth century.

Once more, the center of gravity in Virchow's life shifted. While continuing his interest in medical teaching and in politics (he served in the German national Reichstag from 1880 to 1893), his main interest now turned to anthropology and to archaeology. Great interest had been developed in Darwin's theories. While Virchow recognized their merit, he warned against exaggerated claims of evolution enthusiasts, such as those of his erstwhile assistant, Ernst Haeckel. In the field of racial research, Virchow organized and directed a gigantic project involving the examination of nearly seven million German schoolchildren.

Aim of the study was to determine whether or not there was a true "German type." Virchow's findings proved that less than one-third of German children were blond and that there was no evidence of a predominant skull type among them.

At an age when many men would have begun to slacken their activities, Virchow embraced his new field of interest with enthusiasm. He founded the German Anthropological Society in 1869; and in the same year, the Berlin Society of Anthropology, Ethnology, and Prehistory. He also edited the journal of the Society. His activities then spread to the Near East, where he sponsored Heinrich Schliemann in excavations on the sites of ancient Troy and of Hissarlik. In 1888, he went with Schliemann and Schweinfurth to Egypt; and in 1894 he did his own field work in the Caucasus.

Meanwhile, Virchow continued to be the dominant figure in international medicine. It is said that he could demolish an adversary in a discussion without even raising his voice. A certain coldness of character probably facilitated his ability to analyze situations and persons objectively and to get what he wanted. However, he was easily approachable; he liked, for example, to sit down with friends and students after meetings for a glass of beer and for singing. He was hospitable and could be very gay, especially in his family circle. He could be particularly warm toward the lowly and the sick. With medical men and with students, however, he could be ferocious, insisting on precise logic and order in relation to mere trifles. Still, he was tremendously popular as a teacher. Virchow continued to lecture, to write, to edit, to research, to serve in political bodies, and to influence international medicine, into his eighty-first year and until his death, September 5, 1902, of cardiac failure following an accident. Berliners accorded him his final honor—a public civic funeral.

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