BOOKS: HISTORY

A Modest Maker of Modern Physics

by Lorna Arnold

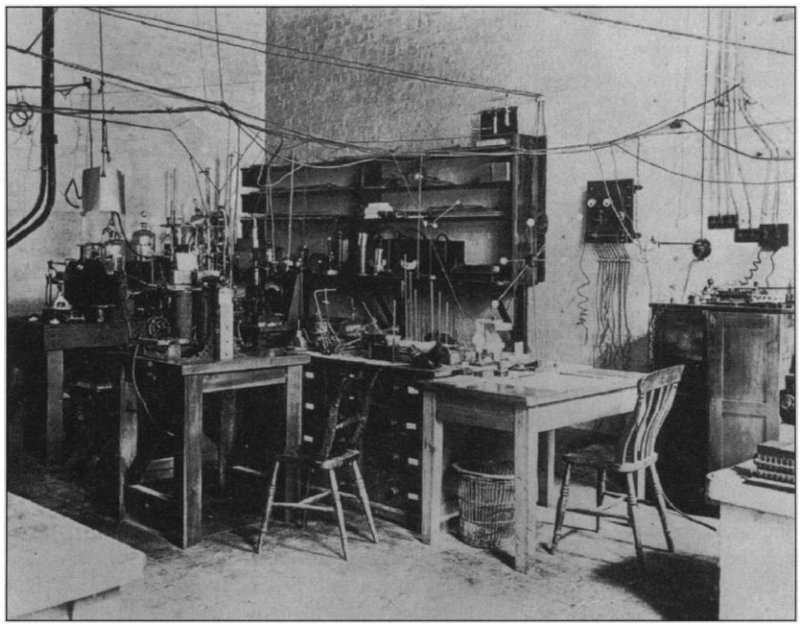
James Chadwick, the discoverer of the neutron, made history not only in the laboratory but also outside, in the world of high politics and the councils of war. *The Neutron and the Bomb*, by radiation oncologist Andrew Brown, is the first biography of this reserved academic, and its title epitomizes the two worlds of Chadwick's life.

The Neutron and the Bomb
A Biography of Sir James Chadwick
by Andrew Brown
Oxford University Press, New York, 1997. 402 pp. $35. ISBN 0-19-853992-4.

A clever diffident boy from a poor family, Chadwick entered Manchester University in 1908 to study under Ernest Rutherford, with whom he would be closely associated for nearly 30 years. When World War I began in 1914, he was a postgraduate student in Berlin, and he was interned for four years. Harsh conditions and undernourishment left lifelong health problems, but Chadwick survived and with a few fellow internees even completed some research in a makeshift laboratory. (He was nearly trapped again by the outbreak of World War II: with what dire consequences had he been interned for the duration?)

Chadwick returned to Manchester frail and penniless. The following year, he moved with Rutherford to Cambridge. There Chadwick completed his Ph.D., continued his researches on atomic structure, and provided invaluable support in directing work at the Cavendish Laboratory. In January 1932, working night and day for three legendary weeks, he completed a series of experiments showing that beryllium, when bombarded by alpha particles of polonium, emitted highly penetrative particles of mass 1 and charge 0—neutrons. Chadwick explained, "The reason that I found the neutron was that I had looked, on and off, since about 1923 or 1924." His colleague Mark Oliphant commented that "his meticulous recognition of the part played by others in pointing the way was a lesson to us all." The discovery was published in *Nature* in February 1932; the Nobel Prize followed in 1935.

After the discovery of uranium fission in 1938, Chadwick, by then at Liverpool University, worked tirelessly to coordinate the diffuse British efforts to study its implications. In 1940 the seminal Frisch-Peierls memorandum led to formation of the "Maud" Committee to consider the possibility of a super-bomb based on a chain reaction in uranium. Chadwick was a key member; during two weeks in July 1941, working 20 hours a day, he drafted the committee's report. This masterly document convinced the Americans that a fission bomb was practicable and expedited the creation of the largest military-scientific endeavor in history, the Manhattan Project.



Early nucleus of atomic research. The room at the Cavendish Laboratory that Rutherford and Chadwick used for their scattering experiments.

The Quebec Agreement of August 1943 formalized Anglo-American collaboration on the development of an atomic bomb, and Chadwick was chosen to head the project's British contingent and act as liaison in Washington. Sensitive, painfully shy, aloof and unworldly, he was hardly a man of action or a natural leader, but he quickly revealed brilliant negotiating and diplomatic skills. His close relationship with General Groves was a linchpin in Anglo-American cooperation; they would meet privately several times a week and became unlikely but lifelong friends. He was immensely respected by American and British scientists alike. For three years, Chadwick toiled long hours with hardly a day off: working in Washington; visiting Los Alamos, Oak Ridge, and Berkeley; dealing with complicated French patent problems and recurrent crises at the Montreal (Anglo-French-Canadian) laboratory; advising on "Tube Alloys," (the remaining atomic effort in Britain); and trying to "keep London on the rails."

The Trinity test in July 1945 was a shattering experience, and afterwards Chadwick wrote, "I am living in a different world from which I cannot easily return." Though he did not recant the use of the bombs against Japan, he was profoundly conscious that the atomic bomb had created a crisis in human affairs. (He later harbored grave misgivings about the development of the hydrogen bomb.) Back in England in 1946, a friend said of him that he had "never seen a man so physically, mentally, and spiritually tired," who had "plumbed such depths of moral decision as more fortunate men are never called upon even to peer into." In 1950 he resigned his chair at Liverpool to become master of Gonville and Caius, his old college in Cambridge. What should have been a golden Indian Summer was sadly marred by troublesome factions, petty politics, and poor health, and he retired in 1958.

Chadwick received many academic honors and awards—including the Medal for Merit from the United States—and was delighted to be made a Companion of Honour by the Queen. Still, many people in a position to know his full achievements felt that he was given too little recognition.

Because Chadwick never wrote his memoirs (unfortunately, for he was a master of prose style), Brown's excellent and well-researched biography is all the more welcome. Drawing on Chadwick's extensive correspondence, it provides a vivid, informed, and sympathetic picture of him—as a physicist, a scientist-diplomat, and a good, wise, and humane man.

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