American National Biography

Houston, William Vermillion (19 Jan. 1900-22 Aug. 1968), physicist and science administrator, was born in Mount Gilead, Ohio, the son of William Houston, a Presbyterian minister, and Lena Vermillion. Houston spent much of his childhood and early years in Columbus, Ohio, where he completed secondary school and in 1920 obtained a B.A. and a B.S. from Ohio State University. After teaching at the University of Dubuque for a short period, Houston undertook graduate studies in physics at the University of Chicago. There he studied under Robert A. Millikan and Albert A. Michelson, two of the most prominent American physicists at the time. Both experimentalists, they exerted a strong influence on Houston's scientific approach and career. Houston received a master's degree in physics at Chicago before returning to Ohio State to complete his doctorate. He received his Ph.D. in physics in 1925 for work conducted under the supervision of A. D. Cole in spectroscopy. In 1924 he married Mildred White; they had one child.

In 1925, with a fellowship from the National Research Council, Houston headed west to the California Institute of Technology, a rising scientific center under the direction of his former teacher Millikan. There Houston continued to work on atomic spectroscopy, conducting experiments and teaching on the topic. In 1927 Houston, now an assistant professor of physics at Caltech, won a Guggenheim Fellowship, which enabled him to study with Arnold Sommerfeld in Munich, Germany. A great authority in the field of atomic spectroscopy, Sommerfeld was a masterful teacher to many of the young stars of the quantum revolution in physics, such as Werner Heisenberg and Wolfgang Pauli.

During his half-year stay at Munich, Houston made his best-known scientific contribution, a quantum mechanical explanation of electrical resistance. Deviating from his original plan to study the theory of the spin of electrons within the atom, Houston, at Sommerfeld's direction, investigated the mean-free path of electrons in metals, which was a crucial indicator of a metal's electrical conductivity. Applying the new wave mechanics, Houston treated the electron as a wave and found not only a way to calculate the mean-free path for electrons in metals but also, more important, a proportional relationship between electrical resistivity and temperature at high temperature. This work, which Sommerfeld called "the first decent treatment of the electrical resistance law," represented a significant step in the application of quantum mechanics to metals and in the rise of solid-state physics. In the spring of 1928 Houston moved to Leipzig to work with Heisenberg. At the latter's suggestion, Houston reverted to his original interest in atomic spectra and examined the interaction between the spin and the orbital motion of electrons in a two-electron atom and the resultant spectra.

Returning to Caltech in 1928, Houston resumed his experimental work on spectroscopy while keeping an active interest in the theoretical front of electrons in atoms and solids. He made more precise measurements on the Zeeman effect (changes in spectra caused by the presence of a magnetic field), which led to a correction of the value of the ratio between the electron's electrical charge and mass. In the field of solid-state theory, Houston continued to work on electrical resistance. In 1929 he showed that quantum statistics, combined with the conservation of energy, gave rise to an electrical resistance proportional to T 5 (T stands for

at by Houston's friend the physicist Felix Bloch. In 1931 Houston became full professor at Caltech. Three years later, he wrote Principles of Mathematical Physics, which was based on his popular introductory course on the subject at Caltech and which became a widely used text.

When World War II broke out, Frank B. Jewett, president of Bell Laboratories and the National Academy of Sciences, persuaded Houston to move to the Columbia University Division of War Research to work on antisubmarine warfare. There Houston led a group in developing a homing antisubmarine device. The device proved effective in the battle of the Atlantic and brought Houston a Medal of Merit from the U.S. Navy at the end of the war. The war transformed Houston from a competent and versatile physicist into a skilled science administrator. He was elected to the National Academy of Sciences in 1943 and later served on its council for several years. In 1945 he succeeded Millikan as chairman of Caltech's division of physics, mathematics, and electrical engineering.

Houston's outstanding administrative qualities and scientific stature at Caltech led to his appointment as the second president of Rice University at Houston, Texas, in 1946. For the next fifteen years, Houston oversaw a considerable expansion of the university in both the sciences and the humanities. Among his innovations at Rice was the development of a residential college system modeled after those of Oxford, Cambridge, and Yale Universities. When a serious illness in 1961 forced Houston to retire from the presidency of Rice, he continued as professor of physics there. The next year, he was elected president of the American Physical Society. Before he died in Edinburgh, Scotland, Houston also received numerous honors from a variety of academic and scholarly organizations.

As one of the few American physicists who made significant contributions to the quantum revolution and to the development of solid-state physics, Houston distinguished himself by his competence in both experiment and theory. As both a major scientific organizer during World War II and a successful university president during the postwar period, Houston had a scientific and academic career that reflected the increased interaction between American science and society in the twentieth century.

Bibliography

Houston's papers, both personal and professional, are deposited in Rice University's Fondren Library. See Harold E. Rorschach, "The Contributions of Felix Bloch and W. V. Houston to the Electron Theory of Metals," American Journal of Physics 38 (1970): 897-904, and Lillian Hoddeson et al., eds., Out of the Crystal Maze: Chapters from the History of Solid-State Physics (1992), for discussions of Houston's scientific work. The best obituary, by Kenneth S. Pitzer, Houston's successor as president of Rice, and Harold E. Rorschach, Jr., a former physics colleague, is "William Vermillion Houston," National Academy of Sciences, Biographical Memoirs 44 (1974): 126-37, which includes a bibliography of Houston's publications.

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Citation:
Zuoyue Wang. "Houston, William Vermillion";

American National Biography Online Feb. 2000.
Access Date: Tue Feb 18 16:04:59 2003
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