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1900—1968

A Biographical Memoir by
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January 19, 1900–August 22, 1968

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WILLIAM VERMILLION HOUSTON was an outstanding physicist who made major contributions to spectroscopy and solid-state physics. He was also an outstanding teacher and administrator who held positions of the highest responsibility in higher education, in scientific societies, and in governmental organizations.

Houston was born in Mount Gilead, Ohio, on January 19, 1900. His father was a Presbyterian minister, and he was brought up in an atmosphere that encouraged intellectual work. He attended elementary and secondary school in Columbus and obtained his baccalaureate degree in physics from The Ohio State University. He began his teaching career at the University of Dubuque, but after one year became convinced that his knowledge of physics was extremely limited. He entered the graduate school at the University of Chicago, where he obtained a master's degree, having taken courses with R. A. Millikan and A. A. Michelson. The stimulation of Millikan, with his enthusiasm for physics, and of Michelson, with his precision and attention to detail, was to have a strong influence on Houston's career. It was also at this time that he began his experimental work on the fine structure of hydrogen that led later to the discovery at Caltech of the anomalies in the spectra, which were eventually associated with quantum electrodynamic effects

and measured precisely by W. E. Lamb and R. C. Retherford. Houston returned to Ohio State for his Ph.D. degree, which he received in 1925 for work in spectroscopy under the direction of Professor A. D. Cole.

Houston now went to the California Institute of Technology on a National Research Fellowship, largely because of Millikan, who had left Chicago for Caltech in 1922. There he began a career of teaching and research that would form the pattern for the rest of his life. At Caltech he continued his work on spectroscopy, making important improvements in the Fabry–Perot interferometer. For some ten years he continued a series of improvements in accuracy—from observing the well-known doublet, found many years earlier by Michelson, through slight disagreement with the Sommerfeld theory in the direction of the spinning-electron theory of G. E. Uhlenbeck and S. A. Goudsmit, and then from further minor disagreements with that theory to the interpretation by S. Pasternak in terms of a displaced *s* level, and the final interpretation in the work of Lamb and Retherford. Early in his career at Caltech, Houston taught a course from A. Sommerfeld's *Atombau und Spektrallinen.*

The award to Houston of a Guggenheim Fellowship in 1927 was naturally seized upon as an opportunity to go to Germany to study with Professor Sommerfeld. He had intended to study the theory of electron spin but was discouraged from this by Sommerfeld. Instead, Sommerfeld handed Houston the proof of his 1928 paper in which, following the lead of W. Pauli, he applied the Fermi statistics to phenomena in metals. He suggested that Houston look up the various treatments of the mean free path, because appropriate assumptions about the mean free path would give any necessary variation of resistance with temperature. It was in going over these proofs that Houston was led to the thought that one might take seriously the idea of the electron as a wave. He applied P. Debye's work on the thermal

diffraction of x rays to a determination of the mean free path for electron waves and found a resistivity at high temperatures proportional to temperature. When Houston showed this work to Sommerfeld, they were both greatly pleased. Sommerfeld got up, paced back and forth across the room, and made a comment that Houston always remembered: "Die erste anständige Bearbeitung des Widerstandsgesetzes [the first decent treatment of the electrical resistance law]."

After spending the winter semester with Sommerfeld, Houston went to Leipzig to spend the spring with W. Heisenberg. Heisenberg suggested that he undertake the study of the spin-orbit interaction in two-electron spectra. Houston's work was successful, and he was able to show the transition from Russell-Saunders to j–j coupling in two-electron atoms and its influence on the Zeeman effect. He also followed with great interest Felix Bloch's work on the motion of an electron in a periodic potential, and they became close friends.

When he returned to Caltech, Houston took up again his experimental work on spectroscopy and continued his interest in the theory of electrons in atoms and solids. His precise measurements on the Zeeman effect resulted in a correction of ½ percent to the accepted value of e/m, and he gave great stimulation and impetus to R. T. Birge and J. W. M. Dumond to work up a consistent set of atomic constants with maximum precision. He made many other contributions to solid-state theory, among which were a treatment of the T^5 law for resistance at low temperature, a study of the surface photoeffect, and the first suggestion and analysis of the use of soft x rays to study the energy band structure of solids.

For many years at Caltech and later at Rice, Houston taught an introductory course on mathematical physics which was extremely effective and popular, not only among physics students but also with the more theoretically inclined chem-

ists and engineers. The senior author of this memoir regarded it as one of the best-organized and best-presented courses in his entire experience.

During World War II, Houston's efforts were devoted to undersea warfare research, for which he was awarded the Navy Medal of Merit. The war years were especially long and strenuous, since Houston had supervisory responsibility for research pertaining to undersea warfare in a large number of institutions including installations at Harvard, San Diego, and Key West. Dr. Frank B. Jewett of the National Academy of Sciences persuaded Houston to enter undersea warfare work, not only because of his experience in physics but also because of his ability to stimulate others in the development of new ideas. Houston received the Medal of Merit ribbon, presented to him by the Secretary of the Navy for directing the building of the first homing missile and for supervising many of the scientific studies designed to improve the effectiveness of various weapons.

In 1946 Houston became the second president of Rice University, Houston, Texas. He served as president and professor of physics until 1961, and during this time he played a key role in the postwar expansion at Rice University and the establishment of new academic programs. These included the five-year program in engineering, in which students completed preparation in the humanities before taking specialized engineering courses; the lowering of the student:teacher ratio to 10:1; enlargement of the graduate school; and the creation of a closer relationship between students and faculty. The increase in the size and quality of the graduate program was perhaps his proudest achievement. The first year he was at Rice, one Ph.D. was graduated. The year he left, the number had grown to 35. He also initiated the development of a residential college system in the tradition of Oxford and Cambridge and more closely fol-

lowing the pattern at Yale, but adapted to the special needs of Rice.

Houston was a scientist, but he recognized the value of the humanities in a complete education, and the humanities program grew under his guidance. The aim of higher education, he said often, is to understand humanity as well as the material world.

After a serious illness in 1961, Houston retired as president of Rice, but he continued as professor of physics and devoted his full attention to teaching and to his graduate research students. He regained relatively good health and was very productive to the day of his death, which occurred in Edinburgh, Scotland, on August 22, 1968.

Houston received many honors that were tributes to his dedication to science, to his skill as a teacher, and to his ability to inspire others. Besides the fellowship of the Guggenheim Foundation for travel and study in Europe in 1927–1928, from 1925 to 1927 he held a National Research Council Fellowship at the California Institute of Technology.

He was elected a member of the National Academy of Sciences in 1943, and he served the Academy faithfully on important committees and on the Council (1959–1962).

He similarly served the American Physical Society in many important capacities culminating in its presidency in 1962.

He was a Fellow in the American Academy of Arts and Sciences and a member of the American Philosophical Society. By presidential appointment, he was a member of the board of the National Science Foundation for two terms and also served on the board of the Carnegie Foundation. He was granted the honorary degree of Doctor of Science by The Ohio State University in 1950 and the degree of Doctor of Laws by the University of California in 1956. He was a member of the Phi Beta Kappa Society and the Society of Sigma Xi.

Houston authored two books, *Principles of Mathematical Physics* and *Principles of Quantum Mechanics,* and over seventy scientific articles.

Rice University awarded him a medal of honor during its fiftieth anniversary celebration in 1962, and the Rice Alumni Association presented a Gold Medal Distinguished Service Award to him in 1967.

Houston was a serene man, never angry, good-natured, a man of dry, understated humor, and he made himself felt as a continuing influence for all that was kind and good in human relationships.

Houston married Mildred White in 1924, who survives him, as does one daughter, Mrs. Harold Coley of Houston, Texas, and a sister, Mrs. Burton Hollister, Glencoe, Illinois.

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KEY TO ABBREVIATIONS

Am. J. Phys. = American Journal of Physics
Am. Phys. Teacher = American Physics Teacher
Phys. Rev. = Physical Review
Phys. Today = Physics Today
Proc. Am. Phil. Soc. = Proceedings of the American Philosophical Society
Proc. Nat. Acad. Sci. = Proceedings of the National Academy of Sciences
Rice Inst. Pam. = Rice Institute Pamphlet
Z. Physik = Zeitschrift für Physik

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