ACA Fankuchen Award to Rossmann

The American Crystallographic Association presented the sixth Fankuchen Award to Michael G. Rossmann (Purdue University) at its June meeting in Hamilton, Ontario. The award is given every three years to honor significant contributions to crystallography or x-ray diffraction. It was established in recognition of the pioneering crystallographic work of the late Isidor Fankuchen, a professor of physics at the Polytechnic Institute of Brooklyn. Rossmann was honored for his pioneering studies of the structures of large viruses; he and his associates recently determined the structure of the human common cold virus by x-ray crystallographic methods. In addition he has studied macromolecular crystals such as catalase, lactate dehydrogenase, glyceraldehyde-3-phosphate dehydrogenase and southern bean mosaic virus.

ROSSMANN

Rossmann received his BSc (1950) and MSc (1953) from the University of London and his PhD (1956) in chemical crystallography from the University of Glasgow. He held postdoctoral positions in chemistry at the University of Minnesota (1956–58) and in molecular biology at Cambridge (1958–64). In the latter post he began his studies of large macromolecules, working with Max Perutz on the structure of hemoglobin. Rossmann developed rotation and translation functions—as well as the software needed to calculate them—to search Patterson functions for molecular fragments. In 1965 he went to Purdue University as a professor of biological sciences, and in 1975 he accepted a joint appointment at Purdue in the departments of biochemistry and biological sciences. He has published *Molecular Replacement Methods* (Gordon and Breach, 1972).

in brief

The following individuals have joined the physics and astronomy faculty of the University of Wyoming: **Melvin Dyck,** formerly associate astronomer at the University of Hawaii Institute for Astronomy, has become professor of physics and astronomy and director of the university's Infrared Observatory. **Robert R. Howell,** formerly assistant astronomer at the Institute for Astronomy, has become an assistant professor of physics and astronomy. **Earl J. Spillar,** who recently received his PhD from Princeton University, has become an assistant professor of physics.

Shoji Nagamiya, formerly a professor of physics at the University of Tokyo, has become a professor of physics at Columbia University.

Gary Steigman, formerly a professor at the Bartol Research Foundation of the Franklin Institute, has become a professor in the departments of physics and astronomy at Ohio State University.

Michael M. R. Williams, formerly head of nuclear engineering at Queen Mary College in London, and **Edward Larsen,** formerly of Los Alamos National Laboratory, have been named professors of nuclear engineering at the University of Michigan.

obituaries

James Rainwater

James Rainwater, professor of physics at Columbia University for four decades and a Nobel laureate, died on 31 May 1986. Born in Council, Idaho, on 9 December 1917, he moved with his family to the San Joaquin valley in California soon thereafter. He was noted in his high-school years for his scholastic excellence and strong interest in mathematics and physics. He graduated from Caltech in 1939 and was appointed a teaching assistant at Columbia University, where he remained the rest of his life. He wrote his

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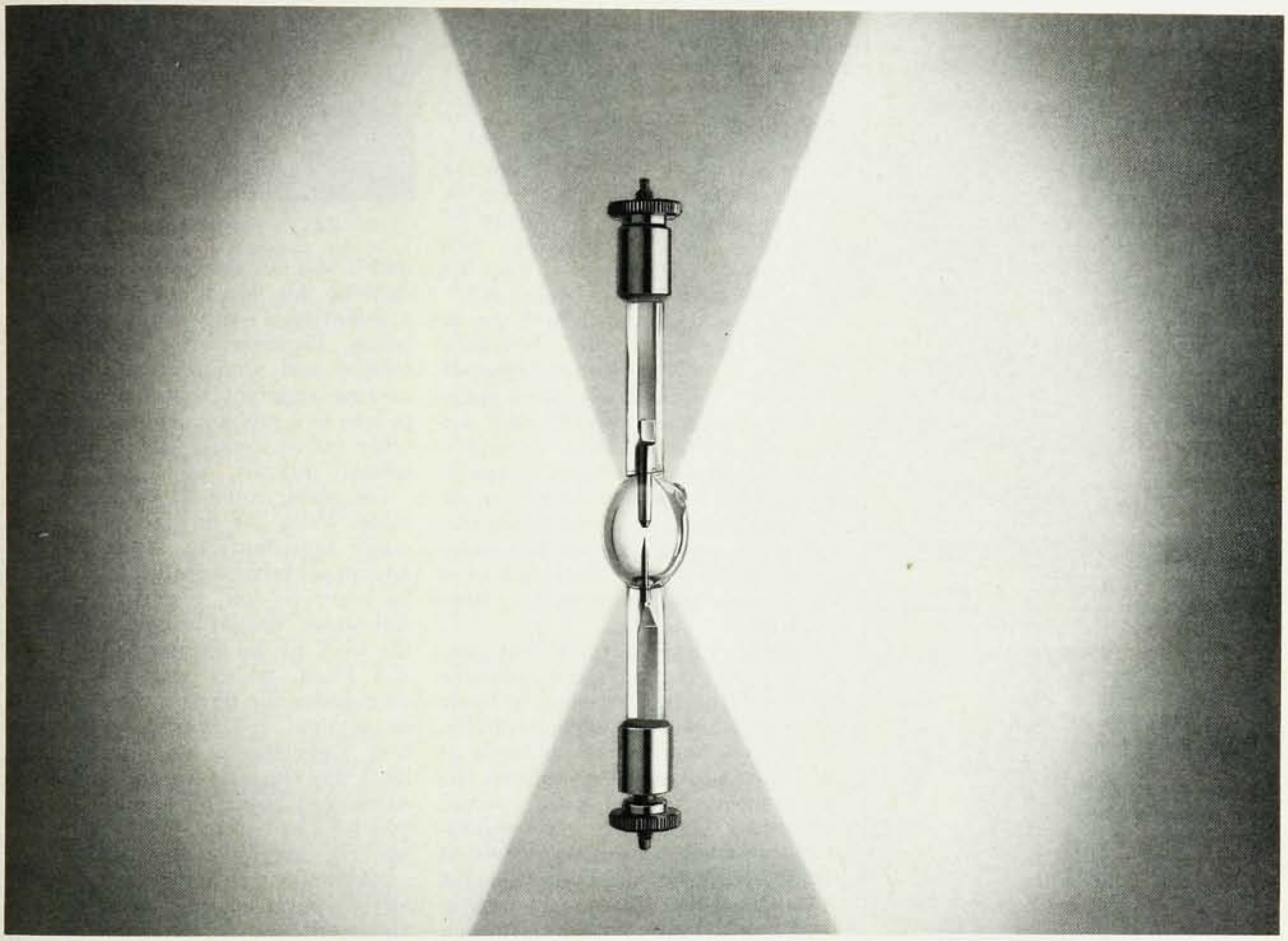

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thesis on neutron spectroscopy under the direction of John R. Dunning; during World War II he worked on the Manhattan Project using the equipment and techniques he developed for his thesis. In 1946 he received his PhD from Columbia, and then advanced quickly, receiving a full professorship in 1952. He was director of the Nevis Cyclotron Laboratories during 1951–54 and 1957–61. He spent most of his time since 1965 supervising the conversion of the Nevis synchrocyclotron to a meson factory.

Rainwater was awarded the Nobel Prize in physics in 1975 for the idea, which he conceived in 1949, that the collective motion of particles in the nucleus is as important in determining the properties of the nucleus as the individual motions of the particles. This idea was further developed by Aage Bohr and Ben Mottelson, who shared the prize with him, into the "collective model" of the nucleus.

Until 1949 the liquid-drop theory of the nucleus, originated by Niels Bohr in 1933, was the best available theory of the nucleus, although there were many nuclear phenomena that it could not explain. In 1949 Maria Goeppert-Mayer and, independently, J. Hans D. Jensen, Otto Haxel and Hans E. Suess introduced the shell model. This theory assumed that the nucleons move independently of each other under the influence of a common spherical potential.

There were flaws in this theory also; for one thing it predicted quadrupole moments of nuclei that were far lower than those observed experimentally. During a colloquium at Columbia in 1949 Charles Townes reported on the discrepancy, and Rainwater conceived the idea of explaining the large quadrupole moments by collective motions of the nucleons. Rainwater reasoned that the shell model implied that the nucleus must be spheroidal rather than spherical for nuclei with high-l nucleons and lacking one nucleon for a closed shell. He argued that if the nuclear volume remains fixed, as postulated in both the liquid-drop and shell models, then the entire nucleus distorts to produce an equatorial bulge, giving a negative quadrupole moment for the resulting oblate spheroid. The effect is amplified by the contribution of the odd nucleon. This idea led to the later development of the "collective model" into a reasonably comprehensive theory of the nucleus and eliminated the apparent contradiction between the liquid-drop and shell models.

Although Rainwater probably understood theoretical physics better than most theorists, he was not a theorist but an original and ingenious experimenter. He always looked at problems from an unconventional point of view,

RAINWATER

and it was not always easy for him to describe his ideas and solutions in conventional and understandable terms. However, after sufficient discussion and amplification it usually became apparent that his direct approach to a problem had bypassed the unimportant details that made it extremely difficult.

Rainwater could have received the Nobel Prize for any one of several major contributions. When the first newspaper reporter called to inquire if he knew he had received the prize Rainwater thought he had gotten it for the work he did on mesic atoms with Val Fitch, which was well known throughout the physics community as an original and important contribution. Only several hours later did he learn that the prize was for his work on collective motion in nuclei, an idea on which he had spent very little time in his long and productive career.

Rainwater was first honored nationally by being awarded the Ernest O. Lawrence Award of the Atomic Energy Commission for his work in neutron spectroscopy, which began with his PhD thesis in 1941 and to which he devoted a large fraction of his professional life. When the United States entered World War II there was some question as to whether neutron research at Columbia University would continue, because most of the efforts of the Manhattan Project at that time were devoted to the separation of U^{235} from the much more abundant U^{238}. However, Dunning had the foresight to see that the Columbia neutron spectrometer was a unique installation and could supply a great deal of the fundamental neutron data necessary for further development of the applications of nuclear energy. Thus, the neutron spectrometer was operated 24 hours a day from the time it started operating to the end of the war.

Rainwater led the Columbia neutron-spectroscopy group from its inception in 1941 until its demise at the beginning of the 1970s. Probably the largest number of papers he wrote concerned neutron spectroscopy; this work led him naturally to his interest in accelerators.

The Columbia cyclotron in the basement of the Pupin Laboratory and the Nevis synchrocyclotron were his prime interests throughout his professional life. Rainwater was only a second-year graduate student when he took over the management of and responsibility for the cyclotron. It had recently been rebuilt and had yet to operate since its rebuilding, because the people who had redesigned and reconstructed it were away on war research. However, Rainwater's hard work and ingenuity resulted in its becoming one of the most reliable operating cyclotrons in the world.

When the Nevis laboratory was established in June 1946, Rainwater was one of the principals in the design, construction and operation of its synchrocyclotron. The work on neutron spectroscopy that had been done at the cyclotron was transferred to the new machine because it was a very much more intense neutron source. For several years it was the most intense pulsed-neutron source in the world. Rainwater spent the last years of his professional life converting the Nevis synchrocyclotron into a meson factory. He truly enjoyed the challenge and experimentation he was able to do in advancing this conversion.

Rainwater deserves credit for many more contributions to physics than are recorded in his long and distinguished record of publications. He was very generous in his suggestions at seminars and colloquia; with a word of advice here and of criticism there he changed the direction of several research projects—from going nowhere to resulting in important contributions. He was a meticulous taskmaster and expected a great deal of those who worked with him; however, he always contributed more and worked harder than any of his colleagues.

He was extremely gifted, a dedicated physicist who left a lasting mark on the field through his thorough research on the selective reaction of neutrons and through his rigorous training of students.

Rainwater had a quiet nature. He was a person of extraordinarily solid integrity who was never satisfied until he got to the bottom of a problem. He had no glib answers and worked at things until he understood them thoroughly.

W. W. Havens Jr
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