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physical chemistry at the University of Illinois.

The American Geophysical Union has presented its Walter H. Bucher Medal to **Bruce Heezen** and its James B. Macelwane Award to **Paul Richards**; both recipients are faculty members of the Columbia University department of geology.

Newly elected as foreign members of the Royal Society are **Erich Hückel** (formerly of University of Marburg, Federal Republic of Germany) and **Ephraim Katzir** (Weizmann Institute of Science, Rehovoth, Israel).

The new chairman of the University of Rochester department of physics is **Harry Gove**, a faculty member since 1963 and also the director of the University's nuclear-structure research laboratory.

Formerly of Wesleyan University, **John U. Trefny** has been appointed assistant professor of physics at the Colorado School of Mines.

The Harvey Prize in science and technology of the Technion (Israel), including \$35 000, has been awarded to **Freeman John Dyson** of the Princeton University Institute for Applied Science.

The first occupant of the recently endowed Thomas Dudley Cabot Institute Chair at the Massachusetts Institute of Technology is **Samuel C.C. Ting**, professor of physics and co-recipient of the 1976 Nobel Prize in Physics.

Gerson Goldhaber, physics group leader at Lawrence Berkeley Laboratory and University of California, Berkeley professor of physics, has been named California Scientist of the Year by the California Museum Foundation.

Recently appointed assistant professors of physics at Stanford University are **Stuart Freedman** (Princeton University) and **Harriss T. King** (Rutgers University).

David J. Dumin, formerly technical director of Allied Chemical's synthetic crystal division, has been appointed professor of engineering at Clemson University.

obituaries

Erwin W. Mueller

Erwin W. Mueller, an Evan Pugh research professor emeritus of physics at The Pennsylvania State University, died 17 May at the age of 65, following a stroke suffered at a National Academy of Sciences meeting in Washington, D.C.

Mueller was born and educated in Berlin, Germany. He studied physics under Nobel Laureate Gustav Hertz at the Technical University in Berlin. Shortly after obtaining his doctorate in 1936, Mueller conceived the idea of the field-emission microscope, which enabled him to image the surface of submicroscopic metal crystals with a resolution of about 20 angstroms. For the first time, the diffusion and reconstruction of surface layers could be vividly seen. In 1941 he discovered field desorption—removal of surface atoms at low temperature by application of a high positive electric field.

With an ambition to see individual atoms by improving the resolution of the field-emission microscope, he investigated the possibility of imaging surface atoms by adsorption and subsequent field desorption of gas atoms. This work led to his invention of the field-ion microscope in 1951 at the Fritz Haber Institute of the Max Planck Society in Berlin. In 1952 he was invited to the US for a lecture tour. After giving an inspiring colloquium he was invited to take a position in the physics department of The Pennsylvania

State University as a research professor.

There he developed most of the techniques and elucidated the physical process in field-ion image formation, in ad-



MUELLER

dition to perfecting the field-ion microscope. In 1955 he achieved atomic resolution of the field-ion microscope by cryogenic cooling of the specimen. For this achievement he became world famous as the first man to "see" atoms.

In 1967 he introduced the atom-probe field-ion microscope—a combination of a field-ion microscope with a time-of-flight mass spectrometer—which opened a new dimension in field-ion microscopy. Now not only could an atom be seen, but also its chemical identity could be ascertained. This atom-probe microscope is the most sensitive analytical tool in existence, being capable of analyzing a single atom.

Mueller's beautiful field-ion micrographs have aroused the interest of many people and hundreds of elementary textbooks published around the world use his micrographs for both scientific illustrations and esthetic attraction.

Mueller's numerous scientific contributions have been described in his two books, four book chapters and more than 200 papers. Although he is best known for his inventions, the scope and impact of his work extend to many areas of surface science. He was one of the few early scientists to contribute extensively to our present knowledge of solid surfaces.

His scientific achievements were recognized by the science community with numerous awards, such as the Davisson-Germer Prize of The American Physical Society, the first Medard W. Welch Gold Medal of The American Vacuum Society and the Gauss Medal of Germany. He was also an elected and honorary member of many scientific societies.

A scientist with undiminished energy, Mueller often participated in the construction of elaborate instruments. His knowledge of practical experimental techniques was enormous. A student could not only benefit from discussing scientific problems with him, but also learn from him practical techniques unavailable in books.

His sudden death is a shock to his friends and a great loss to the scientific community, but his fame will endure through time as will his scientific achievements.

T. T. TSONG

The Pennsylvania State University

Crispin Calvo

Crispin Calvo, professor of chemistry at McMaster University in Hamilton, Ontario, died 19 February at the age of 47.

Calvo earned his doctorate at Rutgers University in 1954 and the following year joined the research staff at RCA's David Sarnoff Laboratories (Princeton, N.J.) as an engineer in the chemistry department. In 1960 he became a faculty member at McMaster University where he became professor in 1968.

His research specialties included x-ray crystallography and structure determination. Among his investigations, Calvo studied the relationship of crystal structure and luminescence in phosphate, arsenate and vanadate systems. □

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