1965 from the University of Iowa, where he is now a professor of physics.

The 1989 Simon Ramo Award, also presented by the APS divison of plasma physics, went to Jon M. McChesney, a senior scientist with General Atomics of San Diego, California, a company involved in basic fusion research and conventional nuclear power. The award, which is given for work performed as part of the recipient's doctoral studies, was presented to McChesney for his "sophisticated measurements showing anomalous ion heating in a tokamak and ... subsequent explanation in terms of chaos theory, thus demonstrating the relevance of basic research to the fusion effort." McChesney received his PhD in applied physics from Caltech in 1989.

The 1989 Shock Compression Science Award, given every other year by the APS topical group on shock compression of condensed matter physics, was presented to George E. Duvall, a professor of physics at Washington State University. Duvall was recognized for his "outstanding contributions to shock wave physics and his educational and organizational leadership in the shock physics community." Duvall received his physics PhD from MIT in 1948. After holding research positions with General Electric Corporation and Stanford Research Institute, Duvall joined the Washington State faculty in 1964.

IN BRIEF

Michael Stavola has become an associate professor in the physics department of Lehigh University in Bethlehem, Pennsylvania, and **Alan Streater** and **Michelle S. Malcuit** have been appointed assistant professors in the same department. Stavola, who was formerly on the technical staff at AT&T Bell Laboratories, studies the physics of defects in semiconductors. Streater, an atomic and molecular physicist, was previously an assistant professor at Southern Oregon State College. Malcuit, a specialist in nonlinear optics, was most recently a research associate at the Institute of Optics of the University of Rochester.

OBITUARIES

Ernst Ruska

In the 1980s the science community witnessed the semicentennial of the electron microscope, the 80th birthday of its designer, Ernst Ruska, the awarding of his Nobel Prize and, sadly, the reason for these lines, his death on 27 May 1988.

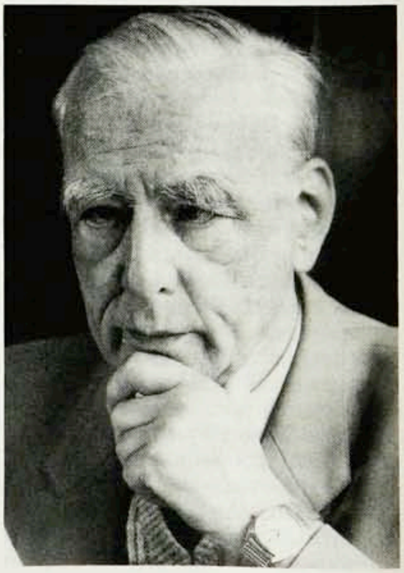
Ruska was born on Christmas Day into a scholarly family—his father was a historian of science and an uncle was an astronomer. His interest in technical subjects led him to study engineering at technical colleges in Munich and Berlin instead of attending a university, even though the latter was in those days regarded as far more prestigious. At the Berlin Technische Hochschule, as part of Max Knoll's project for improving the design of cathode-ray oscillographs, Ruska examined the lens-like behavior of a short coil. Building on the electron-lens work of Hans Busch, Ruska realized that he could focus the electrons with a smaller current if he enclosed the coil in an iron casing in which a narrow gap had been cut. The gap, he reasoned, would allow the field to "leak" into the path of the particles. This idea, which was a crucial step on the road to the electron microscope, led Ruska to construct the first magnetic electron lens to be recognized as such. His lens was much more than a prototype, for although modern versions are made of more homogeneous metal, are machined more accurately and include complex mechanisms for correcting astigmatism and for introducing a specimen or an aperture, the basic design has remained unchanged. Together with his friend and fellow PhD student Bodo von Borries (who later became Ruska's brother-in-law), Ruska patented the *Polschuhlinse* (polepiece lens) in 1932. In 1931 Ruska placed two lenses one above the other and showed that their magnifications (3.6× and 4.8×) multiplied to give an overall value of about 17.3. The first primitive electron microscope had been built.

Support for further development of the microscope was difficult to obtain in the 1930s, not only because of the economic conditions of the time but also because many scientists believed that no specimen could survive inspection by such a device: Placed in a vacuum, bombarded and rapidly heated by electrons, the sample would be burnt to a cinder before any useful information could be gained. In a letter of 8 January 1935, the editor of *Die Naturwissenschaften* unequivocally rejected a paper containing the first electron micrographs of untreated biological specimens. "Reproduction of electron-microscope magnifications," he wrote, "would serve no useful purpose.... I am thus unable to make any use of your MS." It was some time before researchers realized that scattering within the specimen is sufficient for image formation (by phase contrast) and that absorption is not necessary. In 1937, however, Ruska and von Borries succeeded in obtaining support from the Siemens Company in Berlin. Two prototypes were ready the following year and a year after that Siemens delivered the first of about 30 commercial versions of the electron microscope.

Ruska and his colleagues spent the immediate postwar years preparing for a new generation of microscopes. In 1954, the Elmiskop-I appeared. (I have no doubt that some readers of this account are still using theirs, though spare parts have become a problem.) This robust instrument was considerably superior to the 1939 microscope: a higher accelerating voltage, a double condenser for illumination control, a device to correct astigmatism, and good stability made it a desirable tool in physics and biology. From 1949 onward, Ruska spent at least part of his time in the Fritz Haber Institute of the Max Planck Society in West Berlin. In 1955 he left Siemens, and from 1957 until 1974 he directed the Electron Microscope Institute of the FHI.

Ruska was a man of method, who kept detailed records of his research activities going back to his student days, and he devoted much of his time in the last years of his life to tracing the early history of the electron microscope. He was naturally sensitive about the fact that the first patent for an electron microscope was taken out not by Knoll, von Borries or himself, but by Reinhold Rüdenberg of Siemens-Schuckert-Werke AG, whose

Ernst Ruska



work on the microscope was mostly conceptual. This is certainly one of the reasons why every statement in Ruska's own account of the early days[1] is backed up by a wealth of evidence meticulously collected from published and unpublished material. His father, as a historian, would have certainly approved.

The 1970s and 1980s saw increasing recognition of Ruska's contribution to our knowledge of the submicron world. And rightly so, for without the electron microscope many branches of science would be poorer: not only the obvious beneficiaries such as medicine, cell and molecular biology, metallurgy, crystallography, physics and electronics, but also geology, forensic science, archaeology and others. I recollect that the Nobel rules indicate that the prize should be awarded to individuals whose discoveries or inventions will benefit all of humanity. Few can satisfy this requirement so well as Ruska. Apart from the Nobel Prize, two awards gave him particular pleasure. The first was the Cothenius Medal of the Leopoldina Academy, to which his father had also belonged and for which he wrote his historical account;[1] the other was the Ernst-Reuter-Plakette, the highest distinction that West Berlin could offer him.

So much for Ruska as the serious scientist, indefatigable and, in public at least, intimidating. In less formal dealings, though he remained serious, Ruska revealed chinks in his armor of cordial efficiency. It is somehow reassuring to know that such a man did not wear a watch, never quite mastered his office telephone and always took the afternoon off on his wife's birthday. When his institute was being built, he concerned himself over such details as the height of the toilets and worried about the propinquity of the ladies' and gentlemen's shower rooms.[2] A kind, humane man, he offered shelter in his apartment during the wartime bombing of Berlin to Jews, who were excluded from the public shelters. I never knew him as other than courteous and helpful, showing friendliness and understanding, a man with critics but no enemies.

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Ferdinand Brickwedde

Ferdinand G. Brickwedde, Evan Pugh Research Professor of Physics emeritus at Pennsylvania State University, died on 29 March 1989, at the age of 86.

Brickwedde's long and distinguished career in low-temperature physics can be divided into two eras: the time he spent at the National Bureau of Standards, and the Penn State years. He joined NBS in 1925, just after receiving his PhD from the Johns Hopkins University. From 1928 to 1946 he was chief of the low-temperature laboratory at NBS; from 1946 to 1956 he headed the heat and power division; and from 1946 to 1952 he also served as chief of the thermodynamics section. In 1956 Brickwedde joined the faculty of Penn State, where he was dean of the college of chemistry and physics from 1956 to 1963. After his retirement in 1968 he remained active in both teaching and research for many years.

At NBS Brickwedde participated in several significant research projects. In 1931, along with Harold C. Urey and George M. Murphy, he was a codiscoverer of deuterium.[1] (Brickwedde was the one who produced the first measurable amounts of the isotope.) In 1934 Urey, the initiator of the project, received the Nobel Prize for this effort. In 1932 Brickwedde headed the first US group to liquefy helium. In 1936 he coauthored a paper with John R. Dunning, John H. Manley and Harold J. Hoge, in which they established the spin dependence of the neutron–proton interaction by studying the interaction of neutrons with normal and para-hydrogen.[2] During his NBS years, Brickwedde taught physics part time at the NBS graduate school, the Department of Agriculture graduate school and the University of Maryland.

At Penn State Brickwedde continued to pursue his interest in low-temperature physics. He and his students investigated Fermi surfaces via magnetoacoustic effects and studied superconductivity using ultrasonic and tunneling experiments. He and his wife were leaders of social activities in the physics department, and for many years he organized the department colloquia.

In addition to his full-time appointments at NBS and Penn State, Brickwedde also served as a consultant to the low-temperature physics and cryoengineering group at the Los Alamos Scientific Laboratory from 1948 to 1972. He headed the group that established the NBS cryogenic engineering laboratory to meet the needs of the Los Alamos thermonuclear weapons program. His group designed and constructed a 350-liter/hour hydrogen liquefier (which upon completion in 1952 was by far the largest in the world), and organized a comprehensive engineering R&D program to correct problems that were likely to be encountered in the development of that weapons program. During the 1950s a new R&D effort, the Rover Program to develop a nuclear rocket, was initiated at Los Alamos. The project called for millions of gallons of liquid hydrogen, and again Brickwedde played an important role in resolving the many new problems encountered in the handling of such large amounts of liquid hydrogen at pressures of up to 120 atmospheres and flow rates of 76 000 liters/minute.

Brickwedde served the greater scientific community in a variety of ways. He was an active member, and in some cases an officer, of several international scientific and advisory organizations. He also did much to help ensure a continuity between the scientific leaders of his generation and those of the future. At Los Alamos and at Penn State, Brickwedde, already an elder statesman in the worldwide community of low-temperature physicists, made continuing special efforts to introduce the "new boys on the block" to his friends and associates, most of whom were established leaders in this field.

Brickwedde will be fondly remembered by his students, friends and colleagues.

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Don E. Harrison Jr

Don Harrison, a pioneer in the computer simulation of atomic collisions in solids, died suddenly of a heart attack on 24 August 1988 at his home in Carmel, California.