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Ruska's own account of the early days[1] is backed up by a wealth of evidence meticulously collected from published and unpublished material.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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References

1. E. Ruska, Acta Hist. Leopoldina **12** (1979); *The Early Development of Electron Lenses and Electron Microscopy*, Hirzel, Stuttgart (1980). See also P. W. Hawkes, Adv. Electron. Electron Phys. Suppl. **16** (1985), for many other historical details and references to other historical articles. Ruska's Nobel lecture is reprinted in EMSA Bull. **18**, No. 2, 53 (1988).
2. L. Lambert, Ultramicroscopy **20**, 337 (1986).

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.

References

1. H. C. Urey, F. G. Brickwedde, G. M. Murphy, Phys. Rev. **39**, 164 (1932).
2. J. R. Dunning, J. H. Manley, H. J. Hoge, F. G. Brickwedde, Phys. Rev. **52**, 1076 (1937).

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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.