

the theoretical natural sciences, mathematics and the philosophy of science." After receiving his PhD in 1933 from Johns Hopkins University, Wheeler spent two years as a National Research Council Fellow at New York University and at the University of Copenhagen. He subsequently went to the University of North Carolina and, in 1938, to Princeton University.

At Copenhagen he studied under Niels Bohr, later collaborating with him on a seminal study in which they identified  $U^{235}$  as the fissionable isotope of uranium and accurately described the fission process in terms of the liquid-drop model of the nucleus. During World War II, Wheeler helped design the reactor shielding, control and heating systems for the atomic bomb project.

After the war he returned to Princeton, where he devoted his attention to

particle and nuclear physics: cosmic-ray interactions with nuclei, muon capture, the compound nucleus model, and the application of optical dispersion relations to elementary particle physics. In the early 1950s he performed some crucial calculations for the design of the hydrogen bomb at Project Matterhorn in Princeton. Since then his research interests have included general relativity; he has worked toward developing a unification of gravitation and electromagnetic theory. In his attempt to geometrize the fundamental theory he has coined the term "geometrodynamics" to describe his approach. Notable among his collaborations is the text *Gravitation*, which he wrote with C. W. Misner and K. S. Thorne. Wheeler joined the faculty of the University of Texas in 1976 and is now the Jane and Roland Blumberg professor of physics.

# obituaries

## Alois Schardt

Alois Schardt, a senior physicist at the NASA Goddard Space Flight Center, died on 26 May 1984, at age 60.

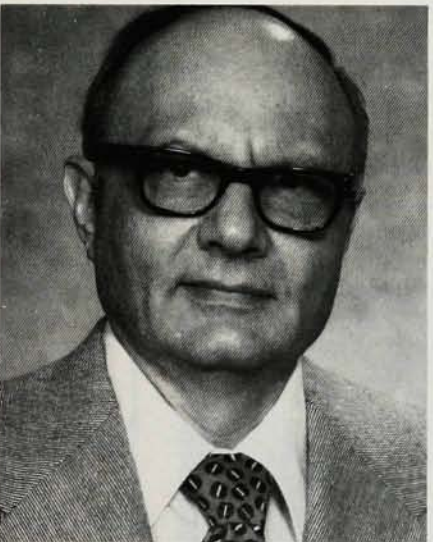
Schardt was born in Germany and came to the United States at age 16 when his father, an art historian, was forced to flee Germany. He received a BS in 1944 from Caltech and, after two years of service in the US Army Signal Corps, he returned there for graduate study, earning his PhD degree in 1951. His thesis work, carried out under William A. Fowler, involved studies of low-energy cross sections of the reactions  $N^{15} + p \rightarrow C^{12} + \alpha$  and  $N^{15} + p \rightarrow O^{16} + \gamma$ , which have great astrophysical importance.

He started his postdoctoral career at the Brookhaven National Laboratory (1950-1954) and continued at Los Alamos Scientific Laboratory (1954-1961). His major efforts during these years were devoted to studies of the decay schemes of radioisotopes and to the development of special instruments required for these studies. With Bruce J. Dropesky, Schardt discovered and studied three new isotopes:  $Ne^{24}$ ,  $V^{53}$  and  $V^{54}$ . One of his special interests was the identification and study of the isomeric transitions in the different Ge, As, At and Br radioisotopes; he collaborated in this work with G. Friedlander and Emilio Segrè.

In the late 1950s, when both the US and the USSR started negotiations towards banning future nuclear weapons tests, Schardt became involved in research aimed at detecting clandestine tests in space. In 1961, after the Los Alamos group had developed the

concepts and techniques required for nuclear-test-detection satellites, he went to the Advanced Research Projects Agency at the Pentagon. As chief of High Altitude Test Detection, he played a major role in developing satellite- and ground-based techniques for detecting nuclear tests in the upper atmosphere and space.

The rapid progress of the research on nuclear-test detection permitted the signing of the partial test ban treaty covering nuclear tests in the atmosphere and in space. Schardt pursued his new interest in space phenomena by joining NASA Headquarters as program chief of particles and fields and advanced during his tenure (1963-76), to director of physics and astronomy programs in the Office of Space Sciences. During the 1960s as the US



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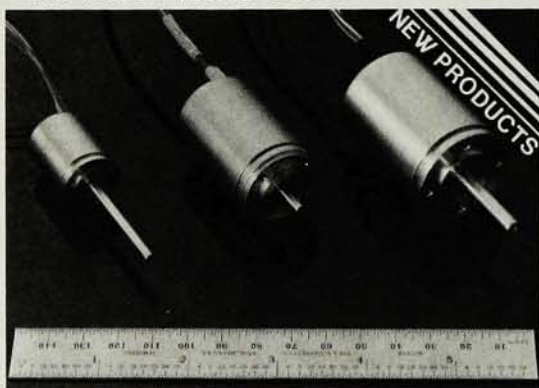


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developed its leadership in space science and established international cooperative programs, Schardt's responsibility was to find and support the most promising scientists in the field. In addition, he headed payload-selection committees, translating purely scientific recommendations into practical and coherent payloads and resolving unavoidable conflicts.

After 15 years of distinguished leadership at NASA Headquarters, Schardt returned to science, coming to Goddard in 1976. He began working with data obtained by Pioneers 10 and 11 during their transits through the Jovian magnetosphere. When Voyager 1 and 2 encountered Jupiter in 1979, Schardt was part of the cosmic ray science team. By the time these spacecraft encountered Saturn (1980-81), he was the leading authority on high-energy magnetospheric particles. At the time of his death he was the principal investigator on an energetic-particles experiment to be flown on the proposed NASA interplanetary spacecraft, which is part of the International Solar Terrestrial Physics program.

To those of us who worked with him, Schardt gave and taught much. His character, like his science, was solid. He accepted success and adversity with equanimity. To him the most important job was the next one waiting to be done. We shall miss him as a colleague and friend.

T. J. BIRMINGHAM

F. B. McDONALD

T. G. NORTHROP

NASA, Washington DC

## Raymond C. Grimm

Raymond C. Grimm died in Sydney, Australia, on 6 August 1984, at the age of 39. He suffered a heart attack while playing in a basketball game.

Grimm was born on 10 November 1944, in Adelaide, Australia. He received his education there, earning a BSc at Adelaide University and a PhD in theoretical physics at Flinders University. After spending two and a half years in the theoretical division of the UK Atomic Energy Authority at Culham Laboratory in England, he joined the Princeton Plasma Physics Laboratory in 1972. In the latter post he served both as principal research physicist at the laboratory and professor of astrophysical sciences at the university. Grimm returned to Australia in April 1984, to organize and lead a fusion-physics program for the Australian Atomic Energy Commission Research Establishment at Lucas Heights, New South Wales. He was the first professorial fellow appointed at the University of Sydney.