cid expositions in five books, *The Stars: Their Structure and Evolution* (Wykeham, 1970), *The Origin of the Chemical Elements* (Wykeham, 1972), *Galaxies: Structure and Evolution* (Wykeham, 1978), *The Hidden Universe* (Ellis Horwood, 1991) and *The Sun as a Star* (Cambridge University Press, 1996) are now a legacy of his clarity of mind. Those who knew him will remember him for his sense of fairness, his kindness and his compassion. He was a man of high moral stature, whose death is mourned by all those who ever met him.

DOUGLAS GOUGH
University of Cambridge
Cambridge, England

Richard Nathaniel Watts

Richard Nathaniel Watts, whose thesis research first demonstrated the use of laser diodes for the cooling of atoms, died of AIDS in Washington, DC, on 16 November 1996. He was 39 years old.

Rich was born in Waco, Texas. He received his BA, *magna cum laude*, from Rice University in 1979, and his MA and PhD in physics from the University of Michigan in 1981 and 1986, respectively. For his thesis, he worked with Carl Wieman after Wieman and his group had moved to JILA in Boulder, Colorado. Rich did postdoctoral work at the State University of New York at Stony Brook and at the National Institute of Standards and Technology (NIST) facility in Gaithersburg, Maryland, between 1986 and 1990, joining NIST permanently as a member of the electron and optical physics division in 1990.

Watts and Wieman demonstrated that a relatively simple, frequency-chirped diode laser could slow and cool an atomic beam, thus making laser cooling experiments accessible to an increased number of researchers. Before then, the only neutral atom to have been cooled was sodium. Rich added cesium and, in his postdoctoral work with Hal Metcalf at Stony Brook, extended the list by adding rubidium, also through the use of a diode laser.

While a postdoc at NIST, Rich was involved in a second important revolution in laser cooling: the discovery of what has come to be called sub-Doppler cooling. He and his NIST coworkers discovered that the low-temperature limit of laser cooling could be much lower than had been predicted by the widely accepted theory. To help validate their result, Rich took on the responsibility of developing a critical part of the experiment: new, reliable methods of determining the temperature. To that end, he led his coworkers in devising four different techniques by which to measure the extremely low temperatures.

Subsequent to his work on laser cooling, Rich branched out into extreme ultraviolet optics. He developed instrumentation and measurement methods needed for the characterization of multilayer mirrors.

Rich was a superb colleague. To his work as a scientist he brought a wonderfully high energy and an ability to get to the heart of problems quickly and seemingly without effort. Exceptionally thoughtful, loyal and generous, he approached life with consistently good humor and could illuminate almost any subject, scientific or otherwise, with his witty and insightful observations. All those who knew and worked with him were very lucky to have such a bright and lively spirit in a friend and colleague. We deeply regret it was for much too short a time.

WILLIAM D. PHILLIPS
TOM LUCATORTO
National Institute of Standards and Technology
Gaithersburg, Maryland

Paul Adams Beck

Paul Adams Beck, professor emeritus of metallurgy at the University of Illinois at Urbana-Champaign, died on 20 March 1997, in Urbana, Illinois. His career extended over some 60 years, spanning the area between metallurgy and solid state physics.

Paul was born in Budapest on 5 February 1908. He studied in the US in the late 1920s, receiving an MS in metallurgy from Michigan Technological University in 1929. He received a master's degree in mechanical engineering at the Budapest Polytechnic Institute in 1931. In the subsequent years, he had research appointments, first at the Kaiser Wilhelm Institute for Metallurgy in Berlin (with Michael Polanyi) and then at the University of Paris (with Pierre Auger).

After working for several Hungarian companies, Paul returned to the US in 1936 and was a research fellow at Michigan Technological University; a research metallurgist at the American Smelting and Refining Corp in New Jersey from 1937 to 1941; a chief metallurgist at the Beryllium Corp in Pennsylvania, from 1941 to 1942 and a superintendent of the metallurgy laboratory of the Cleveland Graphite Bronze Co from 1942 to 1945. In 1945, he became a professor of metallurgy at Notre Dame University and was later head of that department. In 1951, he