search and Engineering Company, Annandale, New Jersey), in recognition of his insight into cooperative effects in solids and solid surfaces dependent on interacting many-body systems, and for his leadership in showing how one couples formal theoretical work with experimental findings to make significant advances in the area of condensed-matter physics

▶ Isadore M. Singer (MIT), for his inspired revival of differential geometry and its connections to analysis, for his contribution to the discovery and applications of the index theorem for differential operators, and for his leadership in using geometric and topological methods in connection with theoretical physics

▶ The late John G. Trump (MIT), for his introduction of new machines and methods for the widespread beneficial application of ionizing radiation to medicine, industry and atomic physics

▶ Richard N. Zare (Stanford University), for his seminal contributions to molecular spectroscopy, photochemistry and chemical-reaction dynamics, especially for his incisive theoretical methods and the development of the experimental technique of laser-induced fluorescence.

The National Medal of Science is the nation's highest scientific honor bestowed by the President. It was authorized in 1959 by Congress and is intended to recognize individuals who have made outstanding contributions to knowledge in the physical, biological, mathematical, engineering, behavioral or social sciences. No more than 20 medals may be awarded in a single calendar year. The list of recipients announced in February was approved and recommended to the President by the President's Committee on the National Medal of Science at its last meeting, held in December 1983. Since 1962, when the first awards were made, the National Medal of Science has been presented to 185 individuals, including this year's 19 recipients.

Three honored for low-temperature work

The 12th Fritz London Memorial Award was presented last August to Werner Buckel (University of Karlsruhe), Olli V. Lounasmaa (Helsinki University) and David J. Thouless (University of Washington). The award was initally endowed by the Arthur D. Little Corporation and later by John Bardeen, who donated the award money from his second Nobel Prize to Duke University to "sponsor future London Memorial Awards and London Memorial Lectures at Duke University, to perpetuate the memory of Fritz London and to promote research and understanding at Duke University and in the wider scientific community." The award is presented every three years "in recognition of outstanding contributions to research in low-temperature physics."

Buckel was honored for his "pioneering application of low temperatures to prepare new, amorphous phases of metals and for his study of the superconducting properties of metals modified by disorder, ion implantation and high pressure." Buckel received his DPhil Nat from the University of Erlangen-Nürnberg in 1948. In 1954 he and R. Hilsch pioneered the technique of vapor quenching metal films to produce disordered and amorphous systems. They found that some of the films, such as bismuth and gallium, became superconducting even though they did not exhibit such properties in the crystalline state. He collaborated with W. Gey and Wittig on extensive studies of how high pressure can be used to induce superconductivity in many materials. With Stritzker and Heim he studied the effects of ion implantation on superconductivity. In 1970, he and Stritzker discovered that the superconductivity of palladium was considerably enhanced by doping with hydrogen; these palladium hydrides have the highest superconducting transition temperatures of any materials except for A-15 compounds.

Lounasmaa was honored for his "systematic development of cooling techniques that combine dilution refrigeration with nuclear demagnetization, and for their application to the production of nuclear-ordered copper and to the discovery of new properties of superfluid He^3." Lounasmaa received his D Phil from Oxford in 1958, and has been the director of the Low Temperature Laboratory at Helsinki University of Technology since 1965. The feasibility of nuclear cooling was demonstrated by Nicholas Kurti in 1950; John Goodkind later extended Kurti's method to cool He^3, using a paramagnetic salt to precool his sample. However, Lounasmaa and his colleagues in Finland pioneered and perfected the technique most widely used today, combining precooling by dilution refrigeration with nuclear adiabatic cooling using copper as a refrigerant. They demonstrated that materials such as liquid helium could be cooled and maintained at temperatures below 1 mK (PHYSICS TODAY, December 1979, page 32). In addition, Lounasmaa and his colleagues developed platinum nmr thermometric techniques to make accurate measurements in this temperature range. Applying these techniques to the study of nuclear ordering in copper,

Lounasmaa and collaborators in 1983 reported nuclear antiferromagnetic ordering in a sample of metallic copper at a temperature of 0.06 microkelvins. They also pioneered studies of new flow phenomena, ion motion and surface states in superfluid helium and, most recently, its properties under rotation.

Thouless was honored for his "elucidation of the subtle effects of fluctuations and disorder on low-temperature systems, including his theories of phase transitions in two dimensions and of electron localization and magnetism in disordered materials." Thouless received his PhD from Cornell in 1958. He and J. M. Kosterlitz developed the theory of two-dimensional phase transitions that has been applied to many systems, including superfluid He^4 films, superconducting films, arrays of Josephson junctions and liquid crytals (PHYSICS TODAY, August 1978, page 17). He collaborated with Philip W. Anderson and R. G. Palmer in 1977 and with J. R. L. de Almeida in 1978 on studies of the infinite-range interaction model of spin glasses. In addition, Thouless and his collaborators have contributed seminally to the theory of electron localization in disordered systems.

Deutch named provost of MIT

John M. Deutch, the Arthur C. Cope professor of chemistry at the Massachusetts Institute of Technology and dean of MIT's School of Science since 1982, has been named provost of the university, effective 1 July 1985. Deutch received his PhD in chemistry from MIT in 1965, and has been a member of the faculty there since 1970. From 1976–77 he took a leave of absence to become the first director of energy research of the newly created Department of Energy. In 1979 he served as Assistant Secretary, Acting Under Secretary and Under Secretary for Energy Technology. He also served on President Reagan's Commission on Strategic Forces in 1983.

Deutch will succeed physicist Francis E. Low, who has served as provost since 1980. Low announced earlier his desire to leave the post to return to teaching and research.

DEUTCH

obituaries

James H. Crawford Jr

James Homer Crawford Jr, professor in the physics and astronomy department at the University of North Carolina at Chapel Hill, died on 20 October 1984, at the age of 62.

Crawford was born on 19 May 1922, in Union, South Carolina. After earning his BS from Wofford College and serving as a US Army meteorologist in World War II, he came to Chapel Hill as a graduate student and earned his PhD in chemistry.

Crawford's professional career was based in two institutions—Oak Ridge National Laboratory, from 1949 until 1967, and the University of North Carolina, Chapel Hill, from 1967 until his death. At Oak Ridge he served as assistant director and then associate director of the Solid State Division. He conducted extensive research on the effects of high-energy radiation on the electrical and structural properties of crystalline and glassy solids, including pioneering investigations of the effects of fast neutrons and gamma rays on semiconductors. Along with related efforts by the Lark–Horovitz group at Purdue, these experiments provided the first detailed information on the electron donor–acceptor states due to point defects in germanium and silicon. In 1961, Crawford and Douglas Billington wrote *Radiation Damage in Solids*, which described these effects.

In 1967, Crawford became the chairman of the physics and astronomy department at the University of North Carolina. He returned to full-time teaching and research in 1977, and recently became the first chairman of a new cross-disciplinary curriculum in applied science. During his tenure at North Carolina, Crawford maintained