

is embodied in the second law of thermodynamics and that describes the macroscopic behavior of matter.

Perhaps the most daring—and most controversial—of Prigogine's work was his attempt to reconcile the microscopic–macroscopic irreversibility dichotomy by modifying the fundamental equations of motion. The conventional picture is that the equations of motion of quantum or classical mechanics are “exact” and that the second law of thermodynamics is to be interpreted as a macroscopic consequence of loss of correlations in the motions of the particles through averaging, or loss of information, or loss by some other means. Prigogine turned the question around and asked that if one accepted the second law of thermodynamics as “exact,” would it be possible to modify the equations of motion to preserve what is known about solutions to those equations and also have the second law emerge as an exact description of macroscopic behavior without use of further hypotheses. He and coworkers postulated such a modification and showed that, at least in solutions generated by perturbation theory, it had the desired features. It remains to be seen whether this development will fundamentally alter our worldview or will prove to be an interesting but fruitless theoretical byway.

I had a very warm, personal relationship with Prigogine. I met him when I was a graduate student and he was a visiting professor at Harvard University. We became friends immediately, and our friendship endured for 48 years. He was a warm and generous person, loyal to his friends and the institutions he served. He also was a spokesperson for science and for the integration of science with all other aspects of culture and society. He is missed.

Stuart A. Rice
University of Chicago
Chicago, Illinois

Vernon Ellsworth Derr

Vernon Ellsworth Derr, a pioneer and leader in optical remote sensing of the atmosphere, died on 24 July 2003 in Boulder, Colorado, of complications of Parkinson's disease.

Born on 21 November 1921 in Baltimore, Maryland, Vernon served in the US Army Signal Corps with the rank of captain. He then entered St. John's College in Annapolis, Maryland, and graduated with an AB in 1948. He was awarded a PhD in



Vernon Ellsworth Derr

physics by Johns Hopkins University in 1959. His thesis work, conducted under the guidance of Richard Cox, was on the irreversibility of quantum mechanical systems perturbed by random forces; it led to a *Physics Review* paper in 1960.

Vernon then joined the Martin Co in Orlando, Florida, as principal scientist in charge of the quantum electronics group, which used wavelengths spanning the range from millimeter waves to UV to study molecular structures. For spectroscopic studies, the group developed instruments, including lasers, masers, and a millimeter-wave molecular beam machine, for applications such as nuclear pumping of lasers and atomic frequency standards.

In 1967, Vernon joined the newly formed Wave Propagation Laboratory of the Environmental Science Services Administration (now the National Oceanic and Atmospheric Administration, NOAA). This remote-sensing laboratory, a descendant of the Central Radio Propagation Laboratory of the National Bureau of Standards, already had expertise at radio frequencies ranging up to 100 GHz. The inclusion of Vernon (and three other members of his Martin team) added critically needed competence in millimeter, IR, and optical frequencies. As head of the submillimeter section, Vernon pioneered the development of an extraordinarily wide range of active (radarlike), passive (radiometric), and line-of-sight (attenuation) studies of the atmosphere and its constituents.

During the early 1970s, his research group developed one of the first transportable light detection and ranging systems for the study of air

pollution. The scannable LIDAR system transmitted IR, visible, or UV radiation, which enabled multi-wavelength studies of the scattering and transmission characteristics of atmospheric aerosols. That system was deployed in several experiments, including some of the earliest studies of air pollution—the Denver Brown Cloud—in the Denver, Colorado, basin. In keeping with Vernon's insatiable scientific curiosity and broad range of interests, he also used LIDAR to study ice characteristics in cirrus clouds and to investigate the feasibility of Raman LIDAR measurements of profiles of temperature and water vapor.

Working with Ron Schwiesow of the submillimeter section, Vernon also developed one of the earliest carbon dioxide Doppler LIDAR systems to measure atmospheric winds. Mounted initially in a small camper and later deployed in a light aircraft, the continuous-wave instrument obtained some of the earliest measurements of airflow in desert dust devils and waterspouts. That research set the stage for many later applications of Doppler LIDAR to study a wide variety of atmospheric phenomena, including canyon and valley flows, sea breezes, low-level jets, wake vortices, thunderstorm outflows, and forest fires.

A unique contribution was Vernon's organization and editing of the 30-chapter, 650-page text *Remote Sensing of the Troposphere* (NOAA, 1972). The book is a landmark overview of the physics of the lower atmosphere and the application of remote-sensing techniques to atmospheric problems.

In 1981, George Ludwig selected Vernon as deputy director of the Environmental Research Laboratories, the 1300-person, 10-laboratory research arm of NOAA. From 1983 to 1988, he served as director of NOAA-ERL and then, until his retirement in 1991, as senior scientist in NOAA's Office of Oceanic and Atmospheric Research. From 1991 to 1994, he was a senior scientist in the jointly sponsored NOAA–University of Colorado Cooperative Institute for Research in Environmental Science at CU Boulder.

Vernon was an excellent scientist and science administrator. A stimulating communicator, teacher, and mentor, he taught an optical remote-sensing course at Colorado for many years as an adjunct professor. His awards included a US Presidential Distinguished Rank Award in 1988 and the Department of Commerce's highest award, the Gold Medal, in 1991.

Until afflicted with Parkinson's disease, Vernon enjoyed sports, especially tennis. He was active in music circles and sang in community choruses, including Gilbert and Sullivan operettas. Vernon was blessed with 60 years of happy marriage and a close family of two daughters, a son, and a grandson.

C. Gordon Little
Boulder, Colorado

David B. Fossan

David B. Fossan, a world leader in studies of nuclear structure and properties of exotic states of nuclei, died 27 July 2003, following a heart attack. At the time, he was swimming at Long Island's south shore during an annual beach outing he had organized for his research group. A professor of physics at SUNY Stony Brook, he had been on the faculty there since 1965.

Dave was born in Faribault, Minnesota, on 23 August 1934. He received his BA in physics and mathematics from St. Olaf College in Minnesota in 1956 and his PhD in physics from the University of Wisconsin in 1960. His doctoral thesis, under the direction of Heinz Barschall, was on fast neutron total cross sections of beryllium, carbon, and oxygen.

After a postdoctoral appointment (1961–62) at the Niels Bohr Institute at the University of Copenhagen, Dave took a research staff position (1963–64) with the Lockheed Corp in Palo Alto, California. He then joined the physics department at Stony Brook as a charter member of the new nuclear structure laboratory. His prolific research, remarkable for its breadth of focus, has long been the cornerstone of the laboratory's program. As new techniques and theory opened new avenues, he returned many times to several themes for exploring nuclei in extreme conditions.

In 1987, Dave was leader in establishing the Gammasphere detector, a national facility for gamma-ray spectroscopy at the Lawrence Berkeley National Laboratory (LBNL). He served on the detector's steering committee from its inception until 1996. He relied on measurements using the Gammasphere for his research involving the correlations of multiple photons emitted in deexcitations of highly excited nuclei. Gammasphere became notorious when, in the movie *The Incredible Hulk*, a replica was used as the main character's vehicle of wrath.

Dave led many studies of heavy nu-



David B. Fossan

clei at high spin in which many structures compete in complex quantum superpositions. Using a wide range of techniques, he investigated such phenomena as backbending, the coexistence of spherical and deformed states, prolate and oblate competition, the shears mechanism of magnetic rotation, and the g -factors of yrast states. Those studies provided the detailed understanding of how heavy nuclei acquire their angular momentum on the basis of collective motions of individual nucleons. The 1999 *Physics Reports* review article of Anatolijs Afanasjev, Fossan, Gregory Lane, and Ingemar Ragnarsson is a standard reference on the transition from collective to noncollective states and serves as a bridge to the study of other mesoscopic systems.

Dave's earlier studies of nuclear shapes matured in his last few years with the discovery of chiral doublet structures in odd-odd nuclei, in which right and left-handed triaxial nuclei were shown to have a nearly degenerate set of energy levels. Until that finding, the presence of such mirror nuclei had been unknown, and their observation opens new avenues of study of the role of symmetries in nuclear structure.

An exceptional mentor for young scientists, Dave set rigorous standards, and his energy, enthusiasm, and dedication helped him provide an unparalleled learning environment for students. He gave them real responsibility and demanded that they produce, but offered advice along the way. Enormously generous with his time, he went out of his way to work with students in both the laboratory and the classroom.

In the national arena, Dave played

a variety of important roles. He served on advisory committees at Brookhaven National Laboratory, the Indiana Cyclotron Facility, LBNL, Oak Ridge National Laboratory, and Argonne National Laboratory. He held guest appointments at BNL, the University of Munich, the Hahn-Meitner Institute in Berlin, LBNL, and the Chalk River Nuclear Laboratories in Canada. He was a member of the editorial board for *Physical Review C* and chair of the 1987 Gordon Conference on Nuclear Chemistry.

In 1989, Dave received the Humboldt Senior Scientist Award from the Alexander von Humboldt Foundation. In 2002, he was awarded the inaugural State University of New York Chancellor's Award for Excellence in Research.

Dave's affability and good nature masked a deep competitive drive, which sometimes was revealed in the demands he placed on himself to extend the understanding of physics. An even more apparent manifestation, though, was his athletic drive. His early love for basketball transformed in later days to frequent rounds of tennis, in which he would put away the opposition with a smile on his face.

We remember Dave for his many contributions to our understanding of the complex processes at work in large and exotic nuclei. His experimental skills, coupled with his deep understanding of the quantum basis for multiparticle systems, distinguished his research career. Even more, we remember him for his outstanding personal contributions to generations of physicists, his fierce honesty, remarkable cheerfulness, and deep interest in bringing out the best in others.

Linwood L. Lee
Robert L. McGrath
Gene D. Sprouse
Paul D. Grannis

State University of New York
Stony Brook

Albert Joseph Howard Jr

Albert Joseph Howard Jr, Jarvis Professor of Physics at Trinity College in Hartford, Connecticut, died at his home in New Haven, Connecticut, on 7 June 2003 as a result of a massive heart attack.

Born on 22 February 1937 in New Haven, Al resided in the New Haven area all his life. He received his BS in physics in 1958 and his PhD in physics in 1963, both from Yale University. His thesis research, under the