

and Woodruff for "courageous efforts to provide the government with reliable and objective science advice on critical issues affecting national security and arms control policy." Through detailed reviews and public testimony, Kidder, a senior physicist at Lawrence Livermore National Laboratory, argued that the US could limit nuclear testing without jeopardizing national security. As a senior official at Livermore, Woodruff objected to the misrepresentation of the Excalibur x-ray laser project, a key component of the Strategic Defense Initiative.

After earning a PhD in physics from Ohio State University in 1950, Kidder worked for the California Research Corporation. He joined Livermore in 1956 and was associate leader of the theoretical division there until retiring in 1990.

Woodruff earned a BS in physics from San Jose State University in 1968 and then joined Livermore, where he was responsible for research projects in advanced nuclear explosive design. He joined Los Alamos National Laboratory in 1990, where he is now the program director for nonproliferation and arms control.

## ASA HONORS BLACKSTOCK AND COLLINS AT OTTAWA MEETING

At its meeting in Ottawa, Canada, in May, the Acoustical Society of America bestowed awards on two of its members. During a ceremony at the Canadian Museum of Civilization, the Gold Medal, ASA's highest honor, was given to David T. Blackstock of the University of Texas, Austin, and the R. Bruce Lindsay Award went to Michael D. Collins of the Naval Research Laboratory.

ASA cited Blackstock for "contributions to the understanding of finite-amplitude sound propagation and worldwide leadership in nonlinear acoustics." Blackstock has been instrumental in laying the foundation for modern approaches to nonlinear acoustics theory; he is noted in particular for developing the low-amplitude nonlinear theory of simple waves, which became a framework for existing models of finite amplitude sound. In one application of his approach he proved that solutions for finite-amplitude waves in the pre-shock region and for sawtooth shock waves are actually limiting cases of a single, more general solution for the propagation of finite-amplitude sound. Blackstock's activities in the international acoustics community include serving as chair of the International Commission on Acoustics, and he served as ASA president in 1982-83.

Blackstock earned a PhD in applied physics from Harvard University in 1960. For the next three years he worked for General Dynamics Electronics in Rochester, New York, after which he joined the electrical engineering faculty at the University of Rochester. In 1970 he became a faculty research scien-



David T. Blackstock

tist at the Applied Research Labs of the University of Texas, Austin, and since 1987 he has also been a professor of mechanical engineering there.

Collins was cited for "exceptional contributions to numerical modeling of complex acoustical phenomena and nonlinear inversion methods." An expert in ocean acoustics and acoustical inverse methods, Collins is recognized for his work on elastic, range-dependent parabolic equation methods. He developed a technique to simultaneously focus and localize acoustic radiators in complex ocean environments.

Collins earned a PhD in applied mathematics from Northwestern University in 1988 and then joined the acoustics division of the Naval Research Lab.

## MEDALISTS HONORED BY FRANKLIN INSTITUTE

The Franklin Institute of Philadelphia awarded its 1993 medals on 5 May. Among the medalists were Leroy L. Chang, who received the Stuart Ballantine Medal, and Herbert Walther and Serge Haroche, who shared the Albert A. Michelson Medal.

Chang, dean of science and a professor of physics at the Hong Kong University of Science and Technology, was cited for "his pioneering contributions to the scientific study and technological development of quantum well and superlattice heterostructures in semiconductor physics." In 1972 Chang built a molecular beam epitaxy system with which he was able to construct superlattices and quantum wells from alternating layers of GaAs and GaAlAs less than 100 Å thick. He showed that electrons moved via resonant transmission in the resulting semiconducting devices, thus proving the formation of quantum states and opening the way to precisely controlled layered materials with prescribed electronic and optical properties.

Chang earned his PhD in electrical engineering from Stanford University in 1963 and then joined the research staff at IBM's Thomas J. Watson Center. Except for the academic year 1968-69, when he was on the electrical engineering faculty at MIT, Chang was at the Watson Research Center until he took early retirement; for the latter part of his career there he was manager of quantum structures in the department of semiconductor physics and devices. In February 1993 he assumed his present position in Hong Kong.

Walther, codirector of the Max Planck Institute for Quantum Optics, in Garching, Germany, and a professor of physics at the University of Munich, and Haroche, a professor of physics at the Ecole Normale Supérieure in Paris, were recognized for "their contributions to quantum optics, especially for the successful demonstration of micromaser action and the experimental verification of fundamental quantum mechanical effects in the interaction of light and matter." Walther invented the micromaser, in which a few atoms at a time pass through a small resonating cavity and give off microwave radiation from single-photon transitions in excited atoms. Haroche developed



Leroy L. Chang

the transient Rydberg atom maser, in which a collection of excited atoms emits a superradiant microwave pulse, and the two-photon micromaser, in which atoms in the resonator undergo two-photon transitions. Walther is also known for his studies of resonance fluorescence and of trapped and cooled atoms. Haroche's research has also included work on superfluorescence and quantum beats in spontaneous emission.

Walther earned his doctorate in physics from the University of Heidelberg in 1962. After a year as a postdoc there, he held positions at the University of Hannover, Germany, and at the Joint Institute for Laboratory Astrophysics in Boulder, Colorado. Subsequently he was a professor of physics first at the University of Bonn and then at the University of Cologne. He has been a

Herbert Walther



Serge Haroche

professor of physics at the University of Munich since 1975. Since 1981 he has also been one of the directors of the Max Planck Institute for Quantum Optics.

Haroche earned his doctorate in physics from the Ecole Normale Supérieure in 1971. He then held positions at the Centre National de la Recherche Scientifique and at the Ecole Polytechnique in Paris. He has been on the faculty of the University of Paris VI since 1975 and at the Ecole Normale since 1983.

## OBITUARIES

### Sadao Oneda

Sadao Oneda, professor of physics at the University of Maryland, died of cancer on 14 August 1992. He was 69. Oneda was internationally known for his contributions to elementary-particle physics.

Oneda was an undergraduate student in Japan during World War II. He graduated from Tohoku University in 1946 and joined Kanazawa University in 1950. He received the DSc degree from Nagoya University in 1953, under the sponsorship of Shoichi Sakata. In 1955 Oneda left Japan for the University of Manchester on a three-year fellowship. From 1958 to 1960 he held postdoctoral positions at the Institute for Advanced Study in Princeton, New Jersey, and at the University of Maryland. He returned to Kanazawa University for two years but came back to the US in 1963 to accept a faculty position at the University of Maryland.

Oneda made significant contributions to fundamental physics, espe-

cially to the development of our knowledge of the strong and weak interactions of elementary particles. Oneda and coworkers realized in 1949 the connection between the branching ratio of the decay of pions into electrons and muons and the axial-vector nature of the underlying interaction. Their paper was published in English in Japan a few months before Malvin Ruderman and Robert J. Finkelstein published the same, independently reached, conclusion in the US. Oneda was among the first to recognize in the early 1950s some unusual aspects of unstable particles discovered around that time; that recognition led him to the idea of associated production in 1951. In a sharper formulation of that concept in 1952, Abraham Pais referred to the model of Oneda. This in turn eventually led to the concept of the strangeness quantum number for hadrons, the strongly interacting particles. Oneda also realized that there was a connection between baryon number conservation and gauge transformations of the first kind and published a letter on the subject at roughly the same time that the paper of Eugene Wigner appeared in the *Proceedings of the National Academy of Sciences*. In the late 1950s Oneda and coworkers were already advocating a dynamical origin for the  $|\Delta I = \frac{1}{2}|$  rule in the nonleptonic decays of strange particles—an idea that has survived even to this day within the modern framework involving quarks and leptons.

Upon his return to Kanazawa, Oneda and his collaborators proposed the so-called rho-dominance model for describing certain properties of hadrons, independently of similar

Sadao Oneda

