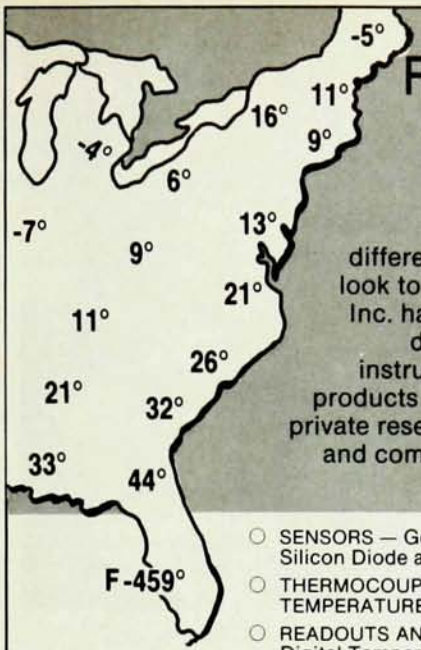
The society presented Distinguished Service Citations to Stanley L. Ehrlich (Raytheon, Submarine Signal Division, Port Smith, Rhode Island) for his "distinguished service to the Acoustical Society of America on both a regional and national level," and to Samuel F. Lybarger (McMurray, Pennsylvania) for his "almost 50 years of voluntary service to bioacoustic standardization."

Franklin Institute honors eight physicists

The Franklin Institute honored eight physicists with awards in 1986.

Benoit B. Mandelbrot (IBM Thomas J. Watson Research Center, Yorktown Heights, New York, and Harvard University, Cambridge, Massachusetts) received the Franklin Medal for his development of fractal geometry. Mandelbrot received his first degree from the Ecole Polytechnique (Paris, 1947), his MS from Caltech (1948) and his PhD in mathematics from the University of Paris (1952). He was with Philips Electronics (Paris, 1950–53), at the Institute for Advanced Study (Princeton, New Jersey, 1953–54), an associate at the Institut Henri Poincaré (Paris, 1954–55), and taught at the University of Geneva (1955–57), and Lille University and Ecole Polytechnique (1957–58). In 1958 he became a research staff member at the IBM Watson Research Center. He has been an IBM Fellow since 1974, and a professor in Harvard's department of mathematics since 1984. Mandelbrot showed that a class of nondifferentiable shapes, which he called fractals, underlay a wide variety of natural phenomena, which he showed posessed properties of self similarity. In his books *Fractals—Form, Chance, and Dimension* (Freeman, 1977) and *The Fractal Geometry of Nature* (Freeman, 1982) he showed

MANDELBROT



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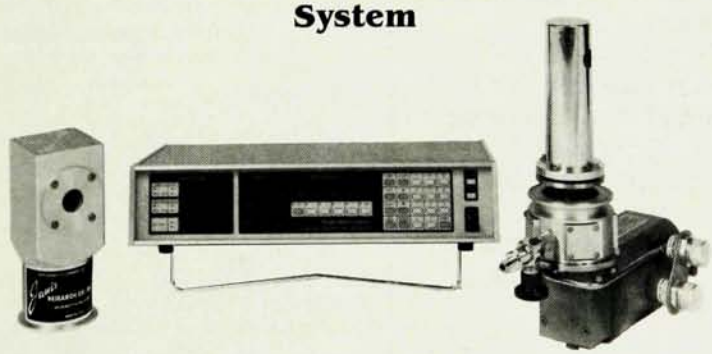

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CARLSON

that fractal shapes occur universally in nature—in the clustering of galaxies and the shapes of polymers, in the topography of coastlines and landscapes, and in the branching of trees and lungs. He introduced the Mandelbrot fractal set to study dynamical systems, and he has pioneered in the application of fractals to turbulence, statistical physics and in the use of multifractal measures (see PHYSICS TODAY, September, page 11).

Theodor W. Hänsch (Stanford University, Max-Planck-Institut für Quantenoptik, Garching, and University of Munich) received the Albert A. Michelson Medal for his outstanding contributions in quantum electronics, laser spectroscopy and atomic physics. Hansch received his master's degree (1966) and his doctorate (1969) from the University of Heidelberg. He initially came to Stanford University in 1970 on a NATO fellowship; in 1973 he was named associate professor of physics there and in 1975 he was named a full professor. In 1986 he was named director of the Max-Planck-Institut für Quantenoptik. Hänsch built the first monochromatic tunable dye laser in 1970. He pioneered saturation and polarization techniques for eliminating Doppler broadening, and applied these techniques to studies of the simple hydrogen atom. In 1975 he made the first measurements of the Lamb shift of the ground state of atomic hydrogen (see PHYSICS TODAY, January 1986, page 97).

Leo Kadanoff (James Franck Institute, Enrico Fermi Institute, and physics department, University of Chicago) received the Elliot Cresson Medal for "the central role he has played in the

KRUSKAL AND ZABUSKY

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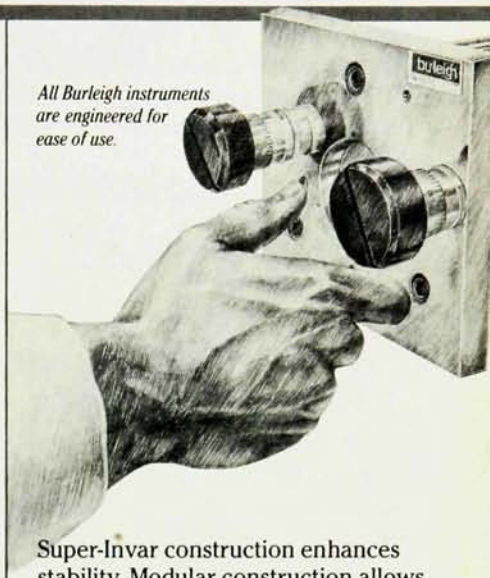

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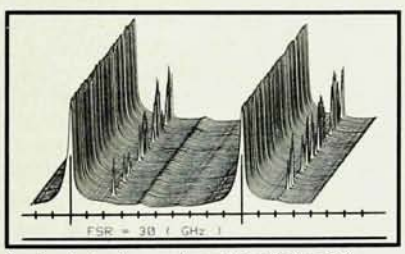

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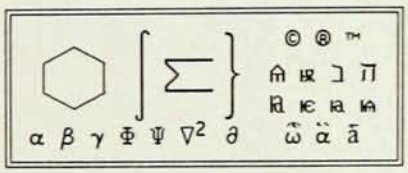

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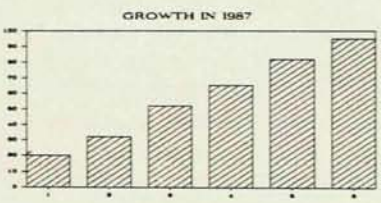

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HÄNSCH

VAN VALKENBURG

resolution of several longstanding problems associated with second-order phase transitions." Kadanoff received his AB (1957), MA (1958) and PhD in physics (1960) from Harvard University. He held a postdoctoral position at the Bohr Institute for Theoretical Studies (Copenhagen) from 1960 to 1962, when he became an assistant professor of physics at the University of Illinois at Urbana. He became a full professor there in 1965. In 1969 Kadanoff went to Brown University as University Professor of physics, and in 1971 he became a professor of engineering there. He has been a professor of physics at the Unversity of Chicago since 1978; in 1982 he was named John D. and Catherine T. MacArthur Distinguished Service Professor of Physics. Early in his career Kadanoff worked on superconductivity, statistical physics and many-body problems. In 1967 Kadanoff and his collaborators, David Aspnes, Wolfgang Gotze, David Hamblen, Robert Hecht, Joseph Kane, E. A. S. Lewis, V. V. Palciaskas, Martin Rayl and J. Swift, helped establish the notion of scaling and universality in critical phenomena, through the analysis of much of the then-existing experimental on this subject. This work followed upon Kadanoff's introduction of scaling concepts for critical phenomena via a heuristic argument applied to the Ising model. More recently he has worked on renormalization group theory, fractals and chaos. He has written *Quantum Statistical Mechanics* (with Gordon Baym, 1962, Benjamin) and *Basic Principles of Physics: Electricity, Magnetism and Heat* (1967, Benjamin).

Martin Kruskal (Princeton University) and Norman J. Zabusky (University of Pittsburgh) received the Howard N. Potts Medal for their discovery of solitons. Kruskal received his BS from the University of Chicago in 1945, and his MS (1948) and PhD in mathematics (1952) from New York University. He became a research scientist in the plasma physics lab at Princeton in 1951, and was named senior research associate in 1959. Kruskal became a professor of astrophysical sciences at Princeton in 1961, and professor of mathematics in 1981. Zabusky received his undergraduate degree in electrical engineering from the City College of New York in 1951. He received his MS from MIT in 1953, and his PhD in physics from Caltech in 1959. Zabusky was an NSF Fellow at the Max-Planck Institute of Physics and Astrophysics for 1959–60 and a visiting research associate at Princeton's plasma physics lab for 1960–61. He became a member of the Bell Telephone Labs technical staff in 1961, and was named supervisor of plasma physics in 1963. He served as head of the Bell Labs Computational Physics Research Department from 1968 until 1973. In 1976 Zabusky became a professor of mathematics and engineering at the University of Pittsburgh. In the mid 1960s Kruskal and Zabusky collaborated in analytical and computational studies of the Korteweg–de Vries equation and found solitons. Their computational synergetic approach (see PHYSICS TODAY, July 1984, page 36) has now become a common technique in large-scale computer simulations of nonlinear systems. Interactive visualization and numerical diagnostics enhance the perception and understanding of properties of mathematical models of observed phenomena.

Linn F. Mollenauer (Bell Laboratories, Holmdel, New Jersey) received the Ballantine Medal for "his distinguished work in optics and for his invention of the soliton laser." Mollenauer received his undergraduate degree in engineering physics in 1959 from Cornell University, and his PhD in physics in 1965 from Stanford Uni-

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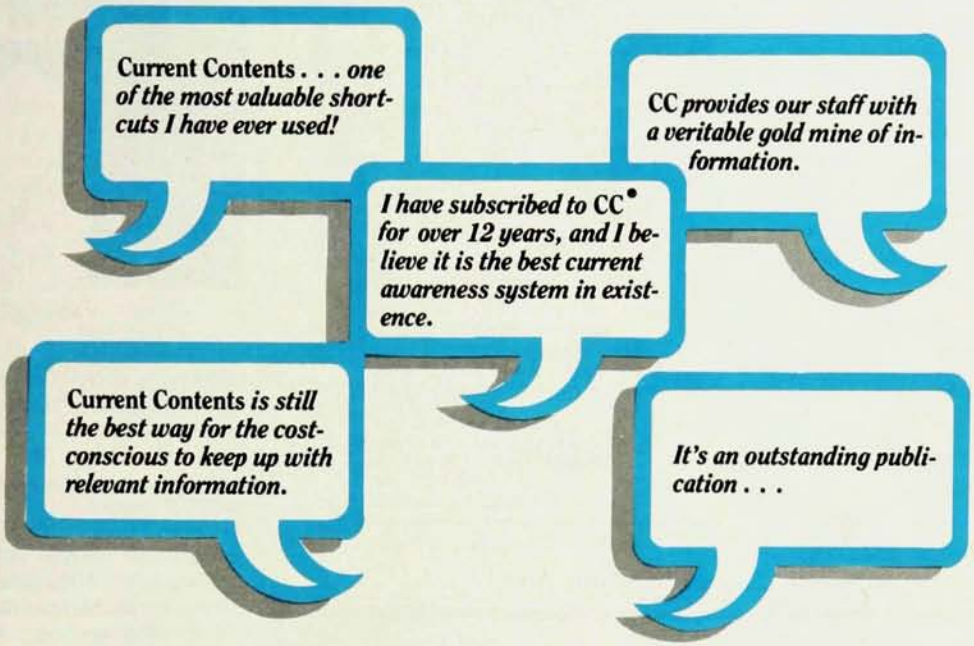

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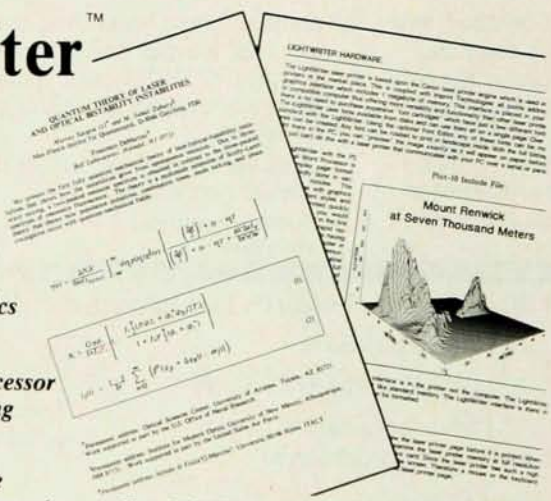

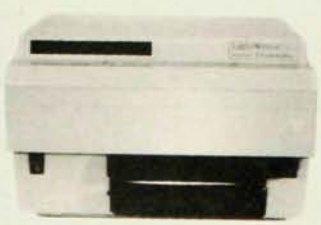

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KADANOFF

versity. He was an assistant professor of physics at the University of California in Berkeley from 1965 to 1972, when he became a member of the research staff at Bell Labs. In 1980 Mollenauer made the first observations of solitons and pulse narrowing in optical fibers. Mollenauer invented the soliton laser in 1983, basing it on a mode-locked tunable color center laser that he had developed in the late 1970s. The soliton laser is injection-locked by its own output pulses as compressed and reshaped by a fiber. Through choice of fiber length, any pulse width from several picoseconds to about 60 femtoseconds can be selected. Recently, Mollenauer and his postdoc Fedor Mitschke used pulses from a soliton laser to discover soliton self-frequency shifts and to study interaction forces between solitons and fibers.

Alvin Van Valkenburg received the John Price Wetherill Medal for his development of the diamond anvil. Van Valkenburg received his undergraduate degree in geology from Union College (Schenectady, New York) in 1936 and his MS in mineralogy from the University of Colorado in 1938; he pursued graduate studies at Harvard and The Johns Hopkins University. He worked at the National Bureau of Standards from 1945 to 1964, when he became the program director for geochemistry at the National Science Foundation. In 1974 he joined the Geophysical Lab of the Carnegie Institution (Washington, DC); he retired from the lab in 1980. In the 1950s Van Valkenburg and his collaborators developed a high-pressure chamber that used diamonds as the pressure transmitting material as well as a window for the entire electromagnetic spec-

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trum. Van Valkenburg proposed using the cell under a microscope for visual observations at extreme high pressures, as well as using a stainless steel gasket and filling the chamber to place the sample under hydrostatic stress. The group's first apparatus achieved 30 000 atmospheres in a chamber about half a millimeter across; more recent devices have maintained pressures of more than 5 megabars for several weeks.

David E. Carlson (Solarex, Newton, Pennsylvania) received the Walton Clark Medal for his contributions to the use of hydrogenated amorphous silicon for solar energy conversion. Carlson received his BS from Rensselaer Polytechnic Institute (Troy, New York) in 1963, and his PhD in physics from Rutgers University (New Brunswick, New Jersey) in 1968. He was a physicist at the US Army Nuclear Effects Laboratory in the Edgewood Arsenal (Maryland) from 1968 to 1969. In 1970 he joined the technical staff of RCA Labs, where he studied ion motion in glasses and insulators, glow-discharge film deposition and thin-film photovoltaic devices. He invented the amorphous silicon solar cell in 1974, and has since worked on improving its efficiency. Carlson became head of RCA's photovoltaic device research group in 1977. In 1983 he became deputy manager and director of research of the thin film division at Solarex, and in 1986 he became general manager.

obituaries

Joseph A. Burton

Joseph A. Burton, retired director of physics research at AT&T Bell Laboratories and treasurer emeritus of The American Physical Society, died at his home in Chatham, New Jersey, on 31 August 1986, at the age of 72. Burton obtained his undergraduate education at Washington and Lee University, graduating with a bachelor's degree in chemistry in 1934. He obtained his PhD in chemistry in 1938 from The Johns Hopkins University. He joined the research staff at Bell Telephone Labs in August of that same year.

Burton's early scientific research at Bell Labs was with low-work-function CsSb photocathode materials and with luminescent phosphors, both of which were important in the rapidly developing field of color television. He subsequently worked with thermionic emitters for vacuum tube cathodes. Following the invention of the transistor at Bell Labs in 1947, Burton became deeply involved in the growth of semiconductor single crystals. He led a study of thermally driven convective mass transport in growth from the melt. He also made critical contributions to understanding the incorporation of impurity atoms during crystal growth, including both dopant impurities and unwanted fast diffusing "deathnium" impurities such as copper. These issues were critical in the early stages of development of semiconductor technology. In 1954 he became head of the semiconductor physics research department and in 1958, director of the chemical physics research laboratory, a position he held until 1971. During this period he not only encouraged research in semiconductor materials but also stimulated and promoted new research efforts in nuclear physics, biophysics and space physics as new scientific opportunities in these fields arose. In 1971, Burton became director of the physics research laboratory and continued to contribute his vision and support in the development of the scientific stature of the individual scientists in his organization. With a keen appreciation for new ideas and their connections to other parts of science and technology, Burton helped researchers at Bell Labs to interact with the world scientific and engineering communities in an extremely broad and effective way. He retired from Bell Labs in 1976.

BURTON

Burton became treasurer of The American Physical Society in 1970, volunteering his services while still a research director at Bell Labs. When he retired from Bell Labs he accepted a full-time post as treasurer of APS. Before Burton became its treasurer, the APS finances had been a one-man operation. Burton developed a simple and easily understandable administrative system that was well suited to APS needs and which has proved very effective over the years. His record of accomplishments in nurturing and safeguarding the assets of the society is exemplary: The assets grew by a factor of 20 during the 15 years he was APS treasurer, while members' dues increased only modestly. In addition, Burton organized and managed several of the APS service programs, including industrial internships, the STEP travel grant for students, the minorities program, programs in physics education such as the Apker Award for excellence in undergraduate physics, and the program for improving the status of women in physics. He retired from APS in 1985.

Burton was a member of the governing board of the American Institute of Physics from 1969 to 1984, and a member of its executive committee from 1970 to 1975 and from 1977 to 1984.

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Frank N. Edmonds Jr

Frank N. Edmonds Jr, professor emeritus of astronomy at the University of Texas in Austin, died at his home on 3 September, one day after he turned 67.

Edmonds was born on 2 September 1919 in Minneapolis, Minnesota. He received his undergraduate education from Princeton University, graduating in 1941 with a bachelor's degree in physics. World War II prevented his acceptance of a scholarship to attend graduate school in Toronto. Having completed ROTC he entered military service as a lieutenant in the Signal Corps of the Army Air Force (later the US Air Force), serving for five years, in both the European and Pacific theaters.

He resumed his studies in 1946 at the University of Chicago, where he received his graduate training in astronomy and astrophysics under two of the leading astrophysicists of the century: Otto Struve, the founder of McDonald Observatory, and Subrahmanyan Chandrasekhar. His PhD dissertation topic, "Two problems in radiative transfer theory" (1950), led to a series of papers on Compton scattering in stellar atmospheres and planetary nebulae, published in the Astrophysical Journal between 1950 and 1954.