

we hear that

Physicists win six medals from Franklin Institute

The Franklin Institute has presented its annual awards for 1981. Among the winners are: Stephen Hawking, of Cambridge University; Frank Fang, Alan Fowler, Webster Howard, Frank Stern, all of the IBM Thomas J. Watson Research Center, who, along with Philip Stiles of Brown University, share a prize for research done jointly; Arthur Bueche (deceased) of General Electric Company; Hermann P. Haken of University of Stuttgart; M. King Hubbert, professor emeritus at Stanford University; and George Leitmann of the University of California-Berkeley, who is honored jointly with Henry Wan Jr of Cornell University. This year's medalists are recognized for work that ranges from the fields of astrophysics and cosmology, to the application of analytical techniques derived from physics to economic problems.

Stephen Hawking is currently Lucasian Professor of Mathematics at Cambridge University, a position once held by Sir Isaac Newton. Simultaneously, Hawking serves as a fellow at Conville and Caius College in Cambridge and as a reader in gravitational physics in the Department of Applied Mathematics

and Theoretical Physics at Cambridge University. He received the prestigious Franklin Medal "for his revolutionary contributions to, among others, the theory of general relativity, astrophysics and cosmology, and to the dynamics, thermodynamics and gravitational effects of black holes."

At the age of 39, Hawking is already recognized for creative contributions to theoretical physics. In 1971 he postulated that the "big bang" produced millions of black holes, submicroscopic in size and governed by the laws of quantum mechanics, relativity and thermodynamics. His investigations into the nature of black holes led him to the conclusion that the energy in the strong gravitational fields surrounding them is capable of generating pairs of particles out of the vacuum. Hawking is currently working to quantize gravity and, by describing gravity in terms of particle behavior, to unify the laws of gravitation with the other force laws.

The Franklin Institute's 1981 John Price Wetherill Medal is shared by Frank Fang, Alan Fowler, Webster Howard, Frank Stern and Philip Stiles "for almost a decade of research that has advanced the scientific community's understanding of transistors and the behavior of electrons at or near their surfaces." Working at IBM, these five physicists investigated the motion of electrons across junctions between thin films. They found that when a sufficient voltage was applied to certain field-effect transistors, electrons at or near the surface moved in only two directions. This knowledge led Stern and Howard to develop the theory of a two-dimensional electron gas; Howard, Fang, Fowler and Stiles subsequently proved its existence experimentally. This work has opened a new field in solid-state physics.

Fang was a graduate from the National Taiwan University in 1951; he went on to receive his master's degree from Notre Dame and his PhD in electrical engineering from the University of Illinois in 1959. After working for Boeing Aircraft Company, he joined the research staff at IBM in 1960. He is currently interested in the electronic



HAWKING

properties of field-effect structures and extremely small-scale devices.

Fowler obtained his BS and MS in physics from Rensselaer Polytechnic Institute and his PhD in applied physics from Harvard. He has been part of the research staff at IBM since his graduation from Harvard.

Howard received a BS in physics from Carnegie-Mellon University and earned his master's and PhD from Harvard. He joined the research staff at IBM in 1961, where, since 1973, he has been manager of the exploratory display group.

After receiving his PhD from Princeton University in 1955, Stern served on the research staff of the US Naval Ordnance Lab in Maryland for nine

FANG



years. He came to IBM in 1962 and is now manager of the semiconductor electronic properties division of their research staff.

Stiles did his graduate work at the University of Pennsylvania, receiving



FOWLER

his PhD in 1961. He joined the research staff at IBM in 1963, after spending one year as a research associate at the University of Pennsylvania and one year as an NSF fellow at Cambridge. Since 1970 he has been a professor of physics at Brown University and department chairman since 1974.

The 1981 Delmer S. Fahrney Medal for leadership in science or technology was presented to Arthur M. Bueche, now deceased (see page 74). He was honored "for his ability to organize, lead, inspire and for his lifelong dedication to his conviction that increased scientific knowledge is an essential element in improving the health and well-being of people."

Bueche was trained in physical chemistry at Cornell, where he received his PhD. He joined the research staff at General Electric Research Laboratory in 1950, pursuing an interest in the physics and chemistry of polymers and the effects of high-energy radiation on plastics.

Hermann P. Haken was awarded the 1981 Albert A. Michelson Medal "for his work in quantum optics and for developing the field of synergetics."

Haken studied at the University of Erlangen and the University of Stuttgart, where he received his PhD in 1960. His career as professor of theoretical physics at Stuttgart has included founding a widely renowned school

for the study of quantum optics. The work on synergetics—the study of cooperative behavior of multicomponent systems—grew out of his research into the theory of the laser. In addition to his research at Stuttgart, he has worked as a visiting professor or researcher at various institutions, including the Research Institute for Fundamental Physics in Kyoto, the University of Strasbourg, Bell Telephone Labs, and the Laboratoire de Telecommunications in Paris.

George Leitmann of the University of California-Berkeley and Henry Wan Jr of Cornell share the 1981 Louis E.



HOWARD

Levy Medal for their joint paper in the Journal of the Franklin Institute, "A Stabilization Policy for an Economy with Some Unknown Characteristics," in which Leitman and Wan applied analytical techniques derived from the physical sciences to develop a stabilization policy for economics.

Leitman is now professor and associate dean for graduate studies in the College of Engineering at Berkeley. He received his master's and PhD in physics from Columbia and a doctorate in engineering from the University of California. In addition to his teaching at Berkeley, he has worked for such institutions as the US Air Force Academy and the Guggenheim Laboratory at Princeton. Wan has been a professor of economics at Cornell since 1970. He did his graduate work at Bucknell University and MIT, and he has written widely on economics.

The Franklin Institute's Elliot Cresson Medal for 1981 was presented to M. King Hubbert. He was recognized for creating a mathematical analysis de-



STERN

signed to predict the total amount of recoverable resources—domestic crude oil in the first instance, but later generalized to other resources—given the way the success rate of exploration changes with time. The resulting, roughly Gaussian, curve showing resource recovery as a function of time is known as "Hubbert's pimple."

Hubbert received his education in geology, physics and mathematics from the University of Chicago. He taught geology and geophysics at Columbia during the 1930s, and from 1962 to 1968 he taught at Stanford University, where he is now professor emeritus. His career has included work for uni-

STILES



versities, the petroleum industry, and the Illinois and US Geological Survey. His research interests include the physics of underground fluids—important

to the exploration for and production of oil and gas—and the physics of deformation as it applies to the Earth's crust.

obituaries

Mark W. Zemansky

On 29 December 1981, Mark Waldo Zemansky, professor emeritus of physics at the City College of New York, died at the age of 81. We would be hard put to think of any teacher or writer of textbooks who had a greater influence on physics in North America than Mark Zemansky; his contributions to research take second place only to his profound achievements as an educator.

Born in New York City in 1900, Zemansky graduated from CCNY in 1921 and received his PhD degree from Columbia University in 1927. In 1925 he joined the faculty of City College, where he remained until 1967. He was a National Research Council fellow, first at Princeton University from 1928 to 1930 and then at the Kaiser Wilhelm Institute in Berlin from 1930 until 1931. The research he conducted during that time, in radiation and collision processes of gaseous atoms, led, *inter alia*, to the book *Resonance Radiation and Excited Atoms* (1934) written in collaboration with A. C. G. Mitchell. Owing to the enhanced interest in resonance phenomena occasioned by the

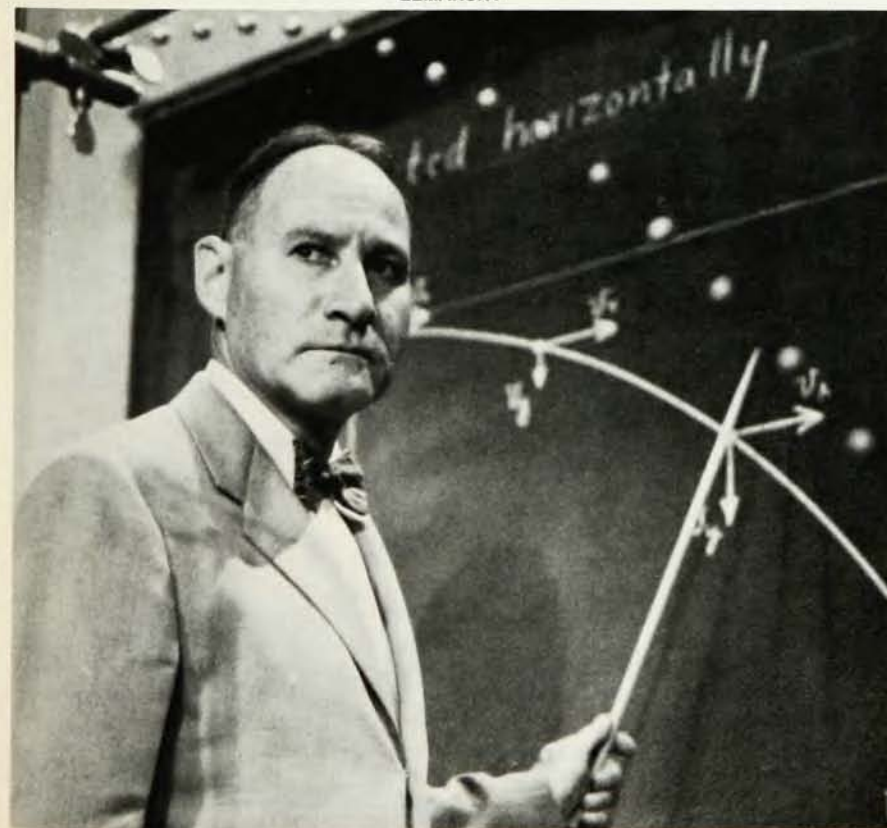
invention of the laser and the discovery of the Mössbauer effect, the book was reprinted in 1961.

Between his return to CCNY from Berlin and his retirement in 1967 Zemansky left the College only for a trip around the world in 1936 and for war work in 1943–44. As chairman of the CCNY physics department from 1956 to 1959, he led it into the modern era and from 1963 to 1966 was the first executive officer of the City University's new doctoral program in physics.

In 1937 Zemansky's world-famous book *Heat and Thermodynamics* was published. It is now in its sixth edition with Richard H. Dittman as co-author. In 1947 Francis W. Sears and Zemansky published the first edition of *College Physics*. In 1949 their *University Physics* followed. These textbooks, for well over two decades and through six editions—the latest written with Hugh D. Young—dominated the market in their field. Zemansky also wrote *Temperatures Very Low and Very High* and contributed to the *American Institute of Physics Handbook*.

From 1946 to 1956, Zemansky was associated with the cryogenics labora-

ZEMANSKY



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