

the college of engineering at the University of Utah in Salt Lake City.

Felix J. Weinberg, professor emeritus of combustion physics at Imperial College, London.

Marvin H. White, Sherman Fairchild Professor of Electrical Engineering at Lehigh University.

IN BRIEF

The Foundation for Research and Technology-Hellas in Greece has named **Raymond E. Goldstein**, an associate professor of physics and of applied mathematics at the University of Arizona, as the winner of the Pnevmatikos Award in Nonlinear Science for 2000. The foundation recognized "his contributions to the understanding of pattern formation involving the dynamics of filaments, interfaces and surfaces, combining powerful mathematical methods with penetrating physical arguments, numerical computations, and experiments to clarify nonlinear phenomena in a wide variety of physical and biological systems." The award will be presented next month at an international conference on Crete.

At the American Physical Society March meeting in Seattle, **Taekjip Ha**, an assistant professor of physics at the University of Illinois at Urbana-Champaign, received the 2001 Outstanding Young Researcher Award from the Association of Korean Physicists in America. The association acknowledged Ha for "his truly outstanding scholarly and pioneering research on the biological physics in the field of single-molecule fluorescence."

Dirk Rischke joined the University of Frankfurt in Germany earlier this year as the chair for theoretical heavy-ion physics. He previously was a RIKEN-BNL Research Fellow with the Brookhaven National Laboratory theory group. Rischke succeeds **Walter Greiner**, who will retire in three years. Until that time, Rischke and Greiner will be working together to ensure a smooth transition.

At the annual Institute of Electrical and Electronics Engineers honors ceremony next month in Jersey City, New Jersey, **Herwig Kogelnik** will receive the IEEE's highest award, the 2001 IEEE Medal of Honor. Kogelnik is adjunct photonics systems research vice president at Lucent Technologies' Bell Labs in Holmdel, New Jersey.

According to the citation, he is being acknowledged for "fundamental contributions to the science and technology of lasers and optoelectronics, and for leadership in research and development of photonics and lightwave communication systems."

On the occasion of his retirement in March from MIT's Plasma Science and Fusion Center, **Dieter J. Sigmar**, senior research scientist, received the US Department of Energy's Distinguished Associate Award. He was honored, in part, for his "con-

tributions to our understanding of plasma confinement, the physics of burning plasmas, and the role of the plasma edge," according to the citation, which also noted that his "commitment to international fusion collaboration and stimulation of theory programs around the world has been critical to our progress in fusion science research." Sigmar plans to continue working on transport theory in tokamak plasmas with his MIT colleagues and following developments worldwide in the physics of burning plasmas.

OBITUARIES

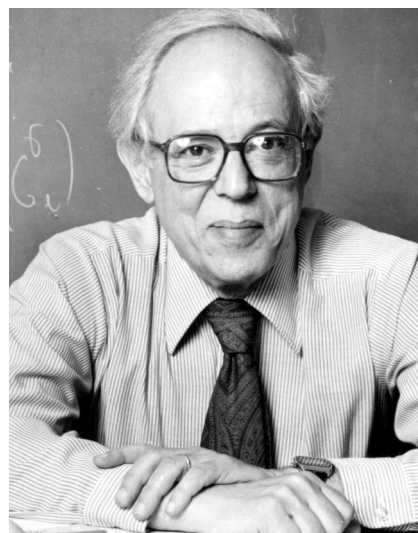
Abraham 'Bram' Pais

Abraham "Bram" Pais had two remarkable careers. As a particle physicist, he was a leader in the tumultuous quarter century after World War II. As a chronicler of physics and biographer of physicists, he has left a rich legacy of firsthand information and insight for the readers of today and the science historians of the future. He died of heart failure on 28 July 2000 in Copenhagen.

Bram was born on 19 May 1918 in Amsterdam, where he spent his childhood and school years. He earned BSc degrees in physics and mathematics at the University of Amsterdam in 1938 and an MS in physics at the University of Utrecht in 1940. In 1941, during the early years of the German occupation of the Netherlands, he obtained his PhD in theoretical physics, the last PhD from Utrecht awarded to a Dutch Jew during the occupation. His thesis adviser was George Uhlenbeck.

The horrors of the later stages of the occupation claimed his sister Annie, but Bram survived by hiding with the help of a friend, Tina Strobos. This remarkable story appears in *To Save a Life: Stories of Holocaust Rescue*, by Ellen Land-Weber (University of Illinois Press, 2000); for an excerpt, see "Bram Pais Tells His Story" at <http://sorrel.humboldt.edu/~rescuers/book/Strobos/BramPais/BramPaisStory1.html>. His harrowing wartime experience stayed with him throughout his life. But so did his friendship with Tina. Attendees will not forget her emotional participation in his 70th birthday symposium at Rockefeller University.

When the war ended, after a brief but exciting time in Denmark where he worked with Niels Bohr (and



ABRAHAM "BRAM" PAIS

invented the term "lepton" for particles like the electron and muon), Bram came to the US in 1946 and joined the Institute for Advanced Study in Princeton, New Jersey.

In the next 25 years, he made many important contributions to elementary particle theory. His work centered on quantum field theory and symmetry, but was always motivated and informed by the unfolding drama of experimental particle physics. He made many solid technical contributions, such as his precise definition of G -parity with Res Jost and his treatment of $SU(6)$ symmetry breaking. But he is primarily associated with two sweeping and beautiful ideas.

The first of Bram's grand breakthroughs was the general idea of "associated production" as an explanation for the puzzling properties of strange particles. Bram's notion was that the strong interactions might somehow have selection rules that constrained them to produce the new

particles in pairs and forbid their decay by the strong interactions. The nature of these selection rules was explained later by Murray Gell-Mann and others who concluded that there is a quantum number (strangeness) conserved in the strong interactions but violated by the weak interactions. This is obvious now that we know about quarks and their quantum numbers. But Bram's principle of associated production and Gell-Mann's introduction of strangeness broke a theoretical logjam.

In a related, but even more striking theoretical discovery, Bram and Gell-Mann described the particle we now call the K_S (kay-short) as a quantum mechanical mixture of a strange particle, the K^0 , and its antiparticle, the $\bar{K}^0$. And they predicted the existence of a different combination, the K_L (kay-long) with a much longer lifetime and an almost infinitesimally different mass. This construction was so far from the classical notion of what a particle is, so bizarrely and ineluctably quantum mechanical, that it still seems strange today. It is almost impossible even to talk about in our everyday language (witness the long list of popular articles and books that get it wrong). If you think you understand the K_S in your bones, you are just not thinking hard enough. But the quantum mechanical arguments of Pais and Gell-Mann were absolutely compelling and essentially correct. They did not know at the time that some of the symmetries they used in their analysis were only approximate, but that did not invalidate their astonishing conclusion. This, to borrow a phrase from my colleague Sidney Coleman, was "quantum mechanics in your face."

With Oreste Piccioni, Bram developed the theory of "regeneration" that describes how these weird quantum mechanical mixtures interact with ordinary matter. Regeneration allows experimenters to manipulate beams of the mixture-particles. The technique is still used today to study them.

Richard Feynman found this description of the K-meson system to be a convincing argument for quantum mechanics itself. In his book *The Theory of Fundamental Processes* (W. A. Benjamin, 1962), Feynman said, "One of the most strikingly brilliant predictions of this theory of strangeness was made by Pais and Gell-Mann. . . . This is one of the greatest achievements of theoretical physics. It is not based on an elegant mathematical hocus-pocus such as the general theory of relativity yet the

predictions are just as important as, say, the prediction of positrons. Especially interesting is the fact that we have taken the principle of superposition to its ultimately logical conclusion. . . . It does not prove it right, but for my money, the principle of superposition is here to stay."

Bram moved to Rockefeller University in 1963 to lead the theoretical physics group, part of Rockefeller's transition from a medical institute to a university. For the rest of his physics career, he remained at Rockefeller, where he was the Detlev W. Bronk professor emeritus. He poured much of his energy into working with younger colleagues and students and building the Rockefeller group. After his retirement, he and his wife Ida Nicolaisen spent half of each year in Denmark where Bram worked at the Niels Bohr Institute.

In the late 1970s, Bram turned to history and biography. Always a master storyteller, he believed that he was in a unique position to help unravel the history of 20th-century particle physics. He knew the cast of characters. He had a feeling for their cultures. He could speak their languages. And most of all, he understood the physics. Perhaps also, he turned to history because the pace of discoveries in experimental particle physics had slowed. For Bram, this took much of the fun out of physics. His book *Inward Bound: Of Matter and Forces in the Physical World* (Oxford University Press, 1986) is dedicated to "those who built the machines, the beams, and the detectors, and those who used them, and those who reflected on their results." It was the complicated interplay among the machine builders, the experimenters, and the theorists that brought physics to life for him. He sought to bring this alive for the reader in his histories and biographies.

His books are wonderful reading. For example, *Subtle is the Lord: The Science and the Life of Albert Einstein* (Oxford University Press, 1982) has won acclaim and awards despite the difficult physics it contains. But the books are probably even more important for their immense scholarship. They are treasure troves that future science historians will quarry for insights into 20th-century physics.

Bram thought hard about the titles of his books. *Subtle is the Lord* speaks for itself. But I think perhaps he was most proud of *Inward Bound*, because it captures some of the excitement and mystery of particle physics. He says in the preface, "Along this incompletely

traveled road inward man has established markers that later generations will rank among the principal monuments of the twentieth century."

HOWARD GEORGI
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Thomas John Ypsilantis

Thomas John Ypsilantis, codiscoverer of the antiproton and codeveloper of the Čerenkov ring-imaging particle-identification technique, RICH, died on 16 August 2000 in Geneva, Switzerland, of a heart attack.

Tom was born in Salt Lake City, Utah, on 24 June 1928. He was the second of three children of Eugenia and John Ypsilantis, who had immigrated to the US from Greece in 1924. His father died when Tom was only 2½ years old, and his mother, then a 26-year old widow, was faced with the daunting task of raising her children during the Depression.

In 1950, Tom graduated from the University of Utah with a BS in chemistry. As a graduate student at the University of California, Berkeley, he soon apprenticed himself to Emilio Segrè. In his book *Mind Always in Motion: The Autobiography of Emilio Segrè* (University of California Press, 1993), Segrè comments, "Among the students was Tom Ypsilantis, who had studied chemistry but had recently come to me because he wanted to change to physics. I soon recognized his human qualities as well as his uncommon scientific ability. During my absence Tom and Clyde [Wiegand] succeeded in polarizing the proton beam of the synchrocyclotron by collision. The success obtained and Ypsilantis's spirit of initiative impressed me, and I proposed a faculty appointment for him. He was one of the most promising physicists at Berkeley." The polarization program that Tom pioneered at Berkeley led to a series of double and triple scattering experiments that yielded the data used by Nicholas Metropolis, Henry Stapp, and Ypsilantis in the first comprehensive phase shift analysis of nucleon-nucleon scattering at 310 MeV using the MANIAC computer at Los Alamos National Laboratory.

Shortly before receiving his PhD in physics in 1955, Tom joined with Owen Chamberlain, Segrè, and Wiegand to search for the antiproton. They designed an experiment based on measuring the masses of momen-