

on nuclear aspects of the weak interactions. This phase of his career culminated in an authoritative review of nuclear muon capture in *Physics Reports* in 1977.

When Nimai joined RPI in 1981, he found that RPI had well-established programs in photonuclear physics and an experimental program in pion photoproduction on few-body nuclei and p-shell nuclei. He believed strongly that, to maximize progress in physics, an intimate relationship must be established between experimental and theoretical work. Thus he built a theoretical program parallel to the existing experimental program at RPI.

One of the major projects that he and his group undertook was to put the basic mechanism for meson production on strong theoretical ground by constructing an elementary operator that is consistent with unitarity and with gauge and Lorentz invariance. The group then applied this approach to the photoproduction process in light nuclei.

The most significant feature of pion photoproduction near threshold is the delta resonance. In the late 1970s, there was an effort by Nathan Isgur, Gabriel Karl, and others to try to understand this resonance based on the constituent quark model. In that model, the resonance excitation corresponded to a spin flip of one of the quarks, and it was necessary to understand how that spin flip led to a large energy splitting from the nucleon ground state. The model that had been developed by Isgur, Karl, and others in the late 1960s and refined in the 1970s to explain this result used a simple shell-like three-quark wavefunction with a perturbing hyperfine color magnetic interaction between the quarks, which gave rise to the requisite energy splitting. This interaction also introduced a d-wave component in the wave function in addition to the dominating s-wave part, resulting in a spatial deformation. Nimai and his group made an important contribution to this physics by elucidating fundamental relationships between transverse electric quadrupole (E2) and Coulomb (S1) multipoles, which both contribute to this hyperfine process.

During the early 1980s and into the mid-1990s, Nimai broadened his research to include the photoproduction and electroproduction of baryon resonances involving pion and eta decay and, to a lesser extent, the study of the low-energy properties of baryons through the Skyrme model and lattice quantum chromodynamics.

He was instrumental in reviving

the Baryons conferences, and co-organized the first one held at RPI in 1988. He was also a co-organizer of other workshops on the subject of excited baryons.

In 1997, Nimai was awarded the Humboldt Senior Scientist Prize. His scientific research on the fundamental properties of matter and energy gave him an appreciation for the mysteries of the universe, which connected symbiotically with his deep spiritual beliefs. He was actively engaged in Hindu scholarship, and, more generally, in the commonality of its spiritual underpinnings with other religions.

Nimai was a dedicated husband, father, and teacher. He will be remembered with great affection by his friends and colleagues as a person who loved and practiced scholarship with much reverence and enthusiasm.

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Karl Strauch

Karl Strauch, an experimental high-energy physicist and professor emeritus of physics at Harvard University, died in Boston on 3 January. His death ended a 15-year struggle with Parkinson's disease.

Karl was born on 4 October 1922 in Giessen, Germany. Not long after Hitler came to power, Karl's parents were exiled from Germany for advocating democratic principles. Consequently, the Strauch family took up residence in Paris, where Karl earned his high school diploma. In 1939, the family emigrated to California. Karl attended the University of California, Berkeley, where he earned an AB in 1943. After serving in the US Navy, he returned to Berkeley to earn a PhD in physics in 1950. That same year, he was elected to Harvard's Society of Fellows; three years later, he was appointed to the university's physics faculty as an assistant professor.

Karl's early research, which made use of Harvard's Cyclotron, was on proton-nucleus scattering. Later, in 1962, he and his group discovered the decay of the η meson into two photons at Brookhaven's Cosmotron, establishing the meson's spin to be zero. In 1967, he began a seven-year term as the director of the Cambridge Electron Accelerator (CEA), a joint Harvard-MIT facility. At the CEA, he led experiments that produced tantaliz-



KARL STRAUCH

ing evidence in the early 1970s for an additional degree of freedom, suggesting the existence of quarks heavier than the up, down, and strange quarks. His most recent research was carried out with several major colliding beam experiments: Experiment I-209 at CERN (ISR) looked for muon pair production in proton-proton scattering; the Crystal Ball experiment at both SLAC and DESY (the German Electron Synchrotron) studied final states with photons in electron-positron collisions; and the L3 Collaboration at CERN (LEP) investigated high-energy electron-positron interactions.

Karl served on various national and international committees and commissions. These included the Commission on Particles and Fields of the International Union of Pure and Applied Physics and the US-USSR Joint Coordinating Committee on Fundamental Properties of Matter, which formed the chief conduit between the US and Soviet scientific communities during the height of the cold war.

Karl rose through Harvard's academic ranks to become the George Vasmer Leverett Professor of Physics in 1975. He served as chairman of the Harvard physics department from 1978 to 1982. His warm and friendly teaching style endeared him to his students, and he firmly guided more than 20 graduate students as they began their physics careers. Karl also chaired two committees that significantly affected the policies and culture of Harvard. The first successfully recommended the merger of Harvard and Radcliffe College's admissions offices and the institution of an admissions policy of equal access for women.

The second established the Science Center, the first multidisciplinary sciences building in the college.

Karl's deep insights, friendly smile, and enthusiasm for physics will be missed by his former colleagues and students.

GEORGE BRANDENBURG
MARGARET LAW
NORMAN RAMSEY
ISAAC SILVERA
RICHARD WILSON
Harvard University
Cambridge, Massachusetts

Peter Swerling

Peter Swerling, a 20th-century Renaissance man who made enormous contributions to the field of radar, died of cancer on 25 August at his home in Santa Monica, California.

Born in New York City on 4 March 1929, Swerling spent his formative years as a precocious youth in the magical world of the movies. His father, Jo Swerling, was one of the most successful screenwriters of the era.

When Swerling was 10 years old, his father, recognizing the analytical gifts of his son, granted Swerling his birthday request to meet Albert Einstein. The awed youngster spent an hour alone with the professor and then the professor visited with the family for the day, because, apparently, even Einstein was fascinated by the gossip of Hollywood. He advised the boy to pursue his studies in mathematics; however, his parting words were to not forget the important things—like baseball!

Swerling entered Caltech at age 15, graduating three years later in 1947 with an undergraduate degree in mathematics. After graduating Phi

Beta Kappa with an AB in economics from Cornell University in 1949, he received his PhD in mathematics from UCLA in 1955. While in graduate school, he was employed full-time by Douglas Aircraft, not on the assembly line for which he had applied, but as a member of the staff of the newly formed Project RAND, an assignment that was the start of a remarkable career.

Best known for his work in radar during the heady days of the RAND Corp, Swerling was also a professor at the University of Southern California and a founder and president of Technology Service Corp. He served on the board of directors for a number of companies, and was a founder and long-term trustee of the Crossroads School, one of the most prominent K-12 private schools in Los Angeles. He also carried out Einstein's advice: Swerling enjoyed hang gliding and bodysurfing, much to the concern of friends and family. He loved opera, particularly Wagnerian opera, and Shakespeare, which he apparently had memorized, being only mildly upset when the Bard was misquoted at various technical meetings.

Swerling is perhaps best known professionally for the class of statistically "fluctuating target" scattering models he developed in the early 1950s to characterize the performance of pulsed radar systems. He extended Jess Marcum's work on statistical detection of steady targets in noise to include the important effect of statistical fluctuations of the target itself. Swerling's target models became an essential tool in the design of practical radar systems. The work was recognized immediately by the radar community, and the models, which have endured, are referred to as Swerling Target I, II, III, and IV in the literature of radar. Less well known (intentionally so, for reasons of national security) is the profound influence of more sophisticated target models Swerling more recently developed for application to targets using stealth technology. This work first became publicly known during the Persian Gulf War.

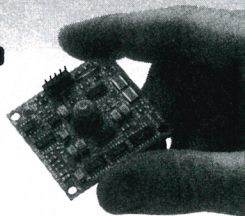
Swerling's work in the area of least-squares estimation and recursive signal processing was the precursor to Kalman filtering, a now ubiquitous signal-processing procedure used in the estimation and control of dynamic systems. Before Richard Kalman's work, Swerling published papers in 1958 and 1959 on "stagewise" smoothing, which were the first efforts to set up and exploit the computational



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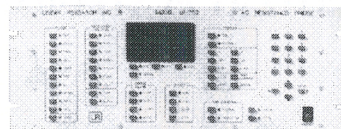
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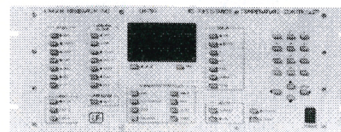
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