began a long and fruitful association between SQUIDs and biomagnetism. Seven years later, Jim participated in another collaboration that first detected magnetic fields from the brain evoked by an auditory stimulus.

While at NIST, Jim introduced two important innovations in SQUID magnetometry: the fractional-turn SQUID, which improved the coupling efficiency, and the SQUID gradiometer, which improved sensitivity to nearby fields.

Later, to make SQUIDs convenient to use outside of the laboratory, Zimmerman began developing a refrigerator suitable for cooling SQUIDs. In 1977, working with Ray Radebaugh, Jim demonstrated a low-power refrigerator made largely of plastic and used it to cool a working SQUID. This success prompted others to enter the field of cyrocoolers, and led him to sponsor a conference that has since grown into a regular biennial event.

Jim's career was marked by numerous honors and awards, including appointment as a NIST Fellow and receipt of the Samuel Wesley Stratton Award, the highest award for scientific achievement conferred by NIST. Jim retired from NIST in 1985 but continued as a guest researcher for several years thereafter.

In 1987 he became one of the first to make a SQUID using the newly discovered high-temperature superconductors. In that year he was also awarded a Humbolt Fellowship to study in Germany.

Although Jim's research touched some of the most intriguing mysteries of quantum physics, his colleagues knew him as a source of simple insights and elegant experiments that cut to the quick with a minimum of apparatus. Indeed, Jim was a master of simplification, often working with materials like dental floss and rubber bands, where others would have applied high technology. It was Jim's genius to lay bare aspects of quantum reality using bits of niobium wire and masterful insight.

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Thaddeus Francis Kycia

Thaddeus (Ted) Francis Kycia, a prominent particle physics experimenter, died on 22 December 1999 in Port Jefferson, New York, from complications of lymphoma.

Born on 10 August 1933 in Montreal, Ted earned a BSc in 1954 and an MSc in 1955, both from McGill University. He did his graduate work at the University of California, Berkeley, where he earned a PhD in 1959 for his study of K^+–proton scattering at the Bevatron.

In 1959 Ted joined Brookhaven National Laboratory, where he spent the remainder of his career, becoming a senior physicist and group leader.

In the early 1960s, he participated in some of the earliest measurements of hyperon magnetic moments. Among other innovations of this work was the deployment of a superconducting magnet in the first measurement of the cascade minus magnetic moment. Also in the 1960s, he led a series of hadron–nucleon total cross section measurements at the Alternating Gradient Synchrotron, pushing this deceptively simple technique to ever-increasing precision and sensitivity. In the process, he discovered many new pion–nucleon and kaon–nucleus resonances, which entered the Particle Data tables and were used in quark model calculations. The final measurements of this series were carried out at the newly operating Fermilab. Achieving a precision of about a part in a thousand, Ted and his coworkers showed that all hadron–nucleon total cross sections had the same behavior: As the incident energy increases, the cross sections fall, reach a minimum, and then rise. Previously, this phenomenon had been demonstrated only in isolated cases, and is still not completely understood.

In the late 1960s, Ted embarked on studies of rare decays of kaons. The first of these experiments studied $K^\pm \to \pi^\pm\pi^0\gamma$ and helped to rule out the possibility of an electromagnetic origin for the *CP* violation observed in the $K_L \to 2\pi$ decay. It also established limits on some decay modes, which are still the best to date. The second experiment, this time studying neutral kaons, discovered several new decay modes of the K_L meson, as well as a form factor dependence in the decay $K_L \to \pi^+\pi^-\gamma$ that has been confirmed but never really explained.

At the end of the 1970s, Ted led a series of experiments to check predictions and claims of discovery of various new particles. These experiments did not confirm any new phenomena, but they considerably clarified the claims.

In the mid 1980s, Ted returned to the subject of rare kaon decays as one of the initiators of AGS Experiment 787—that is, the search for $K^+ \to \pi^+\nu\bar{\nu}\gamma$. This process is of particular interest because it is highly sensitive to the otherwise elusive coupling of the top to the down quark, as well as to many varieties of possible new interaction. Ted's vision for that experiment was to design a detector whose basic structure was capable of detecting this process at the Standard Model level, which at the time of the proposal was some four orders of magnitude beyond what had been done. After many years, this decay mode was discovered by E787, opening up a new window into short-distance physics. This work continues.

Thaddeus Francis Kycia

At the time of his death, Ted was working on a new experiment to make a precise measurement of the Cabibbo angle, one of the fundamental parameters of the Standard Model, through the study of $K^+ \to \pi^0 e^+\nu$.

Ted was a leader in the design of Čerenkov counters, especially with gas radiators, for beam particle identification. He built several of these, impressing his colleagues with their performance, but unfortunately he rarely described them in print. At Fermilab, one of his counters cleanly separated pions and kaons at 340 GeV. A few years later, others made some modifications to the counter and achieved pion–kaon separation at 530 GeV. This record will not likely be exceeded at any time in the foreseeable future.

Ted's expertise was in the design, planning, and execution of particle physics experiments, and he had an impressive record of obtaining correct and accurate results. We and many of

our colleagues learned much through working with him.

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Michael Danos

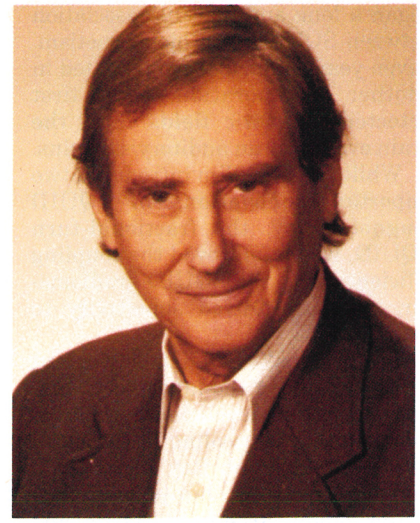
Michael Danos, an influential theorist who worked at the National Institute of Standards and Technology (NIST) for 40 years, died on 30 August 1999 in Washington, DC, following a stroke.

Danos was born 10 January 1922 in Riga, Latvia. He worked as an electrical engineer in Riga to avoid being conscripted into the Latvian, Soviet, and German armies in World War II. He left Riga in 1944 to become an assistant to Heinrich Barkhausen at the University of Dresden. In 1948 he earned a master's degree in electrical engineering at the University of Hannover and a PhD in physics in 1950 at the University of Heidelberg under Hans Jensen.

In 1952 he left Germany for the US and joined Columbia University's Radiation Laboratory as a postdoctoral research associate under Charles Townes. He remained at Columbia until 1954, when he joined NIST (then known as the National Bureau of Standards) as a theoretical physicist in the Betatron section.

Over his career, Danos's interests spanned a wide area of problems in nuclear and radiation physics. A leader in the development of theories of photonuclear reactions, he predicted in 1958 the double peak in the giant resonances of deformed nuclei. He was both the teacher and the consultant for the experimentalists in the photonuclear physics program. In 1961 he gave an important series of lectures entitled "Photonuclear Physics" at the University of Maryland and in 1970 a second series at the University of Melbourne. His many interests included nuclear theory, relativity, quantum mechanics, angular momentum, chaos, thermodynamics, field theory, and quantum computers. His keen understanding of the basic laws of physics impelled him to grapple with many issues involving the interpretation of quantum physics.

Danos's career was enriched by several important collaborations. His collaboration with Walter Greiner of the University of Frankfurt brought many younger physicists to NIST and resulted in more than 30 papers that primarily concerned different aspects



MICHAEL DANOS

of photonuclear reactions. With Vincent Gillet of Saclay he studied and published papers concerning the relativistic many-body problem. With Lawrence Biedenharn of Duke University he examined various aspects of nuclear theory, and with Johann Rafelski of the University of Arizona he published papers on relativistic heavy-ion physics. Also included in his publications during the last few years of his life was a joint review article with Ugo Fano of the University of Chicago concerning graphical representations of angular momentum.

After his retirement from NIST in 1994, he was associated with the Fermi Institute at Chicago. In the mid 1990s, he worked on the development of high-power x-ray tubes for medical imaging and industrial radiology. Though principally a theorist, Danos acquired eight patents in electronics and medical instrumentation.

Danos was gregarious and the center of attention in social groups. He was full of enthusiasm and had many interesting and amusing stories about his past adventures and more recent travels. He spoke with authority on every subject, with many quotes from Cicero, Goethe, or Gerhard Hauptmann, and there was no subject he wouldn't address. He was exuberant with a marvelous sense of humor. At least once, he submitted an abstract with a fictitious author entitled "Computation of the S-matrix for Complicated Nuclear Reactions." He left a void in the lives of those who knew him, and he is greatly missed.

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