summarizes both the theoretical work that led to the creation of Jupitor and the program's many applications.

In 1966 Tamura became interested in the theory of isobaric analog resonances, and this was one of the major factors that led him to transfer from Oak Ridge to the University of Texas. At Texas there was not only a large, fast computer but also a vigorous experimental program generating much novel data that shed light on the role such resonances play in nuclear reactions and scattering. Tamura was always eager to set up collaborations with experimenters in order to stay abreast of the very latest experimental work in the field. By 1970 he had begun to study a variety of reaction-channel-coupling effects in nuclear reactions, particularly those in which two neutrons are stripped out of the target nucleus. Expanding his interest in these effects to the field of heavy-ion reactions, by 1975 Tamura was doing immensely complex calculations that allowed coupling between many different reaction channels, with realistic, finite-range interactions.

During the same period he was working actively in nuclear structure theory. He developed a new formalism that allowed him to write down a realistic fermion Hamiltonian for the nucleus and then to expand it, term by term, in a boson representation. Such an expansion, though laborious, makes it relatively easy to calculate the properties of a wide range of different nuclei in a unified and consistent way, and for the rest of his life Tamura was occupied in pushing this complex and powerful method to its limits.

In the late 1970s Tamura became interested in the description of the continuum spectra of nuclear reactions in terms of multistep direct reactions, and he pursued this approach with characteristic vigor for the remainder of his career.

No one who ever saw Tamura at work could forget the sight. His energy and powers of concentration were genuinely impressive. He actually *ran* to the water fountain or to get his mail so as to provide the minimal interruption of his efforts. In person, he was unfailingly kind, gentle and modest. It was easy to get him to talk about physics, but very difficult to get him to talk about himself, and almost impossible to get him to review his own achievements. Students found him a never-failing source of inspiration, while colleagues and collaborators found him a never-failing source of workable ideas, compact formalisms and neat computational tricks. His famous computer programs were models of compactness and clarity. He was an effective teacher, preparing unbelievably closely written lecture notes that seemed to explore every possible ramification of a subject. While a very quiet and private man, Tamura never shrank from getting actively involved in sometimes heated public discussions concerning the value of some theoretical approach or achievement.

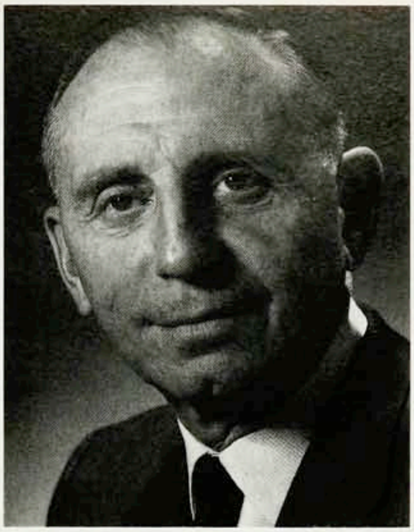
Shortly after he came to Texas in the late 1960s he fell seriously ill. He recovered quickly, and seemed to work as vigorously as ever, while at home he developed a number of relaxing hobbies, including painting in oils and watercolor, growing roses and creating beautiful arrangements with them, and listening to classical music. His health remained good until the spring of 1988, when he began to suffer from fatigue and was hospitalized for pneumonia. Despite these setbacks, he planned a full summer of activities, including lectures in Japan, Italy and Czechoslovakia. A heart attack soon after his arrival in Japan put an end to those plans, and Tamura devoted his energies to getting well enough to resume his duties in Texas in the fall. Unfortunately, a final heart attack occurred within a month after his return to Texas, where he had plunged into his teaching and research duties with characteristic vigor. The night before his death he had stayed up past midnight working on lecture notes for a course.

During the final decade of his life, Tamura was passionately interested in furthering close scientific cooperation between the theory group at Texas and various groups and individuals in Japan. He frequently expressed his love for both his native land of Japan and his adopted land, Texas. He spoke of the new spirit of increasing economic and scientific competitiveness that had arisen in Japan as well as of the generous, friendly and independent spirit he found characteristic of Texans, and he delighted in bringing them together. Both Texas and Japan may find him irreplaceable.

Takeshi Udagawa
Rory Coker
University of Texas, Austin

Lloyd P. Smith

Lloyd P. Smith, former professor of physics at Cornell University and research adviser to many industrial and government organizations, succumbed to a massive blood infection in Menlo Park, California, on 17 June 1988, at the age of 84.



Lloyd P. Smith

A native of Reno, Nevada, Lloyd graduated from the University of Nevada in 1925 with a degree in electrical engineering. His multifaceted career began with a transcontinental motorcycle trip to participate in the then-famous General Electric "Test School," where he (and his trombone) made quite a mark. At GE he became interested in doing graduate work in physics. After attempts to gain admission to an eminent Eastern institution, unsuccessful due to his "lack of classical languages," Lloyd was accepted into the physics program at Cornell, with the help of Willis R. Whitney of GE. He completed his PhD in 1930, and then became a National Research Council Fellow at Caltech and an International Research Fellow at Munich and Utrecht. He returned to Cornell in 1932 as an assistant professor, and he advanced to full professor in 1936.

With this broad training, his exceptional sense of the important in physics and his ability to identify gifted scientists, Lloyd played a seminal role over the next 20 years in building the Cornell physics department into a strong and diverse research and teaching department. Before World War II he brought Hans Bethe, his acquaintance from Munich, to Cornell, and, with Robert Bacher, catalyzed the development of nuclear physics there. He pioneered a course in mathematical methods in physics, and later, with another emigré, the mathematician Mark Kac, developed a curriculum in mathematical physics that continues today. After the war his recognition of new directions in physics and of the opportunity to recruit a new generation of outstanding physicists from the closing defense programs, together with his remarkable success at obtaining essential institutional support, led to the building of a strong and exciting department, which then went on to grow in particle physics, solid-state physics and astrophysics. However, Lloyd did not confine his efforts to the physics department. From his military and industrial consulting experiences, he recognized the need for training in physics appropriate to a broad array of careers, and with several other experienced faculty members he established and directed the School of Applied and Engineering Physics at Cornell, which has been preeminent in that field since its inception.

By 1956 Lloyd had become increasingly interested in research planning and policy, and he left Cornell for a series of executive positions at Avco, Ford Aeroneutronics, the Stanford Research Institute and the Desert Research Institute. At Avco he directed the development of a reentry vehicle for ballistic missiles. At the time of his death he was still active as a consultant in R&D planning.

Lloyd was a versatile physicist, one who carried out research in mathematical physics, atomic and electron physics and microwaves. After the war he recognized that the new microwave technology had opened the possibility of constructing a coherent quantum oscillator using the ammonia molecule inversion. However, the apparatus he built to realize this possibility was not able to achieve the necessary population inversion, which Charles Townes did achieve to make the "maser" workable. Perhaps Lloyd's greatest strength was his ability to combine powerful mathematical analysis with a deep practical insight into problems in physics or engineering.

His buoyant, engaging and persuasive personality will be remembered. He was an able tennis player and an avid fan, an accomplished musician and a vivid raconteur. He was a builder, teacher, scientist and adviser. But in the final analysis the university years were closest to his heart; his last *Who's Who* entry closes with the statement that of all his achievements he was proudest of the good students he had had. His associates over the years, especially those students, will remember him with warm regard.

Hans A. Bethe
James A. Krumhansl
Paul L. Hartman
Cornell University
Ithaca, New York
Robert L. Sproull
University of Rochester
Rochester, New York

Murray A. Lampert

Murray A. Lampert, emeritus professor of electrical engineering at Princeton University, died on 4 August 1988 at the Princeton Medical Center.

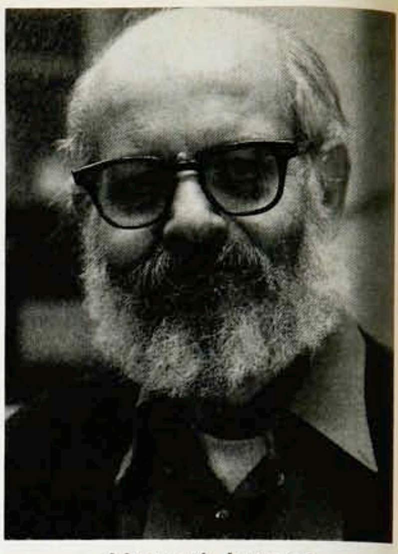
Lampert was born in New York City in 1921. He received a BA in mathematics from Harvard in 1942, and an MA in physics from Harvard in 1945.

Lampert was a teaching fellow in physics at Harvard in 1942–43 and an instructor in electronics at the Harvard Electronics Training School (for Armed Services personnel) from 1943 until 1945. In 1945 he headed the lens design group at the Optical Research Laboratory of the Harvard Observatory. From 1946 until 1948 he was a member of the theoretical group of the Radiation Laboratory of the University of California, Berkeley, where he worked on high-energy problems in nuclear physics. He worked at the Federal Telecommunication Laboratories (now the ITT Laboratories) from 1949 until 1952, studying traveling wave tubes and the interaction of microwaves with plasmas. The latter work resulted in the dielectric gyrator, which he coinvented with L. Goldstein and J. Heney.

Lampert joined the RCA Laboratories in 1952, and in 1958 became a member of the theoretical solid-state group, where he gave particular attention to the electronic physics of insulators. In the fall of 1966 Lampert was appointed professor of electrical engineering at Princeton, where he taught graduate courses in solid-state fundamentals and in insulator physics. During his university career he initiated research projects on charge injection and high-field transport of charge carriers in insulators and on the electronic properties of interfaces between thin insulating films and semiconducting substrates. In 1970, together with Peter Mark, he wrote *Current Injection in Solids*, the definitive book of its field.

One of Lampert's qualities was his irreverent appreciation of the absurdities of life, a characteristic that surfaces in the following quotation from his short autobiographical sketch:

> In 1966, in a strangely unrealistic effort to flee reality, I made a miscalculation of epic proportions and settled into a Grove of Academe. Three coronaries and one lengthy heart operation later I retired from that bizarre arena. At which point the thought occurred to me that possibly we dwell in a hazardous, uncertain world. And so currently, to explore further the mysteries of this familiar, unknown world I am studying biology and psychology—areas richly dense with unanswered and unanswerable questions. I also do a modest amount of consulting on the more comfortable terrain of solid-state physics.


Murray A. Lampert

During the last ten years of his life, Lampert studied some of the highly nonlinear equations that describe biological systems. He made the remarkable discovery that a spherical charge in an electrolyte becomes perfectly screened as the radius of the sphere tends to zero.

In studying these problems, Lampert used a powerful technique he had devised earlier to investigate highly nonlinear differential equations, namely the regional approximation. This consists of partitioning the space within the boundaries of the problem, retaining only the dominant terms of the equation in each region, and matching the solutions at the partition boundaries. He once said that this approach was one of the most useful tools in his analytical arsenal, and that while it sacrificed numerical accuracy, it greatly augmented physical insight.

And this was Murray Lampert's hallmark: keen physical insight. His mathematical analyses of the problems at hand, incisive as they were, never obscured the beautifully simple physical principles at work. He will be remembered for his integrity, his devotion to science, his lively mind, his cosmopolitan interests and his unstinting collaboration with his colleagues.

Albert Rose
RCA Laboratories, retired
Walter Curtis Johnson
Princeton University
Ramon U. Martinelli
David Sarnoff Research Center