Science (1978–95) and Tel Aviv University (1987–90).

Herman's publications affected physics. Generations of physicists—and engineers—fueled their mathematical tool kits from Morse and Herman's *Methods of Theoretical Physics,* whose first edition was published in 1953 and the most recent edition, in 1999 (McGraw-Hill). He put much of his energy into modernizing these volumes, including adding a chapter on group theory and its applications. Unfortunately, he did not complete this task before his death. His book, with Amos de Shalit, called *Theoretical Nuclear Physics* (Wiley, 1974), is one of the classics in the field; Herman wrote the sequel, *Theoretical Nuclear Physics: Nuclear Reactions* (Wiley, 1992), which deserves similar status.

Herman's impact on the physics literature went beyond his own writings. In 1957, he and Morse, in reaction to the splitting of the *Physical Review* into subfields and the publication's constraints on lengthy articles, founded the *Annals of Physics* to publish a range and depth of material. Herman succeeded Morse as chief editor.

Passionate about human welfare and rights and about the folly of war, Herman put his energy and talents into rectifying wrongs. He played a critical role in the founding of the Union of Concerned Scientists, served as its first chair, and continued to support it, especially on nuclear arms control. He pursued similar goals as chairman of the APS panel on public affairs (1976–78). In 1980, as APS president, he established a human rights committee to intervene in support of oppressed physicists in the Soviet bloc, Argentina, and Chile, and made major personal efforts on behalf of the dissidents and refuseniks. Of special interest was his fight for the freedom of Andrei Sakharov. On another front, he was instrumental in improving the position of women and minorities in physics and academia.

Herman's fervor for physics and people endeared him to his colleagues, even if his fierceness on behalf of his causes may have sometimes distressed them. He will be sorely missed by the physics community and his many friends.

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Hsu-Yun Fan

Hsu-Yun Fan, Duncan Distinguished Professor emeritus in the physics department at Purdue University and a leader in condensed matter physics, died in Lafayette, Indiana, on 5 October 2000 after several years of declining health.

Fan was born on 15 July 1912 in Shanghai, China. He received his BS in electrical engineering at the Harbin Polytechnic Institute in China in 1932. He earned an MS in 1934 and a DSc in 1937, both in electrical engineering, from MIT to which he was attracted by its international reputation. His doctoral dissertation was entitled "The Transition from Glow Discharge to Arc."

From 1937 to 1947, Fan worked at the National Tsing Hua University in Beijing, starting as an assistant professor and then becoming a professor of physics in 1939. Fan's tenure at Tsing Hua coincided with a politically turbulent period during which China suffered Japanese aggression followed by civil war. Indeed, the university was evacuated to Kunming in the Yunnan province during part of this time. During this period, Fan heroically managed to function as a scholar and teacher, and carried out research on the physics of electrical contact between a metal and a semiconductor, photoelectric and thermoelectric emission from metals, and the theory of rectification of an insulating layer.

After a short interlude as a visiting professor in the MIT physics department from 1948 to 1949, Fan was attracted to Purdue by Karl Lark-Horovitz, the head of the physics department and a pioneer in semiconductor physics. Fan joined the department as an associate professor at a most opportune time. As a result of wartime defense research, Lark-Horovitz had realized that the field of semiconductors offered great opportunities for exciting research, mobilized the department's resources, and assembled a team of young scientists to tackle a range of experimental and theoretical problems. Fan became a leader in this group and established, within a short time, an extremely productive line of studies, namely, the optics of semiconductors. He made pioneering contributions to the physics of semiconductors during this period.

Hsu-Yun Fan

Fan became a professor in 1951 and the Duncan Distinguished Professor in 1963, a position he held until his retirement in 1978. During the 1950s and 1960s, when semiconductor physics emerged as a major discipline in condensed matter physics and its impact was felt in both basic science and in device technology, Fan made many landmark discoveries. Examples are infrared transparency, absorption edge, and nature of the valence and conduction bands of silicon and germanium; free-carrier absorption in n- and p-type germanium and its complex valence band; and the temperature and pressure dependence of the energy gap of semiconductors. He also found that plasma edge associated with free carriers leads to optical determination of effective masses. His achievements in semiconductor physics are many, including lattice vibrations of covalent and ionic semiconductors, oscillatory intrinsic photoconductivity, and excitonic absorption in the III–V semiconductors. Fan made significant contributions to nearly every branch of semiconductor physics; his papers are standard references in the subject.

Fan maintained an active research program until the time of his retirement. Optical experiments and their analysis continued to occupy his interest. With striking success, he investigated such diverse phenomena as Faraday effect of p-type Ge, two-photon absorption and second-harmonic generation in semiconductors, and light scattering by magnons in magnetic oxides and sulphides.

After retirement, Fan continued to maintain a lively interest in semiconductor physics, the research activities of his colleagues, and the affairs of the department of physics. Based on his many years of teaching, he wrote an

advanced textbook on condensed matter entitled *Elements of Solid State Physics* (Wiley, 1987).

Fan's achievements are uniformly characterized by a sharp focus on fundamental issues, meticulous attention to detail, and careful analysis of experimental data and their physical significance. The range of problems he successfully tackled speaks highly of his intellectual vigor and ambition. During his distinguished career, he mentored 22 PhD students and 20 research associates. He applied to himself and demanded from his collaborators the highest standards, which undoubtedly contributed to the success of his associates. Above all, the originality of ideas and the tenacity with which he pursued them are the hallmarks of Fan's numerous scientific accomplishments.

Purdue's admiration for Fan and pride in his achievements are expressed in the recognitions he received: the Sigma Xi Research Award (1954) and the Herbert Newby McCoy Award (1969).

Fan's international reputation is equally based on his authoritative review articles that have served as milestones in semiconductor physics, and on his scientific leadership in introducing generations of graduate students and postdoctoral associates to the rigors and pleasures of original research. He taught condensed matter physics to advanced students for more than a quarter of a century. Insistence on conceptual and logical clarity characterized his interactions in the classroom, his seminars, and his research with students and collaborators from around the world. His influence continues in many national and international institutions. With his departure, an important chapter in the history of the Purdue physics department comes to a close.

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Werner Lindinger

The scientific community lost a great friend and colleague with the tragic drowning of Werner Lindinger on Kauai, Hawaii, on 16 February 2001. He was a pioneer in the study of ion–molecule interactions.

Werner was born in Brixlegg in the Austrian Tirol on 25 January 1944. In 1963, he enrolled at the University of Innsbruck, where he received his PhD in physics in 1972. His doctoral thesis

WERNER LINDINGER

was on the mass spectrometry of ions sampled from the negative glow plasma in a cylindrical hollow cathode.

From 1967 to 1972, Werner was a part-time teaching assistant at the University of Innsbruck's Institute of Atomic Physics. In 1972, he accepted a tenure track position at the institute.

In 1973, Werner initiated his professional career as a Max Kade Foundation postdoctoral exchange fellow in the aeronomy laboratory of the National Oceanic and Atmospheric Administration (NOAA) in Boulder, Colorado, where he remained until 1975. His considerable talent and exceptional energy led to an extremely productive period there. He rigorously exploited the newly developed flowing afterglow technology for the measurement of thermal and low-energy ion–molecule interactions, ion mobilities, and ion reactions with mainly neutral molecules.

Werner returned to the physics faculty at the University of Innsbruck in 1975. He was instrumental in developing an atomic and ion physics program that quickly achieved international recognition and led to a professorship in 1978 at the Institute of Experimental Physics in Innsbruck. Werner's group made important contributions to ion–molecule reaction kinetics and a variety of ion–molecule interaction processes, and original contributions to thermochemistry. A notable example is their series of studies of molecular–ion vibrational quenching in neutral collisions. Those detailed studies led to greatly increased understanding of the mechanistic processes involved.

In later years, Werner's interests broadened from gaseous electronics. His group extended the application of ion flow systems to supersensitive detection of trace gases in an online, real-time manner in the 1980s by using ion–molecule reaction mass spectrometry (IMR-MS) based on charge exchange reactions and, in the 1990s, by using the proton transfer reaction mass spectrometry (PTR-MS) technique. Werner and his colleagues pioneered its use in a variety of applications in medicine and food analyses, and its use in highly time-resolved studies of the emissions from vegetation and biomass burning to the atmosphere. Many research groups around the world are now applying this technique for studies of biosphere–atmosphere interactions. At the time of his death, Werner was in Hawaii to install his instrument at the NOAA Clean Air Baseline Station on Mauna Loa.

Werner lectured widely in Europe and the US for many years. He was a guest professor at the University of Trento in Italy and the University of Utah, Salt Lake City. His outstanding research on the measurement of thermal and low-energy ion–molecule interactions, ion mobilities, and ion reactions with primarily neutral molecules earned him, early in his career, the Fritz Kohlrausch Prize, the Austrian Physical Society's most prestigious award, in 1976. His scientific achievement was recognized in 1997 with Austria's highest science award, the Erwin Schrödinger Prize of the Austrian Academy of Science.

Werner's interests were broad and varied. He had a lively appreciation of art and music. He was a vigorous person physically. Like many Tiroleans, he was an accomplished skier. He also was an avid hiker and a regular tennis player. In later years, he became a serious equestrian, riding in two African safaris.

Werner's warm and outgoing personality led to the formation of many deep friendships in Boulder, many persisting actively throughout his life. He had friends not only at NOAA, but also at JILA and the University of Colorado's chemistry department. Werner's extraordinary joy of living made his friendship a rewarding and memorable experience. He will be sorely missed.

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