

WE HEAR THAT

ASA Bestows Honors in San Diego

At the 134th meeting of the Acoustical Society of America, held this month in San Diego, six individuals were honored for their contributions to acoustics.

Robert W. Young, was elected to honorary fellowship in ASA, a distinction that has been given to only 12 other individuals (the first was Thomas Alva Edison). Young was honored for his "contributions encompassing many areas of acoustics, to international standards and acoustical terminology, and for sustained and devoted service to the Society." Until he retired in 1982, Young was a consultant to what was then the Naval Ocean Systems Center in San Diego.

Russell Johnson, owner and founder of Artec Consultants in New York City, received the Wallace Clement Sabine Award for "contributions to the understanding of the acoustics of performance spaces and the design of concert halls, theaters, and opera houses throughout the world."

Alice H. Suter, owner of Alice Suter and Associates in Ashland, Ore-

gon, was given the Distinguished Service Citation for "increasing public awareness of acoustics and for dedicated service to the Society as editor of *Echoes*," the ASA quarterly newsletter.

The Silver Medal in Speech Communication went to **Patricia K. Kuhl**, chair of the department of speech and hearing sciences and the William P. and Ruth Gerberding Professor at the University of Washington, for "contributions to the understanding of the innate and learned aspects of speech perception and production."

Robert E. Apfel, the Robert Higgin Professor of Mechanical Engineering at Yale University, received the Silver Medal in Physical Acoustics for "contributions to the understanding of acoustic cavitation, acoustic radiation pressure, and the bioeffects of medical ultrasound."

The Silver Medal in Acoustical Oceanography went to **Herman Medwin**, an emeritus professor of physics at the Naval Postgraduate School and owner of Ocean Acoustics Associates in Pebble Beach, California, for "contributions to the understanding of acoustical scattering, absorption and ambient noise, particularly in relation to the acoustics of bubbles in the sea."

to studies of pion physics. In 1953, he joined the physics department at the University of Michigan. Four years later, he moved to the University of Pennsylvania (1958–60), before settling at Columbia University in 1960. He held visiting positions at the Ecole Normale Supérieure in Paris (1957–58) and at Rockefeller University (1967–1968 and 1975–1976).

Beginning in 1953, Luttinger spent more than a dozen summers at Bell Telephone Laboratories. There, he began a long and fruitful collaboration with Walter Kohn, another summer visitor. He also had strong interactions with resident theorists such as Conyers Herring, Melvin Lax and Philip Anderson, with other, less regular visitors such as Philippe Nozières and John Ward and with resident experimentalists. The early successes of the Kohn–Luttinger visits played a major role in Bell Labs' decision to form and support its theory department.

His research between 1953 and 1965 produced a long string of epoch-making papers. Partly in collaboration with Kohn, Luttinger developed the effective mass theory of electrons and holes in semiconductors and applied it to shallow impurity states and to optical and magnetic effects. Since then, effective mass theory has become an integral part of the thinking about charge carriers in semiconductors.

Also with Kohn, Luttinger carried out the quantum derivation of the Boltzmann transport equation, which made possible the study of higher-order quantum effects such as the ferromagnetic Hall effect.

Luttinger, partly with Kohn, Nozières and Ward, contributed critically to the many-body theory of interacting three-dimensional electrons, including the derivation of the Landau theory of interacting Fermi liquids to all orders in perturbation theory and the de Haas–Van Alphen effect for interacting electrons. Especially noteworthy was what became known later as the Luttinger theorem, which states that the volume enclosed by the Fermi surface of interacting electrons in an external potential is unaffected by the interaction and is completely and simply determined by the number of electrons. This exact theorem is a cornerstone of the theory of strongly interacting electron systems.

In 1963, Luttinger published an exact solution for interacting one-dimensional fermions. (His model was related to an earlier, approximate model devised by Sin-Itiro Tomonaga.) One-

OBITUARIES

Joaquin M. Luttinger

On 6 April, the noted theoretical physicist Joaquin M. (Quin) Luttinger died suddenly in New York City at the age of 73 of complications arising from cancer of the bone marrow. He had been in good spirits until just a few days earlier. Luttinger's major work, done mainly in the period 1945–70, has left its imprint on physics and continues to have a strong influence on current developments.

Having earned a BSc in 1944 and PhD in 1947—both in physics at MIT—Luttinger took advantage of a Swiss–American exchange fellowship to become the first American postdoc in Wolfgang Pauli's group at the Swiss Federal Institute of Technology in Zurich after World War II. There, he demonstrated his brilliance in contributions, made partly with Res Jost, to the just-developed renormalized quantum electrodynamics. Especially noteworthy is his 1948 calculation of the anomalous magnetic moment of the electron, carried out independently of and approximately simultaneously with the calculation by Julian Schwinger.



JOAQUIN M. LUTTINGER

In his early work—as a National Research Council Fellow (1948–49), Jewell fellow at the Institute for Advanced Study (1949–50) and physics professor at the University of Wisconsin (1950–53)—Luttinger pursued interests that were eclectic, ranging from his thesis work on antiferromagnetism

dimensional Fermi systems, now called Luttinger liquids, differ in essential ways from three-dimensional Fermi liquids. The physics of Luttinger liquids is relevant to one-dimensional conductors and to edge currents in the quantum Hall effect, and has been proposed as relevant to two-dimensional interacting electrons, such as those involved in high-temperature superconductors.

In yet other work, undertaken partly with Kohn, Luttinger demonstrated superfluidity and superconductivity in three-dimensional Fermi systems with purely repulsive interactions. Accordingly, the ground state of such a system was not like that of the Landau-Fermi liquid theory, but had an instability that destroyed the sharp Fermi surface.

Luttinger and Kohn also introduced the concept of anomalous diagrams, which lead to Fermi surface rearrangements.

This period of Luttinger's greatest productivity coincided with what one might call the classic period of many-body theory, in which the presently accepted canon was constructed. Luttinger not only was one of the giant figures of that period but also laid some of the foundations for present-day revisions of that canon.

As a teacher at Columbia, Luttinger received student evaluations that were the envy of his colleagues. Despite a strong aversion to public duties, he was persuaded to serve as chairman of the department from 1977 to 1980. In discussing appointments and promotions, he was always the hardest person to satisfy. If Luttinger approved, his colleagues knew they had made a good choice.

In spite of two decades spent in exile elsewhere, Luttinger was really at home only in New York City, the place of his birth. He was raised in a brownstone on Washington Square and lived nearby in the 1960s.

Luttinger was widely read in English, French and German, had a fine ear for classical music and, in the 1960s and 1970s, experimented with abstract plastic arts. He was a delightful conversationalist with a sense of fun, including a touch of irony, and was the life of every party. Luttinger had a natural love of and affinity for children, both his own and those of his relatives and friends.

Luttinger's work was marked by mathematical power and originality; he had an exceptional ability to formulate theories in appropriate and beautiful mathematical structures. His scientific papers stand out for their clarity and literary quality. With his death, the world of physics, especially con-

densed matter theory, has lost an original and influential voice that helped to shape the discourse in the second part of this century and will be heard far into the future.

PHILIP W. ANDERSON

*Princeton University
Princeton, New Jersey*

RICHARD M. FRIEDBERG

*Columbia University
New York, New York*

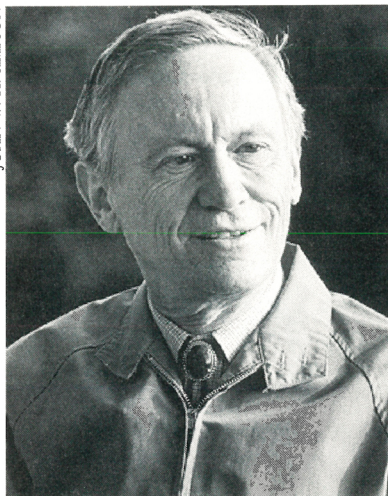
WALTER KOHN

University of California, Santa Barbara

Martin Schwarzschild

Martin Schwarzschild, one of this century's leading astrophysicists, passed away in Langhorne, Pennsylvania, on 10 April, just 10 days after the death of Lyman Spitzer Jr, his close friend and another great scientist.

Born on 31 May 1912, in Potsdam, Germany, Martin earned his PhD in astronomy at the University of Göttingen in 1935. As Hitler's persecution of Jews intensified, he had to leave Germany—initially, for a year in Oslo



JOHN W. H. SIMPSON

MARTIN SCHWARZSCHILD

as a Nansen research fellow. After a brief visit to England, he emigrated to the US in 1937, and became a citizen in 1942.

Following relatively short-term appointments at Harvard and Columbia Universities, he accepted a full professorship at Princeton University in 1947, becoming the Higgins Professor of Astronomy in 1951.

Martin arrived at Princeton at the same time as Spitzer, and he made it clear that Spitzer's appointment as the director of Princeton's observatory was critical to his acceptance of the offer of a professorship. In turn, Spitzer made his acceptance conditional on Schwarzschild's. Building on former observa-

tory director Henry Norris Russell's foundations, the two men made Princeton a center of excellence in theoretical astrophysics, as there were few others of their caliber anywhere in the world.

Martin is best known for his work on the theory of stellar evolution. His book *Structure and Evolution of the Stars* (Princeton University Press, 1958) became the classic text in this field of research. Among his many contributions, perhaps the most fundamental were understanding the structure of red giant stars and using the results to determine stellar ages.

He pioneered the use of computers for calculating numerical models of the stars. As early as 1941, he published the paper "Automatic Integration of Linear Second-Order Differential Equations by Means of Punched-Card Machines." A few years later, he was one of the first to recognize the potential of the early computers developed at Princeton by John von Neumann, and to use them for research.

One of the most intractable theoretical problems in stellar structure was—and still is—explaining the inefficiency of convection just below the stellar atmosphere. Martin recognized that progress could best be made by obtaining very high angular resolution images of the Sun—specifically, by measuring the scale of the turbulent eddies known as solar granules. The fact that all telescopes on the ground have their images blurred by Earth's atmosphere led Martin to develop Stratoscope I in the 1950s and Stratoscope II in the 1960s. These were balloon-borne telescopes with diameters of 12 and 36 inches, respectively, that provided diffraction limited images of the Sun and various other objects, including the nucleus of the nearby Andromeda galaxy. The high resolution of the images demonstrated the scientific potential of observations made from above the atmosphere and paved the way for the Hubble Space Telescope.

Although Martin had always been interested in the structure of galaxies, it did not become his primary area of research until after his retirement in 1979, when he developed a novel and very powerful method of constructing numerical models of stellar systems. His was the first clear demonstration that elliptical galaxies are typically triaxial objects, rather than oblate spheroids. This finding opened up a broad new field of modern theoretical and observational research.

Martin was also very active in public affairs, serving for several years as the vice president of the International Astronomical Union and president of the American Astronomical Society. In