

rected toward measuring actual combat performance of fighter planes and communicating the results in a form useful to pilots. He also helped plan the program for bombers to overfly Germany and land in the USSR. He was called back to the US in 1944 and assigned to the uranium isotope separation project at the Radiation Laboratory of the University of California, Berkeley. He spent the year 1946 working in the Pentagon as Special Assistant to General Curtis LeMay, who had recently relinquished command of the 20th Air Force and who would soon become the first head of the Strategic Air Command. Appointed director of research of the Atomic Energy Commission in 1947, Johnson worked with James B. Fisk to establish the research division of the newly formed agency. As assistant director of the division, he played an instrumental role in the program for exporting radioisotopes to foreign countries for research purposes.

From 1950 onward, Johnson worked in the aerospace industry, starting at the Hughes Aircraft Company. As a vice-president and the director of the research and development laboratories, he was one of the people most responsible for making Hughes a nationally recognized producer of electronics and guided missiles. He joined the Ramo-Wooldridge Corporation in 1953, as associate director of the guided missile division, and later became corporate vice-president of science and technology and a member of the board of directors of the parent company (now TRW Inc).

Johnson was a member of the visiting committee of the MIT physics department during the 1950s, and co-chaired the Administration Panel of the Study Committee on the National Institutes of Health, which was established by President Lyndon Johnson in 1965.

After Ralph Johnson's retirement in 1962, he and his wife Phyllis traveled adventurously. Their most extensive trip took them from Los Angeles to the Strait of Magellan in a Karmann-Ghia two-seater. On a trip to China in 1985, he suffered a heart attack that required a protracted hospital stay in Shanghai. He returned to the US in improved condition, but did not fully recover.

Johnson had a warm sense of humor that was enhanced by a gift for understatement. He was admired and loved by colleagues for thoughtfulness, tolerance, clarity of thinking, and communication skills, both written and verbal. His broad wisdom, when perceived behind his propensity for self-effacement, caused us

and many others to seek and prize his advice.

DAVID B. LANGMUIR

Santa Monica, CA

SIMON RAMO

Los Angeles, CA

DEAN E. WOOLDRIDGE

Santa Barbara, CA

Bernard A. Lippman

Bernard A. Lippman, an emeritus professor of physics at New York University, died on 12 February 1988 at the age of 73. Despite a debilitating final illness, he continued to do research and publish his results until the very end.

Lippman was born in Brooklyn, New York, in 1915. He got his bachelor's degree in electrical engineering from the Polytechnic Institute of Brooklyn in 1934, his MS in physics from the University of Michigan in 1935 and his PhD in physics from Harvard in 1948. In his thesis, written under the supervision of Julian Schwinger, he developed the Lippman-Schwinger integral equation for scattering processes—his best-known work. Thereafter he was frequently asked, "Are You the Lippman of the Lippman-Schwinger equation?" On one such occasion, an amused Lippman strolled over to Schwinger, who happened to be nearby, and asked, "Are you the Schwinger of the Lippman-Schwinger equation?"

After holding various engineering jobs from 1935 until 1941, Lippman joined the MIT Radiation Laboratory, where he stayed until the end of World War II. There he did both experimental and theoretical work on 3-cm (X-band) and 1-cm (K-band) microwave circuit components, and he did basic work on the application of equivalent circuit techniques to direc-

Bernard A. Lippman



tional couplers and to microwave junctions. From 1946 until 1948, while working toward his PhD at Harvard, he led the radar receiver group at the Submarine Signal Company in Boston.

For the next few years Lippman studied the motion of charged particles in magnetic fields at the Naval Research Laboratory. Then, in 1953 and 1954—about the same time as his work on reactor physics with Nuclear Development Associates—he made an important contribution to the theory of scattering by periodic surfaces. In 1957, after a year's work on magneto-hydrodynamics at NYU's Institute of Mathematical Sciences and another year spent heading a solid-state group at the Polytechnic Institute of Brooklyn, Lippman accepted a position at the Lawrence Radiation Laboratory, where he studied electromagnetic and quantum-mechanical scattering. He remained at LRL until 1962. Lippman directed the physics division of General Research Corporation in Santa Barbara, California, for the next four years, and in 1968–1969 he worked as a senior research associate at the NASA Goddard Institute for Space Studies in New York City. He began his physics professorship at NYU in 1969, and took an early retirement in 1977, in order to move to California. There Lippman became manager of the theoretical physics department at Physics International Company in San Leandro, California, a manufacturer of intense electron beam generators.

Lippman's work covered a broad range of theoretical physics—classical, quantum mechanical and relativistic. Because his physical insight and analytical skill enabled him to resolve difficulties in diverse areas, he was also successful in a variety of fields of applied physics. He was particularly adept at finding simple methods to treat problems that were traditionally solved in difficult or cumbersome ways. As a consequence, many of his publications are short didactic papers. He wrote a great number of classified reports, so his published work represents only a small part of his total accomplishment.

Bernard Lippman will be remembered by his friends, colleagues and students for his open and engaging personality and his willingness to provide helpful and insightful support when needed. His insistence on simplicity in analyzing a wide range of physics problems was his hallmark, and will be missed.

JOSEPH B. KELLER

Stanford University

Palo Alto, California ■