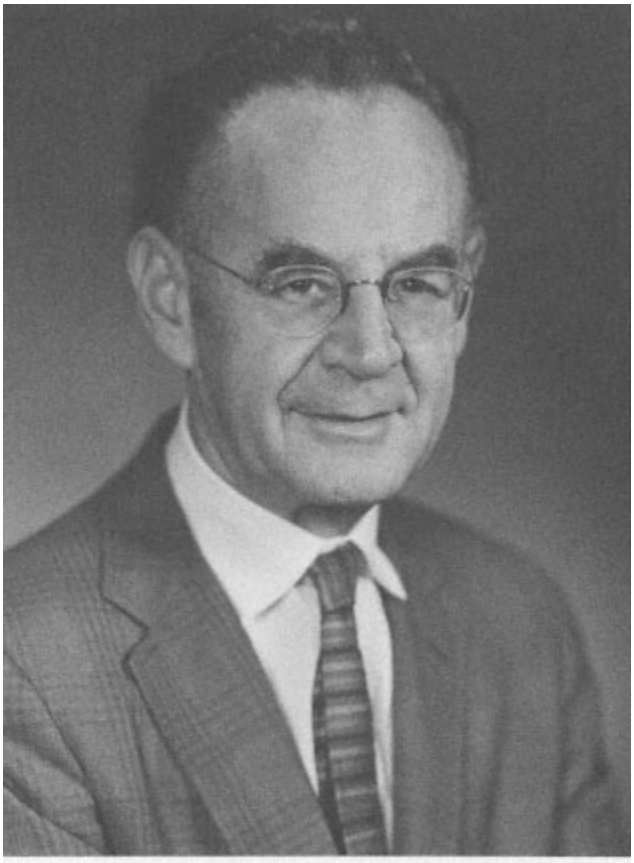

Albert Rose

1910-1990

By Paul K. Weimer

ALBERT ROSE, an eminent research physicist and pioneer in the development of electronic imaging, died on July 26, 1990, at the age of eighty.

Born in New York City in 1910, Al received his A.B. from Cornell University in 1931 and his Ph.D. in 1935. Soon thereafter he joined the technical staff of the Radio Corporation of America (RCA) and spent most of his career as a research fellow at the RCA David Sarnoff Research Center in Princeton, New Jersey. Al's contributions to science and engineering were widely recognized, leading to his election to the National Academy of Engineering in 1975.

The development of television was already a major objective at RCA when Al joined the company in 1935. His first assignment was to design a new television camera with greatly improved sensitivity. At that time an optical image of the scene to be transmitted was focused on a light-sensitive "camera tube" such as an iconoscope that generated the video signal by scanning the image with a high-energy electron beam. Unfortunately, the secondary electrons produced by the high-velocity beam tended to degrade the charge pattern and diminish the signal. Al's first important advance in camera tubes was the use of a "low-velocity" scanning beam that eliminated the redistribution of secondary electrons. The resulting new tube, which was developed in collaboration with Harley Tams, was called an orthicon. It

provided several times higher sensitivity than the iconoscope and better picture quality.

Al's second major innovation, just before World War II, was his invention of the "two-sided thin-glass target," which permitted the construction of a much improved camera tube to be known as the image orthicon. The image orthicon was developed with colleagues H. B. Law and P. K. Weimer for military purposes during the war, and it served for twenty years after the war for most television broadcasting. Its sensitivity exceeded that of its predecessors by a hundred times, permitting television pickup under very adverse lighting conditions.

Concurrently with the above work, Al began to examine the fundamental performance limitations of other types of image sensors, including photographic film and the human eye. He showed that the number of photons required to detect an image of a given contrast and resolution could be calculated for an ideal image sensor whose quantum efficiency was known. Publication of this work in the early 1940s received considerable attention. It was summarized again later in Al's book titled *Vision: Human and Electronic,* published by Plenum Press in 1973.

The complexity of the image orthicon and the rather low quantum efficiency of its photocathode suggested the desirability of a camera tube based on photoconductivity rather than photoemission. In 1948 Al initiated an investigation at RCA that resulted in the development of the first photoconductive camera tubes of the now well-known vidicon type. At about the same time, he began a reexamination of the nature of photoconductivity in a series of papers that presented its basic mechanism as we now understand it. He showed the dependence of its gain-bandwidth product (its figure of merit for devices) on the nature of the contacts to the photoconductor and on the internal distribution of its traps and recombination centers. This work was summarized later in his book titled *Concepts in Photoconductivity and Allied Problems,* published by John Wiley and Sons in 1963.

Although Al never sought a position in research management, RCA asked him in 1955 to direct the establishment of an RCA Laboratories research branch in Zurich, Switzerland. Al's

prestige as a scientist and his stimulating personality attracted talented young applicants and helped establish an immediate rapport with other European laboratories.

Upon returning to the Sarnoff Research Center in 1957, Al joined the solid-state physics group, where his superb grasp of fundamental physics and electronics was most valuable. His approach to problems and the warm regard of his colleagues were perfectly expressed by M. A. Lampert and P. Mark in the dedication of their book *Current Injection in Solids:* "To Albert Rose, who chose simplicity over precision, and thereby gave to all of us insight." Although Al published more than seventy papers, he always had time to help and advise younger colleagues.

For many years Al served as an associate editor of *Physical Review* and of *Advances in Electronics,* and he was on the editorial board of the *International Journal of Physics and Chemistry of Solids.* He also served on the organizing committees of many international conferences on subjects such as photoconductivity semiconductors, surfaces, electrophotography, and electronic imaging.

Upon his retirement from RCA in 1975, Al was appointed a Fairchild Distinguished Scholar at the California Institute of Technology, and in later years he was a visiting professor at Stanford University, Hebrew University in Jerusalem, and several other schools. After returning to Princeton in 1981, he worked as a visiting scientist at the Exxon Laboratories and later at the Chronar Corporation. He also supervised the republication of a collection of his later papers as a book titled *Electron-Phonon Interactions,* published by World Scientific in 1990. He continued to participate in technical conferences on electronic imaging and to present the Albert Rose Electronic Imager of the Year Award that had been created in his honor in 1986 by the Institute for Graphic Communications.

Al's work resulted in many awards. He was a fellow of the American Physical Society and of the Institute of Electrical and Electronics Engineers (IEEE) and a member of the Society Suisse de Physique and Phi Beta Kappa. Other honors included the Morris N. Liebmann Award of the Institute of Radio Engineers (now IEEE) (1945); corecipient of the Television Broad

casters Award (1945); the Journal Award of the Society of Motion Picture and Television Engineers (1946); the David Sarnoff Gold Medal Award of the Society of Motion Picture and Television Engineers (1958); election to the National Academy of Engineering (1975); the Edison Medal of the IEEE (1979); an honorary doctoral degree from the Rochester Institute for Technology (1989); and, posthumously, a Pioneer Induction to the New Jersey Inventors Hall of Fame (1991).

As a strong advocate for the use of solar energy for power generation, Al received the Leo Friend Award for his paper titled "Solar Energy: A Global View," published in the *Chemtech* journal of the American Chemical Society (1981). This unexpected tribute from another discipline shows the breadth of vision of this creative and concerned humanist.