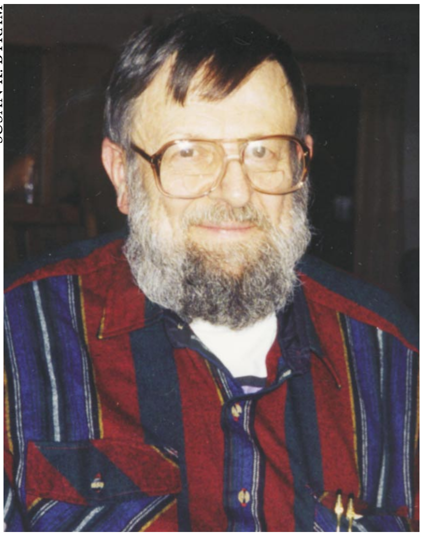
SUSAN K. BYRAM



ROBERT ALLEN SPARKS

sessed an infectious enthusiasm for crystallography and great patience for anyone willing to learn it. Bob received his BS in 1950 and MS in 1953, both in chemistry, from UCLA.

While at UCLA, with Ken Trueblood, Bob was involved in the early computational stages of determining the chemical formula of vitamin B_{12}. Under Trueblood's direction, Bob, as a graduate student early in 1954, helped write the computer programs for the National Bureau of Standards SWAC computer that enabled calculation of electron-density maps for vitamin B_{12}. This work, writing programs for binary-coded punch cards in assembly language, was highly significant in the days when computers were simply glorified adding machines.

In the early 1950s, the structure of vitamin B_{12} was the largest one of unknown chemical formula (93 nonhydrogen atoms) to be tackled. Trueblood, anxious to try out these computations on large structures, contacted Nobel laureate Dorothy Crowfoot Hodgkin at Oxford University. She sent experimental data and Bob, with Trueblood, Dick Prosen, and others, worked through many nights on the computer to produce B_{12} maps. They replaced, when necessary, the vacuum tubes in SWAC, which had a 20-minute mean time between failures. The structure of the hexacarboxylic acid, which established the ring structure of vitamin B_{12}, was published by Hodgkin and others in *Nature* in 1955, and the air-dried and wet native B_{12} structures, which Bob worked on, were published in various publications during the period 1959 to 1962.

Bob received his PhD in 1958 from UCLA under the direction of Trueblood. Bob's thesis was entitled "I. Refinement of Crystal Structures. II. The Structure of Anthracene and Naphthalene. III. The Structure of Postassium Chlorate." He then became an NSF postdoctoral fellow at Oxford in Hodgkin's laboratory, where he wrote a program to locate the 88 hydrogen atoms in the structure, a final confirmation of the chemical formula reported by Hodgkin and coworkers.

Bob cofounded Syntex Analytical Instruments in 1969 to develop computer-controlled x-ray diffractometers. That company, together with California Scientific Systems, which he cofounded in 1978, evolved into Bruker AXS, where Bob remained a driving force behind the development of more than 1000 diffractometers and charge-coupled device instruments for crystallography. He consistently strove to make the software easier to use and accessible to nonexperts, even as the instruments grew capable of solving larger and more complex structures. Several generations of instrument users consider him their mentor. While at Syntex, he also contributed to the development of computer-aided tomography scanners, and later to the development of the Imatron CT heart scanner widely used in hospitals today. A primary interest of his was the development of computer graphics programs to facilitate crystal structure determination and analysis; he presented a set of future plans for such work at the Los Angeles ACA meeting.

Bob's work on crystal structure determination was combined with important contributions to the teaching of x-ray crystallography. He persuaded Trueblood to propose with him a national course for teaching crystallography. This proposal resulted in the annual ACA summer school in crystallography. Bob was codirector of the school for 10 years, from its inception in 1992, when it was held at the University of Pittsburgh, until it moved to its present location at the University of Georgia in Athens, where he actively taught during the summer of 2001 just before the ACA meeting in Los Angeles. The summer courses have been great successes; to date, about 407 students have attended. Bob also served as the treasurer of ACA from 1980 to 1985.

A symposium in his honor had been planned for the next ACA meeting in San Antonio, Texas. Bob had been informed of this honor and was delighted. The symposium will now be in San Antonio on 26 May 2002 as a memorial tribute to a man who has influenced and was admired by so many crystallographers.

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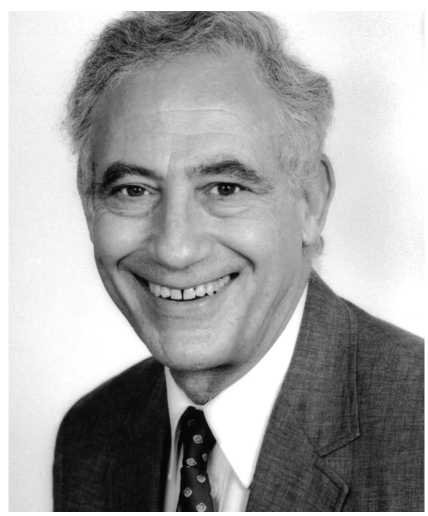
Thomas Howard Stix

Thomas Howard Stix, an original thinker in plasma physics and one of the field's leading developers, died of leukemia on 16 April 2001 in Princeton, New Jersey. He was a professor emeritus in astrophysical sciences at Princeton University.

Tom was born in St. Louis, Missouri, on 12 July 1924. He served in the US Army Signal Corps from 1942 to 1945. He received his BS in physics from Caltech in 1948 and his PhD in physics from Princeton in 1953. His doctoral thesis, under Ronald R. Rau, was entitled "Heavy Nuclei in the Primary Cosmic Radiation: Investigation at Balloon Altitudes by Cloud Chamber and Proportional Counter Telescope."

After receiving his doctorate, Tom joined Project Matterhorn, then a small classified project on Princeton's Forrestal campus, aimed at harnessing fusion energy for peacetime use. Under the leadership of Lyman Spitzer, Project Matterhorn grew rapidly. In 1961, during the time Tom was heading the experimental division, the project's name was changed to the Princeton Plasma Physics Laboratory.

An early assignment at Project Matterhorn in 1956 brought Tom to the problem of plasma heating by radio frequency (RF) waves. Spitzer had proposed a low-frequency scheme called magnetic pumping. An early fusion device, the B-64 stellarator designed and built by Tom, exhibited



THOMAS HOWARD STIX

only marginal heating. But Tom showed that waves at a higher frequency—the so-called ion cyclotron frequency—could lead to impressive heating even on the small devices used in the late 1950s. His inventions included a coil structure in which sections of coil were alternately wound around the device clockwise and counterclockwise. Later known as a Stix coil, this structure successfully coupled RF waves at ion cyclotron frequencies into the plasma.

Thus began a series of ideas by Tom that revolutionized research in plasma heating and continue to be used today. Tom showed how microwaves injected from antennas or waveguides could heat plasma to thermonuclear temperatures while the plasma remained confined within powerful magnetic fields. His paper "Fast Wave Heating of a Two-Component Plasma," published in 1975 in *Nuclear Fusion*, remains one of the most often cited papers published by that journal.

Tom also made important contributions to the theory of stochastic and chaotic behavior of particles and magnetic fields in plasmas. His pioneering achievements include the first (1956) plasma diverter experiments and his theoretical work on heating plasma through neutral beams. In recent years, he was widely recognized for his suggestions on using infrared lasers to destroy atmospheric chlorofluorocarbons.

Tom is also credited with shaping graduate education in modern plasma physics. In 1962, growing out of his research efforts and the need to teach students entering the new, exciting, and recently declassified field of thermonuclear fusion, Tom published his classic text, *The Theory of Plasma Waves* (McGraw-Hill). Enormously influential, this book educated and inspired generations of plasma physicists on the use of plasma waves both for laboratory and astrophysical applications. Also in 1962, Tom was appointed professor of astrophysical sciences at Princeton and given primary responsibility for the then fledgling program in plasma physics, which he directed from 1962 to 1991. In 1992, Tom published *Waves in Plasma* (American Institute of Physics), a much expanded and updated account of his lifelong passion.

That same year, a scientific symposium was held in Tom's honor. The many attendees included numerous alumni of Tom's graduate program. Most evident at this fest were not only recognition of Tom's scientific accomplishments, but also immense appreciation for his warmth, humor, and genuine concern for people.

Tom embraced civic responsibility in the many communities in which he found himself. He served as chair of the American Physical Society's division of plasma physics (1962–63) and the APS committee on international freedom of scientists (1984–85). He also worked tirelessly on behalf of human rights and the political freedom of scientists worldwide. He was chair of the Princeton Hillel Foundation (1972–76) and the Princeton United Jewish Appeal (1954–55 and 1963–64).

Tom received a Guggenheim fellowship in 1969, spending one of his three sabbaticals at the Weizmann Institute of Science in Israel; Tom very much enjoyed these sabbaticals. When he received the APS's James Clerk Maxwell Prize for Plasma Physics in 1980, Tom played a Jack Benny recording at the prize ceremony. What happened next is that Tom surprised the audience a second time. Using his own finest hour to correct a historical wrong, he invited to share the podium with him a physicist whom, in Tom's opinion, history had passed over unjustly. In 1999, he was awarded the Distinguished Career Award by Fusion Power Associates.

Tom loved life. He and his wife Hazel enjoyed traveling worldwide. Alumni invariably remember Tom and Hazel as gracious hosts, who opened their house to graduate students for memorable festivities. Tom enjoyed windsurfing, swimming, skiing, and snorkeling well into his seventies. A devoted grandfather, he learned last year to scooter with his two grandsons around Central Park.

Science was important to Tom, and he found it beautiful. However, although many scientific projects around the world were built on his ideas, he did not appear to take all of this too seriously. He loved gadgets, new ideas, and ideas with impact; he was an inventor. He used to tell students that he was getting paid for his hobby. He was a playful physicist, generous with his own ideas. There was a gesture of his hand, or a shake of his head, that said, "Here's an idea. You can have it. It's yours to play with too if you want."

Tom's colleagues will remember him for his unassuming style and grace that came with doing physics effortlessly and modestly.

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