



*S.A. Bowhill*

# SIDNEY A. BOWHILL

1927–2012

Elected in 1971

*“Contributions to aeronomy and the fostering of national and international programs in radio research.”*

BY LESLIE G. SMITH AND JAMES A. HUTCHINSON  
SUBMITTED BY THE NAE HOME SECRETARY

**S**IDNEY ALLAN BOWHILL, a pioneering educator and researcher of Earth’s upper atmosphere, was born on August 6, 1927, in Dover, England, to Sidney Allan and Violet (née Clarke) Bowhill. After attending Cheltenham Grammar School, he enrolled at Downing College, Cambridge University, where he earned a BA in physics in 1948. He undertook graduate work in Cambridge’s legendary Cavendish Laboratory under the direction of the eminent radio physicist John A. (“Jack”) Ratcliffe, and completed his PhD in 1954 with a dissertation entitled “Some Problems in Very Long Radio Wave Propagation.”

From 1953 to 1955, working in the Baddow Research Laboratories of Marconi’s Wireless Telegraph Company, Ltd., Bowhill supervised projects investigating long-distance pulsed radio signals. He then immigrated to the United States and embarked on a prolific academic career—the bulk of it with the University of Illinois at Urbana-Champaign (1962–1986)—during which he demonstrated the power of broad collaboration in bettering the understanding of our planet. He died on October 4, 2012, at age 85 in Concord, Massachusetts.

He joined the faculty of Pennsylvania State University in 1955 as an assistant professor and soon advanced to the rank of associate professor by virtue of his research work in the Ionosphere Research Laboratory (IRL) directed by Arthur H.

Waynick. At IRL, he headed up projects for the International Geophysical Year (1957–1958), when the sunspot cycle was at its maximum and satellites were deployed to enable more sustained observations of the ionosphere than what could be achieved until then using ground-based radar and rockets. These studies enhanced understanding of the structure and composition of the ionosphere in addition to helping prepare the way for manned space flights.

In 1962 Bowhill accepted the position of full professor at the University of Illinois at Urbana-Champaign, where he founded the Aeronomy Laboratory and quickly led the new lab to a position of international respect. His work helped explain the fading of low-frequency radio signals and dispersive characteristics of the ionosphere, high-frequency ionosphere absorption and Faraday rotation effects, electron density as a function of altitude, and photochemical and diffusion effects in the ionosphere.

He excelled as an experimentalist and theoretician. He designed a new type of radio propagation experiment that measures simultaneously the Faraday rotation, differential absorption, and probe current. The Faraday and absorption data were analyzed using generalized magneto-ionic theory and applied to rocket data to obtain electron density and collision frequency and to calibrate a Langmuir-type electron current probe that measured the fine structure of the electron density profile. To measure Faraday rotation and absorption, Bowhill and colleagues in the Aeronomy Laboratory designed and built an ingenious system for abstracting the data from a rocket shot. Both magneto-ionic modes were radiated from a pair of ground-based transmitters and a power ratio of 10 dB at the rocket receiver was maintained by servoloop, which included the variable power transmitters, the rocket-borne receiver, and the telemetry system. This system yielded remarkable results in sensitivity, accuracy, and reliability.

Wide-ranging collaboration was a hallmark of projects undertaken by Bowhill's laboratory, which hosted conferences attracting scientists from all over the world. Several international researchers served as visiting scientists in the

laboratory during these years. Like the IRL at Penn State during the International Geophysical Year, the Aeronomy Lab played an important role in research projects surrounding the International Year of the Quiet Sun in 1964–1965, when the sunspot cycle had ebbed to its minimum. The lab helped spearhead the Middle Atmosphere Program, a 1980s project overseen by the International Council of Scientific Unions and implemented by the Scientific Committee on Solar-Terrestrial Physics, an international organization that was based at the Aeronomy Laboratory for a while during the 1980s.

Bowhill collaborated across disciplinary as well as national borders: Aeronomy Lab personnel specialized in physics, chemistry, electrodynamics, and meteorology; they joined forces with physical electronics experts to develop space-based lidar (laser radar) systems to measure atmospheric structure and composition, and with antenna experts to build a radar facility near the Urbana campus, from which meteor trails were tracked to glean information about upper-atmosphere winds. Furthermore, Bowhill developed an expertise in computational science and is counted among the first to adapt Monte Carlo computational techniques to study of the atmosphere. He was in the forefront of putting microcomputers to use not only in advanced research but also in the education of undergraduate engineering students.

During the Illinois years, the importance of his scientific work was evident in the many calls to serve the engineering and scientific professions, academia, and his country (he was naturalized in 1962). He chaired committees, panels, and boards of the Institute of Electrical and Electronics Engineers (IEEE), International Union of Radio Science (URSI), and NASA; edited the *IEEE Transactions on Antennas and Propagation*, *Journal of Atmospheric and Terrestrial Physics*, and *Radio Science*; served as a US delegate to international scientific gatherings all over the world; and conducted classified research for the US government as president of the Champaign-based Aeronomy Corporation.

After 24 years as a successful laboratory director, he left in 1986 to assume leadership of the Department of Electrical

and Computer Engineering at the University of Lowell (soon to become UMass Lowell). There, he continued as a leading member of the atmospheric science community while applying his administrative skills to the task of transforming the department into a modern academic unit with research in addition to teaching at the core of its mission. He hired research-oriented faculty who brought expertise in semiconductors, photonics, signal processing, and other fields to the Lowell campus.

Part of Bowhill's appeal as a leader was his support for a broad range of research areas outside his own particular field of interest. He was also respected for his forthrightness, helpfulness, work ethic, fairness, and adherence to principle above politics and self-interest.

He remained active in service to the research community, chairing the US National Committee for URSI (1988–1990) and the US delegation to URSI's 23rd General Assembly in 1990, among a great many other service activities.

In addition to his NAE membership, Bowhill was a fellow of the American Association for the Advancement of Science, American Geophysical Union, American Astronomical Society, IEEE, and Physical Society of London. He authored or coauthored hundreds of publications on the dynamics and chemistry of the middle atmosphere, physics and structure of the ionosphere, artificial heating of the ionosphere, statistical theory of turbulence, transient wave propagation in the ionosphere, remote sensing of the atmosphere by radar and lidar, digital signal processing, and microcomputer applications hardware and software.

Among family, friends, and colleagues alike, Bowhill is remembered for his energy, intellect, creativity, and colorful character. The latter included an ingratiating laugh and a thespian streak that not only enhanced his classroom presence but also led him to leading roles—both on stage and behind the scenes—in community theater. He served as president of a community theater organization in State College, Pennsylvania, and was founding president of the Champaign-Urbana Community Theater. After retiring from UMass Lowell, Bowhill devoted himself to the craft of poetry with

the same keenness he had applied to science, engineering, and theater. He loved the challenge of finding pleasure and freedom within the strictures of a poetic form, the sonnet being his favorite. Through classes, workshops, open readings, and independent study, he learned as much as possible about the subject, then generously shared his expertise with others. A mentor and friend to many, he offered incisive suggestions and treated all with respect.

Bowhill is survived by wife Rita Sagalyn of Lexington, Massachusetts; two children by his first wife Margaret (née McLaughlin): daughter Amanda Bowhill (Michael D'Addio) of San Jose and son Allan Bowhill (Joan) of Seattle; and stepsons Michael (Christy) of Norwalk, Connecticut, and Roger Sagalyn of Lexington, Massachusetts.

Meteor Shower

*by Sidney A. Bowhill*

I see you lying supine in the field,  
enveloped by the canvas hood of night,  
awaiting what the chilly hours will yield  
to calm your mind, and put your fears to flight.  
Gaze at the heavens now, below the stars,  
and watch for changes. Your peripheral eye  
can see the planets, Jupiter and Mars,  
but do not turn your head to where they lie.  
Instead, remain at rest, and watch with care  
for darting lines of silver you will spy,  
each one an arrow's path, as atoms tear  
electrons from their orbits in the sky.  
Your sense of wonder at each beamy track  
will heal your wounds, and bring your spirit back.