



## George C. Weiffenbach (1921–2003)

**G**eorge C. Weiffenbach, an APL physicist who pioneered the use of satellite Doppler tracking in the development of the world's first satellite navigation system, died of stroke complications on 17 January 2003 at the JML Care Center in Falmouth, Massachusetts. He had lived in Falmouth since his retirement from the Laboratory in 1987.

Born on 20 June 1921 in Newark, New Jersey, he spent his early years in Newark and Hillside, New Jersey. He served with the U.S. Army in Italy during World War II. Following the war he received an A.B. in physics from Harvard University and joined APL's Research Center in 1951. In 1957 Weiffenbach and his Research Center colleague William H. Guier studied the telemetry signals received from the Soviet Sputnik satellite. After much hard and inspired work, they demonstrated that the Doppler signals received from a single satellite pass provided all the information required to determine the satellite's orbit. Responding to a suggestion from Frank McClure, the first Head of the Research Center, they then inverted the problem to accurately determine an observer's position on Earth. In 1958 and while working on this challenging new problem, Weiffenbach earned his Ph.D. in physics from the Catholic University of America in Washington, DC. In late 1959 APL established its Space Development Division, headed by Richard B. Kershner, to develop a satellite navigation system. Weiffenbach was named the Leader of the Space Physics and Instrumentation Group in this new division. In that position he continued his work with Guier to develop the Doppler tracking methodology. The result, now well known, was the world's first successful satellite global navigation system, Transit, which was declared fully operational in 1964 and made available to civilian users in 1967.

While working to incorporate the Doppler tracking protocols into the heart of a worldwide, all-weather satellite navigation system, Weiffenbach gained an international reputation as a leading expert in satellite geophysics, geodesy, and spacecraft system design. He put this expertise to use in his role as Project Scientist for the NASA GEOS-A geodetic

satellite, launched in 1965 to study Earth's shape and gravity field. He left APL in 1969 to join the Smithsonian Astrophysical Observatory as Associate Director and Supervisor of its Geoastronomy Division, and subsequently worked as a staff physicist at the Massachusetts Institute of Technology's Lincoln Laboratory from 1977 to 1979.

Weiffenbach returned to APL in 1979 as Assistant Head and Chief Scientist of the Space Department and became Head of the department in 1980. He supported advances in all areas of satellite subsystem design and development which, when implemented, kept the Space Department in the unique role of providing complex and reliable satellites and satellite systems within budget and on schedule for both civilian and DoD users. Examples include the Active Magnetospheric Particle Tracer Explorers (AMPTE) for NASA, initiated in 1981 and launched in 1984, and the Navy's Geosat radar altimeter satellite, launched in 1985. Both missions provided a treasure trove of scientific data that were used by the worldwide science community for several years. He also spearheaded an effort to apply high-level languages for use with large-scale computing. His ambition was to "fly a Cray on a satellite," a dream that the technology of the early and mid-1980s wasn't quite ready to meet.

In 1985 Weiffenbach was named a Senior Fellow at APL by the President of The Johns Hopkins University. He conducted space research and provided Laboratory guidance until his retirement in 1987.

In recognition of his seminal contributions to satellite navigation, Weiffenbach was awarded the 1986 Pioneer Award of the International Aerospace and Electronic Systems Society of IEEE. Sharing the award

with him were his co-workers, Guier, McClure, and Kershner. This award recognized their singular roles in developing, demonstrating, and implementing the Transit satellite navigation system, which ultimately served both the military and civilian communities.

In 1988 Weiffenbach and Guier were awarded the Magellanic Premium of the American Philosophical Society for their work in enabling and defining the Transit satellite navigation system. This award, offered by Jean-Hyacinthe Magellan in 1785 and administered through the American Philosophical Society, recognizes accomplishment or lifetime achievement in navigation, natural philosophy, and astronomy. Only 32 Magellanic Premiums have been awarded in the 215 years since it was first offered.

Throughout his career and particularly during his leadership years, Weiffenbach was a passionate believer in the value of research. He ardently maintained that better research leads to better applications. For many he was a splendid example of the type of research physicist desired by the Laboratory. He always extolled the value of younger staff members and continually encouraged their work. His enthusiasm was infectious and his openness and strength served him well in the difficult leadership capacities he assumed. He played a major role in the establishment and nurturing of the Space Department and as such provided career opportunities for innumerable employees and graduates. He leaves a deep void for those who knew and worked with him. He will be sorely missed.

*Donald J. Williams*

*Stamatios M. Krimigis*

*William H. Guier*