

OBITUARIES

Frank Drake

Few researchers can truthfully say they pioneered an entire field of scientific research. Frank Drake, who died on 2 September 2022, at home in Aptos, California, was one. It was Drake who carried out the first astronomical search for what are now called technosignatures—signatures of technology and hence life beyond Earth. In doing so, he not only initiated the search for extraterrestrial intelligence but also shaped the field of astrobiology, the study of life of any kind in the universe.

Drake was born on 28 May 1930 on the South Side of Chicago. His father was a chemical engineer for the city and often brought home gadgets for his son that ended up in the boy's basement "lab." Frequent bike trips to the city's Museum of Science and Industry fired Drake's imagination, and a large collection of L. Frank Baum's Oz books gave him a taste for thinking about other worlds and the creatures that might inhabit them. While an undergraduate at Cornell University, Drake attended a lecture by visiting astronomer Otto Struve and was introduced to the possibility that planets and life might be common in the universe. After receiving his BA in engineering physics in 1952, Drake went on to earn his MS in 1956 and PhD in astronomy in 1958 at Harvard University under Cecilia Payne-Gaposchkin, arguably the founder of modern astrophysics.

In 1958 Drake took a position at the recently formed National Radio Astronomy Observatory in Green Bank, West Virginia. There he carried out groundbreaking studies of Venus's temperature and Jupiter's radiation belts. Drake had not, however, given up on his fascination with other planets and their potential for life. In 1960 he used the 85-foot Tatel radio dish to conduct the first experiment designed to look for life beyond Earth. Called Project Ozma—after the princess of Oz from the Baum books—Drake's effort demonstrated the feasibility for, and established the logic of, such telescopic astrobiological efforts.

Because of his work with Project Ozma, Drake was soon contacted by the National Academy of Sciences to lead a workshop on interstellar communications. In drawing together an agenda for the event,

which would be attended by Nobel Prize-winning chemist Melvin Calvin and a young Carl Sagan, among others, Drake famously broke the problem into seven factors whose product yielded the number of radio-capable civilizations in the galaxy. That became the famous Drake equation, which remains one of the most well-known scientific formulas in the popular imagination. It became a backbone for the fields of astrobiology and technosignatures by establishing the key intermediate subproblems associated with finding life of any kind. Those items included detecting "exoplanets" and then finding them in the so-called habitable zone, where liquid water can exist on a world's surface. Drake lived to see both terms find observationally validated values.

While Drake initiated the field of searching for intelligence among the stars, he also created the concept of sending information about human civilization to potential civilizations. In 1974 he used the Arecibo radio telescope, the most powerful in the world, to send a signal to the globular cluster Messier 13, which is 6.8 kiloparsecs away. The signal contained a rasterized message providing, among other things, the atomic numbers of elements involved in DNA, the size of an average human male, and a graphic of the solar system. Drake was also instrumental in the design of the Pioneer plaques carried on *Pioneer 10* and *Pioneer 11* and the Golden Record affixed to the two Voyager spacecraft. Those artifacts have carried information about Earth and humanity beyond the solar system.

After his time in Green Bank, Drake served briefly as the chief of the lunar and planetary sciences section at the Jet Propulsion Laboratory. In 1964 he took a faculty position at Cornell University. He was the head of the Arecibo Observatory from 1966 to 1968 and director of Cornell's National Astronomy and Ionosphere Center, which managed Arecibo's operation, from 1970 to 1981.

In 1984 Drake moved to the West Coast to become dean of the division of natural sciences at the University of California, Santa Cruz. That same year he also joined the SETI Institute, and he became director of its Carl Sagan Center for the Study of Life in the Universe in 2004.

Drake's scientific accomplishments were well recognized by colleagues. He



SETH SHOSTAK/SETI INSTITUTE

was vice president of the American Association for the Advancement of Science in 1973, president of the Astronomical Society of the Pacific from 1988 to 1990, and chair of the National Research Council's Board on Physics and Astronomy from 1989 to 1992.

Beyond his soft-spoken nature, his kindness, and his good humor, Drake will be remembered for his intellectual bravery. He championed SETI at a time when it was often considered marginal and prone to the "giggle factor" associated with UFOs and little green men. In 2020 the astronomical community's decadal survey made as its top priority a telescope designed to hunt for biosignatures. Given that technosignatures are just one specific kind of biosignature, the world is finally catching up with Frank Drake and his daring Project Ozma.

Adam Frank

University of Rochester
Rochester, New York

Jill Tarter

SETI Institute
Mountain View, California

Jason Wright

Pennsylvania State University
University Park PA

**TO NOTIFY THE COMMUNITY
about a colleague's death, visit
<https://contact.physicstoday.org>
and send us a remembrance to post.
Select submissions and, space permitting,
a list of recent postings will appear in print.**