Obituary

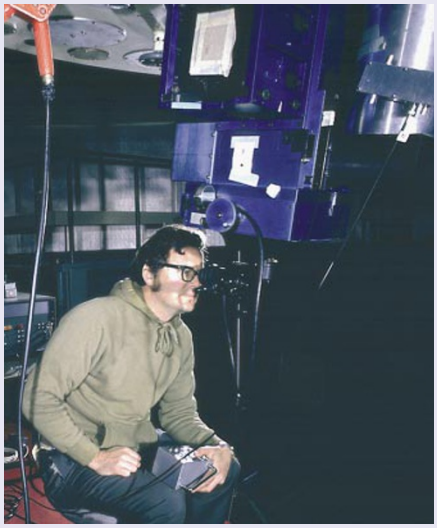
Frederick Gillett (1937–2001)

As a graduate student at the University of Minnesota, Fred Gillett selected the new field of infrared astronomy as his area of interest, and it became his life's work. He realized that advances in infrared-detector technology would soon allow astronomers to close the enormous gap in the electromagnetic spectrum between visible and radio wavelengths — the only two types of radiation not blocked by the Earth's atmosphere. Every object in the Universe with a temperature above absolute zero radiates in the infrared, so this part of the spectrum contains a great deal of information. Objects that are invisible to optical telescopes can be seen at infrared wavelengths. And, because infrared radiation penetrates dust, even objects that are hidden from view — such as the centre of our Galaxy — can be seen in the infrared.

In 1965, Gillett came to Tucson, Arizona, so he could use my new infrared detector (a low-temperature bolometer that converts heat into electricity). Together we designed and built the first infrared spectrometer capable of measuring radiation at wavelengths of 8 to 14 micrometres from nearby stars. These wavelengths correspond to one of the few 'windows' in the atmosphere through which infrared radiation can pass. One of the first stars observed with the new instrument, Betelgeuse, revealed a broad emission feature that was ultimately identified as common silicate dust in the star's atmosphere. Mature stars produce this cosmic silicate matter as they approach the end of their lives, and it was already known that the next generation of stars are born in regions filled with interstellar dust. So Gillett started his career by revealing one of nature's most successful recycling projects — without which we wouldn't be here.

Gillett received one of the first doctorates in infrared astronomy and introduced infrared instrumentation to the Kitt Peak National Observatory at Tucson (now part of the National Optical Astronomy Observatory). A suite of photometric and spectroscopic instruments and telescope upgrades emerged, along with influential papers on stars, planets and the Galactic Centre. Gillett also delved into the secretive world of strategic and tactical infrared sensors, learning about vital technology not otherwise available to astronomers.

While vigorously pursuing his ground-based activities throughout the 1970s and 1980s, Gillett joined the team that developed the Infrared Astronomy Satellite (IRAS). By operating far above the atmosphere, space telescopes can avoid many of the problems that beset ground-based infrared detectors. As well as becoming one of NASA's most successful international projects, IRAS pioneered the concept of an observatory in space having all of its vital parts cooled to less than two degrees above absolute zero. The talents of many physicists and engineers were required to accomplish this feat, and Gillett supplied his own brand of insightful ideas and quiet determination to get things done.



MARK HANNA, NOAO

Pioneer of infrared astronomy from the ground and in space

Launched in 1983 by NASA, in collaboration with Britain and the Netherlands, the 300-day IRAS mission surveyed and mapped 97% of the sky in four broad wavelength bands extending from 8 to 120 micrometres. Its huge impact on astronomy continues to this day. At the top of its long list of discoveries lies the Vega phenomenon, the first observational proof that nearby stars do possess planetary systems like our own. Vega had been chosen as the primary calibration star against which all others were to be compared. The difficult task of establishing and maintaining the absolute calibration of IRAS was assigned to Gillett and his colleague George Aumann. But Vega was not like most other stars; it emitted a huge excess of far-infrared radiation (25–120 micrometres). Gillett and Aumann quickly solved their calibration problem by selecting other stars that were more mature and much better behaved.

Gillett then reprogrammed IRAS to make observations of Vega and other similar stars. These young stars are orbited by disks of planetary debris not unlike the warmer, but more mature, tenuous dust cloud around the Sun. This discovery launched intensive searches for more stars with planetary debris systems, and they are joined by an ever-growing number of planets as well, suggesting that there may be life on planets other than Earth.

IRAS was followed by two more infrared space missions, COBE in the United States and ISO in Europe, as well as four ambitious infrared projects for the 1990s. These include the Space Infrared Telescope Facility, due to be launched in 2002 and, like IRAS, cooled with superfluid liquid helium, and SOFIA, a large airborne infrared telescope to be carried into the stratosphere by a converted Boeing 747. On the ground there is Gemini, a pair of 8-metre telescopes (one on Mauna Kea, Hawaii, and the other on Cerro Pachon, Chile) and 2MASS, a nearly completed near-infrared (1 to 2.5 micrometre) all-sky survey designed to complement IRAS.

While working for two years as a visiting senior scientist at NASA headquarters, Gillett guided all four projects safely forward to approval, and lived to see them all nearing completion. 2MASS has already uncovered a new class of low-mass stars that bridge the gap between active stars and brown dwarfs, and Gemini has demonstrated unsurpassed infrared performance in early tests. To ensure that the Gemini telescope in Hawaii would be optimized for infrared astronomy, Gillett assumed the role of international project scientist. Despite his rare blood disease, he celebrated the dedication of the first Gemini telescope and witnessed its initial operation.

Gillett enjoyed hiking, especially backpacking in the Grand Canyon, and had a great passion for cycling. He did his part for local fuel conservation by riding his bike more than 20 miles each day to work. He also entered many races, achieving strong finishes in the gruelling El Tour de Tucson bike race. His last major cycling trip was across the state of Washington. He passed away on 22 April in Seattle, Washington, following a stem-cell transplant.

Frank Low

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