

Gerry Neugebauer: Pioneer of infrared astronomy

B. Thomas Soifer¹

Division of Physics, Mathematics and Astronomy, California Institute of Technology, Pasadena, CA 91125

Sometime near the end of 2018, National Aeronautics and Space Administration (NASA) will launch the James Webb Space Telescope (JWST). This “mega” space infrared observatory builds on decades of extremely successful space infrared astronomy missions and infrared instruments for ground-based telescopes that have provided new insights into an otherwise hidden universe. None of this would have been possible if not for the groundbreaking efforts of the handful of physicists who created the field of infrared astronomy and convinced the astronomical community of its promise. Standing as the leader of this pioneering group was Gerry Neugebauer (1932–2014).

Gerry was born in Göttingen, Germany, in 1932. Fleeing the Nazis, his family relocated first to Copenhagen in 1933 and then, in 1939, moved to Providence, RI, when his father, the noted historian of mathematics Otto Neugebauer, took a position at Brown University. Gerry received his undergraduate physics education at Cornell University, followed by graduate work in high-energy physics at Caltech. After receiving his PhD in 1960, he was assigned to the nearby Jet Propulsion Laboratory for military service [he had been in the Reserve Officers’ Training Corps (ROTC) in college]. There, he worked on the infrared experiment on Mariner 2, which, when it passed by Venus, became the first satellite to successfully explore another world. (His wife, the prominent space physicist Marcia Neugebauer, also worked on Mariner 2, providing the first direct measurements of the solar wind.) In 1962, after his military service ended, he returned as an assistant professor to Caltech, where he remained for the rest of his professional career.

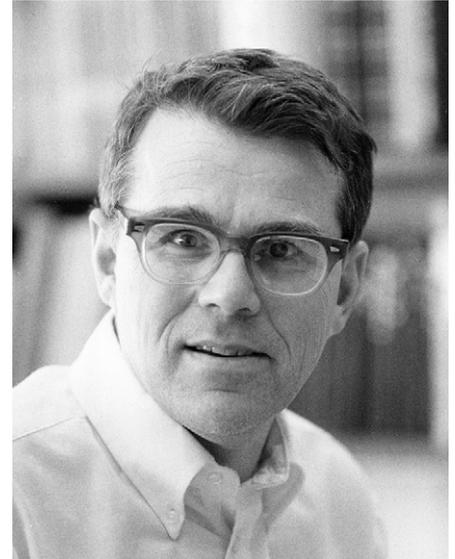
In the 1960s, with his colleague Bob Leighton, Gerry conducted the very first sky survey at infrared wavelengths. At the time, a “big science” project (at least for astronomy), the Two-Micron Sky Survey (TMSS), exemplified his collaborative and

supportive style, as Gerry worked closely with his students to build a unique telescope and instrument to explore the universe at previously unseen wavelengths. The results of the TMSS clearly demonstrated that many unanticipated yet extraordinary phenomena were at work and even common in the cosmos, lighting up the heavens with bright objects observable only in the infrared. This groundbreaking survey, coupled with other advances in the field, triggered the explosive development of infrared astronomy in the 1970s and 1980s.

Gerry’s so-called “infrared army”—consisting of himself, one or two postdocs, and three or four graduate students and a number of undergraduates—was legendary at Caltech for its hard work, excitement in observing, and infectious delight on each new discovery. His group (I was among them, first as a Caltech undergrad, later as a postdoc, and ultimately as Gerry’s successor) built infrared instruments for ground-based optical telescopes. We were happy to exploit observing windows that “real” astronomers disdained—that is, when the moon was full. His team’s efforts led to a continual stream of amazing new phenomena in the heavens.

In addition to the revolutionary work of the TMSS, Gerry and his collaborators made many other discoveries. With his student, Eric Becklin, he originated the study of star formation at infrared wavelengths by finding the Becklin–Neugebauer object, the first “protostar”—a star in the earliest stages of evolution. Again with Becklin, he located at the wavelength of 2 μm the center of our galaxy and made many seminal discoveries in this unique patch of sky.

These early discoveries highlight a major theme of the field: the profound influence of interstellar and circumstellar dust on our view of the universe. Such dust, found in association with individual objects and scattered throughout interstellar space, obscures our view much more effectively at visible wavelengths; in the infrared, it is as if the dust is swept away. Our view is further enhanced



Gerry Neugebauer. Image courtesy of the Caltech Archives.

because the energy absorbed by dust in circumstellar environments heats the material to hundreds of degrees Kelvin, creating especially bright sources of infrared radiation.

In the mid-1970s, Gerry became the co-leader, with Reinder van Duinen and then Harm Habing, of an American–Dutch–British science team that was formed to lead the Infrared Astronomy Satellite (IRAS) mission. IRAS performed the first all-sky infrared survey at far-infrared wavelengths, from 12 to 100 μm . Gerry’s technical contributions and leadership led to a resoundingly successful launch in 1983. The one-year survey mission guided the field and continues to have a major impact on astronomy. Two of IRAS’s significant scientific discoveries—the first direct detection of planetary debris disks and the discovery that exceedingly dusty, luminous galaxies were common in the nearby universe—continue to inspire research today. Neugebauer was directly involved in both.

His enjoyment in discovery was matched by his pleasure at mentoring students and postdocs, treating all as peers; referring to his experimental physics roots, he proudly

Author contributions: B.T.S. wrote the paper.

¹Email: bts@irastr.caltech.edu.

called himself a “plumber.” Known to everyone simply as Gerry, and as GXN to his friends (he had no middle name and the X was imposed on him by the Caltech computer center when accounts required three letters), he was immediately recognizable around the Caltech campus in his uniform: a blue oxford shirt and khaki shorts that he wore even in the depths of winter.

Later in his career, Gerry served Caltech as the Director of the Palomar Observatory from 1980 to 1994 and as the Chairman of the Division of Physics, Mathematics, and Astronomy from 1988 to 1993. He was also deeply involved in the building of the Keck Observatory on Mauna Kea, HI.

He retired in 1998 and moved with Marcia to Tucson, AZ, in 2002. For the last two

decades of his life, he suffered, with courage and good spirits, the debilitating effects of spinocerebellar ataxia, a neurodegenerative disease. Gerry passed away on September 26 from complications of this disease. The spirit of exploration and discovery with which he helped to open the infrared window on the universe lives on in the generations of students (and colleagues) he inspired.