Biographical Encyclopedia of Astronomers

© 2007 Springer

Spitzer, Lyman, Jr.

Born Toledo, Ohio, USA, June 26, 1914

Died Princeton, New Jersey, USA, March 31, 1997

American astrophysicist Lyman Spitzer, Jr. made major contributions to our understanding of diffuse gases, especially the interstellar medium, and was among the first to strongly urge the construction of a large optical telescope in space. He was the son of Blanche C. and Lyman Spitzer, and married Doreen Canaday in 1940.

Lyman Spitzer was educated at Phillips Academy (Andover), Yale University (BA: 1935), Cambridge University (where he attended informal lectures from Subrahmanyan Chandrasekhar at Trinity College and at Princeton University, where he earned a Ph.D. in 1938 for work with Henry Norris Russell on the analysis of spectra of cool supergiant stars. He held a National Research Council Fellowship at Harvard (1938–1939), where Harlow Shapley, Donald Menzel, Bart Bok, and Martin Schwarzschild were particularly influential. He was an instructor at Yale (1939–1942) before moving to war work (1942–1946) at Columbia University, where he became the director of the sonar analysis group before returning to Yale (1946–1947). In 1947, Spitzer became director of the observatory and chair of the astronomy department at Princeton (positions he held until 1979), succeeding Russell, where one of his first actions was to persuade Martin Schwarzschild to join the Princeton group. They remained close colleagues for 50 years thereafter.

Spitzer's scientific contributions fall into a number of fairly discrete areas: physics of the interstellar medium; stellar dynamics; laboratory plasma physics and controlled thermonuclear fusion; and space astronomy and astrophysics

Spitzer's career spanned the period from before the recognition of a general interstellar medium to the time when half a dozen different phases of interstellar material had been characterized, and his monograph *Physical Processes in the Interstellar Medium* served as the standard for two decades. He computed the mean free paths of electrons, ions, atoms, and dust grains, showing that the various phases tended toward pressure equilibrium, and thereby predicted a hot, "coronal" medium outside the galactic plane, later found. He was among the first to conclude that star formation must be an ongoing process, in a paper written before World War II. (It was trimmed of the star-formation section for later publication, but restored to the original text in the reprint volume of his papers.) He also pointed out the importance of magnetic fields and dust in star formation

In the realm of stellar dynamics, Spitzer, concurrently with Viktor Ambartsumian, calculated the rate at which stellar encounters in clusters eject stars, introduced several new ideas into the study of dense star clusters, urged a Princeton student (Haldan Cohn) to develop numerical methods for simulating cluster evolution, and wrote another definitive monograph, *Dynamical Evolution of Globular Clusters*. Seven additional Spitzer students at Princeton were eventually

also involved in cluster work. Spitzer and Martin Schwarzschild together suggested that the gravitational influence of giant gas clouds was responsible for the gradually increasing velocities of stars in the galactic plane as they age, and Spitzer went on to show that gravitational impulses from such clouds were also responsible for the dissolution of most star clusters before they reach an age of 100 million years. He and Walter Baade also introduced the idea of gravitational interaction between galaxies

Spitzer was involved in the Princeton-controlled thermonuclear fusion program from its inception as Project Matterhorn (1953–1961) and through the early years of the Princeton Applied Physics Laboratory (1961–1967). His design, called the "stellerator," for a magnetically confined plasma, had obvious astronomical roots and a formal basis in lectures given at Princeton by visitor Thomas Cowling.

Some kinds of astronomy can be done only from above the Earth's atmosphere, and some phenomena are best studied in situ. Even before the war, while at Yale, Spitzer had tried to organize a program in solar ultraviolet spectroscopy and to recruit Leo Goldberg into it. The ultraviolet Copernicus satellite, launched in 1972, was the eventual fruit of this interest, and the spectrometer designed by his group discovered interstellar molecular hydrogen, measuring the ratio of deuterium to normal hydrogen in interstellar gas and found highly ionized atoms, providing evidence of the million-degree coronal component he had predicted long ago. He began urging the construction of a 3-meter class telescope in space as early as 1947. He oversaw the National Aeronautics and Space Administration planning and congressional scrutiny of what is now known as the Hubble Space Telescope (HST). For many years, he chaired the Space Telescope Institute Council, the institute's oversight group that selects observing programs and processes data for the HST. He also encouraged Martin Schwarzschild to develop the Stratoscope Balloon program for high-resolution astronomy, with input as well from James Van Allen, whom Spitzer temporarily brought to Princeton for the Plasma Lab. Spitzer was awarded six honorary doctorates and medals and awards from the Royal Society (London), the Royal Swedish Academy of Sciences, the American Astro-nomical Society (which he served as president during 1960–1962), the Royal Astronomical Society, and several others. He was elected to membership in the United States National Academy of Sciences, the Royal Society of Sciences of Liège, the American Academy of Arts and Sciences, and other both honorary and scientific service organizations. In addition to writing many scientific papers in various astro-physical journals, Spitzer wrote important textbooks, which are useful to researchers and graduate students because they include new results from his studies.

Satoru Ikeuchi

Selected References

King, Ivan R. (1997). "Lyman Spitzer, Jr., 1914–1997." *Bulletin of the American Astronomical Society* 29: 1489–1491

Smith, Robert W. (1989). *The Space Telescope: A Study of NASA, Science, Technology, and Politics*. Cambridge: Cambridge University Press.

Spitzer Jr., Lyman (1952). *Interstellar Matter*. Princeton, New Jersey: Princeton University Observatory. (A set of notes prepared by John B. Rogerson from lectures by Spitzer.)

—— (1962). *Physics of Fully Ionized Gases*. 2nd rev. ed. New York: Interscience.

—— (1968). Diffuse Matter in Space. New York: Interscience.

—— (1978). *Physical Processes in the Interstellar Medium*. New York: Wiley-Interscience.

—— (1982). *Searching between the Stars*. New Haven: Yale University Press.

—— (1987). *Dynamical Evolution of Globular Clusters*. Princeton, New Jersey: Princeton University Press

—— (1989). "Dreams, Stars, and Electrons." *Annual Review of Astronomy and Astrophysics*. 27: 1-17.

Lyman Spitzer Jr. and J. P. Ostriker (eds.) (1997). *Dreams, Stars, and Electrons: Selected Writings of Lyman Spitzer, Jr.* Princeton, New Jersey: Princeton University Press. (Ostriker was Spitzer's successor as Princeton Observatory director and department chair.)