

2007

1st Annual Dasari Lecture

Charles Townes, University of California Berkeley

"The fun of a physics career"

Charles H. Townes was born in Greenville, South Carolina in 1915. He received bachelor degrees in physics and modern languages from Furman University in 1935, an M.A. degree in physics from Duke University in 1936, and a Ph.D. degree in physics from California Institute of Technology in 1939. Later that year he joined Bell Laboratories. In 1947 he moved to the Physics Department of Columbia University. From 1959 to 1961 he served as Vice President and Director of Research of the Institute for Defense Analyses in Washington D.C. In 1961, he was appointed Provost and Professor of Physics at MIT, and in 1966 he became an Institute Professor here. In 1967 he was appointed University Professor at the University of California. He is located at the Berkeley campus where he continues to conduct research. Working at Bell Laboratories during World War II, Townes developed accurate and precise microwave radar systems. After the war he turned his attention to applying these newly developed microwave techniques to spectroscopy, which he foresaw as providing a powerful new tool for study of the structure of atoms and molecules and a potential new means of controlling electromagnetic waves.

At Columbia University he continued research in microwave physics. In 1951 he conceived the idea of the maser and in 1954, working with James Gordon, a graduate student and Herbert Zeiger, a postdoctoral researcher, obtained microwave generation and amplification using ammonia vapor as the active medium. They coined the word "maser" for this device, an acronym for microwave amplification by stimulated emission of radiation. In 1958, Townes and his brother-in-law, Arthur Schawlow, wrote a seminal paper extending these ideas to the optical and infrared spectral range and proposed how this could be accomplished in particular systems. This work quickly led to development of the "optical maser" or laser (light amplification by stimulated emission of radiation).

At MIT, working with graduate students Elsa Garmire and Raymond Chiao, Townes conducted pioneering research in stimulated Raman and Brillouin scattering and laid the groundwork for the field of nonlinear optics. Working with Ali Javan, he conducted a famous study of the Michelson-Morley ether drag experiment using lasers, in the wine cellar of an estate owned by MIT.

At UC Berkeley he pioneered research in radio and infrared astronomy, discovering the first complex molecules in interstellar space and making the first measurement of the mass of the black hole in the center of our galaxy. Townes continues an active research program in astrophysics and astronomy there.

In 1964 Townes was awarded the Nobel Prize in Physics with Nicolay Basov and Aleksandr Prokhorov “for fundamental work in the field of quantum electronics, which has led to the construction of oscillators and amplifiers based on the maser-laser principle.” Other distinguished awards include the Niels Bohr international medal for contributions to the peaceful use of atomic energy in 1979, the National Medal of Science, presented by Ronald Reagan in 1982, and the Templeton Prize, in 2005, for contributions to the understanding of religion and science. He has been awarded numerous honorary degrees from various universities and is a member of the National Academy of Sciences. Townes served as vice chairman of the Science Advisory Committee to the President. He chaired the Advisory Committee for the first human landing on the moon and the Defense Department’s Committee on the MX missile.