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CALTECH SUBMILLIMETER-WAVE TELESCOPE
TO BE DEDICATED ON HAWAII

A submillimeter-wave telescope that will enable astronomers to begin new explorations of the center of the Milky Way, distant galaxies, and the "stellar nurseries" in space where stars are born, will be dedicated on Saturday, November 22, by officials of the California Institute of Technology, the National Science Foundation, and the University of Hawaii. The Caltech Submillimeter Observatory is expected to make major contributions to the understanding of the life cycle of stars and the evolution of galaxies.

Dedication ceremonies for the telescope will be held at the observatory site, 14,000 feet above sea level on Mauna Kea, Hawaii. The ceremony will include addresses by Caltech President Marvin L. Goldberger and observatory director Thomas G. Phillips, professor of physics at Caltech. Also attending will be representatives of the National Science Foundation, which provided primary funding for the project, and officials of the University of Hawaii, which has leased the Mauna Kea site to Caltech.

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Funds for the observatory were also provided by the Kresge Foundation of Troy, Michigan, Francis L. Moseley of Flintridge, California, Prince Charitable Trusts of Chicago, and NASA.

Submillimeter and millimeter waves are emitted by such chemical compounds in space as carbon monoxide, ammonia, formaldehyde, and hydrogen cyanide. These compounds are found in gas throughout the cosmos, including galactic nuclei and in interstellar clouds, which are primary sites of star formation in the Milky Way and other galaxies. Interstellar dust absorbs the visible light from these clouds and prevents astronomers from studying them with optical telescopes.

The Caltech submillimeter-wave telescope will also be used to investigate compounds that emit radiation only in the submillimeter range of the spectrum, including hydrides of magnesium, calcium, aluminum, and silicon. These chemicals are abundant in the remnants of molecular clouds that surround newborn stars, and their study is expected to provide new insights into the mechanisms that trigger star formation and determine the rate at which it takes place.

"Star formation is a key to processes occurring throughout the universe, from the formation of the spiral arms of galaxies to the birth of planetary systems such as the solar system," said Dr. Phillips. "The submillimeter portion of the spectrum yields the best probes of the physical and chemical conditions in molecular clouds, and may finally permit us to observe how an

interstellar cloud actually collapses to form a protostar. We believe it is this stage that determines whether a star becomes a single or binary stellar system or--like the sun--acquires a family of planets."

According to Dr. Phillips, the telescope could also shed light on the dynamics of "starburst" galaxies--extremely luminous galaxies that appear to be undergoing rapid bursts of star formation in their central regions and along their spiral arms. "The submillimeter-wave band is ideally suited to studying emissions from these sources, many of which exist at great cosmological distances from earth," he stated. "Because their radiation has taken billions of years to reach us, we could be witnessing galaxies that are undergoing the first phase of star formation in their creation."

The new telescope consists of a 10.4 meter (34-foot) radio dish with extremely high surface accuracy, designed and constructed by Dr. Robert Leighton, the William L. Valentine Professor of Physics, Emeritus, at Caltech. Its instruments include a new generation of receivers with the sensitivity to make very fine distinctions among the various emission lines in the submillimeter-wavelength range, as well as very high-sensitivity bolometer detectors for continuum studies. The telescope will have the unprecedented capacity to detect radiation of wavelengths ranging from one millimeter down to 300 micrometers (one-eightieth of an inch).

Mauna Kea, one of the highest and driest observatory sites in the world, was chosen because atmospheric water vapor attenuates submillimeter waves from space. The location also provides an excellent view of the galactic center, now known to harbor a powerful energy source that may mark the presence of a black hole.

To protect the telescope from exposure to the wind and snow on Mauna Kea, an observatory dome has been constructed with support from the NSF. The dome has two novel design features--large, lightweight doors that slide back to expose the entire radio dish to the sky, and an internal wall and floor structure housing the controls, data collection, and support systems for the telescope.

Mauna Kea, an extinct volcano, is one of the world's most active observatory sites. Five additional optical/infrared telescopes are in operation there--one belonging to Canada, France, and Hawaii, two to the United Kingdom, one to NASA, and one to the University of Hawaii.

Mauna Kea is also the designated site of the world's largest optical telescope, the W. M. Keck Observatory, currently under construction by the California Association for Research in Astronomy, a joint venture of Caltech and the University of California. The Keck Telescope is scheduled for completion in 1991.

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