

# Sensor System to Gauge Effects of Cosmic Rays on Lunar Explorers

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Boston University Professor Harlan Spence recently joined five other space scientists at Goddard Space Center in Greenbelt, Maryland to discuss their participation in NASA's Lunar Reconnaissance Orbiter (LRO) program.

Spence learned in late December that his proposal for CRaTER, an instrument that will measure and characterize the potential biological effects of cosmic radiation on humans, was one of six selected by the space agency for the LRO mission scheduled for fall 2008.

A professor in Boston University's Center for Space Physics and a professor in and chairman of the university's Department of Astronomy, Spence is expected to receive a contract for approximately \$9.5 million for CRaTER. He and the other principal investigators will each head institution-based research teams that will build instruments to gather data on the lunar environment, a vital first step in NASA's preparation for what President Bush has announced will be a series of human and robotic missions to the moon.

CRaTER, which stands for Cosmic Ray Telescope for the Effects of Radiation, will measure the high-energy charged particles (ions and electrons, not "rays" at all) that travel throughout the cosmos at nearly light speed. Consisting of a novel cosmic ray sensor system coupled with proven analog and digital electronics, CRaTER will relay its data back to Earth through the LRO spacecraft's communication system.

The sensor system will be the scientific heart of the instrument.

Designed as a stack of detectors housed in a structure of aluminum and special material known as tissue-equivalent plastic, the sensor system will allow CRaTER scientists to measure and characterize the potential biological effects of radiation that occur in deep space. The aim: gather the data needed to develop equipment and materials that will ensure human safety in the lunar environment.

“In 1971, I stood with my family in the throngs that watched Apollo 15 thunder into space from Cape Canaveral,” Spence recalls. “It was a defining moment for me, hooking me on a career in astronomy and space science. With CRaTER, I get to relive that excitement as a space scientist — and get to experience my own voyage, of sorts, to the moon!”

Scientists on Spence’s team include Larry Kepko, senior research associate in BU’s Center for Space Physics; J. Bernard Blake, director of the Space Sciences Department at the California-based research group, The Aerospace Corporation; Joseph Mazur, research scientist and laboratory manager at Aerospace; Justin Kasper, a research scientist in MIT’s Center for Space Research; and Lawrence Townsend, a professor of nuclear engineering at The University of Tennessee in Knoxville. Team collaborators include Michael Golightly of the Air Force Research Laboratory in Bedford, Massachusetts and Terrence Onsager of the National Oceanic and Atmospheric Administration’s Space Environment Center in Boulder, Colorado.

The LRO mission is part of NASA’s Robotic Lunar Exploration Program. In 2008, the orbiter will carry the instruments built by the teams into space where they will begin gathering the information that will inform the planning and execution of future lunar missions. The five other NASA-selected teams are from Goddard Space Flight Center in Greenbelt, Maryland; Northwestern University in Evanston, Illinois; Institute for Space Research and Federal Space Agency in Moscow;

University of California in Los Angeles; and Southwest Research Institute in Boulder, Colorado.

Faculty research in BU's Department of Astronomy is coordinated through its Institute for Astrophysical Research and its Center for Space Physics. Research areas include observational and theoretical studies in galactic and extragalactic astrophysics, magnetospheric and ionospheric physics, planetary and cometary atmospheres, space weather, space plasma physics, star formation and galactic structure, star and star clusters, active galaxies and quasars, high-energy and particle astrophysics, galaxy formation, and cosmology.

Source: Boston University

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