

Chamber Helps To Reproduce Conditions On Mars

October 28 2005

A little bit of mars has landed at SHOT, and it's open for business. Developed with support from the NASA Institute for Advanced Concepts (NIAC), the SHOT Martian Environment Simulator faithfully recreates the atmosphere, temperature and light spectrum found on the red planet.

Researchers from across the nation recently have begun conducting experiments inside the device's 5,673 cubic centimeter (346.2 cubic inch) pure quartz central chamber, which is a test bed for experimental ecopoiesis. Ecopoiesis is the starting-up of a planetary ecosystem based on Earth life. It also is a component of terraforming -- the creation of an Earth-like planetary environment.

"This new test bed opens up a world of planetary conditions for biologists and mineralogists to explore," Said, SHOT Chief Scientist Paul Todd, Ph.D. "Scientists can put simple life forms in it to determine their ability to survive on planets such as Mars."

To simulate the environment, the quartz test chamber is filled with the gas composition found on Mars -- more than 95 percent of which is carbon dioxide. The chamber can maintain the gas at as little as 10 millibars of atmospheric pressure. Earth's atmospheric pressure is 1,000 millibars.

The entire chamber is housed in an enclosure that uses liquid nitrogen to lower the temperature to minus 211 degrees Fahrenheit (minus 135

Celsius). Internal heaters raise it to a daytime Martian temperature of 78.8 degrees Fahrenheit (26 Celsius). A 1,000-watt xenon-arc lamp simulates the solar light spectrum that reaches the planet's surface.

"Replenishment of life support consumables for humans on planetary surfaces may enable long duration occupancy and exploration," said NIAC Director Robert A. Cassanova, Ph.D. "The SHOT team, led by Dr. Paul Todd, is exploring the concept of ecopoiesis which may eventually lead to the evolution of plant species that will thrive on planetary surfaces and provide these essential consumables for explorers."

SHOT has assembled an all-star team of Mars scientists to ensure that the system faithfully recreates the conditions that are the most interesting to researchers studying extremophiles -- organisms that are able to survive in extremely harsh environments.

An associate professor of biology at the Batesville, Arkansas campus of Lyon College, Thomas recently concluded his first set of experiments in the chamber's red simulated Martian soil.

"In a set of short term experiments ranging from one day to nearly two weeks in duration, quite a few microorganisms survived the harsh environment," said Thomas. His experiments were conducted with environmental conditions in the chamber set as it may be possible to make them in the future, rather than as they are believed to exist today.

"If we can find a way to warm mars by four degrees Celsius, we can start a runaway greenhouse effect that will melt the ice cap and any other water frozen on the planet's surface.

The condition limiting life on Mars is dryness," said Thomas, who also serves as editor of Marsbugs, an online astrobiology newsletter.

Researchers interested in conducting experiments in the chamber at SHOT headquarters, or in installing a SHOT Martian Environment Simulator in their own laboratories, are encouraged to call 812-923-9591 x246 for more information.

The scientific advisory committee includes Christopher P. McKay, Ph.D., and Lynn Rothschild, Ph.D., NASA Ames Research Center; Andrew Schuerger, Ph.D., University of Florida; Lawrence Kuznetz, Ph.D., NASA Johnson Space Center; Penelope J. Boston, Ph.D., New Mexico Institute of Mining and Technology and president of Complex Systems Research, Inc.; and David J. Thomas, Ph.D., Lyon College.

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