

## HAUGHTON-MARS PROJECT: 10 YEARS OF SCIENCE OPERATIONS AND EXPLORATION SYSTEMS DEVELOPMENT AT A MOON/MARS ANALOG SITE ON DEVON ISLAND, HIGH ARCTIC.

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### Summary

The Haughton-Mars Project (HMP) on Devon Island, High Arctic, is currently the world's largest land-based Moon/Mars analog field research project. In parallel with its science program, the HMP supports an exploration program aimed at advancing the technologies, strategies, and personnel training needed to prepare for human exploration operations on the Moon and Mars.

### Introduction

The Haughton-Mars Project (HMP) is an international multidisciplinary field research project centered on the scientific study of the Haughton impact structure (75°N, 89°W) and surrounding terrain on Devon Island, High Arctic, viewed as an *analog* for the Moon and Mars (Fig.1). The geological features, terrain diversity, biological adaptations, and climatic record found at this rocky polar desert site offer unique opportunities for comparative studies with the Moon and Mars from both science and operations perspectives. Thus, in parallel with its Science Program, the HMP has supported since its inception an Exploration Program aimed at helping define and advance new technologies, strategies, and personnel training needed to enable future safe and productive human exploration of the Moon and Mars.



Fig. 1: Map showing location of Haughton Crater.



Fig.2: Aerial view of the Haughton-Mars Project Research Station (HMP RS) located at 75° 25.95' N, 89° 51.75' W on the northwestern rim of Haughton Crater. The HMP RS offers a model for how a future outpost on the Moon or Mars might be laid out and operated.

### History

The HMP was initiated in 1997 by P. Lee as a postdoctoral research project based at NASA Ames Research Center (ARC) in Mountain View, CA, with initial support from the National Research Council and NASA. The project grew year after year with continued funding support from NASA and contributions from a wide range of private sponsors, including the National Geographic Society ([www.marsonearth.org](http://www.marsonearth.org)).

Now in its tenth year of operation, the HMP remains headquartered at NASA ARC, and since 2002, is managed jointly by the Mars Institute and the SETI Institute, two private non-profit research organizations based in Mountain View, CA. Simon Fraser University in Canada is under contract to the Mars Institute as key HMP technological partner. Research on the HMP is funded in large part by NASA and, since 2004, also by the Canadian Space Agency (CSA). For the purpose of hosting CSA-supported research, the *HMP Research Station* (HMP RS) was selected to join in 2005 the CSA's newly created Canadian Analog Research Network (CARN) as one of the CARN program's original nodes.

The HMP is currently the world's largest and leading analog field research project, bringing together each Summer dozens of researchers, students, and support staff to the HMP RS on Devon Island.

### Research

There are over 200 scientific, technical, and popular science publications released to date by HMP Researchers. Science publications cover topics ranging from Mars analog geology and impact geology, to Mars climate evolution and astrobiology.

Exploration publications include results of field tests and demonstrations of robotic rover and aircraft systems, Moon/Mars EVA field simulation studies, and telemedicine experiments. The use of vehicles in planetary exploration surface operations and the design of exploration communications and networking architectures are among the most important and productive areas of exploration research at HMP.

Research in the HMP's Exploration Program has been devoted to the operational development and implementation of a terrestrial analog site for support of human and human-and-robot based planetary exploration. Experience has been gained in the development of exploration science systems, operational/logistical approaches to supporting analogs sites, and from a wide range of field tests involving systems designed to support planetary science and exploration objectives.

Polar Continental Shelf Project (PCSP) of Natural Resources Canada, Indian and Northern Affairs Canada (INAC), the Qikiqtani Inuit Association (QIA), the Nunavut Research Institute (NRI), and the Communities of Grise Fiord and Resolute Bay. A special debt of gratitude is also owed to the United States Marine Corps for their fidelity in logistical support.

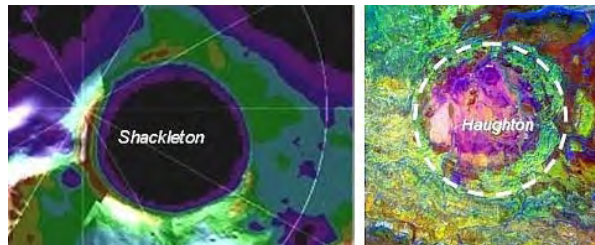


Fig. 3: *Shackleton Crater* at the South Pole of the Moon is 19 km across and might present H<sub>2</sub>O ice in surrounding shadowed zones. It is generally viewed as a prime candidate site for human exploration. *Haughton Crater*, also ~ 20 km in size, is by far the best preserved impact structure in its class on Earth *and* it is located in a H<sub>2</sub>O ground ice-rich rocky desert. Thus, *Haughton* might be one of the best *scientific and operational analogs for lunar sites such as Shackleton*.

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