

THE CANADIAN ANALOGUE RESEARCH NETWORK (CARN): OPPORTUNITIES FOR MARS ANALOGUE STUDIES IN THE CANADIAN ARCTIC. G. R. Osinski, A. Berinstain, M. Lebeuf, R. Léveillé, Canadian Space Agency, 6767 Route de l'Aéroport, St-Hubert, QC J3Y 8Y9, Canada (gordon.osinski@space.gc.ca)

Introduction: Mars remains a high priority target for the international planetary science and exploration communities. It is geologically one of the most Earth-like bodies in the Solar System and is the only body, besides Earth, where water is known to have flowed across the surface. Currently, the only way we can "explore" Mars is *via* data sent back from unmanned orbiting spacecraft and rovers, and through the study of martian meteorites, laboratory experiments, and numerical modeling. However, it is widely recognized that interpretations of Mars must begin by using the Earth as a reference [e.g., 1].

Terrestrial analogues are places on Earth that approximate the geological, environmental and putative biological conditions on Mars and other planetary bodies, either at the present-day or sometime in the past. Three key themes dominate terrestrial analogue activities [e.g., 2]: (1) comparative planetary geology, including process studies and the characterization of analogue materials; (2) astrobiology; and (3) exploration science, which includes instrument testing and development, astronaut training, and exploration-related activities. Analogue sites are also important focal points for education and public outreach activities.

The Canadian Analogue Research Network (CARN): In response to input from the Canadian scientific community, the Canadian Space Agency (CSA) has established the Canadian Analogue Research Network (CARN) as part of a multi-disciplinary approach to use Mars analogue sites (and those of other planetary bodies) in Canada to further our scientific understanding of the Solar System, to develop and test specific exploration technologies, and to understand how to explore and live in a safe manner on other planets. The establishment of the CARN addresses one of the major recommendations made by Farr [3] as part of a U.S. National Research Council decadal community report, which was that there is currently little or no coordination between the many individual analogue projects in individual countries and around the world.

The first 3 CARN sites were selected in June 2005 through a "Request for Proposals [RFP] to Provide Logistical and Engineering Support Services for Analogue Research Studies in Canada". The selected sites are (Fig. 1):

- Haughton–Mars Project Research Station, Devon Island, Nunavut, 75°22' N, 89°41' W (Fig. 2).

- McGill Arctic Research Station, Axel Heiberg Island, Nunavut, 79°26' N, 90°46' W (Fig. 3).
- Pavilion Lake Research Project station, British Columbia, 50°51'N, 121°44' W.

In addition, the Exploration Systems Operations Centre (ExSOC) based at Simon Fraser University, British Columbia, was selected through this RFP to provide engineering, communications, and safety support, mission operations support, analysis, management, and planning services for analogue activities at these (and other) sites. ExSOC will be able to aid scientists in placing their analogue activities into a planetary exploration science context and assist in the application of science results to other planetary exploration activities, in addition to providing core logistics services (S. Braham, pers. comm. 2006).

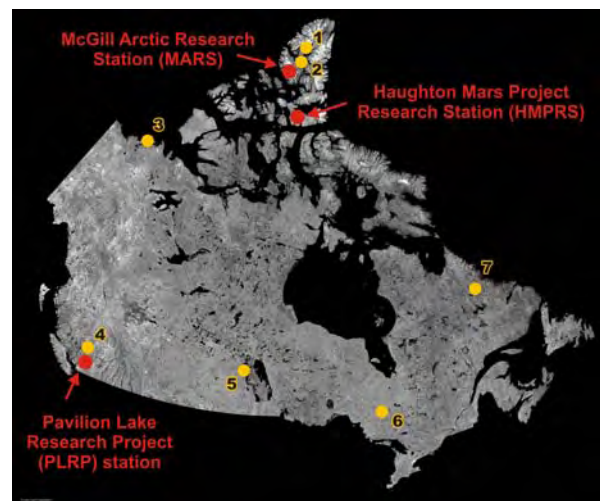


Figure 1. Current activities of the Canadian Analogue Research Network (CARN) superimposed on a Radarsat mosaic of Canada. The red dots represent the 3 sites chosen (via competitive process) to have logistical and infrastructure support. Research at these sites was supported through RFP CARN 05-01. The yellow dots represent other sites where analogue studies have been supported through RFP CARN 05-02. 1 = Borup Fiord, Ellesmere Island, Nunavut. 2 = Eureka Sound lowlands, Ellesmere Island, Nunavut. 3 = Tuktoyaktuk Peninsula, Northwest Territories. 4 = Various evaporite basins, British Columbia. 5 = East German Creek, Manitoba. 6 = Kidd Creek Mine, Ontario. 7 = Mistastin impact structure, Labrador and Newfoundland.

Opportunities for Mars analogue studies in the Canadian Arctic: The Canadian Arctic offers a wide

variety of potential analogue sites, including vast regions of continuous permafrost, polar deserts, meteorite impact craters, glacial landscapes, perennial springs, ice-covered lakes, and unique biological habitats. Two of the 3 CARN sites are located in the Canadian High Arctic. It is important to note that these Arctic analogue sites are relatively easy to access, unlike Antarctica, as a result of being in North America and the pre-existing logistical framework provided by Natural Resources Canada's Polar Continental Shelf Project (PCSP) and, now, the Canadian Space Agency's CARN program.

Following the selection of the three CARN sites and ExSOC, a Request for Proposals for Access and Support for Activities at Canadian Analogue Research Network (CARN) Sites (RFP CARN 05-01) was released in August 2005. This RFP was specifically to support science investigations and science instrument testing and validation at the three CARN sites. However, it was also recognized through discussions with the Canadian planetary science community that there are several proven and likely other potential analogue sites throughout Canada, both on land and under the ocean. Thus, a second RFP was released simultaneously to support research activities at other analogue sites in Canada: Request for Proposals for Analogue Research Studies in Canada (RFP CARN 05-02) (see Fig. 1). Details of both RFP's can be found on the CSA website:

http://www.space.gc.ca/asc/eng/scientific/ao/dp_ca/m0501.asp

http://www.space.gc.ca/asc/eng/scientific/ao/dp_ca/m0502.asp



Figure 2. Oblique aerial photograph of the Haughton meteorite impact structure, Devon Island, Nunavut, site of the Haughton-Mars Project Research Station. Photo: GRO.

It is anticipated that these two announcements will be released on an annual basis to support analogue

research activities in Canada (the expected release date is July 2006 for studies planned for April 01 2007 to March 31 2008). As is shown in Figure 1, many of the supported analogue activities are at the two northern CARN sites and other locations in the Canadian Arctic. This provides a unique coordinated opportunity for comparative studies of planetary geology, astrobiology, and exploration science between the polar regions of Earth and Mars.



Figure 3. Perennial springs at Expedition Fiord, Axel Heiberg Island, Nunavut, near the McGill Arctic Research Station, Axel Heiberg Island. Photo reproduced with permission of D. Andersen.

Future directions: Currently, support through the CARN is only available to Canadian universities, not-for-profit institutions, industry and other government departments. It is a desire of the Canadian Space Agency (CSA) to continue to expand the CARN to more sites throughout Canada and to use this program to leverage an International Analogue Network. Such a network would make available any site to any researcher in a participating country, for the benefit of the entire planetary science and exploration communities. Given the likely international nature of future Moon-Mars missions, international coordination of analogue activities would be a logical first step.

Interested organizations and agencies are invited to contact the CSA and/or contact the authors at this conference.

References: [1] Farr T. G. et al. (2002) *ASP Conference Proceedings: San Francisco, Astronomical Society of the Pacific*, p. 35-76. [2] Osinski G. R. et al. (2006) *Geosci. Canada*, in press. [3] Farr T. G. (2004) *Planet. Space Sci.*, 52, 3-10.