

MARSFEST (Martian Arctic Regions Science Field Experience for Secondary Teachers) Professional Development Workshop and Teacher Ambassador Program. S. R. Buxner¹, J. M. Keller², A. J. Shaner¹, C. F. Bitter¹.
¹Lunar and Planetary Laboratory, Univ. Arizona, Tucson, AZ 85721 (sanlyn@lpl.arizona.edu), ²Physics Department, Cal Poly San Luis Obsipo, SLO, CA 93407 (jmkeller@calpoly.edu).

Introduction: Data from the Gamma Ray Spectrometer (GRS) instrument suite aboard the 2001 Mars Odyssey spacecraft provides compelling evidence for the presence of near surface buried water ice at the high latitude regions of Mars. [1,2,3]. In May 2008 the Phoenix Mars Lander will touch down in the northern high latitude region of Mars to investigate frozen water ice. The Phoenix mission will investigate soil and ice samples using chemical and microscopic analyses as well as accumulating meteorological data from the landing site. MARSFEST (Mars Arctic Regions Science Field Experience for Secondary Teachers) is an on-going program planned and supported by the GRS and Phoenix E/PO teams and supported additionally by the Cold Regions Research and Engineering Laboratory (CRREL), the University of Alaska Fairbanks (UAF), the Canadian Space Agency (CSA), and the Jet Propulsion Laboratory (JPL). MARSFEST began with a one-week teacher workshop during the summer of 2006. During this workshop teachers learned about Mars exploration through remote sensing and in-situ observations, the upcoming Phoenix mission and Mars science. The purpose of the workshop was to expose teachers to Mars science and Mars curriculum in an effort to improve and support quality science instruction. The MARSFEST program continues through an education ambassador program supported by the GRS/Odyssey and Phoenix missions.

Description of MARSFEST:

Participants. Ten teacher teams of two from the US and Canada were selected from over 500 applicants through a national application program. The two-teacher model is based on other successful teacher programs and is intended to promote teacher mentorship and collaborative work. The twenty participants include middle and high school science teachers that teach biology, geology, physics, chemistry, biology, and integrated science, as well as an English integrated studies teacher and a district science coordinator. Participants were chosen on a criterion of being new to NASA, serving an underserved population, and a commitment to the ambassador program for the Phoenix Mission.

2006 Summer Teacher Workshop. Teacher participants joined science members from the Phoenix mission, GRS instrument team, UAF, and CRREL for a one-week experience in and around Fairbanks, Alaska. During the workshop teachers participated in scientific

inquiry, lesson modeling, evaluation of educational products, and dissemination planning of Phoenix information and Mars exploration educational products.

Science Inquiry Process. Teachers conducted investigations using both remote sensing and hands-on collection of data related to permafrost in the local area. Teacher teams investigated their own research questions in the CRREL permafrost tunnel including sample collection and lab analysis with the assistance of science team members. The conclusion of the inquiry process was the presentation of work to the group and science team members.

Lesson and Activities. Throughout the week teachers enacted curriculum related to Mars from a variety of missions that have existing lessons for both formal classrooms and informal settings. Teachers also gave formative feedback to curriculum developed by the GRS and Phoenix E/PO teams which were incorporated into revisions of lessons for national distribution.

Evaluation. Initial workshop evaluation included daily surveys, journal reflections, pre and post pedagogy surveys, and content surveys. Longer term evaluation includes a one-year follow up pedagogy survey and series of interviews. A full description of evaluation and results can be found at an additional MARSFEST evaluation poster.

Documentary. Through their inquiry experience in the CRREL permafrost tunnel, teachers acted as analogs to the Phoenix Lander, collecting ice and soil samples, doing chemical and microscopic analyses of the samples and collecting local atmospheric conditions data within the tunnel. A film crew from the Jet Propulsion Laboratory documented the entire week workshop and is currently producing a set of short films to be used in classrooms to help students understand the mission and mission science.

Workshop Follow-Up and Ambassador Program:

Ambassador Program. MARSFEST participants comprise a substantial part of the Phoenix E/PO team and disseminate information at local and national science teacher association meetings, museums, community events, school and district professional development workshops, and in their own classrooms. Teacher ambassadors will remain active as an integral part of the Phoenix mission until the end of surface operations in 2008. Additional participants are active in creating their own products for the mission (e.g.

translation of materials into Spanish, curriculum enactment guides) which are being added to public E/PO products.

Monthly Telecons and Additional Support: Teachers participate in year-round monthly telecons in which they are kept up to date on the mission, share their own experiences, and build their community of ambassadors. Additionally teachers are supported through the use of a course management system in which they can share information, presentations, and discussions in a dedicated area different from their personal and work emails and in an organized place.

Long Term Evaluation. A longitudinal study is being conducted to investigate the follow-up effort of this program to sustained use of activities in teachers' classrooms and an overall change in scientific inquiry.

CDs of curriculum and contact information for ambassadors will be available during the session.

References:

- [1] Boynton et al. (2002), "Distribution of hydrogen in the near surface of Mars: Evidence for subsurface ice deposits," *Science*, 297:81
- [2] Feldman et al. (2002), "Global distribution of neutrons from Mars: Results from Mars Odyssey," *Science*, 297:75.
- [3] Mitrofanov et al. (2002), "Maps of subsurface hydrogen from the High Energy Neutron Detector, Mars Odyssey," *Science* 297:78.

Additional Information: Individuals interested in the MARSFEST program or about GRS or Phoenix outreach are encouraged to contact the E/PO Team at the following addresses:

Sanlyn Buxner <sanlyn@lpl.arizona.edu>

Andy Shaner <ashaner@as.arizona.edu>

Additional information can be found on our websites at:

<http://grs.lpl.arizona.edu/>

<http://phoenix.lpl.arizona.edu/>