

**STUDENT INTERNS WORK ON MARS.** C.D. Bowman<sup>1</sup>, M. Bebak<sup>2</sup>, D.M. Bollen<sup>3</sup>, K. Curtis<sup>2</sup>, C. Daniel<sup>4</sup>, B. Grigsby<sup>5</sup>, T. Herman<sup>6</sup>, E. Haynes<sup>7</sup>, D. H. Lineberger<sup>4</sup>, S. Pieruccini<sup>8</sup>, S. Ransom<sup>9</sup>, K. Reedy<sup>2</sup>, C. Spencer<sup>6</sup>, A. Steege<sup>4</sup>. <sup>1</sup>Raytheon ITSS, NASA Ames Research Center, M/S 269-3, Moffett Field, CA 94035, cbowman@mail.arc.nasa.gov, 650-269-2787, <sup>2</sup>Nardin Academy, Buffalo, NY, <sup>3</sup>Cornell University, Ithaca, NY, <sup>4</sup>Durham Academy Upper School, Durham, NC, <sup>5</sup>Shasta County Office of Education, Redding, CA, <sup>6</sup>West Valley High School, Cottonwood, CA, <sup>7</sup>Centaurus High School, Lafayette, CO, <sup>8</sup>Milton Hershey School, Hershey, PA, <sup>9</sup>University High School, Los Angeles, CA.

**Introduction:** The exceptional imagery and data acquired by the Mars Exploration Rovers since their January 2004 landing have captured the attention of scientists, the public, and students and teachers worldwide. One aspect of particular interest lies with a group of high school teachers and students actively engaged in the Athena Student Interns Program. The Athena Student Interns Program (ASIP) is a joint effort between NASA's Mars Public Engagement Office and the Athena Science Investigation that began in early 1999 as a pilot student-scientist research partnership program associated with the FIDO prototype Mars rover field tests [1]. The program is designed to actively engage high school students and their teachers in Mars exploration and scientific inquiry. In ASIP, groups of students and teachers from around the country work with mentors from the mission's Athena Science Team to carry out an aspect of the mission.



Figure 1. Students and teacher working with science team member to determine rock distribution.

**Preparation:** ASIP participants were selected through a national process. Applicants applied to work with a specific mentor and had to meet certain requirements for technology access and time commitment, as well as describe their plans and ability to engage other students and the public in their activities. Selections for Athena Student Interns were made by the mentors based on the fit with each mentor's work (as described in the application) and

ability to meet the requirements. The ASIP teams are listed at <http://athena.cornell.edu/educators/asip.html>.

Since May 2003 mentors have been working closely with the groups to ensure all involved are prepared for their research. In addition to meetings between the mentors, teachers, and students, groups take part in numerous teleconferences with mission scientists, engineers, software developers and other students in the program. To prepare for actual mission operations, the students and teachers participate in one of the Science Team's Operational Readiness Tests (ORTs) at JPL with the FIDO prototype Mars rover [2]. Through the ORT, teleconferences, email, one-on-one time with mentors, and individual research, the students prepare to be members of the Science Team.

**Mission:** Possibly the most exciting aspect of ASIP is the actual participation in the scientific exploration and discovery of Mars. Each mentor is an expert in the science associated with one or more of the instruments carried by each rover. Starting with the landing of the first rover, each ASIP group spends one week at JPL in mission operations, working as part of their mentor's own team to help manage and interpret data coming from Mars and to perform research that aids the Science Team in the development of daily activities for the rovers (see Figure 2).

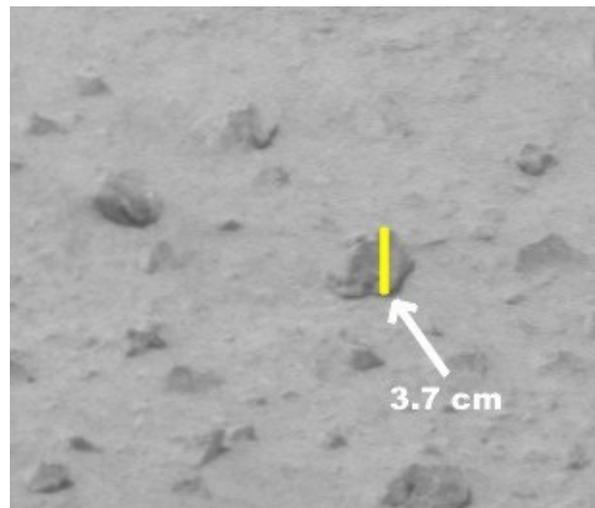


Figure 2. Students analyzed rock size and distribution at part of Spirit's landing site.

Student journals, images, data products and other information are available on the ASIP website at <http://marsrovers.jpl.nasa.gov/classroom/students/asip.html>.

**Teacher Participation:** With the guidance of the teachers in the program, the student interns progress from learning factual information about Mars and the mission to becoming better scientists and ambassadors of science to others. Teachers collaborate with mentor scientists in defining the specific goals of the student interns, help create extended learning opportunities, and oversee student progress throughout the program, making sure students truly understand the concepts and processes at each level of learning. Teachers also participate directly in sharing the mission experience with other students in their schools through integrating Mars-related science and math into their classroom curricula and giving in-class presentations.

**Outreach:** Outreach is an integral part of the Athena Student Interns Program. Teams work within their high schools, assisting with math, science, or technology lessons. Collaboration with their district elementary and middle schools involves team members as “Mars Mentors” to younger students. Teachers conduct meetings or workshops with faculty members focusing on Mars classroom activities. Partnerships with local science museums and astronomy clubs provide teams a wider audience. For instance, the ASIP team from Buffalo, New York, volunteers at the Buffalo Museum of Science, giving public demonstrations on how solar energy powers the Mars rovers. In addition, teams cooperate with larger education networks such as NASA’s Solar System Ambassadors Program, leveraging their joint expertise and community connections and the excitement of the current mission. Teams also keep a weekly web diary of lessons learned, accomplishments, and discoveries. Contributions to publications such as web articles and conference abstracts serves to give others a “behind-the-scenes” glimpse of being part of the mission, and participation in NASA webcasts and web chats helps reach an even broader audience.

**Evaluation:** The Athena Student Interns Program is designed to accomplish several main goals. The students and teachers gain an increased understanding of Mars science, the Mars Exploration Rover mission as a whole, and the processes involved in planning a mission and implementing those plans. The ASIP program also helps its participants to better understand current computer and information technologies, including online forums, webcasts and webchats, and rover science software. The students gain an improved appreciation of the importance of teamwork to projects such as planetary missions, and how the necessary level

of cooperation for such an endeavor is achieved and maintained throughout.

Evaluation of the ASIP program takes place on many different levels. The most formalized assessment, empowerment evaluation, has been used with the Athena Student Interns Program and its precursor program, LAPIS, since 2001 [3]. The technique allows program participants to be fully involved in the ongoing evaluation of ASIP by determining the mission or vision of the program, identifying the most important aspects of the program and taking stock of how well they are going, and planning for the future of ASIP, including making mid-course corrections and improvements [4]. Products and activities created by the participants are another important aspect of the assessment, as well as being part of their contribution to the mission. Students send weekly updates and working diary installments to the program coordinators to be included on the public outreach website. Groups also create presentation materials (such as slides, handouts, and images) that are shared with the group and, ultimately, the public. Additionally, each group works with their mentor to create their own research project based on the mentor’s expertise. The project is carried out during the landed mission and is another method of gauging student learning.

**Future:** With the knowledge they gain through the ASIP program, both the students and the teachers involved are able to reach out to their communities and introduce more people to science and Mars exploration, including what goes on behind the scenes. After completing the ASIP program, student participants will have a deeper foundation of knowledge upon which to base decisions about future careers in science and technology. They will also have added to the foundation of the Athena Student Interns Program. Just as previous groups of ASIP participants helped refine the current program, future interns will benefit from the lessons learned during this program as it provides a model for student outreach associated with future space missions to Mars and beyond.

**References:** [1] Arvidson, R.E. et al. (2000) *Eos*, 81, 11. [2] Arvidson, R.E. et al. (2000) *Eos*, 81, 7. [3] Bowman, C.D. et al. (2003) *J. Geosci Edu*, 51, 1. [4] Fetterman, D. and C.D. Bowman. (2002) *J. Experiential Edu*, 25, 2.

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