STUDENTS WORK ALONGSIDE SCIENTISTS TO TEST MARS ROVER. M. P. Fuchs[1], T. J. Green[2], J. M. S. Levant[3], J. I. Nuñez[4], C. D. Bowman[5], D. M. Sherman[6], [1]O'Brien House, 3745 West Pine Mall, Box #4, St. Louis, MO 63108, fuchsmp@slu.edu, [2]Haltom High School, 5501 N. Haltom Road, Ft. Worth, TX 76137, GigEmRobotGuy@msn.com, [3]Yale University, P.O. Box 201252, New Haven, CT 06520, jmsl84@yahoo.com, [4]University of Alabama, Birmingham, FOT 820A, 510 20th St. South, Birmingham, AL 35294-3708, Jorge.Nunez@ccc.uab.edu, [5]Raytheon ITSS/NASA Ames Research Center, M/S 269-3, Moffett Field, CA 94035-1000, cbowman@mail.arc.nasa.gov, [6]Cornell University, 426 Space Sciences Building, Ithaca, NY 14853, diane@astro.cornell.edu.

Introduction: NASA's 2003-2004 Mars Exploration Rovers and associated Athena Science Payload will provide an exciting opportunity to get students and the public involved in Mars exploration. One outreach component, the Athena Student Interns Program, will directly engage high school students in scientific discovery on Mars by incorporating the students into the mission's science team. The Athena Student Interns Program, based on the successful LAPIS program [1], was prototyped during the FIDO rover field trials that took place in the Arizona desert and at the Jet Propulsion Laboratory (JPL) in August 2002 (http://mars.jpl.nasa.gov/mer/fido). Use of a participatory evaluation process allowed mid-course corrections to be made to the program and provided the model for mission-related outreach.

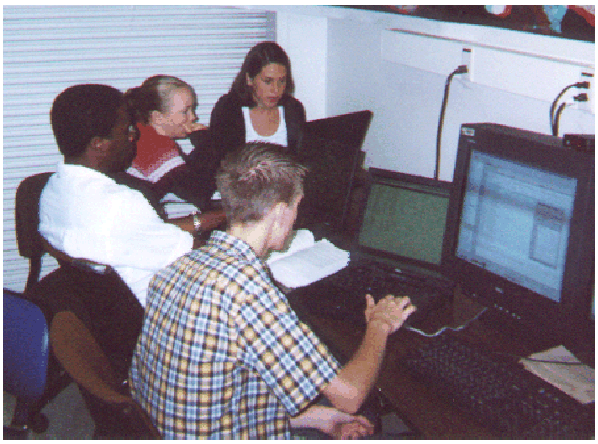

Figure 1. Students working with the Science Activity Planner and special 3D visualization software at JPL

Preparation: Extensive background work was needed before the interns participated in the field tests at JPL. Students took part in numerous teleconferences with scientists, engineers, software developers and other students. During these meetings, the interns became acquainted with each other, and the mentors provided necessary background information on Mars geology, rover systems, mission planning, and data archiving. Students also met with their mentors throughout the preparatory process preceding the field tests to gain experience in the various tasks that would be implemented at JPL. Finally, the students trained in using both the rover science planning software and a special 3D visualization tool. Through the teleconferences, email interactions, one-on-one time with mentors, and individual research, the students were prepared to be full members of the Science Team.

Operations: For the field tests, the Athena Student Interns were involved in an array of activities that varied from day to day to broaden and enhance the students' understanding of such a large-scale mission. These activities included shadowing mentors, other science team members, rover engineers, or support staff, working on specific tasks such as gathering data collected by the rover each day and generating spreadsheets and posters of the images of targets with the respective spectral data, and comparing spectral data to a database for target identification. The students also worked on the field test website, posting data collected by the rover in a reference library format for the science team to use when planning future rover traverses, created educational outreach materials for the Mars Exploration Rover website (http://mars.jpl.nasa.gov/mer/fido/students.html) and participated in the specific science working groups such as atmospheric science and soil properties. Although the program focused mainly on science, students were encouraged to explore interests in leadership, engineering, and other areas through working with the Chairperson of the Science Operations Working Group, directly with the rover engineers, or with various science theme groups. At the end of each day, the students participated in assessment meetings to review the day's activities, and met with different science team members over dinner to become acquainted with the people involved with the mission in a more relaxed setting. The diversity of these activities contributed to the overall success of the mission and enhanced the students' learning experience, which will help them in defining a future career path in science, mathematics, and engineering.

Outcome: The program participants gained valuable insight into the world of science. They were in constant and direct communication with highly respected scientists and engineers, learned what it is like being a professional affiliated with NASA, and

experienced first-hand the challenges and triumphs of scientific inquiry. The interns proved they were more than just stagnant sponges there to soak up as much knowledge as possible for a future career. They attacked problems alongside scientists, utilizing critical thinking skills within a pressure-filled atmosphere. Not only did the Athena Student Interns Program further the students' knowledge of planetary exploration, but it also encouraged them to be actively involved and to work to extract as much information from the rover's explorations as possible.

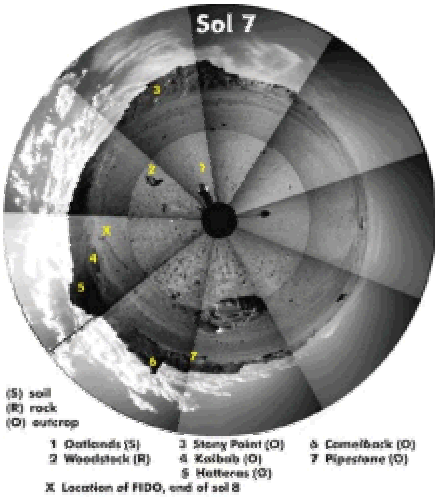

Figure 2. Student-created panoramic projection made with images from the rover's navigational cameras

Assessment: Used successfully with the LAPIS program, a participatory form of evaluation, called *empowerment evaluation,* was employed to assess Athena Student Interns [2]. Through a three-stage process that took place during the program, the members of Athena Student Interns worked to refine the mission of the program, take stock of its most important aspects and activities, and plan for the future. Due to the distributed nature of the program, much of the early evaluative work took place via teleconferences, email, or the team website. The final stage, planning for the future, provided the most important feedback. The students identified a desire for more opportunities to learn about mentors' career paths and more information about how to pursue certain educational and career goals. The completed assessment will be used to improve the future mission-implementation of the Athena Student Interns Program

Future: Athena Student Interns is one way to help the school-aged public become more aware of and more directly involved in Mars exploration [3]. Built on past programs and crucial lessons learned, the program has achieved its goal--to enable a sense of participation in the actual Athena science investigation. It allows the students to learn about and participate in the mission through the mentors, the science team as a whole, and through work with specific science and engineering groups. This immersive experience changes the students' perspectives at all major steps through the scientific investigation. This also helps each student further define what he or she is interested in and explore various careers at NASA and beyond. Future Athena Student Interns can look forward to an even stronger role in the mission and deeper participation with the science team. They will also have the support of the participants of the Athena Student Interns prototype, who will consult with the program in the future. Past Athena Student Interns will share their lessons learned, provide background information, and help more students become aware of this ever-growing program. The Interns' continuing interaction helps make the program bigger and better by showing students, schools, and communities how much the program has to offer. With formalized evaluation efforts, a growing number of participants, and the involvement of Athena Student Interns alumni, the program will provide a model for future outreach associated with Mars and other planetary exploration missions and will continue to work to open doors to careers in and increased understanding of science, engineering, technology, math, and exploration. Perhaps one day, those first Athena Student Interns will be mentors themselves and will work to introduce future generations to the excitement of scientific discovery.

References: [1] Arvidson, R.E. et al. (2000) *Eos, 81, 11,* 113, 117. [2] Fetterman, D. F. and Bowman C. D. (in press) *Journal of Experiential Education*. [3] Bowman, C. D. and Sherman, D. M. et al. (in press) *Journal of Geoscience Education*.

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