TEACHING GENERAL EDUCATION COLLEGE SCIENCE VIA THE MARS STUDENT IMAGING PROJECT. R. E. Beiersdorfer[1], P. Valderrama[2],and C. R. Singler[1], [1]Dept. of Geological and Environmental Sciences, Youngstown State University, Youngstown, OH, 44555, rebeiersdorfer@ysu.edu, [2]Mars Education Program, Mars Space Flight Facility, Arizona State University, P.O. Box 876305 Tempe, AZ 85287-6305

Introduction: Asking and answering scientific questions using recent data acquired from the THEMIS instrument aboard the Mars Odyssey spacecraft is a great way to motivate college students enrolled in a required General Education science laboratory class.

General Education Science: Youngstown State University's (YSU) general education goals [1] with respect to natural science are for the students to: 1) understand the scientific method; forming and testing hypotheses as well as evaluating results; 2) realize the evolving interrelationships among science, technology and society and 3) understand and appreciate the natural environment and the processes that shape it. Students satisfy these goals by successfully completing Arts & Sciences 2600 - Explorations in the Sciences (AS2600) plus one or two additional science courses. AS2600 is a fifteen week semester course divided into three five-week modules taught by faculty from Biology, Chemistry, Geological & Environmental Science, Physical Geography or Physics & Astronomy. The Department of Geological & Environmental Sciences uses a thematic approach. Themes include rocks & minerals, fluvial processes, radon studies [2], surface & ground water geochemistry, and Martian geology.

Mars Student Imaging Project (MSIP): MSIP is a comprehensive national education program run in partnership by Arizona State University (ASU) and NASA/JPL [3]. Student teams from grades 5 to 14 conduct authentic research by creating a research question and answering that question using data from the THEMIS visual-wavelength camera on board the 2001 Mars Odyssey spacecraft. The program uses inquiry-based learning and actual planetary data to allow students in a variety of different grade levels to better understand the scientific method and investigation process as it applies in the scientific community. Student experiences for image reception activities can take place either on-site at ASU's Mars Space Flight Facility or via distance learning. The MSIP web site is http://msip.asu.edu.

MSIP at YSU: The students in AS2600 use MSIP archived-data consisting of previously taken THEMIS images of Mars. The images used for YSU's participation highlighted Martian geologic features such as wind-streaks, channels, craters, gullies, streamlined islands, and volcanic flows. Prior to working with the THEMIS images, students receive training in geology and Adobe Photoshop® using curriculum provided by MSIP. The Mapping the Surface of a Planet curriculum [3] consists of activities using data from the Mars Global Surveyor's Mars Orbiter Camera, Thermal Emission Spectrometer, and Mars Orbiter Laser Altimeter. The students learn how to: 1) distinguish geologic features; 2) determine relative ages and 3) work out the time sequence of events. The MSIP Image Processing curriculum uses Adobe Photoshop® to train students how to 1) adjust the gray scale to bring out details; 2) select features for cropping and enlargement; 3) measure the size and depth of craters and other features and 4) count the number of craters within a region to determine relative ages.

Students complete several activities using the scientific method prior to learning about Mars. The MSIP Student Handbook and Activity Guide uses a model activity, the "Soda Straw Rocket" exercise (created by Dr. John Callas at NASA/JPL), to demonstrate the scientific method and experiment design process with a concrete, fun, hands-on activity. Students can then apply what they have learned about the scientific process when formulating their Mars-related project and experiment design.

The Projects: After completing 15 class hours of training in the scientific method, Martian geology and image processing, the students work in groups to create a hypothesis that can be answered using MSIP archived THEMIS images of Mars. Examples of student generated hypotheses include: 1) the length of the wind-streaks exhibited behind craters in Syrtis Major are related to the a)size; b)depth; or c)crater age 2) the channels in Auquakuh Valles were formed by a)running water; or b)wind and 3) the topographic depression in the image taken from the southeast flank of Olympus Mons formed as a result of a)an impact; b)a volcanic depression or c)mass wasting. Results are presented in class and documented in a report.

Conclusion: The opportunity to incorporate MSIP into YSU's General Education science laboratory course allows students to be involved in the exploration of another planet using real planetary data from a current spacecraft orbiting Mars. This excites and motivates even non-science major students about science and helps to illustrate the relevance of a well-rounded higher education in the pursuit of future careers.

References: [1] Youngstown State University Undergraduate Bulletin (2002) *Undergraduate Catalog, 71,* 38-44. [2] Singler C. R. and Usis J. D. (2002) *Geol Soc Amer abs., 34-6,* 523. [3] Klug S. L. et al. (2002) *LPS XXXIII*, Abstract #1758.