MULTISPECTRAL HAND LENS AND FIELD MICROSCOPE. R. G. Sellar[1], J. D. Farmer[2], M. S. Robinson[2], and J. I. Nuñez[2], [1]Jet Propulsion Laboratory, California Institute of Technology (4800 Oak Grove Drive, Pasadena, CA 91109, glenn.sellar@jpl.nasa.gov), [2]Arizona State University, School of Earth and Space Exploration (PSF room 686, Tempe, Arizona 85287-1404).

Introduction: With recent support from NASA's Moon and Mars Analogue Mission Activities (MMAMA) program, we plan to perform field trials of a *Multispectral Microscopic Imager (MMI)* within the context of ESMD's Desert Research and Technology Studies (Desert RATS) lunar analogue mission activity. The MMI is intended as a basic tool for use by an astronaut or robotic rover for traverse characterization, documentation, and mapping the distributions of a broad variety of geological materials, including igneous and sedimentary materials (e.g. basaltic pyroclastics and their sedimentary derivatives, lavas, impact ejecta and soil/regolith materials, as well as weathering alteration surfaces of rocks, soil crusts, etc.). Color microscopic imaging and spectroscopy provides fundamental observations for interpreting the origin of rocks and soils, for inferring their secondary (post-depositional) alteration (diagenesis) and for interpreting paleoenvironments. Such observations are basic to an evaluation of the physical properties, health risks, and *in situ* resources for human exploration of the Moon.

Development of the MMI was achieved through the addition of spectrometric capabilities to the highly-successful Microscopic Imagers (MIs) currently in operation on the Mars Exploration Rovers (MERs). The MMI, with its multiple spectral bands and spectral range extending into the infrared, has a demonstrated capability to discriminate and resolve the spatial distributions of minerals and textures at the microscale [1], [2]. After initially demonstrating these capabilities (Fig. 1) in the laboratory we have fabricated a rugged and portable MMI instrument (Fig. 2) for use in supporting field-based research at analogue sites. A flight version of the MMI could be mounted on a tripod or accommodated on a crewed rover for use during EVAs or could be employed for sample screening and documenatation at a lunar base.

The MMI employs multi-wavelength light-emitting diodes (LEDs), a substrate-removed InGaAs focal-plane array, and *no moving parts* to provide a multispectral, microscale image of a sample in 21 spectral bands extending from visible wavelengths to 1.7 µm in the infrared. This provides 21-band visible-to-infrared reflectance spectra acquired from every pixel in the field-of-view. Such data sets provide highly-desirable contextual information for guiding sub-sampling of rocks and soils for sample return and/or detailed analysis with instruments onboard a rover or at a lunar base.

Figure 1. False-color composite image composed of three bands (525, 805, and 1300 nm displayed in blue, green, and red respectively) extracted from a multispectral data set; the field-of-view is 40 x 32 mm with a resolution of 62.5 µm per pixel.

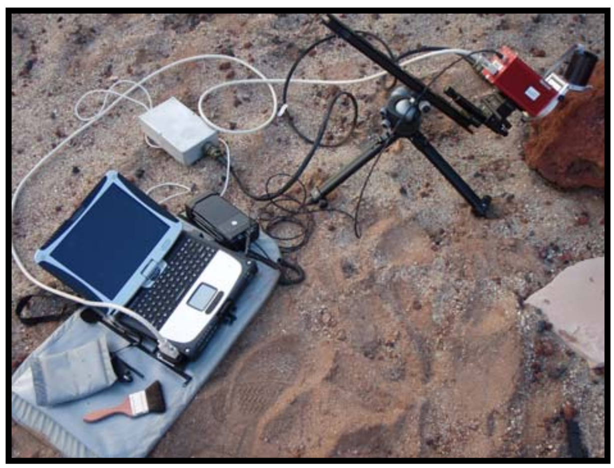

Figure 2. Field version of the Multispectral Microscopic Imager shown in the JPL Mars Yard.

References: [1] R. G. Sellar, J. D. Farmer, P. Gardner, P. Staten A. Kieta, and J. Huang (2007) *Seventh International Conference on Mars*, abstract # 3017. [2] Sellar R. G., J. D. Farmer, A. Kieta, and J. Huang (2006) *Proc. SPIE* 6309, 63090E.

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