2010 GSA Denver Annual Meeting (31 October –3 November 2010)

Paper No. 19-2

Presentation Time: 8:20 AM-8:40 AM

A NEW APPROACH TO ADVANCED PLANETARY FIELD GEOLOGY

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Field geologic research is practiced differently on Earth than it was on the Moon during the Apollo program. Limitations of both time and resources on the Moon led to operational modes that required highly choreographed field traverses. Such constraints rob field geologists of one of their more powerful research tools: observational flexibility. The greatest science return from future human exploration of the Moon, near-Earth asteroids, and Mars will be achieved if we find a way to increase the autonomy of astronaut explorers and encourage them to do field geology more like their compatriots who do field geology on Earth.

In this presentation, we review the scientific successes of Apollo, and suggest how a more flexible exploration strategy might have advanced our understanding of lunar evolutionary processes even farther. Operationally, such a strategy will require deliberate action on the part of space-fearing nations to recruit trained field geologists as astronauts. Time and resource limitations and excessive risk can be overcome by an aggressive program of collaborative human and robotic exploration. Robotic precursor missions would provide increasingly sophisticated (and higher resolution) reconnassance of sites being considered for human exploration. Robotic assistants can be deployed during human missions to perform time-consuming geologic surveys or high-risk activities. Informed by the results of human field research, robots also can perform follow-up scientific activities to expand on our geologic knowledge of a targeted region.

Analog exercises on Earth are an essential part of the preparations necessary for successful advanced planetary field geology. These exercises will be most informative if they embrace the entire geologic research process -- including problem definition, field observation, and laboratory analysis -- and not simply field work. We would argue that terrestrial field geology itself is overdue for a renaissance in which new technologies -- including field robotics -- will increase the science return of this most fundamental of geologic research activities. Terrestrial field geologists as well as planetary scientists can gain much from greater collaboration.

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General Information for this Meeting

Session No. 19
Field Geology on Other Planets: An Emerging Science
Colorado Convention Center: Room 710/712
8:00 AM-12:00 PM, Sunday, 31 October 2010