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Activities of the Committee on "The Scientific Context for the Exploration of the Moon"

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The National Research Council (NRC) of the U.S. National Academy of Sciences is undertaking a study to examine the scientific challenges and opportunities opened up by a sustained program of robotic and human exploration of the Moon. The study will address NASA's near-term needs for scientific guidance for the lunar component of the Vision for Space Exploration (VSE). In particular, the NRC study focuses on four tasks. First, to identify a prioritized set of scientific goals that can be addressed in the near term by robotic lunar missions and in the mid term by astronauts on the Moon. Second, to determine which of the identified scientific goals are most amenable to orbital measurements, in situ study, or terrestrial analysis via the return of lunar samples to the Earth. Third, to comment on those areas where there is a synergistic overlap between measurements addressing scientific goals and measurements required to ensure human survival. And finally, to identify and characterize possible scientific goals that might be addressed on or from the Moon in the long term. The committee provides the following prioritization of lunar science that can be accomplished by lunar measurements and analyses during the early phases of the Vision for Space Exploration: 1) fundamental solar system science (e.g., the impact flux in the inner solar system), 2) planetary processes (e.g., compositional and physical diversity of volcanic processes), and 3) other opportunities (e.g., using the Moon as an observational platform). The study is currently underway and already resulted in an interim report that was issued in September 2006 (http://www.nap.edu/catalog/11747.html). Its purpose is to prompt discussion in the scientific and engineering communities. A final report will be issued in the latter half of 2007 after one more committee meeting, which will assess the contributions from these communities. So far, several scientifically worthwhile themes

have been identified on the basis of expert input and panel deliberations. These themes include: 1) The bombardment history of the inner solar system is uniquely revealed on the Moon; 2) The structure and composition of the lunar interior provide fundamental information on the evolution of a differentiated body; 3) The Moon's crust is more complicated than simple magma ocean products; 4) Lunar volcanism provides a window into the thermal and compositional evolution of the Moon; 5) The Moon is an accessible laboratory for studying the impact process on planetary scales; 6) The Moon is a natural laboratory for regolith processes and weathering on anhydrous airless bodies; 7) The lunar poles are special environments that may bear witness to the volatile flux over the latter part of solar system history; 8) Further exploration can vastly improve understanding of the fragile lunar atmosphere, exosphere, etc.; and 9) The Moon may provide an excellent platform for specific types of observations. We would like to invite the lunar science community to provide feedback in form of white papers, and/or comments.