ROBOTIC AND HUMAN EXPLORATION OF THE SCHRÖDINGER BASIN. T. Kohout[1, 2, 3], K. O'Sullivan[4], A, Losiak[5], D. Kring[6], K. Thaisen[7] and S. Weider[8, 9], [1]Department of Physics, University of Helsinki, Finland, tomas.kohout@helsinki.fi, [2]Department of Applied Geophysics, Charles University in Prague, Czech Republic, [3]Institute of Geology, Academy of Sciences of the Czech Republic, Prague, Czech Republic, [4]Department of Civil Engineering and Geological Sciences, University of Notre Dame, Notre Dame, IN, USA kosulli4@nd.edu, [5]Michigan State University, East Lansing, MI, USA, [6]Lunar and Planetary institute, Houston, TX, USA, [7]University of Tennessee, Knoxville, TN, USA, [8]The Joint UCL/Birkbeck Research School of Earth Sciences, London, UK, [9]The Rutherford Appleton Laboratory, Chilton, Oxfordshire, UK.

Introduction: The Schrödinger impact basin provides numerous scientific opportunities due to its location and relatively young age. Located near the South Pole on the far side of the Moon, it is the second y-oungest impact basin (after Orientale), thus remains well exposed. Schrödinger intersects the pre-Nectarian Amundsen-Gainswindt basin (AG), as well as the inner rings of the South Pole-Aitken basin (SPA). Modeling suggests [1] that Schrödinger's inner ring originates from a depth of 10-30 km and therefore may contain indigenous SPA materials.

Scientific objectives for the human exploration within Schrödinger basin: The following main scientific goals can be accomplished within Schrödinger [2]:

- Date the Schrödinger impact event.
- Collect and date SPA material, thus, anchoring the Earth-Moon impact flux curve.
- Study material produced by various basaltic volcanic events (Upper Imbrian and Eratosthenian in age [3, 4]).
- Study deep seated explosive volcanism (Eratosthenian or Copernician in age [3, 4]).
- Study potential products of crustal and mantle degassing along deep fractures.
- Study ghost craters flooded by melt sheet.
- Study secondary craters on the basin floor.

We propose a landing site for human exploration on a relatively smooth terrain ([3, 4]) within the inner ring of Schrödinger. This location can provide access to the features outlined above and meet the planned ~20 km extra vehicular activity (EVA) limit [2].

Robotic precursory mission concept: In order to maximize the scientific success of a human landing in Schrödinger basin, a precursory robotic mission is proposed to identify and characterize the best sampling localities to be later visited by astronauts during their EVAs. The following instrument package is proposed for the robotic rover (fig. 1):

- Panoramatic camera for high resolution imaging and for terrain evaluation (e.g. roughness, slope)
- Alpha Particle X-ray Spectrometer (APXS), or similar, to determine rock chemical composition.
- Microscopic Imager (MI) for rock texture studies.
- Rock Abrasion Tool (RAT) similar to that on Mars Exploration Rovers to expose the flat fresh rock surface for chemical and mineralogical studies.
- Robotic arm for sample manipulation / collection.
- Seismic receiver to record seismic signals from a static mechanical seismic generator located on the rover's lander platform. This configuration creates a seismic profile through recording repetitive seismic signals at various distances as the rover moves away from its lander platform. The subsurface structure as the thickness of regolith, melt sheet and basaltic units can be determined from the data.
- Ground Penetration Radar (GPR) for near subsurface studies of the site (e.g. regolith thickness).
- Penetrometers to measure the physical and mechanical properties of the regolith.

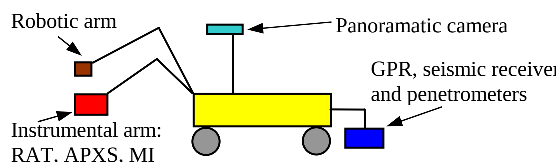

Figure 1: The concept of the robotic rover.

Conclusions: A precursor robotic rover can reduce the risk, requirements, and cost of a human exploration [5] and provide site characterization to enhance the efficiency of human exploration by identifying the highest priority traverse stations. It could also collect and deliver samples from remote areas to the human mission landing site or conduct complementary research after the human mission departure [5].

Acknowledgements: This work is part of the 2008 LPI Lunar Exploration Summer Intern program. We would like to thank LPI staff for their help and support.

References:

[1] Cintala M. J. and Grieve R. A. (1998) *MAPS, 33*, 889-912. [2] O'Sullivan et al. (2008) in this volume. [3] Shoemaker E. M. et al. (1994) *Science, 266*, 1851–1854. [4] Mest S. C. and Van Arsdall L. E. (2008) *NSLI Lunar Science Conference*, Abstract #2089. [5] Kring D.A. (2007) *LEAG Workshop on Enabling Exploration*, Abstract #3037.