BIOGRAPHICAL SKETCH FOR THE Co-I Ellen Howell

Education:
Ph.D., Planetary Sciences, 1995, University of Arizona
B.S., Geophysics − 1983, California Institute of Technology

Professional Experience:
2015-present Senior Research Scientist, Lunar and Planetary Lab, U. Arizona.
2011-2015, Scientist, Arecibo Observatory/USRA, Arecibo, Puerto Rico.
1999-2011, Research Associate, Arecibo Observatory/ Cornell University, Arecibo, PR. 1995-1999, Postdoctoral Fellow, Geology Department, Univ of Puerto Rico, Mayaguez, PR.

Scientific, Technical, and Management Performance of Prior Research Efforts:
Senior Scientist at Lunar and Planetary Laboratory, support for the OSIRIS-Rex Sample Return Mission, July, 2015 to present. PI and Co-I of several NSF and NASA grants in the last 20 years. Previously, Support Scientist and Software Specialist at Arecibo Observatory in the Planetary Radar Group.

Research Experience:
Rotational studies of comets and other small bodies of the solar system
Radar imaging of asteroids and comets
Multi-wavelength studies of near-Earth asteroids to measure composition and thermal properties
Radio OH studies of comets

Honors:
Asteroid **(2735) Ellen**
Comet 88P/Howell discovered in 1981.

Selected Publications

Virkki, A., E. Zubko, M. C. Nolan, E. S. Howell, L. A. M. Benner, and J. K. Harmon, Decimeter-scale particle characterization in the coma of 73P/Schwassmann-Wachmann 3 using dual-wavelength radar observations, *Icarus* 325, 94-104, 2019.

Lauretta, D. S., and 29 coauthors including E. S. Howell, The unexpected surface of asteroid (101955) Bennu, *Nature* 2019. https://doi.org/10.1038/s41586-019-1033-6

Nolan, M. C., E. S. Howell, D. J. Scheeres, J. W. McMahon, O. Golubov, C. W. Hergenrother, J. P. Emery, K. S. Noll, S. R. Chesley, and D. S. Lauretta, Detection of Rotational Acceleration of Bennu using HST Lightcurve Observations, *GRL*, 2019, doi:10.1029/2018GL080658.

Howell, E. S., R. J. Vervack, Jr., C. Magri,, M. C. Nolan, P. A. Taylor, Y. R. Fernandez, M. D. Hicks, J. M. Somers, A. S. Rivkin, and S. E. Marshall , SHERMAN: A shape-based thermophysical model and application to (8567) 1996 HW1, *Icarus*, 303, 220-233, 2018.

Crowell, J. L., E. S. Howell, C. Magri, M. C. Nolan, Y. R. Fernandez, J. E. Richardson, A. Springmann, and R. J. Vervack, Jr., Radar and Lightcurve Shape Model of Near-Earth Asteroid 1627 Ivar, *Icarus* 291, 254-267, 2017.

Nolan, M. C., C. Magri, E. S. Howell, L.A.M. Benner, , J. D. Giorgini, C. W. Hergenrother, R. S. Hudson, D. S. Lauretta, J.-L. Margot, S. J. Ostro, and D. J. Scheeres 2013, Shape model and surface properties of the OSIRIS-REx target Asteroid (101955) Bennu from radar and lightcurve observations, *Icarus* **226**, 629-640,2013.