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SCIENTIFIC AND TECHNICAL EXPERTISE

LROC Science and Operations: As an active member, since 2007, in both the science and operations of the Lunar Reconnaissance Orbiter Camera (LROC), centered at Arizona State University (PI Mark Robinson, ASU), I have had responsibilities ranging from instrument calibration, data quality analysis, and targeting to proposal writing, scientific analyses, and publications. As part of operations, I was involved in both uplink and downlink activities. I also attended the LROC Science Team meetings, Lunar Reconnaissance Orbiter (LRO) Planetary Science Working Group meetings, and LRO/LROC teleconferences to ensure inter-team communications. Working with students on various image interpretation projects provided insight into project management.

Uplink involves commanding the cameras and selecting imaging targets. Downlink involves validating and processing images returned from the cameras. Prior to launch of the spacecraft, LROC software was developed and tested for functionality, usability, and accuracy. Interfacing with developers, the science team, and mission operations personnel was required for success. As the LROC mission phase migrated from launch, to commissioning, and then primary operations, responsibilities moved from procedure development to procedure implementation. For data processing tasks, procedures were developed and tested with the specific goal of creating an efficient system for processing, cataloging, and storing of LROC data returned from the Moon. During this time, it was necessary to be ready to respond to mission-critical activities 24 hours a day, 7 days a week.

As operational procedures matured, I was able to dedicate more time to support and data analysis. Employing planetary and geologic knowledge, I authored and contributed to dozens of original research projects, abstracts, publications and proposals. In-flight calibration and on-going monitoring of instrument parameters and response remains critical to continued successful operations. I also played a key role in organizing and maintaining a geospatial data repository for on-site collaborative studies. The geospatial data in this library has greatly benefited global geologic studies and future mission planning activities.

Geologic Modeling Expertise: While my recent research focuses on the Moon, the skills I have gained are applicable to all rocky bodies. Methods of detecting and quantifying water (or H, or OH) resources are a high priority for upcoming missions. One way of tracing the water, is to look for signs of its interactions with minerals on or near the surface. Therefore, to understand the water-mineral interface between minerals and near-surface water on rocky bodies, including Mars and the Moon, I implemented geochemical models of reaction kinetics to constrain the degree of expected alteration in the presence of liquid water. The models were applied to Mars meteorites (Nakhlites) and a theoretical lunar polar terrain. In the lunar scenario, the geochemical model was tied to a heat-transfer model to quantify how impact craters interact with sequestered water-ice.

Planetary Remote Sensing Interpretation: My current research (including my time as a Ph. D. student at ASU) focuses on addressing key lunar science questions pertaining to the geology and evolution of the lunar surface through interpretation of remotely sensed data. Unprecedented detail of the lunar surface is provided by LROC images, allowing new interpretations of fundamental geologic processes. My research includes the morphologies and geologies of small-area volcanic deposits, recent volcanic deposits, strength-regime impact craters, as well as the abundance and behavior of impact melt in and around craters. I have developed and updated classic geomorphological techniques for geospatially aware, high-resolution data in order to investigate the processes driving lunar volcanism over time, as well as how target properties (such as topography, porosity, and composition) affect the morphologies of relatively small impact craters.

Planetary Materials Science: My graduate research (University of Hawaii) included Mars meteorites and near-surface geochemistry, where I utilized several fundamental analytical techniques, including optical microscopy, electron microprobe, scanning electron microprobe, laser-ablation mass spectrometry, and Raman spectroscopy. I focused on interpreting the timing of low-temperature dissolution and mineralization in Nakhilite meteorites, and on distinguishing terrestrial from martian alteration products.

Exploration Science: As I graduate student (also at the University of Hawaii), I helped to design, implement, and operate, a stand-off Raman spectrometer for landers and rovers. As a graduate student at ASU, I contributed to a long-duration rover mission-concept study. I continue to be involved in on-going collaborations involving a variety of lunar exploration projects, including a rover traverse-planning tool that pilots a least-energy path to pre-selected waypoints. As part of this effort (PI S. Lawrence, JSC), I am characterizing terrain parameters of several high-priority future landing sites. Ultimately, I aim to be involved in future exploration missions where my experiences and skills in operations, material analyses, applied exploration science, and fundamental scientific research will play a vital, leading role.

Collaborative Research: My ongoing collaborations both within and outside the LROC Science Team cover a diverse range of projects, ranging from morphologies of secondary craters, cryptomare detection, silicic volcanism, to exploration and sample return of young lunar basalts. This research focuses on combining LROC-derived geomorphologies with compositional and other data sets to further improve our interpretations of fundamental lunar geologic processes.

Computer Skills: As part of the LROC team, I became familiar with Linux, UNIX, shell scripting, database (SQL) queries, wiki language, SPICE functions, ISIS image processing, ArcGIS, IDL/ENVI, gnuplot, ImageMagick, scientific python, GDAL, and Matlab. My 5-year outlook includes developing capabilities for processing, manipulating, and analyzing “Big Data” sets like that of LROC.

Experienced Proposal Writing: As a graduate student (University of Hawaii), I was awarded a NASA Graduate Student Researchers Fellowship for the proposal entitled “Geochemical studies of aqueous alteration on Mars: Kinetics and products”. Since 2011, I have authored, co-authored, and collaborated on numerous proposals to the NASA ROSES program, and have successfully received funding through this program. I also aided in the development of the LRO Extended Mission proposals.

Scientific Peer-review and Community Service: From 2004 to the present, I have been actively engaged in NASA review panels, University-level advisory committees, and various conference organizing committees. I have reviewed numerous manuscripts for publication in peer-reviewed journals. I co-convened the session “Lunar Reconnaissance Orbiter – Seven Years at the Moon” for the Fall AGU Meeting 2016.

Public Engagement: I have participated in a variety of public events and outreach activities ranging from Open Houses to website content. Since the launch of LRO, I have continually contributed Featured Image content, interpreting LROC images for a public audience.

SCIENTIFIC PAPERS, CONFERENCE PROCEEDINGS, AND BOOK CONTRIBUTIONS

Submitted:

Stopar, J. D., M. S. Robinson, O. S. Barnouin, A. S. McEwen, E. J. Speyerer, S. Sutton, M. R. Henriksen (in revision) Relative depths of simple craters and the nature of the lunar regolith, *Icarus*.

Peer-Reviewed Publications:

Ashley, J. W., M. S. Robinson, **J. D. Stopar**, T. D. Glotch, B. R. Hawke, C. H. van der Bogert, H. Hiesinger, S. J. Lawrence, B. L. Jolliff, B. T. Greenhagen, T. A. Giguere, D. A. Paige (2016) The Lassell Massif – A silicic lunar volcano, *Icarus* 273: 248-261.

Speyerer, E. J., S. J. Lawrence, **J. D. Stopar**, P. Glaser, M. S. Robinson, B. L. Jolliff (2016) Optimized traverse planning for future polar prospectors based on high resolution lunar topography, *Icarus* 273: 337-345.

Clegg-Watkins, R. N., B. L. Jolliff, A. Boyd, M. S. Robinson, R. Wagner, **J. D. Stopar**, J. B. Plescia, E. J. Speyerer (2016) Photometric characterization of the Chang'e-3 landing site using LROC NAC Images, *Icarus* 273: 84-95.

Stopar, J. D., B. R. Hawke, M. S. Robinson, B. W. Denevi, T. A. Giguere, S. Koeber (2014) Occurrence and mechanisms of impact melt emplacement at small lunar craters, *Icarus* 243: 337-357.

Braden, S. E., **J. D. Stopar**, M. S. Robinson, S. J. Lawrence (2014) Evidence for recent basaltic volcanism on the Moon, *Nature Geoscience*, doi:10.1038/ngeo2252.

Stopar, J. D. and C. H. van der Bogert (2014) “Melt Pond” in *Encyclopedia of Planetary Landforms: SpringerReference*, eds. H. Hargitai and A. Kereszturi, Springer-Verlag Berlin Heidelberg, accessed online (www.springerreference.com).

Mahanti, P., M. S. Robinson, D. C. Humm, **J. D. Stopar** (2014) A standardized approach for quantitative characterization of impact crater topography, *Icarus* 241: 114-129.

Stopar, J. D., G. J. Taylor, M. A. Velbel, M. D. Norman, E. P. Vicenzi, L. J. Hallis (2013) Element abundances, patterns, and mobility in Nakhilite Miller Range 03346 and implications for aqueous alteration, *GCA*, 112, p. 208-225.

Lawrence, S. J., **J. D. Stopar**, B. R. Hawke, B. T. Greenhagen, J. T. S. Cahill, J. L. Bandfield, B. L. Jolliff, B. W. Denevi, M. S. Robinson, T. D. Glotch, D. B. J. Bussey, P. D. Spudis, T. A. Giguere, and W. B. Garry (2013) LRO observations of morphology and surface roughness of volcanic cones and lobate lava flows in the Marius Hills, *JGR-Planets*, doi:10.1002/jgre.20060.

Taylor, G. J., **J. D. Stopar**, W. V. Boynton, S. Karunatillake, J. M. Keller, J. Bruckner, H. Wanke, G. Dreibus, K. E. Kerry, R. C. Reedy, L. G. Evans, R. D. Starr, L. M. V. Martel, S. W. Squyres, O. Gasnault, S. Maurice, C. dUston, P. Englert, J. M. Dohm, V. R. Baker, D. Hamara, D. Janes, A. L. Sprague, K. J. Kim, D. M. Drake, S. M. McLennan, and B. C. Hahn (2006), Variations in K/Th on Mars, *J. Geophys. Res.*, 111, E03S06, doi:10.1029/2006JE002676 [printed 112(E3), 2007].

Stopar, J. D., G. J. Taylor, V. E. Hamilton, L. Browning (2006) Kinetic model of olivine dissolution and extent of aqueous alteration on Mars, *GCA*, 70, p. 6136-6152.

Other Publications:

Stopar, J. D. (2016) “Ponds, Flows, and Ejecta of Impact Cratering and Volcanism: A Remote Sensing Perspective of a Dynamic Moon”, Ph. D. Thesis, Arizona State University.

Stopar, J. D. (2014) “Impact Melt Flow” in *Encyclopedia of Planetary Landforms: SpringerReference*, eds. H. Hargitai and A. Kereszturi, Springer-Verlag Berlin Heidelberg, accessed online (www.springerreference.com).

Barlow, N. G., **J. D. Stopar** and H. Hargitai (2014) “Ejecta” in *Encyclopedia of Planetary Landforms: SpringerReference*, eds. H. Hargitai and A. Kereszturi, Springer-Verlag Berlin Heidelberg, accessed online (www.springerreference.com).

Stopar, J. D. (2007) “Aqueous alteration of Martian meteorite Miller Range (MIL) 03346”, M. S. Thesis, University of Hawaii.

Stopar, J. D., P. G. Lucey, S. K. Sharma, A. K. Misra, G. J. Taylor, H. W. Hubble (2005) Raman efficiencies of natural rocks and minerals: performance of a remote Raman system for planetary exploration at a distance of 10 meters, *Spectrochimica Acta A*, 61, p. 2315-2323.

Stopar, J. D., Lucey, P. G., Sharma, S. K., Misra, A. K., Hubble, H. W. (2004) A remote Raman system for planetary exploration: evaluating remote Raman efficiency, in *Instruments, Methods, and Missions for Astrobiology VII*. Edited by Hoover, Richard B.; Rozanov, Alexei Y. Proceedings of the SPIE, Volume 5163, pp. 99-110.

ABSTRACTS

Jolliff, B. L., R. N. Clegg-Watkins, M. R. Zanetti, S. J. Lawrence, **J. D. Stopar**, K. A. Shirley, T. D. Glotch, B. T. Greenhagen (2016) Felsic volcanics on the Moon, *New Views of the Moon 2*, abstract #6051.

Lawrence, S. J., B. L. Jolliff, **J. D. Stopar**, E. J. Speyerer, B. W. Denevi, M. S. Robinson, N. E. Petro, L. Gaddis, J. Gruener, D. Draper, B. J. Thomson, L. R. Ostrach (2016) The new view of the Moon: Redefining future surface exploration using the Lunar Reconnaissance Orbiter, *New Views of the Moon 2*, abstract #6066.

Stopar, J. D., S. J. Lawrence, M. S. Robinson, L. R. Gaddis, T. A. Giguere, S. Sutton and the LROC Team (2016) Proximal volcanic deposits: Roughness and implications for lunar volcanism, *Lunar and Planetary Science Conference 47*, abstract #2555.

Lawrence, S. J., **J. D. Stopar**, L. R. Ostrach, B. L. Jolliff, M. S. Robinson (2016) Assessing the relationship between absolute age and surface roughness with LROC, *Lunar and Planetary Science Conference 47*, abstract #2755.

Gaddis, L. R., B. Horgan, M. McBride, K. Bennett, **J. Stopar**, J. O. Gustafson (2016) Alphonsus crater: Compositional clues to eruption styles of lunar small volcanoes, *Lunar and Planetary Science Conference 47*, abstract #2065.

Brown, H. B., M. S. Robinson, **J. D. Stopar**, S. J. Lawrence (2016) Visualizing the topography of the Marius Hills complex, *Lunar and Planetary Science Conference 47*, abstract #2993.

Giguere, T. A., B. R. Hawke, J. M. Boyce, J. J. Gillis-Davis, S. J. Lawrence, **J. D. Stopar**, L. R. Gaddis, J. O. Gustafson, and the LROC Science Team (2016) The volcanic processes of the Gassendi crater interior, *Lunar and Planetary Science Conference 47*, abstract #1884.

Hiesinger, H., J. Gebhart, C. H. van der Bogert, J. H. Pasckert, J. Weinauer, S. J. Lawrence, **J. D. Stopar**, M. S. Robinson (2016) Stratigraphy of low shields and mare basalts of the Marius Hills region, Moon, *Lunar and Planetary Science Conference 47*, abstract #1877.

Cohen, B. A., S. J. Lawrence, N. E. Petro, G. D. Bart, R. N. Clegg-Watkins, B. W. Denevi, R. R. Ghent, R. L. Klima, G. A. Morgan, P. D. Spudis, **J. D. Stopar** (2016) Identifying and characterizing impact melt outcrops in the Nectaris basin, *Lunar and Planetary Science Conference 47*, abstract #1389.

Stopar, J. D., M. S. Robinson, B. W. Denevi, S. J. Lawrence (2015) LROC NAC photometry: Preliminary results and relative reflectance of small impact melt deposits, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract 2063.

Gaddis, L. R., T. Hare, S. Lawrence, **J. Stopar**, J. Skinner, J. Hagerty (2015) A new era of exploration of lunar Alphonsus crater, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract.

Lawrence, S. J., **J. D. Stopar**, B. L. Jolliff, E. J. Speyerer, M. S. Robinson (2015) Lunar surface traverse and exploration planning: what makes a “good” landing site? *Annual Meeting of the Lunar Exploration Analysis Group*, abstract.

Stopar, J. D., M. S. Robinson, S. J. Lawrence, B. R. Hawke, L. Gaddis, T. A. Giguere, H. Sato, S. Sutton, and the LROC Team (2015) Interpretations of volcanic deposits associated with small lunar cones, *Lunar and Planetary Science Conference 46*, abstract #1474.

Giguere, T. A., B. R. Hawke, C. A. Peterson, S. J. Lawrence, **J. D. Stopar**, and the LROC Science Team (2015) Impact melts at Glushko crater -- LROC revelations, *Lunar and Planetary Science Conference 46*, abstract #1308.

Hawke, B. R., T. A. Giguere, C. A. Peterson, S. J. Lawrence, **J. D. Stopar**, L. R. Gaddis (2015) Cryptomare, lava lakes, and pyroclastic deposits in the Gassendi region of the Moon: final results, *Lunar and Planetary Science Conference 46*, abstract #1310.

Lawrence, S. J., **J. D. Stopar**, B. L. Jolliff, M. S. Robinson, H. Sato, H. Hiesinger, B. R. Hawke, T. A. Giguere (2015) Characterizing mare deposits in the Australe Region, *Lunar and Planetary Science Conference 46*, abstract #2739.

Lawrence, S. J., **J. D. Stopar**, B. L. Jolliff, M. S. Robinson, E. J. Speyerer (2015) Lunar surface traverse and exploration planning: destinations for automated sample return, *Lunar and Planetary Science Conference 46*, abstract #2755.

- Stopar, J. D.**, M. S. Robinson, E. Asphaug, B. L. Jolliff, E. J. Speyerer, P. R. Christensen (2014) In search of impact-induced H₂O-alteration signatures: initial thermal constrains, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #3030.
- Robinson, M. S., S. J. Lawrence, E. J. Speyerer, **J. D. Stopar** (2014) Intrepid: lunar roving prospector – providing ground truth and enabling future exploration, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #3026.
- Speyerer, E. J., S. J. Lawrence, **J. D. Stopar**, M. S. Robinson, B. L. Jolliff (2014) Optimized traverse planning for future lunar polar prospectors, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #3066.
- Clegg, R. N., B. L. Jolliff, A. K. Boyd, **J. D. Stopar**, H. Sato, M. S. Robinson, B. W. Hapke (2014) LROC NAC photometry as a tool for studying physical and compositional properties of the lunar surface, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #3032.
- Lawrence, S. J., M. S. Robinson, **J. D. Stopar**, E. J. Speyerer, B. L. Jolliff (2014) Lunar surface traverse and exploration planning: farside locations, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #3069.
- Lawrence, S. J., B. L. Jolliff, C. Shearer, M. S. Robinson, **J. D. Stopar**, S. E. Braden, E. J. Speyerer, J. T. Hagerty, B. W. Denevi, C. R. Neal, D. S. Draper (2014) Robotic sample return II: addressing fundamental exploration themes, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #3062.
- Lawrence, S. J., E. J. Speyerer, **J. D. Stopar**, M. S. Robinson, B. L. Jolliff (2014) High-priority destinations for lunar exploration, *NASA Exploration Science Forum*, abstract.
- Braden, S. E., M. S. Robinson, **J. D. Stopar**, S. J. Lawrence (2014) Irregular mare patches as lunar exploration targets, *NASA Exploration Science Forum*, abstract.
- Stopar, J. D.**, B. R. Hawke, S. J. Lawrence, M. S. Robinson, T. A. Giguere (2014) Basaltic cones: a relatively common and distinct style of lunar volcanism, *Lunar and Planetary Science Conference 45*, abstract #1425.
- Lawrence, S. J., M. S. Robinson, **J. D. Stopar**, B. R. Hawke, B. Denevi, B. L. Jolliff, T. A. Giguere, E. J. Speyerer (2014) Remote sensing and geologic observations of “Red Spots” in the Cognitum region, *Lunar and Planetary Science Conference 45*, abstract #2279.
- Lawrence, S. J., **J. D. Stopar**, E. J. Speyerer, M. S. Robinson, B. L. Jolliff (2014) Characterizing locations for future lunar exploration using recent mission results, *Lunar and Planetary Science Conference 45*, abstract #2785.
- Klem, S. M., M. R. Henriksen, **J. Stopar**, A. Boyd, M. S. Robinson, and the LROC Science Team (2014) Controlled LROC Narrow Angle Camera high resolution mosaics, *Lunar and Planetary Science Conference 45*, abstract #2885.
- Hawke, B. R., T. A. Giguere, S. J. Lawrence, T. D. Glotch, B. T. Greenhagen, B. L. Jolliff, P. G. Lucey, **J. D. Stopar**, C. A. Peterson, D. A. Paige, M. S. Robinson, and the LROC Science Team (2014) Remote sensing studies of Hansteen Alpha, *Lunar and Planetary Science Conference 45*, abstract #1730.
- Giguere, T. A., B. R. Hawke, L. R. Gaddis, J. O. Gustafson, S. J. Lawrence, **J. D. Stopar**, S. Mattson, M. S. Robinson, and the LROC Science Team (2014) Geologic studies of volcanic constructs in eastern Mare Frigoris, *Lunar and Planetary Science Conference 45*, abstract #1318.
- Boyd, A. K., M. S. Robinson, **J. D. Stopar** (2014) LROC NAC photometric analysis: a global solution and local applications, *Lunar and Planetary Science Conference 45*, abstract #2826.

Plescia, J. B., O. Barnouin, **J. Stopar** (2014) Impact melt volumes in simple lunar craters: constraints on modeling, *Lunar and Planetary Science Conference 45*, abstract #2141.

Ashley, J. W., M. S. Robinson, **J. D. Stopar**, T. D. Glotch, B. R. Hawke, S. J. Lawrence, B. L. Jolliff, B. T. Greenhagen, D. A. Paige (2013) The Lassell Massif -- a silicic lunar volcano, *AGU Fall Meeting*, abstract #V51G-07.

Braden, S. E., M. S. Robinson, **J. D. Stopar** (2013) Evidence of young volcanic vents in the lunar maria, *AGU Fall Meeting*, abstract #V53C-2809.

Stopar, J. D., S. J. Lawrence, M. S. Robinson, E. J. Speyerer, B. L. Jolliff (2013) Assessment of fundamentally different lunar terrains for future long-duration surface exploration, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #7038. (POSTER)

Lawrence, S. J., M. S. Robinson, **J. D. Stopar**, E. J. Speyerer, B. L. Jolliff (2013) Operational and scientific assessment of lunar exploration sites, *Annual Meeting of the Lunar Exploration Analysis Group*, abstract #7044.

Jolliff, B.L., S. J. Lawrence, M. S. Robinson, **J. D. Stopar** (2013) Science priorities for lunar sample return, *Annual Meeting of Lunar Exploration Analysis Group*, abstract #7050.

Speyerer, E.J., M. S. Robinson, S. J. Lawrence, **J. D. Stopar** (2013) Intrepid: lunar roving prospector providing key ground truth measurements and enabling future exploration, *Annual Meeting of Lunar Exploration Analysis Group*, abstract #7049.

Ashley, J. W., M. S. Robinson, **J. D. Stopar**, T. D. Glotch, B. R. Hawke, S. J. Lawrence, B. T. Greenhagen, D. A. Paige (2013) Morphology and spectroscopy of the Lassell Massif -- evidence for non-mare volcanism in Mare Nubium, *Lunar Science Forum*, abstract.

Plescia, J. B., M. S. Robinson, B. Jolliff, S. J. Lawrence, **J. Stopar** (2013) Small volcanic shields of Mare Tranquillitatis, *Lunar Science Forum*, abstract.

Speyerer, E., S. Lawrence, **J. Stopar**, M. Robinson, B. Jolliff (2013) Traversability assessment of lunar exploration sites with LROC NAC Digital Elevation Models, *Lunar Science Forum*, abstract.

Stopar, J. D., B. R. Hawke, M. S. Robinson, T. A. Giguere (2013) Impact melt generation at small lunar craters, *Lunar Science Forum*, abstract.

Stopar, J. D., B. R. Hawke, M. S. Robinson, T. A. Giguere (2013) Impact melt burial and degradation through crater modification in simple lunar craters, *Lunar and Planetary Science Conference 44*, abstract #1772.

Ashley, J. W., M. S. Robinson, **J. D. Stopar**, T. D. Glotch, B. R. Hawke, S. J. Lawrence, B. T. Greenhagen, D. A. Paige (2013) The Lassell Massif -- evidence for complex volcanism on the Moon, *Lunar and Planetary Science Conference 44*, abstract #2504.

Braden, S. E., M. S. Robinson, **J. D. Stopar**, C. H. van der Bogert, and B. R. Hawke (2013) Age and extent of small, young volcanic activity on the Moon, *Lunar and Planetary Science Conference 44*, abstract #2843.

Hawke, B. R., T. A. Giguere, J. J. Gillis-Davis, P. G. Lucey, C. A. Peterson, S. J. Lawrence, **J. D. Stopar**, and M. S. Robinson (2013) An investigation of cryptomare and pyroclastic deposits in the Gassendi region of the Moon, *Lunar and Planetary Science Conference 44*, abstract #1994.

Hawke, B. R., T. A. Giguere, L. R. Gaddis, J. O. Gustafson, S. J. Lawrence, **J. D. Stopar**, C. A. Peterson, J. F. Bell III, M. S. Robinson and the LROC Science Team (2013) Cryptomare and pyroclastic deposits on the northern East Side of the Moon, *Lunar and Planetary Science Conference 44*, abstract #1983.

- Lawrence, S. J., **J. D. Stopar**, M. S. Robinson, B. R. Hawke, B. L. Jolliff, T. A. Giguere (2013) Mare deposits in the Australe Region: extent, topography, and stratigraphy, *Lunar and Planetary Science Conference 44*, abstract #2671.
- Mahanti, P., M. S. Robinson, R. Stelling, S. J. Lawrence, and **J. Stopar** (2013) A probabilistic model to explore depth-diameter dependencies for lunar craters, *Lunar and Planetary Science Conference 44*, abstract #1215.
- Speyerer, E. J., S. J. Lawrence, **J. D. Stopar**, and M. S. Robinson (2013) Traverse planning using elevation models derived from LROC NAC images, *Lunar and Planetary Science Conference 44*, abstract #1745.
- Jolliff, B. L., **J. D. Stopar**, S. J. Lawrence, M. S. Robinson, B. R. Hawke (2012) New views of silicic volcanism on the Moon, *Second Conference on the Lunar Highlands Crust*, abstract #9037.
- Jolliff, B. L., S. J. Lawrence, **J. D. Stopar**, S. E. Braden, B. R. Hawke, M. S. Robinson, T. D. Glotch, B. T. Greenhagen, and S. M. Seddio (2012) Felsic volcanics on the Moon, *AGU Fall Meeting*, abstract.
- Lawrence, S. J., B. L. Jolliff, T. Glotch, B. R. Hawke, B. T. Greenhagen, **J. D. Stopar**, M. S. Robinson, W. B. Barry, J. O. Gustafson (2012), Exploring the Moon with LRO: characterizing volcanism on the lunar surface, *Geological Society of America Annual Meeting*, abstract #224-1.
- Speyerer, E. J., S. J. Lawrence, **J. D. Stopar**, K. N. Burns, M. S. Robinson (2012) Traverse planning using Lunar Reconnaissance Orbiter Narrow Angle Camera Digital Elevation Models, *Annual Meeting of Lunar Exploration Analysis Group*, abstract #3044.
- Stopar, J. D.**, B. R. Hawke, M. S. Robinson, B. W. Denevi, T. A. Giguere, S. D. Koeber (2012) Characterizing exterior impact melt deposits associated with small lunar craters, *Lunar Science Forum*, abstract.
- Jolliff, B. J., N. Petro, S. J. Lawrence, **J. Stopar**, M. S. Robinson (2012) LRO targeting of the South Pole-Aitken basin for the extended science mission, *Lunar Science Forum*, abstract.
- Koeber, S. D., B. W. Denevi, **J. D. Stopar**, M. S. Robinson (2012) Lunar craters with exterior impact melt deposits, *European Lunar Symposium*, Berlin, Germany, 19-20 April, abstract.
- Robinson, M. S., B. R. Hawke, B. L. Jolliff, S. J. Lawrence, J. Plescia, **J. D. Stopar** (2012) Morphometry and color of lunar domes, *Lunar Science Forum*, abstract.
- Burns, K. N., T. Tran, M. S. Robinson, S. J. Lawrence, E. J. Speyerer, **J. Stopar** (2012) LROC Digital Elevation Modeling of key science targets, *European Lunar Symposium*, abstract.
- Koeber, S. D., B. W. Denevi, **J. D. Stopar**, M. S. Robinson (2012) Lunar craters with exterior impact melt deposits, *European Lunar Symposium*, abstract.
- Hawke, B. R., T. A. Giguere, L. R. Gaddis, O. Gustafson, S. J. Lawrence, **J. D. Stopar**, C. A. Peterson, J. F. Bell III, M. S. Robinson, the LROC Science Team (2012) Localized pyroclastic deposits in the Grimaldi region of the Moon, *Lunar and Planetary Science Conference 43*, abstract 1749.
- Hawke, B. R., T. A. Giguere, S. J. Lawrence, T. D. Glotch, B. T. Greenhagen, J. J. Hagerty, S. E. Braden, L. R. Gaddis, B. L. Jolliff, P. G. Lucey, **J. D. Stopar**, C. A. Peterson, D. A. Paige, M. S. Robinson, the LROC Science Team (2012) The geology and composition of Hansteen Alpha, *Lunar and Planetary Science Conference 43*, abstract 1754.
- Lawrence, S. J., **J. D. Stopar**, B. R. Hawke, B. L. Jolliff, M. S. Robinson, P. D. Spudis, T. A. Giguere (2012) Characterizing volcanic cones in the Marius Hills region, *Lunar and Planetary Science Conference 43*, abstract 2432.

Speyerer, E. J., M. S. Robinson, S. J. Lawrence, K. N. Burns, **J. D. Stopar** (2012) In search of shade in persistently illuminated regions near the lunar poles, *Lunar and Planetary Science Conference 43*, abstract 2633.

Stopar, J. D., B. R. Hawke, M. S. Robinson, B. W. Denevi, T. A. Giguere (2012) Distribution, occurrence, and degradation of impact melt associated with small lunar craters, *Lunar and Planetary Science Conference 43*, abstract #1645.

Stopar, J. D., M. S. Robinson, E. J. Speyerer, K. Burns, H. Gengl, the LROC Team (2012) Regolith characterization using LROC NAC Digital Elevation Models of small lunar craters, *Lunar and Planetary Science Conference 43*, abstract #2729.

Stopar, J. D., B. W. Denevi, M. S. Robinson, B. R. Hawke, S. J. Lawrence, S. Koeber (2011) Impact melt properties and characteristics as observed with the LROC Narrow Angle Cameras, *Annual Meeting of the Lunar Exploration Analysis Group*, Houston, TX, Nov 7-9, 2011, abstract 2050.

Robinson, M. S., S. J. Lawrence, E. J. Speyerer, **J. Stopar** (2011) Intrepid: lunar roving prospector providing ground truth and enabling future exploration, *Annual Meeting of the Lunar Exploration Analysis Group*, Houston, TX, Nov 7-9, 2011, abstract 2042.

Stopar, J. D., M. S. Robinson, O. S. Barnouin, E. Speyerer, H. Gengl (2011) Depths, diameters, and profiles of small craters in different lunar terrains, *Lunar Science Forum*, abstract.

Hallis, L. J., G. J. Taylor, **J. D. Stopar**, M. A. Velbel, E. P. Vicenzi (2011) Martian vs. terrestrial alteration assemblages in MIL 03346 and Nakhla: hydrogen isotope and compositional comparisons, *Lunar and Planetary Science Conference 42*, abstract #1442.

Hawke, B. R., T. A. Giguere, S. J. Lawrence, T. D. Glotch, B. T. Greenhagen, J. J. Hagerty, S. E. Braden, L. R. Gaddis, T. Tran, B. L. Jolliff, P. G. Lucey, **J. D. Stopar**, C. A. Peterson, D. A. Paige, M. S. Robinson, and the LROC Science Team (2011) Hansteen Alpha: a silicic volcanic construct on the Moon, *Lunar and Planetary Science Conference 42*, abstract #1652.

Lawrence, S. J., B. W. Denevi, B. R. Hawke, T. A. Giguere, M. S. Robinson, **J. D. Stopar**, T. Tran, B. L. Jolliff, D. B. J. Bussey, R. Stelling (2011) Size frequency distributions of block on lunar volcanic landforms: results from LROC, *Lunar and Planetary Science Conference 42*, abstract 2422.

Tran, T., M. S. Robinson, S. J. Lawrence, S. E. Braden, J. Plescia, B. R. Hawke, B. L. Jolliff, **J. D. Stopar**, and the LROC Team (2011) Morphometry of lunar volcanic domes from LROC, *Lunar and Planetary Science Conference 42*, abstract 2228.

Hallis, L., **J. D. Stopar**, G. J. Taylor, M. A. Velbel, E. P. Vicenzi (2010) Alteration assemblages in martian meteorite MIL 03346: terrestrial, pre-terrestrial, and inferences for martian surface fluids, *Eos, Fall Meet. Suppl.*, abstract.

Lawrence, S. J., B. R. Hawke, B. Bussey, **J. D. Stopar**, B. W. Denevi, M. S. Robinson, T. Tran (2010) Marius Hills: surface roughness from LROC and Mini-RF, *Eos, Fall Meet. Suppl.*, abstract.

Stopar, J. D., M. S. Robinson, O. S. Barnouin, T. Tran (2010) Depths, diameters, and profiles of small lunar craters from LROC NAC stereo images, *Eos, Fall Meet. Suppl.*, abstract P53C-1543.

Lawrence, S. J., B. L. Jolliff, B. W. Denevi, B. R. Hawke, M. S. Robinson, **J. D. Stopar**, M. E. Banks, W. B. Garry, H. Sato, V. J. Bray, and the LROC Team (2010) LROC views the Constellation regions of interest: science and exploration observations, *Annual Meeting of the United States Lunar Exploration Analysis Group*, abstract 3032.

- Lawrence, S. J., B. R. Hawke, M. S. Robinson, D. B. J. Bussey, J. T. S. Cahill, T. Tran, M. Mechtley, B. W. Denevi, T. Giguere, **J. D. Stopar** (2010) LROC/Mini-RF observations of the Sulpicius Gallus Formation, *Lunar Science Forum*, abstract.
- Lawrence, S. J., **J. D. Stopar**, B. R. Hawke, L. R. Gaddis, M. S. Robinson, B. W. Denevi, T. A. Giguere, B. L. Jolliff, S. E. Braden, and the LROC Science Team (2010) LROC observations of the Marius Hills, *Lunar and Planetary Science Conference 41*, abstract #1906.
- Velbel, M. A., **J. D. Stopar**, G. J. Taylor, E. P. Vicenzi (2010) Aqueous alteration of olivine in Mars meteorite MIL03346: corrosion textures and redistribution of elements in alteration products, *Lunar and Planetary Science Conference 41*, abstract #2223.
- Gaddis, L. R., M. S. Robinson, B. R. Hawke, T. Giguere, O. Gustafson, L. Keszthelyi, S. J. Lawrence, **J. D. Stopar**, B. L. Jolliff, J. F. Bell III, W. B. Garry (2009) Insights into pyroclastic volcanism on the Moon with LROC data, *Eos*, Vol. 90, Number 52, 29 December 2009, *Fall Meet. Suppl.*, abstract U31A-009.
- Lawrence, S. J., **J. D. Stopar**, B. R. Hawke, B. W. Denevi, M. S. Robinson, T. A. Giguere (2009) LROC observations of geologic features in the Marius Hills, *Eos*, Vol. 90, Number 52, *Fall Meet. Suppl.*, abstract U31A-0012.
- Lawrence, S. J., **J. D. Stopar**, D. N. Nelson, M. B. Bunte, M. S. Robinson, M. B. Broxton (2009) Evaluation of Apollo 15 Metric Camera based Digital Terrain Models, *2nd National Lunar Science Institute Forum*, NASA Ames Research Center.
- Gaddis, L. R., M. S. Robinson, B. R. Hawke, T. Giguere, O. Gustafson, S. J. Lawrence, **J. D. Stopar**, B. L. Jolliff, J. F. Bell (2009) LRO targeting of lunar pyroclastic deposits, *Lunar Reconnaissance Orbiter Science Targeting Meeting*, held June 9-11, 2009 in Tempe, Arizona, *LPI Contribution No. 1483*, abstract #6025.
- Stopar, J. D.**, B. R. Hawke, S. J. Lawrence, M. S. Robinson, T. Giguere, L. R. Gaddis, B. L. Jolliff (2009) Targeting of lunar domes, cones, and associated volcanic features, *Lunar Reconnaissance Orbiter Science Targeting Meeting*, held June 9-11, 2009 in Tempe, Arizona. *LPI Contribution No. 1483*, abstract #6039.
- Hines, R., **J. Stopar**, W. Taylor, M. E. Minitti, M. Wadhwa (2009) Enhancing and expanding educational outreach programs at the Center for Meteorite Studies, Arizona State University, *Lunar and Planetary Science Conference 40*, abstract #1875.
- Jolliff, B. L., S. J. Lawrence, **J. D. Stopar**, M. S. Robinson, L. R. Gaddis, B. R. Hawke (2009) "Targeting the Lunar Reconnaissance Orbiter Narrow Angle Cameras: target sources and selection strategy", *Lunar and Planetary Science Conference 40*, abstract #2343.
- Lawrence, S. J., M. S. Robinson, B. L. Jolliff, E. Bowman-Cisneros, T. Tran, **J. D. Stopar**, B. R. Hawke, S. D. Thompson, S. Koeber, LROC Targeting Action Team (2009) Preparing to scout the Next Frontier: hardware and operational constraints encountered during targeting of the Lunar Reconnaissance Orbiter Camera Narrow Angle Cameras, *Lunar and Planetary Science Conference 40*, abstract 2316.
- Lawrence, S. J., M. S. Robinson, M. Broxton, **J. D. Stopar**, W. Close, J. Grunsfeld, R. Ingram, L. Jefferson, S. Locke, R. Mitchell, T. Scarsella, M. White, M. A. Hager, T. R. Watters, E. Bowman-Cisneros, J. Danton, J. Garvin (2008) "The Apollo Digital Image Archive: new research and data products", *Nat. Lun. Sci. Conf. 1*, abstract 2066.
- Stopar, J. D.** and G. J. Taylor (2008) Aqueous alteration of martian rocks, clods, soils, and meteorites: trends in major and minor elements, *Lunar and Planetary Science Conference 39*, abstract #1514.

Stopar, J. D., G. J. Taylor, M. D. Norman (2007) Aqueous alteration in Nakhilite MIL 03346: LA-ICPMS and Raman spectroscopy, *Seventh International Conference on Mars*, abstract #3105.

Stopar, J. D., G. J. Taylor, M. D. Norman (2007) Major and trace elements in Nakhilite MIL 03346 with a focus on aqueous alteration products, abstract #1448.

Stopar, J. D. and G. J. Taylor (2006) Martian and lunar meteorites: styles of aqueous alteration, *Lunar and Planetary Science Conference 37*, abstract #1652.

French, L. C., F. S. Anderson, G. McMurtry, E. Pilger, **J. D. Stopar** (2005) A rugged miniature mass-spectrometer for measuring aqueous geochemistry on Mars, *Lunar and Planetary Science Conference 36*, abstract #2138.

Stopar, J. D., S. J. Lawrence, R. C. F. Lentz, G. J. Taylor (2005) Preliminary analysis of Nakhilite MIL 03346, with a focus on secondary alteration, *Lunar and Planetary Science Conference 36*, abstract #1547.

Taylor, G. J., **J. D. Stopar**, W. V. Boynton, J. Bruckner, H. Wanke (2005) Assessing aqueous alteration on Mars using global distributions of K and Th, *Lunar and Planetary Science Conference 36*, abstract #1540.

Stopar, J. D., G. J. Taylor, W. Boynton, W. (2004) Aqueous alteration pathways for K, Th, and U on Mars, *Lunar and Planetary Science Conference 35*, abstract #1429.

Stopar, J. D., G. J. Taylor, V. E. Hamilton, L. Browning, D. Pickett (2003) Maximum rates of olivine dissolution on Mars, *Sixth International Conference on Mars*, abstract #3151.

Stopar, J. D., P. G. Lucey, S. K. Sharma, H. W. Hubble, A. K. Misra (2003) Performance of a remote Raman system: defining remote Raman efficiency, *Lunar and Planetary Science Conference 34*, abstract #1450.

Lawrence, S. J., E. Lau, D. Steutel, **J. D. Stopar**, B. B. Wilcox, P. G. Lucey (2003) A new measurement of the absolute spectral reflectance of the Moon, *Lunar and Planetary Science Conference 34*, abstract #1269.