FORTY-FIFTH LUNAR AND PLANETARY SCIENCE CONFERENCE

PROGRAM OF TECHNICAL SESSIONS

MARCH 17–21, 2014

The Woodlands Waterway Marriott Hotel and Convention Center
The Woodlands, Texas

INSTITUTIONAL SUPPORT

Universities Space Research Association
Lunar and Planetary Institute
National Aeronautics and Space Administration

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Ryan Zeigler, NASA Johnson Space Center

Produced by the Lunar and Planetary Institute (LPI), 3600 Bay Area Boulevard, Houston TX 77058-1113, which is supported by NASA under Award No. NNX08AC28A. Logistics, administrative, and publications support for the conference were provided by USRA Houston Meeting Planning Services.
ABOUT LPSC

The Lunar and Planetary Science Conference brings together international specialists in petrology, geochemistry, geophysics, geology, and astronomy to present the latest results of research in planetary science. The five-day conference is organized by topical symposia and problem-oriented sessions.

LOGISTICAL INFORMATION

Venue Address and Phone Number
The conference is being held at The Woodlands Waterway Marriott Hotel and Convention Center, which is located at 1601 Lake Robbins Dr., The Woodlands TX 77380. The phone number for the hotel is 281-367-9797. Messages may be left for conference attendees by phoning the hotel and asking for the conference registration desk.

Please note that copy and printing services are not available at the conference registration desk, and must be arranged through the hotel business center. For your convenience, a minimal number of laptops and printers will be available in the Wi-Fi access rooms (see below).

Registration
Conference registration and check-in will be held on Sunday, March 16, from 4:00 to 8:00 p.m., and from 8:00 a.m. to 5:00 p.m. Monday through Friday, March 17 through 21. Conference badges provide access to all technical sessions, special events, and shuttle service.

Internet Access
Complimentary Wi-Fi service will be available throughout the duration of the conference in the Creekside Park room (open only during conference hours), and in the Town Center Exhibit Area and immediate vicinity. Wi-Fi service will NOT be available in the oral session rooms for anyone other than the selected LPSC microbloggers. This restriction is (and has been) in place to curtail activities that could be distracting to speakers during their presentations.

Conference Shuttle Service
Conference shuttle bus service between the venue and the approved list of hotels will be provided on Sunday evening during the registration time and throughout the duration of the conference. Shuttle service will run before and immediately following all technical sessions. Detailed shuttle schedules are available in the registration area and on the LPSC website at [www.hou.usra.edu/meetings/lpsc2014/travel/shuttleInfo](http://www.hou.usra.edu/meetings/lpsc2014/travel/shuttleInfo).

Poster Printing Available
AlphaGraphics will have a staffed booth at The Woodlands Waterway Marriott, just outside the Town Center Exhibit Area. Poster presenters can pick up pre-ordered posters or place orders for posters beginning on Sunday, March 16. The desk is located just outside the Town Center Exhibit Area on the first floor. For more information, visit their website at [www.txagprinting.com](http://www.txagprinting.com).

Personal Schedule
Create your own personal meeting schedule using the Personal Schedule tool found in the USRA Meeting Portal at [https://www.hou.usra.edu/meeting_portal/schedule/](https://www.hou.usra.edu/meeting_portal/schedule/). Select the sessions you want to attend or talks you want to hear, then create a shareable schedule that can be viewed on your smart phone or shared with a colleague.
List of Exhibitors

Cambridge University Press
www.cambridge.org/us/academic
32 Avenue of the Americas
New York NY 10013

Contact: Emma Kiddle
ekiddle@cambridge.org

Cambridge’s publishing in books and journals combines state-of-the-art content with the highest standards of scholarship, writing and production. Visit our stand to browse new titles, available at a 20% discount, and to pick up sample issues of our journals. Visit our website to see everything we do: www.cambridge.org/us/academic.

Centre for Planetary Science and Exploration (CPSX)
cpsx.uwo.ca
University of Western Ontario, Dept Earth Sciences
1151 Richmond St
London Ontario N6A 5B7 Canada

Contact: Melissa Battler
mbattle@uwo.ca

The Centre for Planetary Science and Exploration at Western University is the hub for planetary science and exploration research in Canada. Our mantra is excellence in research, education, and outreach. The Centre hosts Canada’s only graduate program in planetary science and provides national leadership by running short courses, workshops, and field trips, and by leading Canada’s membership in the NASA Lunar Science Institute and the NASA Astrobiology Institute.

GSA Planetary Geology Division
http://geosociety.org/pgd/
P.O. Box 9140
Boulder CO 80301-9140

Contact: James Wray
jwray@gatech.edu

The Geological Society of America is a global professional society with more than 25,000 members in 107 countries. Its Planetary Geology Division exists to bring together geoscientists working in (or interested in) the various disciplines of planetary geoscience. PGD works to stimulate communication with geoscientists working in other fields, and supports and encourages planetary geoscience students by sponsoring the Stephen E. Dwornik Award at LPSC and the annual Pellas-Ryder Award for best student paper.

Jacobs Technology
www.jacobstechnology.com
2224 Bay Area Blvd
Houston TX 77058

Contact: Sara Stanley
sara.stanley@nasa.gov

Jacobs Technology is the advanced technology division of Jacobs Engineering, one of the nation’s largest engineering and technical services-only companies. With 70+ years of experience supporting government and commercial clients, we have earned a reputation for excellence and outstanding technical and managerial achievements in quality, performance, and safety. Jacobs Technology provides comprehensive planetary science research and analysis services for the NASA Johnson Space Center.
The Johns Hopkins University’s Applied Physics Laboratory (APL) leads several NASA missions and conducts significant grant based research on planetary, space, and Earth science interests. APL has built over 60 spacecraft and instruments, including New Horizons, MESSENGER, STEREO, the Van Allen Probes, and an operational cubesat.

**JMARS — Mars Space Flight Facility — Arizona State University**

jmars.mars.asu.edu
201 E. Orange Mall
Tempe AZ 85287

Contact: Scott Dickenshied
sdickens@mars.asu.edu

JMARS (Java Mission-planning and Analysis for Remote Sensing) is a free, open-source, Java-based geospatial information system developed by the Mars Space Flight Facility at Arizona State University. It is currently used for mission planning and scientific data analysis by several NASA missions, including Mars Odyssey, Mars Reconnaissance Orbiter, the Lunar Reconnaissance Orbiter, and the upcoming OSIRIS-REx mission.

**Lockheed Martin**

[www.lockheedmartin.com](http://www.lockheedmartin.com)
P.O. Box 179
Denver CO 80201

Contact: Melissa Croswhite
mellissa.croswhite@lmco.com

Expanding our knowledge and understanding of the universe is a challenging endeavor that Lockheed Martin has been actively engaged in for more than five decades. We have developed and deployed numerous spacecraft and products supporting our understanding of Earth and planetary science, heliophysics, and astrophysics. We’re accountable to one standard — 100% mission success. We understand the risks and will not shy away from the hard challenges associated with this mission.

**LPI-JSC Center for Lunar Science and Exploration**

[www.lpi.usra.edu/nlsi](http://www.lpi.usra.edu/nlsi)
3600 Bay Area Blvd
Houston TX 77058

Contact: Delia Enriquez
denriquez@hou.usra.edu

The LPI-JSC Center for Lunar Science and Exploration is one of the founding members of the NASA Lunar Science Institute (NLSI) and the new Solar System Exploration Research Virtual Institute (SSERVI). At LPSC, the Center will help faculty find classroom resources, advise university students about future training opportunities, and distribute educational and public outreach materials.

**Lunar Reconnaissance Orbiter Camera**

[www.lroc.asu.edu](http://www.lroc.asu.edu)
P.O. Box 873606
Tempe AZ 85287-3603

Contact: Nicholas Estes
nme@ser.asu.edu

The LROC Science Operations Center (SOC) supports camera instrument operations, instrument trending, systematic data processing, and data dissemination. Lunaserv development by the LROC SOC supports projecting data in Moon-specific spatial reference systems (SRS) in support of those tasks, but Lunaserv is capable of supporting standard WMS clients in any planetary SRS.

**Moon Express**

[www.moonexpress.com](http://www.moonexpress.com)
19-2060 North Akron Road
NASA Ames Research Park
Moffett Field CA 94035

Contact: Daven Maharaj
daven@moonexpress.com

Moon Express is introducing the MX-1 as the first of a series of robotic space vehicles based on a scalable patent pending design to operate in Earth orbit and deep space destinations. Moon Express will utilize the MX-1 in its maiden technology demonstrator flight in 2015, delivering a number of commercial and government payloads to the Moon and pursuing the $30M Google Lunar XPRIZE.
The Geosciences Node of NASA’s Planetary Data System (PDS) archives and distributes digital data related to the study of the surfaces and interiors of terrestrial planetary bodies. We work directly with NASA missions to help them generate well-documented, permanent data archives. We provide data to NASA-sponsored researchers upon request, make the data available using Analyst’s Notebook and Orbital Data Explorers, and provide expert assistance in using the data.

Regional Planetary Information Facility (RPIF) Network
www.lpi.usra.edu/library/RPIF
USGS Astrogeology Science Center
(c/o David S. F. Portree)
2255 N. Gemini Dr.
Flagstaff AZ 86001

Contact: David Portree
dportree@usgs.gov

The NASA-supported Regional Planetary Information Facility (RPIF) Network was established in 1977. Seventeen RPIFs in the U.S. and abroad preserve and make available photographs, documents, maps, digital media, and other data products generated through more than half a century of U.S. and international lunar and planetary exploration.

The Boeing Company
www.boeing.com
7700 Boston Boulevard
Springfield VA 22153

Contact: Kurt Klaus
kurt.k.klaus@boeing.com

Boeing is the world’s largest aerospace company and innovative manufacturer of commercial jetliners and defense, space and security systems. A top U.S. exporter, Boeing products and services include commercial and military aircraft, satellites, weapons, C4ISR, electronic and defense systems, launch systems, and performance-based logistics and training.

University of North Dakota — Space Studies
space.edu
4149 University Ave. Stop 9008
512 Clifford Hall
Grand Forks ND 58202

Contact: Bev Fetter
fetter@aero.und.edu

The University of North Dakota offers premier online and campus graduate programs in the field of space studies. The M.S. and Ph.D. degrees are interdisciplinary programs, combining space physical science, space life science, space engineering, space policy and law, space business and economics, and space history. The popular online program is ideally suited for professionals who wish to enhance their career opportunities in the space arena.
# LPSC WEEK AT A GLANCE

The session code appears in bold brackets above each session title.

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<tr>
<th>Day and Time</th>
<th>Waterway Ballroom 1</th>
<th>Waterway Ballroom 4</th>
<th>Waterway Ballroom 5</th>
<th>Waterway Ballroom 6</th>
<th>Montgomery Ballroom</th>
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<tbody>
<tr>
<td><strong>Monday Evening, 5:30 p.m.</strong></td>
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<td>[M201] NASA Headquarters Briefing</td>
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<td><strong>Tuesday Afternoon, 1:30 p.m.</strong></td>
<td>[T251] Lunar Geophysical Evolution: GRAIL and More</td>
<td>[T252] SPECIAL SESSION: Fluids on Differentiated Bodies</td>
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<td><strong>Tuesday Evening, 6:00 p.m.</strong></td>
<td>Town Center Exhibit Area</td>
<td>Poster Session I</td>
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<td><strong>Thursday Evening, 6:00 p.m.</strong></td>
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<td><strong>Friday Afternoon, 1:30 p.m.</strong></td>
<td>[F551] Lunar Highlands and Beneath: Composition from Orbit</td>
<td>[F552] Mars Glaciers and Ground Ice</td>
<td>[F553] Solar System Workings: Linking Meteorites to Planetary Bodies and Processes</td>
<td>[F554] Formation of Habitable Worlds and Fate of Habitable Environments</td>
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**LPSC WEEK AT A GLANCE**

The session code appears in bold brackets above each session title.
**SPECIAL SESSION: NEW PERSPECTIVES OF THE MOON: ENABLING FUTURE LUNAR MISSIONS**

8:30 a.m. | Waterway Ballroom 1

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8:30 a.m. Zuber M. T. * Smith D. E. Goossens S. J. Asmar S. W. Konopliv A. S. et al.  
*A High-Resolution View of the Orientale Basin and Surroundings from the Gravity Recovery and Interior Laboratory (GRAIL)* [#2061]  
A high-resolution view of the Orientale Basin and surroundings from the Gravity Recovery and Interior Laboratory (GRAIL).

8:45 a.m. Warren P. H. * Dauphas N.  
*Revised Estimation of the Bulk Composition of the Moon in Light of GRAIL Results, and Why Heat Flow Should be a Top Priority for Future Lunar Missions* [#2298]  
A revised estimation of the bulk-Moon composition, based on new interior-density constraints from GRAIL and recent seismic studies, has a higher-than-Earth FeO.

9:00 a.m. Jolliff B. L. * Petro N. E.  
*Recent Mission Observations Provide Scientific Context and Enabling Support for Future Exploration of the Moon’s South Pole-Aitken Basin* [#2357]  
We take an integrated look at results from recent missions, current knowledge gaps, and implications for future in situ or sample-return exploration.

9:15 a.m. Hurwitz D. M. * Kring D. A.  
*Destinations for Sampling Impact Melt Produced by the South Pole — Aitken Basin Impact Event* [#1398]  
This paper identifies destinations where SPA impact melt samples can be collected. Analyses of these samples can identify the age of this oldest lunar basin.

9:30 a.m. Lawrence S. J. * Stopar J. D. Speyerer E. J. Robinson M. S. Jolliff B. L.  
*Characterizing Locations for Future Lunar Exploration Using Recent Mission Results* [#2785]  
We present results from a project to characterize accessibility and science potential of high-priority locations for future lunar precursor missions.

9:45 a.m. Mahanti P. * Robinson M. S. Stelling R.  
*How Deep and Steep are Small Lunar Craters? — New Insights from LROC NAC DEMs* [#1584]  
New observations of depth-to-diameter ratio and wall slope for globally distributed small (<200 m) lunar impact craters will be presented.

10:00 a.m. Robinson M. S. Boyd A. K. Denevi B. W. Lawrence S. J. Moser D. E. et al.  
*New Crater on the Moon and a Field of Secondaries* [#2164]  
A new 18-m-diameter crater was discovered that geographically corresponds with a flash recorded on 17 March 2013 by the NASA Lunar Impact Monitoring Program.

*Evidence for Water Ice and Temperature Dependent Space Weathering at the Lunar Poles from LOLA and Diviner* [#2325]  
The darker it gets the brighter it is.
Far ultraviolet albedo maps obtained using the Lunar Reconnaissance Orbiter (LRO) Lyman Alpha Mapping Project (LAMP) uniquely address lunar volatile processes.

10:45 a.m. Hayne P. O. * Retherford K. D. Sefton-Nash E. Paige D. A. Temperature and Ultraviolet Albedo Correlations in the Lunar Polar Regions: Implications for Water Frost [#1943]
We compared temperature data from Diviner and UV albedo data from LAMP, in order to constrain the processes controlling the distribution of water on the Moon.

11:00 a.m. Zhao J. * Huang J. Xiao L. Qiao L. Xiao Z. et al. Geology of CE-3 Landing Site and Path Planning for Yutu Rover [#1864]
We made the geological map of Chang’e-3 landing area and proposed two paths for the future exploration of Yutu rover.

11:15 a.m. Garry W. B. * The Mare Imbrium Flow Field: Regional Geologic Context of the Chang’e 3 Landing Site [#2169]
China’s robotic rover landed within the best preserved lava flow field on the Moon. Here, we provide a regional perspective of the flow field and landing site.

11:30 a.m. Hiesinger H. * Ivanov M. Pasckert J. H. Bauch K. van der Bogert C. H. Geology of the Lunar Glob Landing Sites in Boguslawsky Crater, Moon [#2370]
We studied the floor of crater Boguslawsky (~95 km in diameter, centered at 72.9°S, 43.26°E), which was selected as the landing site for the Luna-Glob mission.

11:45 a.m. BREAK

12:00 p.m. Schmitt H. H. * Apollo 17: New Insights from the Synthesis and Integration of Field Notes, Photo-Documentation, and Analytical Data [#2732]
Field and other data related to Apollo 17 gives new insights on ages of eight large basins, lava cooling, orange ash geology, micrometeor flux, regolith, etc.
9:00 a.m. Zolotov M. Yu. * Mironenko M. V.  
**Massive Sulfate Deposits on Mars Could be Remobilized Noachian Salts [#2876]** 
Models show salt formation together with phyllosilicates. Sulfate deposits could have formed through Hesperian mobilization of salts.

9:15 a.m. Ruff S. W. * Niles P. B. Alfano F. Clarke A. B.  
**Evidence for a Noachian-Aged Ephemeral Lake in Gusev Crater, Mars [#1739]** 
A reassessment of the Comanche carbonate-bearing outcrops demonstrates that the alteration could have arisen by evaporative precipitation of ephemeral waters.

9:30 a.m. Rogers A. D. * Hamilton V. E.  
**Compositional Provinces of Mars from Statistical Analyses of TES, GRS and CRISM Data [#1585]** 
New global compositional distinctions are apparent (e.g., Sinus Meridiani, Hesperian volcanic terrains) from statistical analyses of multiple datasets.

**Noachian Impact Breccias on the Rim of Endeavour Crater, Mars: Opportunity APXS Results [#1640]** 
We describe textures and compositions of impact breccias from the rim of Endeavour Crater, Meridiani Planum, Mars studied by Mars Exploration Rover Opportunity.

10:00 a.m. Schmidt M. E. * Berger J. A. Blaney D. Gellert R. Grotzinger J. P. et al.  
**Geochemical Classification of Rocks in Gale Crater with APXS to Sol 360: Sediment Provenance, Mixing, and Diagenetic Processes [#1504]** 
A classification scheme is presented for rocks examined by the MSL Alpha Particle X-ray Spectrometer in Gale Crater to sol 360.

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**Monday, March 17, 2014 [M103]**

**TISSINT: SHOCKING RESULTS AND SCIENTIFIC IMPACTS**

10:30 a.m. Waterway Ballroom 4

**Chairs:**  
Christopher Herd  
Yann Sonzogni

10:30 a.m. Castle N. * Herd C. D. K.  
**Observational and Experimental Results for Tissint Magma Formation: The Story Thus Far [#2334]** 
We present redox estimates and the preliminary results of petrologic experiments on the Tissint meteorite, and discuss their implications for martian magmatism.

10:45 a.m. Shih C.-Y. * Nyquist L. E. Park J. Agee C. B.  
**Sm-Nd and Rb-Sr Isotopic Systematics of a Heavily Shocked Martian Meteorite Tissint and Petrogenesis of Depleted Shergottites [#1184]** 
Sm-Nd, Rb-Sr, and Ar-Ar ages of Tissint suggest it and DaG, SaU, and Y980459 could be derived from a 472-Ma basaltic terrane on Mars by an ejection event 1 Ma ago.

11:00 a.m. Sharp T. G. * Walton E. L. Hu J.  
**Shock Effects in Tissint: Evidence Against a Long Duration Shock and Large Impacting Body [#2820]** 
High-P minerals in Tissint indicate a shock pressure of ~25 GPa and a shock pulse shorter than the (tens of ms) quench time of large veins.

**Discovery of Ahrensite γ-Fe$_2$SiO$_4$ and Tissintite (Ca,Na,□)AlSi$_2$O$_6$: Two New High Pressure Minerals from the Tissint Martian Meteorite [#1222]** 
Newly found minerals, ahrensite and tissintite from the Tissint meteorite, provide new insights into shock conditions and impact processes on Mars.
11:30 a.m. Chen Y. * Liu Y. Guan Y. Eiler J. M. Ma C. et al.
Unusual Interaction Between Martian Surface and Magmatic Reservoirs: Volatiles in Impact Melts in the Tissint Meteorite [#2425]
We report volatile concentrations and H isotopes in impact melts in the Tissint meteorite and discuss volatile reservoirs on Mars surface and mantle.

11:45 a.m. Tucker K. * Hervig R. Mane P. Romaniello S. Wadhwa M.
Hydrogen Isotope Systematics of Maskelynites in the Shergottites Zagami, QUE 94201 and Tissint: Terrestrial Contamination or Deuteric Alteration? [#2190]
D/H and H2O content of three shergottites imply that isotopic variations may reflect mixing of three end-members: Mars atmosphere, Mars mantle, and deuteric alteration.

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Monday, March 17, 2014 [M104]
PRESOLAR GRAINS
8:30 a.m. Waterway Ballroom 5

Chairs: Rhonda Stroud  
Bradley Meyer

8:30 a.m. Gyngard F. * Avila J. N. Ireland T. R. Zinner E.
More Interstellar Exposure Ages of Large Presolar SiC Grains from the Murchison Meteorite [#2348]
We report here interstellar exposure ages derived from new Li-isotope measurements of LS + LU presolar SiC grains from the Murchison meteorite.

8:45 a.m. Hoppe P. * Lodders K. Fujiya W. Groener E.
Sulfur in Presolar Silicon Carbide Grains from Asymptotic Giant Branch Stars [#1031]
Presolar SiC mainstream grains have close to solar S-isotopic ratios and low S abundances that can be reproduced by equilibrium condensation calculations.

9:00 a.m. Liu N. * Savina M. R. Gallino R. Davis A. M. Bisterzo S. et al.
Correlated Strontium and Barium Isotopic Compositions of Single Presolar SiC Grains from Murchison [#2049]
We report correlated Sr- and Ba-isotopic compositions of 90 acid-cleaned presolar SiCs and their implication to the s-process nucleosynthesis in AGB stars.

9:15 a.m. Lewis J. B. * Isheim D. Floss C. Daulton T. L. Seidman D. N.
New Atom-Probe Tomography Data and Improved Techniques for Meteoritic Nanodiamond Analysis [#2607]
We present new subnanometer-scale C-isotope measurements from Allende nanodiamonds and discuss new processing techniques.

9:30 a.m. Croat T. K. * Bernatowicz T. J. Jadhav M.
TEM Studies of High-Density Presolar Graphites from the Orgueil Meteorite [#1441]
Internal grains found within graphites, including s-process enriched TiCs and SiCs, suggest multiple stellar sources for high-density Orgueil presolar graphites.

Diversity in Carbon K-Edge XANES Among Presolar Graphite Grains [#1492]
We analyzed 13 low- and high-density presolar graphite grains using Carbon K-edge XANES. We found diversity in the abundance and variety of minor organic peaks.
We have discovered a unique presolar grain in an IDP consisting of a crystalline spinel core and glassy silicate mantle.

10:15 a.m. Leitner J. * Metzler K. Hoppe P. Characterization of Presolar Grains in Cluster Chondrite Clasts from Unequilibrated Ordinary Chondrites [#1099]
Cluster chondrite clasts in two UOCs have higher presolar silicate abundances than previous studies suggested. One very large complex presolar grain was found.

10:30 a.m. Stroud R. M. * De Gergorio B. T. Nittler L. R. Alexander C. M. O’D. Comparative Transmission Electron Microscopy Studies of Presolar Silicate and Oxide Grains from the Dominion Range 08006 and Northwest Africa 5958 Meteorites [#2806]
Transmission electron microscopy of matrix and presolar grains indicates amorphous materials are well preserved in DOM 08006, but heavily altered in NWA 5958.

10:45 a.m. Zega T. J. * Haenecour P. Floss C. Stroud R. M. Extraction and Analysis of Presolar Grains from the LAP 031117 CO3.0 Chondrite [#2256]
We present results on the extraction and analysis of three in situ presolar grains within the LAP 031117 CO3.0 chondrite.

11:00 a.m. Takigawa A. * Stroud R. M. Nittler L. R. Vicenzi E. P. Herzing A. et al. Crystal Structure, Morphology, and Isotopic Compositions of Presolar Al2O3 Grains in Unequilibrated Ordinary Chondrites [#1465]
Nine presolar Al2O3 grains were identified. A unique subhedral shaped but polycrystalline corundum with voids and distorted crystal structures was found.

11:15 a.m. Matsuno J. * Tsuchiyama A. Noda J. Tanaka M. Watanabe T. et al. GEMS-Like Grains Produced by Condensation Experiment [#1335]
To investigate the origin of GEMS, condensation experiments in the system of Si-Mg-Fe-Al-Na-Ca-Ni-O were performed. The condensate are very similar to GEMS.

GEMS’ chemical and isotopic compositions should be interpreted with extreme caution since GEMS become reactive when they encounter the terrestrial environment.

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Monday, March 17, 2014 [M105]
SPRINGTIME FOR TITAN’S LAKE DISTRICT:
GEOGRAPHY, CHEMISTRY, AND DYNAMICS
8:30 a.m. Waterway Ballroom 6

Chairs: Mathieu Choukroun
Alexander Hayes

We present a map of the distribution and liquid volume in lakes/seas using a combination of images acquired using the Cassini RADAR, VIMS, and ISS instruments.
8:45 a.m. Vixie G. * Barnes J. W.  Rodriguez S.  Sotin C.  
* Northern Temperate Lakes on Titan [#2572]  
Several small lake candidates have been observed in Titan’s northern temperate latitudes and could have implications for GCMs and topography there.

9:00 a.m. Barnes J. W. *  Sotin C.  Soderblom J. M.  Hayes A. G.  Donelan M.  et al.  
* Specular Reflections from Titan’s Punga Mare Seen by Cassini/VIMS Indicate Surface Roughness: Waves? [#1947]  
Cassini/VIMS T85 observations of Titan’s north pole show significant specular return from parts of Punga Mare consistent with 6°-slope waves.

* Subsurface Control of Lakes at Low North Polar Latitudes on Titan: Implications for Fluvial Processes and Lake Morphology [#2633]  
Lakes observed at arid latitudes on Titan are dependent on equatorward subsurface flow driven by high recharge rates at less arid polar latitudes.

9:30 a.m. Michaelides R. J. *  Hayes A. G.  
* Determining Physical Properties of Titan’s Empty Lake Basins Through Radar Backscatter Modeling [#1321]  
We use repeat SAR observations to study the scattering properties of Titan’s paleo-lake basins by constructing backscatter models of individual features.

9:45 a.m. Singh S. * Chevrier V. F.  Wagner A.  Leitner M.  Gainor M.  et al.  
* Solubility of Acetylene in Liquid Hydrocarbons Under Titan Surface Conditions [#2850]  
We present the solubility of acetylene in liquid hydrocarbons under simulated Titan surface conditions.

10:00 a.m. Malaska M. *  Hodyss R.  
* Determination of the Solubilities of Aromatic Molecules in Cryogenic Ethane at 94 K — Application to Titan Lake Fluids [#1170]  
One ring, many rings / How much of it will dissolve? / The rest becomes sludge.

10:15 a.m. Mitchell K. L. *  Barmatz M.  Jamieson C. S.  Lorenz R. D.  
* Composition of Ligeia Mare, Titan, from Cryogenic Laboratory Measurements and Bathymetry [#2434]  
Ligeia Mare / RADAR and cold lab unveil / Deep sea of methane!

10:30 a.m. Cable M. L.  Vu T.  Choukroun M.  Hodyss R.  Beauchamp P. *  
* Hydrocarbon Trapping in Titan Surface Materials [#2873]  
Solid benzene forms a co-crystal with ethane under Titan surface conditions. This co-crystal may be an important component of Titan evaporite deposits.

10:45 a.m. Mousis O. *  Choukroun M.  Lunine J. I.  Sotin C.  
* The Possible Interplay Between Liquid and Clathrate Reservoirs on Titan [#1241]  
We investigate the interplay between a reservoir of hydrocarbons in Titan’s subsurface and a clathrate reservoir forming when the liquid diffuses throughout.

11:00 a.m. Luspay-Kuti A. *  Chevrier V. F.  Singh S.  Rivera-Valentin E. G.  Wagner A.  et al.  
* Composition and Dynamics of Titan’s Lakes [#1882]  
Evaporation rates of CH₄-C₂H₆ liquid mixtures are experimentally determined under Titan conditions. The results are used to estimate polar lake composition.

11:15 a.m. Lorenz R. D. *  
* The Throat of Kraken: Tidal Dissipation and Mixing Timescales in Titan’s Largest Sea [#1476]  
Tight strait splits Kraken / Titan’s sea has tidal race / Like Corryvreckan.
The Case of Titan’s Mysterious New Island: Analysis of Anomalously Bright Features Observed in the Cassini T92 SAR Pass Over Titan’s Ligeia Mare

Anomalous features were detected in Ligeia Mare that were not in any preceding nor subsequent observations. They are unique on Titan or transient in nature.

### Monday, March 17, 2014

**VESTA AND CERES**
**8:30 a.m. Montgomery Ballroom**

**Chairs:** Debra Buczkowski
David Blewett

8:30 a.m. Neumann W. * Breuer D. Spohn T.
*Shallow Magma Ocean on Vesta and Implications for the HEDs [#2046]*
We show that in contrast to previous studies a whole-mantle magma ocean does not form on Vesta if partitioning of $^{26}$Al is considered.

8:45 a.m. Hoff C. M. * Jones J. H. Le L.
*Experimental Constraints on a Vesta Magma Ocean [#1634]*
A MELTS-derived magma ocean model for the differentiation of Vesta was experimentally tested, revealing differences between MELTS and experimental data.

*A Proposed Time-Stratigraphic System for Protoplanet Vesta [#1381]*
We propose a time stratigraphic system and geologic timescale for Vesta, based on geologic mapping and integrated studies of Dawn data.

9:15 a.m. Clenet H. * Jutzi M. Barrat J.-A. Gillet Ph.
*Adapted Modified Gaussian Model: No Detection of Olivine in Regions Predicted to be Mantle-Rich from Models of Planet-Scale Collisions [#1349]*
MGM dedicated to olivine-pyroxene(s) mixtures was applied on Dawn VIR images. Olivine was not found in the Rheasilvia region, arguing in favor of a thick crust.

9:30 a.m. Cheek L. C. * Sunshine J. M.
*Spectral Mixture Analysis as a Tool for Characterizing the Distribution of Vesta’s Olivine-Rich Material [#2735]*
The geologic context and materials associated with Vesta’s olivine is explored by merging spectral and imaging data to provide clues to their petrologic origin.

9:45 a.m. Lunning N. G. * McSween H. Y. Tenner T. J. Kita N. T.
*Olivine from the Mantle of 4 Vesta Identified in Howardites [#1921]*
With our identification of the first vestan mantle samples, we can directly examine the evolution of Vesta in ways that were previously not possible.

10:00 a.m. Daly R. T. * Schultz P. H.
*How much of the Impactor (and Its Water) Ends up in Vesta’s Regolith? [#2070]*
We use experiments at the NASA AVGR to assess projectile survival and water retention from impacts into asteroid regoliths, with direct applications to Vesta.

10:15 a.m. Schäfer M. * Nathues A. Hoffmann M. Cloutis E. A. Reddy V. et al.
*Serpentine in Exogenic Carbonaceous Chondrite Material on Vesta Detected by Dawn FC [#1745]*
Dawn Framing Camera reveals for the first time an absorption feature in dark material deposits on 4 Vesta that can be attributed to serpentine in CM meteorites.
Surveying Vesta’s Styles of Space Weathering and Surface Mixing [#1208]  
Spectral analysis of space-weathering trends in various Vesta terrains, and the nature of the unusually colored material near Oppia crater.

10:45 a.m. Karimi M. * Dombard A. J.  
Studying the Possible Viscoelastic Deformation of the South Polar Craters of Vesta [#2666]  
We find these craters are unlikely to have evolved via lower crustal flow, which suggests their high-standing central peaks are a product of their formation.

11:00 a.m. Buczkowski D. L. * DeSanctis M. C. Nathues A. Hoffman M. Roatsch T. et al.  
Vesta’s Dark Ribbon: A Fluidized Ejecta Flow? [#2165]  
We propose that a roughly linear unit of distinct material on Vesta, informally referred to as the “dark ribbon”, represents a fluidized ejecta flow.

Reaction Conditions for Formation of Alteration Minerals on Ceres Inferred from Hydrothermal Experiments [#1698]  
We show that low CO₂ concentrations in Ceres are required for formation of brucite, which is inconsistent with the outer solar system origin of the icy dwarf.

11:30 a.m. Rivkin A. S. * Asphaug E.  
The Case of the Missing Ceres Family [#1649]  
Ceres’ paradox / Goddess of fertility / Yet no family.

Monday, March 18, 2013  
MASURSKY LECTURE AND DWORNIK AWARD PRESENTATIONS  
1:30 p.m. Waterway Ballroom 4/5

Presentation of the 2013 GSA Stephen E. Dwornik Award Winners —

Best Graduate Oral Presentation:  
E. S. Amador, University of Washington, “The Lost City Hydrothermal Field: A Spectroscopic and Astrobiological Martian Analog”

Honorable Mention (Graduate Oral)  
Matthew Chojnacki, University of Tennessee, Knoxville, “Local Sourcing and Aeolian Fractionation as Factors for Compositional Heterogeneity of Martian Aeolian Bedform Sand”

Best Graduate Poster  
R. Parai, Harvard University, “Strontium Isotopic Constraints on Early Solar System Chronology”

Honorable Mention (Graduate Poster)  
T. C. Prissel, Brown University, “Mg-Suite Plutons: Implications for Mantle-Derived Primitive Magma Source Depths on the Moon”

Best Undergraduate Oral Presentation  
K. M. Lehman, Texas Christian University, “Composition Analysis of the Marius Hills Volcanic Complex using Diviner Lunar Radiometer Experiment and Moon Mineralogy Mapper”

Honorable Mention (Undergraduate Oral)  
Best Undergraduate Poster

Presentation of the McGetchin Memorial Scholarship Award Winner —

Peter Martin, Wesleyan University

Presentation of the LPI Career Development Award Winners —

Winners to be announced

Masursky Lecture —

Scott D. R. *
Masursky’s Moon and the Science of Apollo 15
The talk will discuss Hal Masursky's contributions to Apollo 15, and manner in which human exploration capabilities of today can be applied to four other specific lunar sites identified by Hal and observed during Apollo 15. In particular, the “science-engineering synergism” developed during Apollo 15 will be emphasized to illustrate maximizing the science return from each new site.

David R. Scott began his professional career after graduating fifth in his class at West Point in 1954. He holds a Bachelor of Science degree from the U.S. Military Academy at West Point, 1954; a Master of Science degree in Aeronautics and Astronautics from MIT, 1962; the degree of Engineer in Aeronautics and Astronautics from MIT, 1962; an Honorary Doctor of Astronautical Science degree from the University of Michigan, 1971; an Honorary Doctor of Science degree from Southern Utah University, 1997; an Honorary Doctor of Science degree from Brown University, 2011; and an Honorary Doctor of Science and Technology degree, Jacksonville University, 2013. He is a graduate of the USAF Experimental Test Pilot School, 1963, and the USAF Aerospace Research Pilot School, 1964. In 1963 he was selected in the third group of NASA astronauts. During the next eight years he flew three space missions: Gemini VIII, the first docking in space (March 1966); Apollo 9, the first test flight of all spacecraft and flight operations for the Apollo lunar mission (except landing) (March 1969); and Apollo 15 (July 1971), for which, as Commander, he received NASA's highest award “For leading the most complex and carefully planned scientific expedition in the history of exploration . . .” Scott has logged more than 5600 hours flying time in 25 types of aircraft, helicopters, and spacecraft, and 546 hours in space (including more than 20 hours of extravehicular activity during five separate EVA excursions).

Scott held positions in NASA management for six years, becoming the Special Assistant for Mission Operations for the joint USA/USSR Apollo Soyuz Test Project (ASTP). In 1975, he retired from the Air Force as a full Colonel to accept the civilian appointment as Director of the NASA Hugh L. Dryden Flight Research Center, Edwards, California, the prime NASA aeronautical flight research facility. After entering the private sector in 1978, Scott formed several U.S. corporations conducting business in the U.S. and England, activities of which included project management consulting, the development of an opto-electronic structural sensor, and commercial applications of space technology. After the loss of the space shuttle Challenger in 1986, he served for four years on the Commercial Space Transportation Advisory Committee (COMSTAC) to advise the Secretary of Transportation on the conversion of military ICBMs to commercial Expendable Launch Vehicles (ELVs). He is currently President of the Baron Company, Ltd., a Bermuda company formed to pursue unique opportunities in the commercial space sector. He is the holder of 15 patents in the U.S., Europe, and Japan covering inventions in the areas of spaceflight operations and robotic planetary exploration.

Chairs: Monica Grady
        Carl Agee

2:30 p.m. Hewins R. H. * Zanda B. Humayun M. Lorand J.-P. Pont S.
        
        Impact Melt Rocks and Pristine Clasts in Northwest Africa 7533 [#1416]
        This martian breccia contains feldspathic clasts with Ni-rich pyroxene and some Ni-poor
        orthopyroxene clasts, respectively interpreted as impact-related and pristine material.

2:45 p.m. Santos A. R. * Agee C. B. Shearer C. K. Burger P. V. McCubbin F. M.
        
        A Trace Element Investigation into the Petrogenetic Relationships of Different Igneous Lithologies
        Within Martian Meteorite NWA 7034 [#2621]
        Major elements and REEs in pyroxene were used to determine the petrogenetic relationships between
        igneous lithologies in NWA 7034.

        
        Oxygen Isotope Compositions and Ti and REE Concentrations of Zircon from Martian
        Meteorite NWA 7533 [#1720]
        Oxygen-isotope compositions of zircon from martian meteorite NWA 7533 suggest existence of
        different oxygen reservoirs during zircon formation and alteration.

        
        An Earth-Like Beginning for Ancient Mars Indicated by Alkali-Rich Volcanism at 4.4 Ga [#1320]
        Discovery of 4.35–4.44 Ga and 1.44 Ga zircons and 1.35 Ga phosphates in a martian meteorite
        indicates Earth-like beginning for Mars with alkali-rich volcanism.

3:30 p.m. Goderis S. * Brandon A. D. Mayer B. Humayun M. Agee C. B.
        
        Tracing Impactor Signals Prevalent in Martian Regolith Breccia Northwest Africa 7034 with
        Os Isotopes and Platinum Group Elements [#2200]
        The highly siderophile element budget of NWA 7034 suggests roughly carbonaceous chondritic
        impactors and a Re-Os fractionation event ~1.9 Ga ago.

3:45 p.m. Humayun M. * Hewins R. H. Lorand J.-P. Zanda B.
        
        Weathering and Impact Melting Determined the Mineralogy of the Early Martian Crust Preserved in
        Northwest Africa 7533 [#1880]
        Weathering of an olivine-bearing regolith to form Fe-oxides, followed by impact melting, creates an
        opx and magnetite mineralogy in the early martian crust.

4:00 p.m. Schwenzer S. P. *
        
        Evaluating Potential Alteration Products of NWA7034: Expanding Our Knowledge of Martian
        Crustal Alteration Assemblages [#1718]
        Modeling insights into alteration minerals formed by a variety of processes — from martian/terrestrial
        weathering to volcanic and impact-generated hydrothermal.

        
        A TEM Investigation of the Fine-Grained Matrix of Martian Basaltic Breccia NWA 7034 [#2763]
        Fine-grained groundmass of NWA 7034: textural evidence of short term heating event.
Analysis of C, N, and noble gases in martian meteorite NWA 7034 indicates that it contains trapped martian atmosphere.

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**Monday, March 17, 2014**

**MARS ROVER SCALE GEOLOGY AND GEOMORPHOLOGY**

2:30 p.m. Waterway Ballroom 4

**Chairs:**
Michelle Minitti
Horton Newsom

2:30 p.m.
Arvidson R. E. * Squyres S. W. Gellert R. Mittlefehldt D. W. Athena Science Team

*Recent Results from the Opportunity Rover’s Exploration of Endeavour Crater, Mars* [#1400]

Results of Opportunity’s investigation of aqueous alteration of rocks on Cape York’s Matijevic Hill are compared with observations acquired on Murray Ridge.

2:45 p.m.
Crumpler L. S. *

*MER First In Situ Results from the Rim of a Complex Impact Crater on Mars* [#1493]

The Mars Exploration Rover Opportunity is establishing the in situ context of clays, and some unexpected outcrop-scale characteristics of a complex impact crater.

3:00 p.m.

*Gale Crater and Impact Processes from Curiosity* [#2103]

Exposure ages and a paucity of craters <2 m in diameter constrain resurfacing rates at Gale Crater to ~30 mm/m.y., consistent with observed crater degradation.

3:15 p.m.

*Lithology and Texture of a Potential Conglomerate in Gale Crater as Imaged by MAHLI* [#1295]

A potential conglomerate reveals its textural secrets to MAHLI — multiple sediment populations are indicated, including impact breccia.

3:30 p.m.
Garvin J. B. * Malin M. C. Minitti M. E.

*Sedimentology of Martian Gravels from MARDI Twilight Imaging: Techniques* [#2511]

Geologic analysis of images acquired under twilight conditions by Curiosity’s MARDI camera have been analyzed using quantitative sedimentology methods.

3:45 p.m.

*A Fluvial Sandbody on Mars: Reconstruction of the Shaler Outcrop, Gale Crater, Mars* [#1648]

We examine the facies and sedimentary architecture of a fluvial sandbody and compare it to other fluvial and lacustrine deposits encountered by Curiosity.

4:00 p.m.

*Sedimentology of Darwin Waypoint from Curiosity Observations* [#2401]

We report on sedimentological observations at Darwin based on images from the Mastcam and MAHLI instruments.

4:15 p.m.

*MAHLI After Dark: Nighttime Mars Hand Lens Imager Observations Under LED Illumination* [#2029]

MAHLI has conducted white light and UV LED-illuminated night imaging on four occasions, two focused on geologic targets and two focused on rover hardware.
4:30 p.m. Fernando J. * Schmidt F. Pilorget C. Pinet P. Ceamanos X. et al.  
CRISM/MRO Photometric Maps for the Physical Characterization of Surface Materials at  
MER-Opportunity Landing Site, Meridiani Planum, Mars [#1473]  
The spatial variations of surface photometric parameters suggest different surface physical properties  
and thus a different history (formation and evolution).  

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**Monday, March 17, 2014**  
**EMERGING WORLDS: HOW TO MAKE A PLANET**  
2:30 p.m. Waterway Ballroom 5  

**Chairs:**  
David Rubie  
Claire McLeod  

2:30 p.m. Rubie D. C. * Jacobson S. A. Morbidelli A. Young E. D.  
*Accretion and Differentiation of the Terrestrial Planets: Implications for the Compositions of Early-Formed Solar System Bodies [#1734]*  
We combine N-body accretion simulations with a model of core-mantle differentiation and can thus  
constrain the compositions of primitive solar system bodies.  

2:45 p.m. de Vries J. * Nimmo F. Melosh H. J. Jacobson S. Morbidelli A. et al.  
*Melting Due to Impacts on Growing Proto-Planets [#1896]*  
Pressure and temperature conditions for planetary differentiation are determined from the depth of  
melting caused by impacts during planetary accretion.  

3:00 p.m. Kendall J. * Melosh H. J.  
Dispersion of Planetary Iron Cores During Accretional Impacts [#2827]  
We show the dispersion of planetesimal iron cores during accretional impacts using 3-D hydrocode  
simulations. This plays a large role in planet formation.  

3:15 p.m. Hillgren V. J. * Fei Y.  
Metal-Silicate Partitioning of Si and S Under Highly Reducing Conditions: Implications for the Evolution of Mercury [#2751]  
The metal-silicate partitioning of Si and S under highly reducing conditions may explain some of the  
unique features of Mercury.  

3:30 p.m. Shofner G. A. * Campbell A. J. Danielson L. Rahman Z. Righter K.  
Metal-Silicate Partitioning of Tungsten from 10 to 50 Gpa [#1267]  
New high-P-T experimental data (50 GPa, ~4000 K) on W metal-silicate partitioning improves  
constraints on core formation conditions and timing (Hf-W).  

3:45 p.m. Jordan M. K. * Young E. D.  
Equilibrium Metal-Silicate Fe Isotope Fractionation and the Implications for Differentiation in Planetary Bodies [#2318]  
We establish the equilibrium fractionation of Fe between metal and silicate phases as a function of  
temperature using a differentiated aubrite, Norton County.  

4:00 p.m. Righter K. * Pando K. A. Danielson L. R. Nickodem K. A.  
Core-Mantle Partitioning of Volatile Elements and the Origin of Volatile Elements in Earth and Moon [#2130]  
Earth and Moon mantle concentrations of Ge, Ga, Cu, As, and Sb are explained by magma oceans in  
Earth and Moon, but the lowest T metals (Zn, In, Sn) only in Earth.
4:15 p.m.  Hier-Majumder S. Hirschmann M. M. *
*Trapping of Volatiles and Trace Elements During Crystallization of a Magma Ocean [#2558]*
We develop a dynamic model of the effect of incomplete melt/crystal separation on the partitioning of volatiles between magma oceans and overlying atmospheres.

4:30 p.m. Gardner-Vandy K. G. * McCoy T. J. Bullock E. S.
*Making Evolved Melts on Asteroids [#1483]*
We derived melts like GRA 06128/9 via low-degree melting of an R chondrite. This challenges the idea that evolved melts formed only on planet-sized bodies.

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**Monday, March 17, 2014 [M154]**

**VENUS: A RIDDLE WRAPPED IN A MYSTERY INSIDE AN ENIGMA**
2:30 p.m.  Waterway Ballroom 6

** Chairs:** Bradley Thomson  Debra Hurwitz

2:30 p.m. Weller M. B. * Lenardic A.
*The Evolution of Terrestrial Planets: Multiple Tectonic Regimes and Diverging Geologic Histories [#1576]*
As planets evolve / Stagnant may become active / Active may idle.

2:45 p.m. Smrekar S. E. * Davaille A.
*Subduction of a Sluggish Lid: Examples from Laboratory Experiments and Venus [#2713]*
Laboratory experiments with realistic rheology produce subduction at mantle plumes. Geophysical data analysis shows that Venus may exhibit such subduction.

3:00 p.m. Ivanov M. A. * Head J. W.
*The History of Topography on Venus [#1079]*
The vast majority (80–85%) of the currently observed long-wavelength topography formed during the earlier global tectonic regime.

3:15 p.m. Karimi M. * Dombard A. J.
*Studying the Viscoelastic Deformation of Mead Basin: Implications for the Thermal History and Rheology of Venus [#2625]*
We constrain heat flux and rheology in the vicinity of Mead by simulating lower crustal flow, finding heat fluxes higher than predicted and dry conditions.

3:30 p.m. Bondarenko N. V. * Kreslavsky M. A.
*Venus: New Maps of Multiple Parameters of Meter-Scale Roughness [#2266]*
We derived three parameters of meter-scale roughness from Magellan radar altimeter echo profiles. The maps show variability of roughness signatures over plains.

3:45 p.m. Le Corvec N. * McGovern P. J. Grosfils E. B.
*Effects of Crustal-Scale Mechanical Layering on Magma Reservoir Failure and Magma Propagation Within the Venusian Lithosphere [#2330]*
Finite-element modeling on the influence of mechanical layering on magma chamber stability and radial dike formation within the venusian lithosphere.

4:00 p.m. Quick L. C. * Glaze L. S. Baloga S. M.
*Emplacement of Volcanic Domes on Venus and Europa [#1581]*
We present a model for the emplacement of volcanic domes on Venus and consider how this model may apply to the formation of putative cryolava domes on Europa.
4:15 p.m.  Shalygin E. V. *  Markiewicz W. J.  Basilevsky A. T.  Titov D. V.  Ignatiev N. I.  et al.  
*Bright Transient Spots in Ganiki Chasma, Venus [#2556]*  
In data obtained by VMC onboard the ESA VEx we found a few transient phenomena in Ganiki Chasma that we interpreted as evidence of present volcanic activity.

4:30 p.m.  Kohler E. *  Chevrier V.  Johnson N.  Craig P.  Lacy C.  
*Proposed Radar-Reflective Minerals Tested Under Venus Surface and Atmospheric Conditions [#2321]*  
Results from experiments constraining the origins of the radar anomalies in the venusian highlands are presented.
Tuesday, March 18, 2014

SPECIAL SESSION: LUNAR DUST AND EXOSPHERE
FEATURING THE FIRST RESULTS FROM LADEE
8:30 a.m. Waterway Ballroom 1

Chairs: Richard Elphic
        Andrew Poppe

*The Lunar Atmosphere and Dust Environment Explorer (LADEE): Initial Science Results[#2677]
LADEE is making measurements of the tenuous lunar exosphere and the dust cloud from
meteoroid impacts.

8:45 a.m. Glenar D. A. * Stubbs T. J. Elphic R.
*LADEE Search for a Dust Exosphere: A Historical Perspective[#2640]
The LADEE search for a dust exosphere is discussed in the context of recent dust upper-
limit measurements.

9:00 a.m. Horanyi M. * Gagnard S. Gathright D. Gruen E. James D. et al.
*The Dust Environment of the Moon as Seen by the Lunar Dust Experiment (LDEX)[#1303]
The Lunar Dust Experiment (LDEX) onboard the LADEE mission continues to make observations in
lunar orbit since its cover was deployed on 10/16/2013.

9:15 a.m. Kempf S. * Grün E. Horanyi M. James D. Lankton M. et al.
*Observations of the Lunar Dust Exosphere with LDEX[#1389]
This talk will report about first insights into the properties of the lunar dust exosphere based on a
preliminary analysis of the LDEX data.

9:30 a.m. Stubbs T. J. * Glenar D. A. Wang Y. Hermalyn B. Sarantos M. et al.
*The Impact of Meteoroid Streams on the Lunar Atmosphere and Dust Environment During the
LADEE Mission [#2705]
We describe the 18 annual meteoroid streams predicted to encounter the Moon during the LADEE
mission, and discuss the implications for the lunar environment.

9:45 a.m. Halekas J. S. * Poppe A. R. Delory G. T. Elphic R. C. Angelopoulos V. et al.
*ARTEMIS Observations and Data-Based Modeling in Support of LADEE [#1548]
Plasma processes influence the lunar exosphere and its structure and variability. We utilize ARTEMIS
data and data-based modeling to provide inputs for LADEE.

10:00 a.m. Szalay J. R. * Horanyi M. Poppe A. R. Halekas J. S.
*LDEX Observations and Correlations with ARTEMIS Measurements [#1500]
This presentation will focus on the correlations between LDEX and ARTEMIS data.

*Model-Data Comparisons of LADEE/LDEX Observations of Low-Energy Lunar Dayside Ions [#1393]
We model the response of the LADEE/LDEX instrument to low-energy lunar dayside ions and discuss
implications for the lunar exo- and ionosphere.

10:30 a.m. Benna M. * Mahaffy P. R. Hodges R. R.
*Early Results from Exospheric Observations by the Neutral Mass Spectrometer (NMS)[#1535]
We present early observations of He, Ar, and Ne observations from the LADEE NMS orbit.
*Overview of the LADEE Ultraviolet-Visible Spectrometer: Design, Operations, and Initial Results [#2566]*  
This talk will overview the design, performance, and initial results of the LADEE UVS instrument.

11:00 a.m. Hermaly B. * Colaprete A. Elphic R. C. Landis D. Karcz J. et al.  
*Impact Lofted Ejecta Contribution to the Lunar Exosphere: Experiments and Results from the LADEE Ultraviolet Visible Spectrometer [#2518]*  
This study presents preliminary results of lunar limb observations from the UVS on LADEE toward understanding the impact contribution to the dust exosphere.

11:15 a.m. Wooden D. H. * Cook A. M. Colaprete A. Shirley M. H. Vargo K. E. et al.  
*LADEE UVS Observation of Solar Occultation by Exospheric Dust Above the Lunar Limb [#2123]*  
LADEE UVS solar occultation measurements (40–0 km altitudes) reveal spectral signatures of forward scattering and absorption by dust in the lunar exosphere.

11:30 a.m. Hurley D. M. * Benna M. Mahaffy P. R. Elphic R. C. Colaprete A. et al.  
*Upper Limits on the Propagation of Constituents of the Chang’e-3 Exhaust Plume from LADEE Observations [#2160]*  
Examining the LADEE observations during the day of the Chang’e-3 landing for the presence of the rocket exhaust plume and comparing to model simulations.

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**Tuesday, March 18, 2014**  
**MARS PETROLOGY AND PETROGENESIS**  
*8:30 a.m. Waterway Ballroom 4*

**Chairs:** Ryan Mills  
Jennifer Rapp

8:30 a.m. Symes S. J. K. * Borg L. E. Brennecka G. A.  
*A Young Differentiation Age for Mars Deduced from High-Precision $^{142}$Nd Analyses of Martian Meteorites [#2063]*  
We present Sm- and Nd-isotopic data combined with a new mathematical approach to define the age of silicate differentiation on Mars.

8:45 a.m. Righter M. * Andreassen R. Lapen T. J. Irving A. J.  
*The Age and Source Composition for Depleted Shergottite Northwest Africa 7635: A 2.3 Ga Magmatic Rock from Early Amazonian Mars [#2550]*  
NWA 7635 depleted shergottite has an Sm-Nd age of 2.3 Ga. Calculated source compositions show that it derived from a source that is more depleted than any other shergottites.

*Lead-Lead Isotope Systematics and Terrestrial and Ejection Ages of Early Amazonian Depleted Shergottite Northwest Africa 7635 [#2865]*  
Depleted shergottite NWA 7635 has an ejection age of 1 m.y. and a 2.8-k.y. terrestrial. Lead-lead isotopes are the least radiogenic measured for martian meteorites.

9:15 a.m. Bellucci J. J. * Nemchin A. A. Whitehouse M. J.  
*A Unique Differentiation History of Mars Preserved in Martian Meteorite NWA 7533 [#1327]*  
A Pb isotopic study of martian regolith breccia NWA 7533.
9:30 a.m. Sharp Z. D. * Shearer C. K. Burger P. V. Agee C. McKeegan K.
*The Unique Chlorine Isotope Composition of Mars: Implications for Planetary Formation and Differentiation [#1617]*
The Cl-isotope composition of Mars differs from Earth, the Moon, and chondrites. Mantle samples are light; crustal materials are heavy. Mantle samples are unique.

9:45 a.m. Shearer C. K. * Sharp Z. D. McKeegan K. D. Burger P. V. McCubbin F. M.
*Chlorine Isotopic Composition of Martian Meteorites. Implications for the Composition of the Martian Crust and Mantle, Their Interactions, and Magmatic Processes [#1502]*
We examine the Cl-isotopic compositions of a variety of martian rocks to better understand the composition of the martian crust and mantle and their interactions.

10:00 a.m. Balta J. B. * McSween H. Y. Jr.
*Application of the MELTS Algorithm to the Composition and Crystallization of Martian (and Other Extraterrestrial) Magmas [#1365]*
The MELTS algorithm is commonly used to model crystallization of planetary magmas. We apply it to martian compositions and explore its strengths and weaknesses.

10:15 a.m. Collinet M. * Charlier B. Medard E. Vander Auwera J. Grove T. L.
*New Experimental Constraints on the Origin of Shergottites: Super-Chondritic Ca/Al in Melts from a Garnet-Free Martian Mantle [#2776]*
Melts with CaO/Al2O3 ratios identical to shergottites were produced from a primitive martian mantle at a lower pressure than the spinel to garnet transition.

*Tracking the Martian Mantle Signature in Olivine-Hosted Melt Inclusions of Basaltic Shergottites Yamato 980459 and Tissint [#2405]*
We present here our in situ SIMS analysis of trace elements in olivine hosted melt inclusions for the basaltic shergottites Yamato 980459 and Tissint.

10:45 a.m. Williams K. B. * Sonzogni Y. Treiman A. H.
*Amphibole in the Tissint Martian Meteorite: Composition and Implication for Volatile Content of Parental Magma [#1435]*
Our chemical analyses of kaersutite in the new Tissint shergottite provide volatile contents that, in turn, constrain the volatile content of the parent magma.

11:00 a.m. Bell A. S. * Burger P. V. Le L. Papike J. J. Jones J. et al.
*Chromium Oxidation State in Planetary Basalts: Oxygen Fugacity Indicator and Critical Variable for Cr-Spinel Stability [#2198]*
The ratio of trivalent to divalent Cr in magmas has consequences for the stability of phase spinel and the Cr concentration of clinopyroxene and olivine.

*Discovery of a New Martian Meteorite Type: Augite Basalt — Northwest Africa 8159 [#2036]*
We report here the discovery of a new type of martian meteorite, NWA 8159 augite basalt, that has characteristics distinct from other martian meteorite types.

11:30 a.m. Herd C. D. K. * Agee C. B. Muttik N. Walton E. L.
*The NWA 8159 Martian Augite Basalt: Possible Eruptive from the Nakhlite Suite [#2423]*
A new Mars basalt / Defies being classified / Nakhlite related?
Precise Oxygen Isotope Measurements Reveal Difference Between Single Hibonite Crystals and Spinel-Hibonite Inclusions from CM Chondrites [#2508]

Our oxygen-isotope measurements of 76 CAIs show a clear difference between PLACs and SHIBs. In addition, we have identified three highly fractionated CAIs.

Large Enrichments in $^{16}$O and Evidence for Multiple Reservoirs in the Protosolar Accretion Disk in a Corundum Bearing CAI [#2025]

Oxygen-isotopic signatures of core and WL rim of a corundum-hibonite from ALHA 77307 reveals the presence of distinct reservoirs in the early solar system.

Heterogeneous Oxygen Isotopic Composition of a Complex Wark-Lovering Rim and the Margin of a Refractory Inclusion from Leoville [#1233]

Extreme oxygen isotopic variability measured by NanoSIMS in the Wark-Lovering rim and the margin of a pristine compact Type A inclusion from Leoville.

Oxygen Isotopes in Fine-Grained Spinel-Pyroxene and Melilite-Rich CAIs in the ALHA 77307 CO3.0 Carbonaceous Chondrite [#2789]

We measured oxygen isotopes in CAIs in ALHA 77307 to investigate if the objects record transport within the protoplanetary disk.

The primary distribution of oxygen isotopes for CAIs and chondrules from CV-ox and CV-red chondrites lies along the CCAM line rather than the Y&R line.

Mineralogy and Oxygen Isotope Compositions of a Ti-Rich Refractory Inclusion from the CH Chondrite SaU 290 [#1230]

A CAI (A0031) containing multiple Ti-rich minerals was found in the CH chondrite SaU 290. Mineralogy and oxygen isotope compositions of this CAI are reported.

Multi-Isotope Study of the Compound Ultra-Refractory Inclusion Efremovka 101.1 Sheds Light on Complex CAI Formation Processes [#1747]

O, Mg, and Si isotopes in the ultra-refractory CAI E101.1 indicate coagulation and assimilation of proto-CAIs with different thermal histories in a $^{18}$O-poor gas.

How much Dust can be Processed by a Single Lightning Bolt in the Solar Nebula? [#1132]

We quantify variations in two parameters of the lightning model for oxygen isotopic fractionation: the dust evaporation coefficients and temperature of the bolt.
10:30 a.m. Ivanova M. A. * Lorenz C. A. Shuvalov V. V. Krot A. N. MacPherson G. J. et al. *Plastically-Deformed Igneous Calcium-Aluminum-Rich Inclusions from CV Carbonaceous Chondrites: Clues to a Nature of CAI Melting Events [#2166]*
The bowl-shaped igneous CAIs from the CV chondrites were plastically deformed during a rapid transport through a low gas-pressure environment while being molten.

10:45 a.m. Ustunisik G. * Ebel D. S. Walker D. Boesenberg J. S. *Experimental Investigation of Condensation Predictions for Dust-Enriched Systems [#1212]*
Experimental tests of predicted mineral-liquid equilibria in condensates reveal no perovskite+liq, small olivine+spinel+liq, and large melilitite+liquid fields.

11:00 a.m. Tachibana S. * Takigawa A. Miyake A. Nagahara H. Ozawa K. *Condensation of Forsterite Under Controlled Protoplanetary Disk Conditions [#1226]*
Condensation experiments in the Mg$_2$SiO$_4$-H$_2$O system were performed under nebular conditions. Properties of condensates and kinetics will be discussed.

Results on vacuum evaporation experiments of Mg- and Si-rich CMAS melts are used to discuss evolution of chemical and isotopic compositions of FUN CAIs.

We show new Al-Mg data from a search for FUN CAIs by LA-MC-ICP-MS. We observe a wide range in stable-isotope fractionation between and within different CAIs.

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**Tuesday, March 18, 2014**

**IMPACTS I: THEORY AND MODELS**

8:30 a.m. Waterway Ballroom 6

**Chairs:**

Ross Potter
Veronica Bray

8:30 a.m. Tonge A. L. * Ramesh K. T. Barnouin O. S. *Large Impacts on Airless Bodies: The Himeros Event on Eros [#1998]*
We investigate the link between observables, such as the bulk porosity, and the impact history on Eros including multiple impacts using a new material model.

8:45 a.m. Bray V. J. * Collins G. S. Morgan J. V. Melosh H. J. Schenk P. M. *Summit-Pit Crater Formation in Layered Crusts and the Effect of Target Heat Flow on Pristine Crater Dimensions [#2729]*
Pristine crater shape / Much changed by crustal heat flow / Summit-pits formed too. (My first attempt at the LPSC haiku; don’t judge!).

9:00 a.m. Hay H. C. F. C. * Collins G. S. Davison T. M. *Complex Crater Collapse: A Comparison of the Block and Melosh Models of Acoustic Fluidization [#1938]*
We compare two models of dynamic weakening in numerical simulations of impact crater formation. Localized regeneration of acoustic energy facilitates collapse.

9:15 a.m. Elbeshausen D. * Melosh H. J. Wünnemann K. *Formation of Peak Ring Craters — Insights from Numerical Modelling and GRAIL [#2034]*
We are studying the formation of peak-ring craters by use of numerical modeling and gravity data from GRAIL.
9:30 a.m. Stewart S. T. * Lock S. J. Mukhopadhyay S.
Atmospheric Loss and Volatile Fractionation During Giant Impacts [#2869]
We present a scaling law to predict blowoff of atmospheres and oceans by giant impacts. Partial loss of the atmosphere was common; loss of an ocean was not.

Vaporization of Planetesimal Cores During Accretion [#2888]
The iron rich cores of planetesimals will vaporize at the end stages of Earth’s accretion.

The Evolution of Giant Impact Ejecta and the Age of the Moon [#1611]
Scattered ejecta from the Moon-forming impact hit asteroids and made ancient Ar-Ar reset ages. They suggest the Moon formed 100 ± 30 Ma after CAIs.

10:15 a.m. Citron R. I. Aharonson O. * Perets H. Genda H.
Moon Formation from Multiple Large Impacts [#2085]
We investigate the possibility that the Moon formed from the merger of successive large impacts that each produced a distinct debris disk.

10:30 a.m. Sarid G. * Stewart S. T. Leinhardt Z. M.
Mercury, the Impactor [#2723]
Mercury, the most peculiar terrestrial planet, may have played the role of the significantly deformed and disrupted projectile in an early hit-and-run event.

10:45 a.m. Jögi P. M. * Paige D. A.
A Ballistic Model for Antipodal Impact Melt Deposits on the Moon [#2574]
We propose that the presence of anomalous melt deposits at the antipode of Tycho Crater is due to the frictional heating of ballistically emplaced ejecta.

11:00 a.m. Kreslavsky M. A. * Asphaug E.
Direct Delivery of Lunar Impact Ejecta to the Earth [#2455]
Large impacts into the eastern hemisphere of the Moon cause hours- to days-long impact showers on Earth with a chance for traces in the terrestrial geological record.

11:15 a.m. Potter R. W. K. * Kring D. A.
Collisional Erosion: Consequences for the Young Earth [#2230]
The viability of collisional erosion as a method for removing Earth’s crust and, therefore, producing Earth’s observed geochemical anomalies is assessed.

11:30 a.m. Abramov O. * Kring D. A. Mojzsis S. J.
Predictions of Crustal Age-Resetting by Impact Bombardments on Early Earth [#2491]
Effects of impact bombardments, individual impact craters, and ejecta blankets are modeled to make predictions for the oldest terrestrial rocks and minerals.
### SPECIAL SESSION: STRUCTURE AND EVOLUTION OF PLANETARY BODIES:
A GEOPHYSICAL PERSPECTIVE
8:30 a.m. Montgomery Ballroom

**Chairs:**
- Francis Nimmo
- Amir Khan

**Tuesday, March 18, 2014**

#### 8:30 a.m.
*Scale and Timing of Primitive Mantle Differentiation in Terrestrial Planets: Insights from Geochemistry and Geophysics [#1868]*
Geochemical-geophysical models suggest Mars, Mercury, and the Moon are ~2× more differentiated with respect to incompatible lithophile elements than Earth and Venus.

#### 8:45 a.m.
*Mercury’s 2nd-Degree Shape and Geoid: Lunar Comparisons and Thermal Anomalies [#2634]*
Subsurface thermal density anomalies related to the 3:2 resonance-driven surface temperature distribution may explain Mercury’s second-degree shape and geoid.

#### 9:00 a.m.
*New Insights into Mercury’s Core Dynamics from Numerical Dynamo Simulations [#1559]*
A numerical dynamo explanation to the recently discovered significant north-south asymmetry in Mercury’s magnetic field and implications for Mercury’s interior.

#### 9:15 a.m.
*A New Model for the (Geo)Magnetic Field Spectrum to Estimate the Radius of Planetary Dynamos [#1993]*
We estimate the radius of the dynamo of Jupiter, Saturn, Uranus, and Neptune using two new statistical expressions for the magnetic field power spectrum.

#### 9:30 a.m.
*A High-Resolution Model of the Lithospheric Magnetic Field of Mars [#1372]*
We present a high-resolution model of the martian lithospheric magnetic field in terms of spherical harmonics expanded up to degree and order 110.

#### 9:45 a.m.
*Lunar Heat Flow: Regional Geophysical Modeling of the Apollo Landing Sites [#2100]*
We reexamine the Apollo Heat Flow Experiment using 3-D thermal conduction models, and examine effects of crustal thickness, density, and radiogenic abundance.

#### 10:00 a.m.
*Seismic and Gravity Modeling of the Lunar Megaregolith [#2632]*
Our study constrains the depth distribution of crustal porosity on the Moon using a joint forward model of GRAIL gravity and Apollo seismic data.

#### 10:15 a.m.
*Effects of Lateral Variations in Megaregolith Thickness on Recorded Seismic Signals [#1231]*
We produce synthetic seismograms from models with laterally varying megaregolith thicknesses and identify regions less affected by high levels of scattering.

#### 10:30 a.m.
*Geophysical Constraints on the Structure and Evolution of Vesta’s Crust and Mantle [#2214]*
Dawn’s geophysical data reveal density variations within the crust and mantle of Vesta that are consistent with serial magmatism during Vesta’s formation.
10:45 a.m. Elder C. M. * Tackley P. J. Showman A. P.  
*Convection in Io’s Partially Molten Mantle [#2336]*  
We present preliminary 2-D numerical simulations of mantle convection in Io including the formation, segregation, and eruption of partial melt.

11:00 a.m. Barr A. C. * Hammond N. P.  
*A Common Origin for Icy Satellite Extensional Ridge-and-Trough Terrain by Sluggish Lid Convection [#2427]*  
The driving force behind extensional ridge-and-trough terrains on many icy satellites may be solid-state convection in an ice shell with a weak upper surface.

11:15 a.m. Hammond N. P. * Barr A. C.  
*Formation of Coronae on Miranda by Convection Driven Resurfacing [#1277]*  
We simulate convection in Miranda’s ice shell to test the hypothesis that coronae formed by convection-driven resurfacing during an episode of tidal heating.

11:30 a.m. Desch S. J. *  
*Formation of Pluto and Charon from Two Partially Differentiated Impactors [#1135]*  
If Charon formed from an impact-generated disk around Pluto, its density is explained if the impactors were only partially differentiated, with rock/ice crusts.

**Tuesday, March 18, 2014**  
**LUNAR GEOPHYSICAL EVOLUTION: GRAIL AND MORE**  
1:30 p.m. Waterway Ballroom 1

**Chairs:** David Smith  
Paul Byrne

1:30 p.m. Elkins-Tanton L. T. * Bercovici D.  
*Contraction or Expansion of the Moon’s Crust During Magma Ocean Freezing? [#1128]*  
Models show that the Moon may well have expanded during solidification, consistent with GRAIL data; further, any contraction scarps would have relaxed away.

1:45 p.m. Nimmo F. * Chen E. M. A.  
*Tidal Dissipation in the Early Lunar Magma Ocean and its Role in the Evolution of the Earth-Moon System [#1459]*  
The Moon’s initial outward evolution was slower than usually assumed, because otherwise its inclination would have damped via magma ocean dissipation.

2:00 p.m. Garrick-Bethell I. * Perera V. Nimmo F. Zuber M. T.  
*The Tidal-Rotational Shape of the Moon and Evidence for Polar Wander [#2476]*  
When the Moon’s largest basins are removed, the global lunar shape is consistent with processes controlled by early Earth tides.

2:15 p.m. Tikoo S. M. * Weiss B. P. Shuster D. L. Fuller M. D.  
*How Long Did the Lunar Core Dynamo Persist? [#1972]*  
The paleomagnetic record of a young regolith breccia raises the possibility that the lunar core dynamo magnetic field may have persisted beyond 3.3 Ga.

2:30 p.m. Hood L. L. * Tsunakawa H. Spudis P. D.  
*Central Magnetic Anomalies in Old Lunar Impact Basins: New Constraints on the Earliest History of the Former Core Dynamo [#1482]*  
Probable central magnetic anomalies, implying thermoremanent magnetization in a steady magnetic field, are present in at least three pre-Nectarian impact basins.
2:45 p.m. Laneuville M. * Wieczorek M. A. Breuer D. Aubert J. Morard G. et al. 
* A Long Lived Lunar Dynamo Powered by Core Crystallization [#1819]
The long duration of the lunar paleomagnetic field is hard to reconcile with lunar models. We show here that inner core growth is a potential explanation.

3:00 p.m. Smith D. E. * Zuber M. T. 
* Isolating the Gravitational Signature of the Lunar Mantle from GRAIL [#1956]
We model potential density anomalies in the mantle of the Moon and compare with features in the Bouguer gravity field of the Moon observed by GRAIL.

* The Geophysical Nature of the Procellarum Region of the Moon as Revealed by GRAIL Gravity Data [#2679]
GRAIL gravity data reveals a quasi-rectangular pattern of linear anomalies encompassing the Procellarum region, which are interpreted as magma-flooded rifts.

* The Contribution of Impact Melt Sheets to Lunar Impact Basin Gravity Anomalies [#2831]
Impact melt sheets at lunar basins make a moderate positive contribution to the free-air gravity. At Orientale, the melt sheet is 5–10% of the observed anomaly.

* Deep-Seated Contractional Tectonics in Mare Crisium, the Moon [#2396]
Mare Crisium / Has a ring of deep faults that / Are mascon-bounding.

4:00 p.m. Besserer J. * Nimmo F. Wieczorek M. A. Weber R. C. Kiefer W. S. et al. 
* GRAIL Constraints on the Vertical Density Structure of the Lunar Crust [#2407]
High-degree GRAIL data were analyzed using admittance. Mare regions are readily identified; South Pole-Aitken basin exhibits a shallower low-density layer.

* Small Scale Density Variations in the Lunar Crust as seen in GRAIL Data [#2730]
GRAIL data shows a high-degree signal that corresponds to small-scale density anomalies. Here we investigate three hypotheses for the source of these anomalies.

4:30 p.m. Huang Q. * Xiao Z. Xiao L. 
* Subsurface Structures of Large Volcanic Complexes on the Nearside of the Moon [#1790]
We carry out localized spectral analyses and band-limited Bouguer gravity for lunar volcanic complexes to comprehensively study their subsurface structures.

Tuesday, March 18, 2014 [T252]
SPECIAL SESSION: FLUIDS ON DIFFERENTIATED BODIES
1:30 p.m. Waterway Ballroom 4

Chairs: Adam Sarafian Yang Liu

1:30 p.m. Fu R. R. * Elkins-Tanton L. T. 
* The Fate of Magmas in Planetesimals and the Retention of Primitive Chondritic Crusts [#1382]
Volatiles migrate readily on igneous planetesimals, leaving dry silicate melts that may ascend or remain at depth, depending on bulk composition.
MON ORALS

1:45 p.m. Isa J. Warren P. H. * Rubin A. E. McKeegan K. D. Gessler N. 
Fluid Deposition Products in Eucrites and Moon Rocks: A Study in Contrasts [#2777]
We discuss the enigmatic fluid-metasomatic melange, including Fe-metals, in the NWA 5738 eucrite, and a search for analogous stuff in ancient lunar rocks.

Is Earth’s Original D/H Ratio Preserved in the Deep Mantle? [#1283]
Hydrogen isotope ratios in basaltic melt inclusions from Baffin Island and Iceland indicate Earth’s primordial D/H ratio survives in the deep mantle.

2:15 p.m. Bridges J. C. * Schwenzer S. P. Leveille R. Westall F. Ollila A. et al. 
Fluid Composition and Mineral Reactions at Yellowstone Bay, Mars [#1944]
Diagenesis fluid in Sheepbed mudstone was NaK-poor, FeMg-rich, neutral-alkaline at W/R 100–1000. Amorphous material and olivine were selectively dissolved.

2:30 p.m. Liu Y. * Guan Y. McCubbin F. M. Eiler J. M. Agee C. B. et al. 
The Martian Surface Water in Breccia Meteorite NWA 7034 [#2368]
Investigate the storage and isotope composition for martian surface water in breccia meteorite NWA 7034.

2:45 p.m. Muttik N. * Agee C. B. McCubbin F. M. McCutcheon W. A. Provencio P. P. et al. 
Looking for a Source of Water in Martian Basaltic Breccia NWA 7034 [#2783]
Here we attempt to locate the source of water in NWA 7034 by Fourier transform infrared spectrometry (FTIR) and transmission electron microscopy (TEM).

3:00 p.m. Chojnacki M. * McEwen A. Dundas C. Mattson S. Ojha L. et al. 
Geologic Context of Recurring Slope Lineae in Coprates Chasma [#2701]
Abundant RSL (possible water seeps) are detected among diverse geologic settings of Coprates Chasma (Mars) and provide new constraints to these unique phenomena.

Sub-Curvilinear Gullies Interpreted as Evidence for Transient Water Flow on Vesta [#1796]
Subcurvilinear gullies on Vesta in craters with pitted terrain are morphological indicators of surface transient water flow and of localized subsurface ice.

3:30 p.m. Titus T. N. * Tosi F. Li J.-Y. Capria M. T. De Sanctis M. C. et al. 
Thermal Inertia Analysis of the Surface and Near-Surface of 4 Vesta [#2802]
Vesta’s surface temperatures are compared to thermal models. Regions where H2O ice may be stable are identified, along with areas that may be dust-free.

3:45 p.m. Combe J.-Ph. * Ammannito E. De Sanctis M.-C. Tosi F. McCord T. B. et al. 
Vesta’s Surface OH and H2O Investigated Using Near-Infrared Spectroscopy [#2170]
Vesta global distribution of hydroxyl from near-infrared spectroscopy by the Dawn spacecraft indicates possible H2O and several origins for OH in the northern regions.

4:00 p.m. Soderlund K. M. * Schmidt B. E. Wicht J. Blankenship D. D. 
The Influence of Heterogeneous Mantle Heating on Ocean Convection at Europa [#2054]
We will present numerical simulations of Europa-like ocean convection that investigate the influence of heterogeneous tidal heating in the underlying mantle.

Impact Craters as Probes of Fluids on Differentiated Bodies [#2439]
We use the physical and morphological properties of impact melt and ejecta deposits of impact craters to probe fluids on differentiated bodies.
4:30 p.m.  Carey E. M. * Castillo-Rogez J. Scully J. E. C. Russell C. T.
Rate of Evaporation of Water Under Low-Pressure Conditions [#2060]
We will present experiments on the evaporation rate of liquid water, with and without the addition of particulates, under low-pressure environments.

Tuesday, March 18, 2014  [T253]
STRUCTURE AND EVOLUTION OF SOLAR SYSTEMS
1:30 p.m.  Waterway Ballroom 5

Chair:  Edward Young

Planet Formation Within the Grand Tack Model [#2274]
We report a new clock to time the Moon-forming impact using simulations and HSE abundances. The same runs suggest an explanation for the Earth-Venus dichotomy.

1:45 p.m.  Frank E. F. * Meyer B. S. Mojzsis S. J.
A Radiogenic Heating Model for Cosmochemically Earth-Like Exoplanets [#2209]
We present the integration of a galactic chemical evolution model with cosmochemistry and geochemistry to constrain radiogenic heating in exoplanets.

2:00 p.m.  Kalyaan A. * Desch S. J. Monga N.
Structure and Evolution of Externally Photoevaporated Protoplanetary Disks [#2202]
We investigate the structure of externally photoevaporated protoplanetary disks with non-uniform \( \alpha \). We obtain near-steady-state solutions with steep \( \Sigma \) profiles.

2:15 p.m.  Smith R. L. * Blake G. A. Boogert A. C. A. Pontoppidan K. M. Lockwood A. C.
New Observations of CO Isotopologues Toward Massive Protostars: An Expanded View of Molecular Reservoirs in the Galaxy [#2563]
Preliminary observational results suggest similar trends across carbon molecular reservoirs and real connections of CO and CO\(_2\) gas in massive, luminous protostars.

2:30 p.m.  Desch S. J. Monga N. *
Jupiter’s Noble Gas Abundances May Require External UV Irradiation of the Solar Nebula [#1725]
Trapping of Ar in ices is needed in all models of Jupiter’s noble gas abundances. Argon can be trapped as photodesorbed water vapor recondenses as amorphous ice.

2:45 p.m.  Ciesla F. J. *
Chemical and Physical Processing of Ices in a Dynamic Solar Nebula [#1058]
Solar nebula ices / Warmed and irradiated / Species lost and gained.

Tuesday, March 18, 2014  [T254]
STARDUST MISSION AND COSMIC DUST
3:15 p.m.  Waterway Ballroom 5

Chairs:  Andrew Westphal
Natalie Starkey

Final Reports of the Stardust ISPE: Seven Probable Interstellar Dust Particles [#2269]
Here we present the final reports of the Stardust Interstellar Preliminary Examination. We describe seven probable interstellar dust impacts.
3:30 p.m.Joswiak D. J.* Brownlee D. E.
Refractory-Rich Materials in Comets: CAIs, Al-Rich Chondrules and AOAs from Comet Wild 2 and a Giant Cluster Interplanetary Dust Particle (IDP) of Probable Cometary Origin and Comparison to Refractory-Rich Objects in Chondrites [2282]
Six refractory-rich cometary particles including CAIs, Al-rich chondrules, and an AOA are most similar to more evolved refractory materials in chondrites.

Lack of Evidence of In-Situ Decay of Aluminum-26 in a FeO-poor Ferromagnesian Crystalline Silicate Particle, Pyxie, from Comet Wild 2 [1172]
An FeO-poor ferromagnesian Wild 2 particle shows no resolvable excess of $^{26}\text{Mg}$ derived from in situ decay of $^{26}\text{Al}$, suggesting late formation of the particle.

4:00 p.m. Gainsforth Z. * Ogliore R. C. Bustillo K. Westphal A. J. Butterworth A. L.
Ni Zoned Nano-Pyrrhotite from Stardust Track C2062,2,162 (Cecil) [2637]
Condensation via troilite to pyrrhotite and other mechanisms are considered for a Ni-zoned pyrrhotite from a Stardust grain to understand its origin.

4:15 p.m. Snead C. J. * McKeegan K. D. Boehnke P.
Oxygen Isotope Compositions of Two Stardust Impact Crater Residues [2928]
We measured the oxygen-isotope compositions of residues within two impact craters from Stardust foils.

4:30 p.m. Starkey N. A. * Franchi I. A. Lee M. R.
Heavy Oxygen Isotope Ratios in an Interplanetary Dust Particle [1870]
The first report of heavy O-isotope ratios in an IDP investigated by NanoSIMS and TEM are discussed in relation to their potential formation and survival.

4:45 p.m. De Gregorio B. T. * Stroud R. M. Nittler L. R. Kilcoyne A. L. D.
Extreme Aliphatic and Aromatic Organic Matter Preserved in Comet 81P/Wild 2 [2759]
TEM, XANES, and NanoSIMS analysis of two C-rich cometary samples reveal that early nebular processes produced both refractory aliphatic and graphitic carbon.

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Tuesday, March 18, 2014
IMPACTS II: ANALYSES, EXPERIMENTS, AND FIELD STUDIES
1:30 p.m. Waterway Ballroom 6

Chairs: Robert Herrick
Livio Tornabene

1:30 p.m. Osinski G. R. *
The Fate of Carbonates During the Formation of the Ries Impact Structure, Germany [2389]
New evidence for the shock melting of carbonates during the formation of the Ries impact structure, Germany, is presented.

1:45 p.m. Thompson L. M. *
Radial Distribution of Impact Damage at Manicouagan: Shock, Comminution and Shatter Cones [2017]
This work provides new insights into the distribution, associated microscopic shock, other damage effects, and formation mechanisms of shatter cones.
2:00 p.m. Tornabene L. L. * Osinski G. R. Greenberger R. N. Bishop J. L. Cloutis E. A. et al. 
We assess the origin of hydrated phases associated with the Haughton impact structure based on remote sensing and ground-truth data from the field.

Unique Example of an Impact of a Binary Asteroid in a Marine Target Environment: The Lockne-Målingen Doublet, Central Sweden [#1024] 
Of the few known putative doublets on Earth, the Lockne and Målingen craters are the first to be dated with enough precision to be considered unequivocal.

2:30 p.m. Wada K. * Arakawa M. Saiki T. Imamura H. Hayakawa M. et al. 
Large Scale Impact Experiments Simulating Small Carry-On Impactor (SCI) Equipped on Hayabusa-2 [#1768] 
We report results of the SCI experiment, launching a 2-kg copper liner at 2 km/s, which is a good chance to examine the scale dependence of crater formation.

Momentum Transfer in Impact Cratering of a Porous Target [#1950] 
We cratered pumice targets, ~0.5 g/cc, with ~4 km/s projectiles and found the momentum transferred by crater ejecta exceeded that from projectile capture.

3:00 p.m. Kurosawa K. * Nagaoka Y. Hasegawa S. Sugita S. Matsui T. 
Ultrafast Imaging Observations of the Impact Jetting During Oblique Impacts [#1856] 
We present the first systematic experimental dataset for the jet velocity as a function of impact velocity and the shock impedance of the target.

3:15 p.m. Hermalyn B. * Schultz P. H. 
Effects of Target Properties on Impact Ejecta Distributions: Time Resolved Experiments and Computational Benchmarking [#2791] 
We present novel data on the ejecta velocity distribution for vertical and oblique impacts into more realistic target materials.

3:30 p.m. Bruck Syal M. * Schultz P. H. 
Spatially-Resolved Spectroscopy of Impact-Generated Vapor Plumes [#2760] 
The evolving temperatures and compositions within impact-generated vapor plumes are characterized using high-speed spectroscopy at the NASA AVGR.

3:45 p.m. Zanetti M. * Stadermann A. Krüger T. van der Bogert C. Hiesinger H. et al. 
Mapping Crater Density Variation on Copernican Ejecta Blankets: Evidence for Auto-Secondary Cratering at Tycho and Aristarchus [#1528] 
Crater densities on continuous ejecta provide evidence for auto-secondary cratering with implications for both the cratering process and counting statistics.

4:00 p.m. Robbins S. J. * Hynek B. M. 
The Population of Secondary Impact Craters on Mars [#1666] 
Mars impact craters / Are multiple types that need / To be sep rated.

4:15 p.m. Sharpton V. L. * 
Constraints on Crater Growth Mechanisms, Ejecta Thicknesses and Excavation Depths from Target Outcrops at Fresh Lunar Craters [#1176] 
Outcrops on lunar craters constrain excavation flow characteristics.
4:30 p.m. Herrick R. R. *  
Protopasins are Not Part of the Normal Sequence, Target is Important, and Other Musings on the Central-Peak to Peak-Ring Transition Based on Mercury’s Impact Craters [#1782]  
Summary of observations regarding impact craters on Mercury that are 100–140 km in diameter, in the transition between central-peak and peak-ring craters.

Tuesday, March 18, 2014
ENCELADUS AND FRIENDS: TECTONICS ON ACTIVE ICY BODIES
1:30 p.m. Montgomery Ballroom

Chairs: Oleg Abramov
Edgard Rivera-Valentin

1:30 p.m. Martin E. S. * Kattenhorn S. A.  
A History of Pit Chain Formation Within Enceladus’ Cratered Terrains Suggests a Nonsynchronous Rotation Stress Field [#1083]  
The patterns of pit chains in Enceladus’ cratered terrains show systematic changes in orientation through time, consistent with nonsynchronous rotation.

1:45 p.m. Bland M. T. * McKinnon W. B.  
Constraining the Heat Flux Between Enceladus’ Tiger Stripes: Numerical Modeling of Funisicular Plains Formation [#2079]  
Enceladus’ stripes are hot; the land in between? Maybe not. Forming ropy plains therein, requires lithosphere quite thin, so the heat flux must’ve been quite a lot.

2:00 p.m. Pappalardo R. T. Paththoff D. A. * Chilton H. T. Golombek M. Thomas P. C.  
Contractional Deformation for the Formation of Dorsa on the Trailing Hemisphere of Enceladus [#2143]  
Cross-sectional shapes / Suggest dorsa are compressed: icy wrinkle ridge.

2:15 p.m. Dombard A. J. * Craft K. L. Patterson G. W.  
Testing the Cryovolcanic Sill Model for the Formation of Double Ridges on Jupiter’s Moon Europa [#2531]  
We explore whether the heat from a cryomagmatic sill can sufficiently thin the lithosphere to permit the observed flexure at some double ridges.

2:30 p.m. Kattenhorn S. A. * Prockter L. M.  
Subduction on Europa: The Case for Plate Tectonics in the Ice Shell [#1003]  
We describe previously unrecognized tabular bands on Europa along which subduction of a brittle ice layer may have occurred into the ice shell interior.

Elevation Distribution of Titan’s Mountain Ridge Belts: Implications for Tectonic Evolution [#2766]  
Compared the location of the ridge belts to a new global topographic map; explored the connections between elevation and tectonism — suggest contraction.

3:00 p.m. White O. L. * Schenk P. M.  
A New Global Topographic Map of Io: Implications for Global Shape and Internal Heating [#1534]  
Voyager and Galileo stereo DTM’s are mosaicked to create a topographic map covering ~75% of Io in order to constrain the locations of global-scale undulations.
3:15 p.m. McKinnon W. B. * Mohit P. S. Greenhagen B. T. Bland M. T.
_Polar Wander on Ganymede and Callisto — A Solution to the Apex-Antapex Cratering Conundrum_ [#1869]
Repeated, early episodes of polar wander of Ganymede’s icy shell may have reduced or eliminated its otherwise predicted, large apex-antapex cratering asymmetry.

3:30 p.m. Moore J. M. * Umurhan O. M. Howard A. D. Schenk P. M.
_Helene: The Face that Launched a Thousand Slips_ [#1192]
We have developed a historical working scenario for the evolution of Helene’s landscape involving both mass loss and gain, which we are currently modeling.

3:45 p.m. Lopez Garcia E. J. * Rivera-Valentin E. G. Schenk P. M. Hammond N. P. Barr A. C.
_Topographic Constraints on the Origin of the Equatorial Ridge on Iapetus_ [#1450]
An extensive topographic and geologic analysis of Iapetus’ equatorial ridge suggests that an exogenic origin may be possible.

4:00 p.m. Rivera-Valentin E. G. * Lopez Garcia E. J. Barr A. C.
_Geologic Constraints on Outer System Planetesimal Disk Mass from Ridge Survival on Iapetus_ [#2615]
Using recent morphological investigations of Iapetus’ ridge along with our cratering model, we constrain the outer system planetesimal disk mass.

4:15 p.m. Schenk P. * Moore J. M.
_Topography of Midsize Icy Satellites 2: Tethys and the Effects of Odysseus_ [#2598]
Tethys received a mighty whack! Odysseus made a giant crack! Watch us pick up the pieces.

4:30 p.m. Stern S. A. * Gladstone G. R. Zangari A. Goldstein D. Fleming T.
_Transient Atmospheres on Charon and Water-Ice Covered KBOs Resulting from Comet Impacts_ [#1268]
Charon has suffered thousands of impacts by comets; these import significant supervolatilic inventories that create tenuous transient atmospheres there.
Chairs: Marc Norman  
Kelsi Singer

8:30 a.m. Melosh H. J. * Kendall J. Johnson B. C. Bowling T. Horgan B. et al.  
*The Moon’s Upper Mantle: Mostly OPX, not Olivine? [#2505]*  
Impact modeling of the SPA basin, multispectral and petrologic data all suggest that the upper mantle of the Moon is dominated by orthopyroxene, not olivine.

8:45 a.m. Spudis P. D. * Martin D. J. P.  
*Composition of the Deposits of the Lunar Orientale Basin [#1469]*  
We have mapped the composition of each geological unit of the deposits of the lunar Orientale basin to search for clues to the basin-forming process.

9:00 a.m. Frey H. V. * McBride M. J.  
*Absolute Age Scenarios for an Expanded Inventory of Large Lunar Basins: The Importance of Nectaris [#1101]*  
Different absolute age scenarios are presented for an expanded inventory of large lunar basins. These depend strongly on the absolute age of the Nectaris Basin.

9:15 a.m. Singer K. N. * Jolliff B. L. McKinnon W. B.  
*Lunar Secondary Craters Measured Using LROC Imagery: Size-Velocity Distributions of Ejected Fragments [#1162]*  
We map lunar secondary craters using LROC images, estimate ejecta fragment size and velocity, and compare to results for terrestrial planets and icy satellites.

9:30 a.m. Wittmann A. * Korotev R. L. Jolliff B. L.  
*Third of a Kind — Impact Melted Lunar Granulitic Breccia Meteorite Dhofar 1766 [#1182]*  
Dho 1766 is an impact melted variety of granulite Dho 733. Is their composition evidence for unknown lunar lithologies or impact melt origins for granulites?

*Global Distribution of Lunar Impact Melt Flows [#1159]*  
Melt rock held hostage / Escapes from crater prison / Over rim crest low.

10:00 a.m. Plescia J. B. * Barnouin O. Stopar J.  
*Impact Melt Volumes in Simple Lunar Craters: Constraints on Modeling [#2141]*  
Estimates of melt volume for simple lunar craters are typically less than model predictions. This suggests the models overestimate the volume of melt produced.

10:15 a.m. Gleißner P. * Becker H.  
*Differentiated Impactor Signature in Apollo 16 Impact Melt Rocks [#1837]*  
HSE and Os-isotopic composition of ancient lunar impact melt rocks from the Apollo 16 landing site point to the presence of differentiated impactor signatures.

10:30 a.m. Haber T. * Norman M. D. Bennett V. C. Jourdan F.  
*Formation Ages, Cogenetic Relations and Formation Processes of a Set of Apollo 16 Impact Melt Rocks [#1693]*  
Apollo 16 impact melt rocks represent at least five distinct impact events into highly-variable targets, ranging from anorthositic/noritic to KREEP-like material.
10:45 a.m. Boehnke P. * Heizler M. T. Harrison T. M. Lovera O. M. Warren P. H.  
Avoiding Interpretive Pitfalls in Analysis of $^{39}\text{Ar}/^{39}\text{Ar}$ Step-Heating Data from Thermally Disturbed Meteoritic and Lunar Samples [#2545]  
Modeling of $^{39}\text{Ar}/^{39}\text{Ar}$ age spectra from Jilin and Apollo samples reveal serious problems with prior efforts to constrain impact ages in the inner solar system.

11:00 a.m. Mercer C. M. * Young K. E. Weirich J. R. Hodges K. V. Jolliff B. L. et al.  
Diverse Impact Histories of Apollo 17 Melt Breccias Revealed by In Situ $^{40}\text{Ar}/^{39}\text{Ar}$ Geochronology [#2669]  
Laser microprobe $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology reveals that the Apollo 17 melt breccias 77115 and 73217 record diverse and extensive impact histories.

11:15 a.m. Zellner N. E. B. * Delano J. W.  
$^{40}\text{Ar}/^{39}\text{Ar}$ Ages of Lunar Impact Glasses: Compositional-, Size-, and Shape-Dependencies [#1069]  
We demonstrate the importance of reporting size, shape, and chemical composition of each inclusion-free impact glass for $^{40}\text{Ar}/^{39}\text{Ar}$ investigations.

11:30 a.m. Norman M. D. * Ireland T. R. Cousins L.  
U-Pb Ages and Chemical Compositions of Apollo 11 Regolith Glasses [#1756]  
Major-trace elements and U-Pb isotopic compositions of volcanic and impact glasses from Apollo 11 regolith illuminate the ages and origins of these glasses.

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Wednesday, March 19, 2014  
ALTERATION OF THE MARTIAN SURFACE AND CRUST:  
EVIDENCE FOR DIVERSE CONDITIONS  
8:30 a.m. Waterway Ballroom 4

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Chairs: Nina Lanza  
Elizabeth Rampe

8:30 a.m. McAdam A. C. * Franz H. B. Mahaffy P. R. Eigenbrode J. L. Stern J. C. et al.  
SAM-Like Evolved Gas Analyses of Phyllosilicate Minerals and Applications to SAM Analyses of the Sheepbed Mudstone, Gale Crater, Mars [#2337]  
SAM EGA-MS water traces from Sheepbed mudstone samples are most consistent with high-temperature water evolution from an Fe-saponite.

Characterizing the Phyllosilicate Component of the Sheepbed Mudstone in Gale Crater, Mars Using Laboratory XRD and EGA [#1890]  
Lab XRD and EGA analyses of smectite and vermiculite indicate interlayer cation composition causes differences in phyllosilicates detected at Gale by MSL.

9:00 a.m. Milliken R. E. * Bish D. L.  
Distinguishing Hisingerite from Other Clays and its Importance for Mars [#2251]  
Hisingerite is compared to other Fe-clays and its relevance to Mars is discussed in light of possible existence in CheMin XRD patterns.

9:15 a.m. Carter J. * Viviano-Beck C. Le Deit L. Bishop J. Loizeau D.  
Orbital Detection and Implications of Akaganeite on Mars [#2364]  
We report the detection of the iron/chloride hydroxide akaganeite at several locations on Mars using orbital data from CRISM/MRO, and discuss its implications.
9:30 a.m.  Clark B. C. * Gellert R. Arvidson R. E. Squyres S. W. Ruff S. W. et al.  
Esperance: Extreme Aqueous Alteration in Fracture Fills and Coatings at Matijevic Hill, Mars [#1419]
Fracture fill composition in Esperance boxworks is consistent with montmorillonite + silica; a dark coating is rich in mafic sulfates; both potentially habitable.

9:45 a.m.  Lanza N. L. * Ollila A. M. Cousin A. Hardgrove C. Wiens R. C. et al.  
Manganese Trends with Depth on Rock Surfaces in Gale Crater, Mars [#2599]
ChemCam has discovered trends with depth in manganese on rock surfaces in Gale Crater that are consistent with Mn-rich rock coatings.

10:00 a.m.  Johnson J. R. * Wiens R. C. Maurice S. Bender S. DeFlores L. et al.  
First Year of ChemCam Passive Reflectance Spectroscopy at Bradbury Landing, Mars [#1367]
MSL ChemCam passive reflectance spectra from Sols 0-360 revealed six spectral classes of materials distinguished by variations in ferrous and ferric components.

Mineralogy of Acid Sulfate Fumarole vs. Near Neutral Sinter Deposits at Lassen Volcanic National Park: Comparison to Gusev Crater, Mars [#2712]
The Lassen hydrothermal system has both acid sulfate fumaroles and near neutral sinters, providing a test for the origins of Gusev Crater hydrothermal deposits.

10:30 a.m.  Che C. * Glotch T. D.  
Unique Spectral Features Detected in the Mawrth Vallis Regions of Mars: Implications for the Search for Thermally Altered Clays on Mars [#2112]
Analysis of CRISM data revealed a unique spectral shape in the Mawrth Vallis, Mars. This spectral shape is consistent with 500°–700°C heated montmorillonites.

10:45 a.m.  Thomas N. H. * Bandfield J. L. Amador E. S.
Identification and Characterization of Martian Serpentine Using Target Transformation and CRISM Data [#1909]
We have identified serpentine on Mars and are testing for its presence in association with olivine-rich basalts by applying target transformation to CRISM data.

11:00 a.m.  Viviano-Beck C. E. * Murchie S. L.
Hydrothermally Altered Stratigraphy in the Walls of Valles Marineris [#1963]
Hydrothermally-altered minerals are localized to the eastern walls of Coprates and may imply an orogenic formation of the Thaumasia highlands to the south.

11:15 a.m.  Berger J. A. * Schmidt M. E. Gellert R. King P. L.
Comparing Gale Crater and Gusev Crater Enrichments of Fluid-Mobile Elements Measured by Alpha-Particle X-Ray Spectrometers on Mars [#2285]
Curiosity’s APXS discovered fluid-mobile element enrichments in Gale — Cl, Br, K, Na, Zn, Ge. MSL results are presented and compared to similar enrichments in Gusev.

11:30 a.m.  Filiberto J. * Goodrich C. A. Treiman A. H. Gross J. Giesting P. A.
Evidence for Magmatic-Hydrothermal Activity on Mars from Cl-Rich Scapolite in Nakhla [#1620]
We report the first occurrence of Cl-scapolite in a martian meteorite and use terrestrial metamorphic analogs to constrain its origin.
Wednesday, March 19, 2014
CHONDRULES, METALS, AND SULFIDES
8:30 a.m. Waterway Ballroom 5

Chairs: Harold Connolly Jr.
Kathryn Dyl

8:30 a.m. Simon S. B. * Beckett J. R. Sutton S. R. Grossman L.
Experimental Investigation of Ti and Fe Valence in Chondrule-Like Melts During Cooling Under Changing Redox Conditions at Low Partial Pressures [#1633]
The relative rates of Ti and Fe valence change were investigated in dynamic cooling experiments with low partial pressures of reactive species.

Is There Any Evidence to Link Oxygen Isotopic Abundance to the Process that Controlled the Redox State of Chondrules: A Study of NA 7731? [#1889]
We show that oxygen-isotope abundances collected on site for the L3.00 UOC, NWA 7731, are within the range of other UOCs and link the data to redox states.

9:00 a.m. Bigolski J. N. * Weisberg M. K. Ebel D. S. Connolly H. C. Jr.
Microchondrules: Records of Multiple Heating Events in the Solar Nebula and Implications for Type II Chondrule Formation [#1879]
Microchondrules are analyzed in order to provide insight into chondrule formation. The emergence of Type II chondrules in the solar nebula is also discussed.

Presolar Silicates as Tracers of the Formation of Fine-Grained Chondrule Rims in CO3 Chondrites [#1316]
In CO3 chondrites, presolar silicate abundances are lower in the chondrule rims than in the matrix, likely reflecting isotopic homogenization by heating.

9:30 a.m. Dobrica E. * Brearley A. J.
Collisional Formation of Smooth-Crystalline Microchondrules Identified in Unequilibrated Ordinary Chondrites [#2084]
This study shows that microchondrules seem to have formed by materials splattered from the chondrules when they were still molten.

9:45 a.m. Harju E. R. * Kohl I. E. Rubin A. E. Young E. D.
Evaluating Silicon Condensation in Type 1AB Chondrules Using In-Situ Silicon Isotopes [#2829]New Si- and Mg-isotope ratios from CR chondrules test the model that the chondrule pyroxene formed from olivine reacting with an Si-rich gas in the nebula.

10:00 a.m. Kadlag Y. * Becker H.
Highly Siderophile and Chalcogen Element Constraints on the Origin of Components of Unequilibrated L Chondrites [#1771]
Highly siderophile elements (Re, Au, and platinum group elements) and chalcogen (S, Se, and Te) abundances in the components separated from two L chondrites.

10:15 a.m. Jacquet E. * Paulhiac-Pison M. Alard O. Kearsley A. T. Gounelle M.
The Formation of CR Chondrite Metal [#1194]From LA-ICP-MS analyses, CR metal grains derive from a common precursor, with chondrule margin grains less processed than and accreted after interior grains.
10:30 a.m. Fedkin A. V. * Grossman L. Humayun M. Simon S. B. Campbell A. J.
Impact Formation of CB Chondrites: The Metal-Rich Body had a Silicate Mantle [#2153]
Conditions were found for co-condensation of CB metal and silicates from a plume of impacting vaporized planetesimals that had different silicate compositions.

10:45 a.m. Dyl K. A. * Bland P. A. Cleverley J. S.
Unraveling the Record of Nebular and Asteroidal Processes in the Murchison (CM2) Meteorite: Pentlandite Formation and its Association with Zinc Mobility [#2311]
We utilized novel instrumentation to map [Zn] in Murchison, revealing insights into its behavior during aqueous alteration and condensation from the nebula.

11:00 a.m. Johnson B. C. * Minton D. A. Melosh H. J.
The Impact Origin of Chondrules [#1471]
Using impact modeling, a planetesimal accretion code, and a radiative transfer model, we test the hypothesis that chondrules had an impact origin.

11:15 a.m. Morris M. A. * Desch S. J.
A Re-Evaluation of Chondrule Formation in Large-Scale Shocks [#2577]
In light of recent developments, we reevaluate chondrule formation in large-scale shocks.

11:30 a.m. Wasson J. T. * Baecker B. Rubin A. E.
Multiple, Hierarchical Heating of Chondrules and Implications for Cooling Rates [#2883]
Multiple overgrowth layers in chondrule pyroxene show that chondrules experienced many small heating events that caused large increases in phenocryst size.

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**Wednesday, March 19, 2014**

**MERCURY**

**8:30 a.m. Waterway Ballroom 6**

**Chairs:** Paul Byrne
Carolyn Ernst

8:30 a.m. Paige D. A. * Hayne P. O. Siegler M. A. Smith D. E. Zuber M. T. et al.
Dark Surface Deposits in the North Polar Region of Mercury: Evidence for Widespread Small-Scale Volatile Cold Traps [#2501]
MESSENGER MLA reflectance observations suggest the presence of widespread small-scale cold traps in Mercury’s north polar region.

8:45 a.m. Ernst C. M. * Chabot N. L. Susorney H. C. M. Barnouin O. S. Harmon J. K. et al.
Exploring the Morphology of Simple Craters that Host Polar Deposits on Mercury: Implications for the Source and Stability of Water Ice [#1238]
There is no significant difference between the d/D of simple craters that do and do not host radar-bright deposits in Mercury’s north polar region.

9:00 a.m. Evans L. G. * Pepowski P. N. Ebel D. S. Lawrence D. J. McCoy T. J. et al.
Chlorine on the Surface of Mercury: Implications for Mercury’s Surface Evolution [#1794]
Analysis of MESSENGER gamma-ray measurements to determine the abundance of chlorine on the surface of Mercury, the spatial variability, and implications.

9:15 a.m. Namur O. * Charlier B.
Sulfur Solubility in Basalts from the Northern Volcanic Plains of Mercury [#1312]
We present experimental results on Mercury’s basalts. We investigate the solubility of sulfur in silicate melts and discuss Mercury’s surface composition.
9:30 a.m. Vander Kaaden K. E. * McCubbin F. M. Bell A. S.  
Phase Equilibrium Experiments on Analogue Lavas from the Northern Volcanic Plains of Mercury: Implications for the Mineralogy of the Mercurian Mantle [1906]  
Using a sulfur- and alkali-free composition, we have determined the liquidus mineralogy for a NVP-like mercurian composition from 1 bar to 5 GPa.

9:45 a.m. Parman S. W. * O’Brien H. P. Vaughan W. M. Head J. W.  
Experimental Constraints on Melting Conditions in Mercury [2367]  
Sulfide-saturated mantle melting experiments (1 GPa) at log fO2 = IW–3.4 to –7.5 are used to constrain melting conditions on Mercury.

10:00 a.m. Weider S. Z. * Nittler L. R. Starr R. D. Crapster-Pregont E. J. Solomon S. C.  
Geochemical Terranes on the Innermost Planet: Possible Origins of Mercury’s High-Magnesium Region [1866]  
We explore several scenarios to explain Mercury’s high-Mg region: partial melting processes, an ancient giant impact, and lateral heterogeneity in the mantle.

10:15 a.m. Riner M. A. * Lucey P. G.  
Incorporating Geologic Context to Constrain the Composition and Maturity of Mercury’s Surface from Multispectral Imaging [2630]  
Using geologic context and spectral modeling, we find immature crater ejecta on Mercury has >4 times more space weathering than the most mature lunar samples.

10:30 a.m. Whitten J. L. Head J. W. Helbert J. Solomon S. C.  
Rembrandt Basin: Distinguishing Between Volcanic and Impact-Produced Smooth Plains Deposits on Mercury [1289]  
Rembrandt basin on Mercury is surrounded by extensive smooth plains. We identified which smooth plains deposits are volcanic and which originate from impacts.

10:45 a.m. Fegan E. R. * Rothery D. A. Conway S. J. Anand M. Massironi M.  
Linking the Timing of Volcanic and Tectonic Features on Mercury: Results from Buffered Crater Counting [1780]  
We use the buffered crater count method to investigate the sequence of events in an area with clear superposition of two volcanic units and a lobate scarp.

The Global Contraction of Mercury [2525]  
Global contraction / Of Mercury is more than / Recognized before.

Duration of Activity on Lobate-Scarp Thrust Faults on Mercury [2722]  
Observations from MESSENGER demonstrate that global contraction has been a widespread process on Mercury since the late heavy bombardment into the Kuiperian.

11:30 a.m. James P. B. * Solomon S. C. Zuber M. T. Phillips R. J.  
What Mercury’s Topographic Rises tell Us About the Interior [1452]  
We survey the various physical mechanisms in Mercury’s mantle that may be supporting topographic rises, using gravity and topography data returned by MESSENGER.)
Wednesday, March 19, 2014
LUNAR VOLATILES: APATITE FOR DESTRUCTION
1:30 p.m. Waterway Ballroom 1

**Chairs:** Bradley Jolliff
Ryan Zeigler

1:30 p.m. Shearer C. K. * Burger P. V. Sharp Z. D. Provencio P. P. McCubbin F. M. et al.
*Origin of Volatile Element Enrichments and Alteration of “Rusty Rock” 66095. A New View of Volatile Element Behavior in the Lunar Crust [#1097]*
We examine the alteration mineralogy and geochemistry in 66095 to gain insights into its origin and transport of volatiles in the lunar crust and surface.

*Transport of Water in a Transient Impact-Generated Atmosphere [#2742]*
We model the transport of water to lunar cold traps after a comet impact and discuss how gas dynamic processes constrain where and how much ice is deposited.

2:00 p.m. Barnes J. J. * Tartèse R. Anand M. Franchi I. A. Starkey N. A. et al.
*The Hydrogen Isotopic Composition of Apatites in Lunar Impact-Melt Breccias [#1878]*
We have measured the OH content and H-isotopic composition of apatite grains from two Apollo lunar impact-melt breccias (15405 and 65785).

2:15 p.m. Pernet-Fisher J. F. Liu Y. Guan Y. Chen Y. Taylor L. A. *
*The Significance of OH Contents in Lunar Apatites [#2719]*
This study questions the significance of estimated lunar-mantle water content calculated from apatites.

*Primitive Lunar Water in Evolved Rocks? [#1607]*
We present new data providing evidence for a low-deuterium reservoir in the lunar interior with some of the lowest D/H values yet reported in lunar apatite.

*Water Content and Hydrogen Isotopic Composition of Apatite in KREEP and High-Al Mare Basalts: New Perspectives on Water in the Moon [#1999]*
We report new measurements of water content and corresponding hydrogen-isotopic composition for apatite in the rare KREEP and high-Al mare basalts.

3:00 p.m. Greenwood J. P. * Itoh S. Sakamoto N. Yanai K. Singer J. A. et al.
*Hydrogen Isotopes of Water in the Moon: Evidence for the Giant Impact Model from Melt Inclusions and Apatite in Apollo Rock Samples [#2707]*
D/H of water in olivine-hosted melt inclusions and apatite from the Apollo 12 olivine basalts are similarly elevated in D/H. The lunar mantle has high D/H.

*Apatite-Melt Partitioning in Basaltic Magmas: The Importance of Exchange Equilibria and the Incompatibility of the OH Component in Halogen-Rich Apatite [#2741]*
Apatite-melt partitioning experiments were conducted and the results put into the context of using apatite to determine H2O abundances in melts/source regions.

3:30 p.m. Boyce J. W. * Tomlinson S. M. McCubbin F. M. Greenwood J. P. Treiman A. H.
*Equilibrium-Exchange Apatite Hygrometry and a Solution to the Lunar Apatite Paradox [#2096]*
Hydrous apatite / From the Greek, meaning “to lie” / Dry Moon once again?
3:45 p.m. Li S. * Milliken R. E.  
Quantitatively mapped hydration in lunar pyroclastic deposits indicates heterogeneous water from the lunar interior.

4:00 p.m. Thomas-Keprta K. L. * Cleckett S. J. Berger E. L.  Rahmann Z. McKay D. S.  et al.  
Vesicles in Apollo 15 Green Glasses: The Nature of Ancient Lunar Gases [#2507]
Here we report the nature of mineral phases spatially associated with vesicles in a green glass bead from Apollo sample 15411,42.

4:15 p.m. Wetzel D. T. * Hauri E. H.  Saal A. E.  Rutherford M. J.  
Dissolved Carbon Content of the Lunar Volcanic Glass Beads and Melt Inclusions: Carbon from the Lunar Interior [#2238]
Indigenous dissolved carbon is measured in the lunar picritic glass beads and melt inclusions, which confirms carbon was present in the lunar source regions.

4:30 p.m. Hauri E. H. * Saal A. E.  Rutherford M. J.  Wetzel D. T.  
Volatile Content of Lunar Volcanic Glasses and the Volatile Depletion of the Moon [#2628]
The derived volatile/refractory ratios for the Moon indicates it was only moderately depleted in volatile elements at the time of the lunar magma ocean.

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**Wednesday, March 19, 2014**

**MARS GEOMORPHOLOGY AS AFFECTED BY AQUEOUS PROCESSES OVER THE HISTORY OF MARS**

1:30 p.m. Waterway Ballroom 4

**Chairs:** Carlton Allen
William Dietrich

1:30 p.m. Jaumann R. * Neukum G.  Tirsch D.  Hauber E.  Hoffmann H.  et al.  
The Martian Geomorphology as Mapped by the Mars Express High Resolution Stereo Camera (HRSC): Implications for Geological Processes and Climate Conditions [#1772]
After 10 years of orbiting the planet, HRSC on Mars Express has covered about 90% of the surface in stereo and color with resolutions up to 10 m/pixel.

1:45 p.m. Irwin R. P. III * Tanaka K. L.  Robbins S. J.  
Noachian Resurfacing in the Martian Highlands: Analysis of a New Global Geologic Map and Crater Database [#2685]
Analysis of the new global geologic map of Mars and impact crater database indicate spatially nonuniform Noachian resurfacing by gravity-driven processes.

2:00 p.m. Head J. W. III * Wordsworth R.  Forget F.  Madeleine J.-B.  Halevy I.  
Late Noachian “Cold and Icy Highlands” Model: Geological Predictions for Equilibrium Environments and Equilibrium/Non-Equilibrium Melting Scenarios [#1412]
We test the Late Noachian icy highlands model exploring predictions for geologic settings/cryospheric processes in equilibrium/nonequilibrium climate states.

2:15 p.m. Bennett K. A. * Bell J. F. III  
A Global Survey of Central Mounds in Large Martian Craters: Implications for Paleolakes [#1539]
We present our global survey of central mounds as well as mound and crater rim heights that have implications for mound formation from lacustrine settling.
2:30 p.m. Allen C. C. * Dapremont A. M. Oehler D. Z.
*The Complex, Multi-Stage History of Mt. Sharp [#1402]*
Mt. Sharp was formed in two phases of deposition and erosion, separated by a significant time gap. Location and morphology were influenced by a peak ring.

2:45 p.m. Dietrich W. E. * Palucis M. C. Parker T. Rubin D. de Pablo M. A. et al.
*Looking Towards Curiosity’s Canyon Path: A 4 km Sequence of Gully, Debris Deposits, and Fan/Deltas which are Border by a Sloping Bedform-Capped Plain and Crossed by Lake Shorelines [#1684]*
Curiosity’s canyon path includes a gully, debris deposits, and fan/deltas that are bordered by a sloping bedform-capped plain and crossed by lake shorelines.

3:00 p.m. Kite E. S. * Lucas A. Armstrong J. C. Aharonson O. Lamb M. P.
*Resolving the Great Drying of Mars: Paleo-Climate Versus Time from River Deposits in Aeolis Dorsa [#2638]*
River-channel dimensions in Aeolis Dorsa suggest a threefold reduction in peak runoff production during the ≳ (1–20)-m.y. interval of deposition.

3:15 p.m. Hauber E. * Adeli S. Le Deit L. Kleinhaus M. G.
*Outflow Channels and Associated Fan Deltas: Post-Noachian Fluvial Diversity in the Southern Highlands of Mars [#2021]*
A series of channels in the southern highlands of Mars resemble outflow channels en miniature, and represent a rich post-Noachian record of aqueous activity.

3:30 p.m. Harrison T. N. * Osinski G. R. Tornabene L. L.
*Global Documentation of Gullies with the Mars Reconnaissance Orbiter Context Camera (CTX) and Implications for Their Formation [#2124]*
We inspected CTX images planet-wide from T01–D09 to document the locations of gullies in an attempt to constrain their possible formation mechanism(s).

3:45 p.m. Conway S. J. * Balme M. R. Murray J. B. Towner M. C.
*A Signal for Water on Mars: The Comparison of Topographic Long Profiles of Gullies on Earth to Gullies on Mars [#2438]*
We compare topographic long profiles of fluvial and debris flow gullies on Earth to those on Mars. Martian gullies are similar to both terrestrial gully-types.

4:00 p.m. Auld K. S. * Dixon J. C.
*Classification of Martian Gullies from HiRISE Imagery [#1270]*
HiRISE imagery and was used to develop a classification of gully types based on the morphological components of gullies. Classes are developed and maps created.

4:15 p.m. Dickson J. L. Head J. W. Barbieri L. Goudge T. A.
*Evolution of the Latitude Dependent Mantle on Mars: Thickness Estimates and Evidence for Cyclical Emplacement as Revealed by Late Amazonian Gullies [#1680]*
Multiple episodes of gully activity allow for the first measurements of minimum latitude dependent mantle thickness using HiRISE stereo DEMs.

4:30 p.m. Watkins J. * Ojha L. Chojnacki M. Reith R. Yin A.
*Structurally Controlled Subsurface Fluid Flow as a Mechanism for the Formation of Recurring Slope Lineae [#2911]*
A fault-controlled brine flow hypothesis, in which structural inhomogeneities act as conduits for subsurface fluid migration, is tested for RSL formation.
Wednesday, March 19, 2014
CHONDRITES: MATRIX, WATER, AND ACCRETING PARENT BODIES
1:30 p.m. Waterway Ballroom 5

Chairs: Kieren Howard
Michael Weisberg

1:30 p.m. Clemett S. J. * Messenger S. Nakamura-Messenger K. Thomas-Keprta K. L.
Coordinated Chemical and Isotopic Imaging of Bells (CM2) Meteorite Matrix [#2896]
We present results of the first coordinated in situ isotopic and chemical mapping of the Bells meteorite
using a newly developed two-step laser mass spectrometer.

1:45 p.m. Treiman A. H. * Verchovsky A. B. Grady M. M.
N and C Isotopic Compositions of Amphibole-Bearing R Chondrites: Spoof of Insoluble
Organic Matter (IOM)? [#2175]
What is the source of heavy hydrogen (δD > 2500‰) in amphibole-bearing R chondrites? Their δ15N
and δ13C are ~0‰, which excludes cometary sources.

2:00 p.m. Kebukawa Y. * Kobayashi S. Kawasaki N. Cody G. D. Yurimoto H.
Isotope Imaging and the Kinetics of Deuterium-Hydrogen Exchange Between Insoluble
Organic Matter and Water [#1308]
Isotope imaging of D-H exchanged IOM analog shows homogeneous D/H ratio, indicating that the
exchange is not controlled by diffusion as we previously proposed.

2:15 p.m. Alexander C. M. O’D. * Bowden R. Howard K. T.
A Multi-Technique Search for the Most Primitive CO Chondrites [#2667]
After surveying 17 primitive COs, DOM 08006 is the most primitive CO that we have identified and it
experienced similar thermal conditions to Semarkona.

2:30 p.m. Howard K. T. * Alexander C. M. O’D. Dyl K. A.
PSD-XRD Modal Mineralogy of Type 3.0 CO Chondrites: Initial Asteroidal Water Mass Fractions
and Implications for CM Chondrites [#1830]
Using bulk mineral abundances we follow the actions of water, and explore its availability, in the
primitive planetesimal environments of CO and CM chondrites.

2:45 p.m. Ebel D. S. * Weisberg M. K. Friedrich J. M.
Primordial Ice Abundance in CV Chondrites [#1207]
X-ray map analysis reveals excess matrix vol% in oxidized CV matches porosity difference between
oxidized and reduced CV, indicating primordial ice grains.

3:00 p.m. Doyle P. M. * Krot A. N. Nagashima K. Dobrică E. Brearley A. J.
Manganese-Chromium Ages of Aqueous Alteration of Unequilibrated Ordinary Chondrites [#1726]
We describe the mineralogy, petrography (EMP,TEM) and in situ measurements of O and Mn-Cr
isotope systematics (SIMS) of fayalite-bearing assemblages in EET 90161.

3:15 p.m. Schrader D. L. * Davidson J. Greenwood R. C. Franchi I. A. Gibson J. M.
O-Isotope Compositions of CR Chondrite Matrix: Implications for Aqueous Alteration [#1562]
Here we present the O-isotope composition of CR chondrite matrix across the whole range of
aqueous alteration.

3:30 p.m. Weisberg M. K. * Zolensky M. E. Kimura M. Ebel D. S.
Primitive Fine-Grained Matrix in the Unequilibrated Enstatite Chondrites [#1551]
EH3 matrix is a primitive component related to but not derived from chondrules. In ALH 81189 it
contains amorphous silica. EH and EL matrices appear to differ.
**Turning Candyfloss into Rocks: Modelling the PT Evolution of Primitive Solar System Materials During Impact-Induced Compaction** [#1574]
Numerical modelling at high spatial resolution (100-µm scales) allows us to observe PT variability within chondritic components during impact-induced compaction.

4:00 p.m. Davison T. M. * Collins G. S. Bland P. A.
**Mesoscale Numerical Modeling of Compaction of Primitive Solar System Solids in Low-Velocity Collisions** [#2718]
We present a novel numerical method for modeling shock compaction of bimodal mixtures of chondrules and matrix to quantify the meteorite-scale response to impacts.

4:15 p.m. Sanborn M. E. * Yin Q.-Z. Irving A. J.
**Isotope Forensics Utilizing Δ^{17}O-ε^{54}Cr Systematics Provide Supporting Evidence for Differentiated Parent Bodies Overlain by Chondritic Veneers: A Case for the CR Parent Body** [#2032]
We present high-precision Cr-isotopic data for several unique CR chondrites and discuss the implications for the evolution of the CR parent body.

**Oxygen Isotope Evidence for the Relationship Between CM and CO Chondrites: Could They both Coexist on a Single Asteroid?** [#2610]
New oxygen-isotope data provides additional constraints on the relationship between CO and CM chondrites. Both may be derived from a single asteroidal source.

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**Wednesday, March 19, 2014**

**REGOLITH PROCESSES ON SMALL BODIES FEATURING ITOKAWA**

<table>
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<tr>
<th>Time</th>
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<tr>
<td>1:30 p.m.</td>
<td>Keane J. T. * Matsuyama I.</td>
<td><strong>Hill Slope Failure as a Mechanism to Resurface Asteroids During Planetary Flybys</strong> [#2733]</td>
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<td>The signatures of space weathering are being mysteriously wiped off of asteroids during planetary flybys. We propose a new mechanism for how this happens.</td>
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<td>1:45 p.m.</td>
<td>Noviello J. L. * Ernst C. M. Barnouin O. S. Daly M.</td>
<td><strong>Block Distribution on Itokawa: Implications for Asteroid Surface Evolution</strong> [#1587]</td>
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<td>Our observations indicate that small blocks are potentially affected by differing accretionary or geological processes relative to the large ones.</td>
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<td>2:00 p.m.</td>
<td>Basilevsky A. T. * Head J. W. Horz F. Ramsley K.</td>
<td><strong>Survival Time of Meter-Sized Rock Boulders on the Surface of Asteroid Itokawa</strong> [#1688]</td>
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<td>The meter-sized boulders on Itokawa should have a survival time 2.5–3 times longer comparing to similar boulders on the lunar surface.</td>
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<td>Recent discoveries of water on Vesta, and new ideas concerning energetic events and volatile surfaces, we suggest that fluidization have formed the Eros ponds.</td>
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2:30 p.m. Gillis-Davis J. J. * Scott E. R. D.

*Explaining the Sulfur Depletion on Eros and the Different Space Weathering of S-Type and V-Type Asteroids [1189]*

We report on what caused S depletion on Eros, and why S-type asteroids appear more weathered than the surface of Vesta.

2:45 p.m. Vilas F. * Hendrix A. R.

*Searching for Evidence of UV/Blue Space Weathering in S-Complex Asteroid Photometry from the Sloan Digital Sky Survey [2772]*

Differences in UV/blue space weathering of S-complex asteroids is sought in the Sloan Digital Sky Survey Moving Object Catalog photometry.

3:00 p.m. Koga S. * Sugita S. Kamata S. Ishiguro M. Hiroi T. et al.

*Spectral Evolution Tracks of S-Type Asteroids Suggested by Principal Component Analysis of Multi-Band Images of Itokawa [1721]*

We performed PCA for spectra of Itokawa using high-resolution multiband images and found a possible spectral evolution track of S-type asteroids.

3:15 p.m. Meier M. M. M. * Alwmark C. Baji S. Böttger U. Busemann H. et al.

*A Precise Cosmic-Ray Exposure Age for an Olivine Grain from the Surface of Near-Earth Asteroid (25143) Itokawa [1247]*

We have determined the masses of seven Hayabusa grains, and the He,Ne content of three grains, all of which have a cosmic-ray exposure age of 1.5 Ma (within error).

3:30 p.m. Fujiya W. * Hoppe P. Ott U. Meier M. M. M. Bochsler P.

*Solar Wind Boron Observed in a Hayabusa Sample and a Gas-Rich Meteorite [1802]*

Boron-10 excesses were found in asteroidal regolith, possibly due to implanted solar wind. However, the isotopic ratios cannot be explained by current models.

3:45 p.m. Thompson M. S. * Christoffersen R. Zega T. J. Keller L. P.

*Nanoscale Analysis of Space-Weathering Features in Soils from Itokawa [2121]*

An analysis of grains from asteroid Itokawa for microchemical and structural evidence of space weathering using transmission electron microscopy.

4:00 p.m. Keller L. P. * Berger E. L.

*A Transmission Electron Microscope Investigation of Space Weathering Effects in Hayabusa Samples [1935]*

Itokawa dust / Electron microscope pics / Show space-altered rims.

4:15 p.m. Britt D. T. * Schelling P. K. Consolmagno G. J. Bradley T.

*Space Weathering on Volatile Rich Asteroids [2067]*

Space weathering processes and products on volatile-rich asteroids can include the in situ production of organics through Fischer-Tropsch catalytic reactions.

4:30 p.m. Nakauchi Y. * Abe M. Tsuchiyama K. Kitazato K. Yasuda K.

*Laboratory Simulation of Solar Wind Implantation on Hydrated Silicate Minerals [2004]*

The reflectance spectra of hydrated silicate minerals irradiated solar wind protons showed a conspicuous change at the bands related to bonding state of –OH.
Thursday, March 20, 2014
PROTOLUNAR DISK AND MAGMA OCEAN: MODELS AND SAMPLE CONSTRAINTS
8:30 a.m. Waterway Ballroom 1

Chairs: Kaveh Pahlevan
        Erik Hauri

8:30 a.m. Burkhardt C. *  Dauphas N.
  * Formation Scenarios of the Moon: The Message from Tungsten Isotopes [#1433]
  From a W isotope perspective, making the Moon mainly out of impactor material is as likely as
  making it primarily out of proto-Earth mantle material.

8:45 a.m. Akram W. M. *  Schönbächler M.
  * Constraints on the Zirconium Isotope Composition of Theia and Current Moon
  Forming Theories [#2201]
  Identical Zr-isotope compositions for Earth and the Moon are used to place constraints on different
  giant impact models, and infer the composition of Theia.

9:00 a.m. Pahlevan K. *  Morbidelli A.
  * The Lunar Inclination as a Dosimeter for Terrestrial Late Stage Accretion [#2738]
  We identify a new mechanism to excite the lunar inclination and use the observed smallness of its
  value to set constraints on post-Moon-formation accretion.

9:15 a.m. Nakajima M. *  Stevenson D. J.
  * Hydrodynamic Escape does not Prevent the “Wet” Moon Formation [#2770]
  We suggest that the giant impact hypothesis is consistent with the “wet (water abundant)” Moon
  formation because hydrogen loss by hydrodynamic escape is minor.

9:30 a.m. Salmon J. *  Canup R. M.
  * Lunar Accretion from Disks Produced by Non-Canonical Impacts [#2768]
  We use a numerical model to investigate the accretion of the Moon from protolunar disks generated by
  non-canonical giant impacts.

9:45 a.m. Petaev M. I. *  Jacobsen S. B.  Huang S.
  * Testing Models of Moon Origin: Condensation of Impact-Vaporised Bulk Silicate
    Earth Material [#2316]
  We extended thermodynamic database of the GRAINS code up to 5000 K and use it to model
  condensation of vapor generated by the Earth-Moon forming giant impact.

10:00 a.m. Huang S. *  Petaev M. I.  Jacobsen S. B.
  * Testing Models for the Origin of the Moon: Stable Isotopic Fractionation [#2246]
  We explore the chemical and isotopic effects during condensation of a silicate atmosphere, and
  constrain the origin of the Moon.

10:15 a.m. Kleine T. *  Kruijer T. S.  Sprung P.
  * Lunar $^{182}$W and the Age and Origin of the Moon [#2895]
  We show that a small $^{182}$W excess of the Moon requires a late formation of the Moon predominantly
  from terrestrial mantle material.

10:30 a.m. Sprung P. *  Kleine T.  Scherer E. E.
  * Evidence for a Common Initial $^{176}$Hf/$^{177}$Hf of the Earth, Moon, and Chondrites [#2821]
  Model ages from KREEP-rich rocks and Lu-Hf systematics of Hadean terrestrial and lunar zircons
  imply chondritic lunar and terrestrial bulk Lu-Hf parameters.
10:45 a.m. McLeod C. L. * Brandon A. D. Armytage R. M. G.
*Constraints on the Formation Age and Evolution of the Moon from $^{142}$Nd-$^{143}$Nd Systematics of Apollo 12 Basalts [1490]*
New high-precision Nd-isotope data for Apollo basalts are used to evaluate early lunar differentiation timescales and assess mare basalt source reservoirs.

11:00 a.m. Nyquist L. E. * Shih C-Y. Yamaguchi A. Mittlefehldt D. W. Peng Z. X. et al.
*A Comparison of Anorthositic Lunar Lithologies: Variations on the FAN Theme [1125]*
We will report min-pet, in situ trace element studies, Nd/Sr-isotope studies, and Ar-Ar chronology of the 64435 anorthosite and troctolitic anorthosites.

11:15 a.m. Gaffney A. M. * Borg L. E.
*Evidence for Magma Ocean Solidification at 4.36 Ga from $^{142}$Nd-$^{143}$Nd Variation in Mare Basalts [1449]*
Neodymium-142 and $^{143}$Nd isotopic compositions of mare basalts indicate that the mare basalt sources formed around 4.36 Ga.

11:30 a.m. Neal C. R. * Davenport J. D.
*Trace Element Evolution of the Lunar Magma Ocean, the Origin of KREEP, and the Influence of Garnet [1181]*
The trace-element evolution of the lunar magma ocean to form KREEP is modeled to investigate if garnet is a primary crystallization product and is present in the mantle below 500 km.

11:45 a.m. Rapp J. F. * Draper D. S.
*The Lunar Magma Ocean: Sharpening the Focus on Process and Composition [1527]*
We discuss experiments simulating lunar magma ocean crystallization, and their implications for lunar bulk composition and magma ocean crystallization processes.

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**Thursday, March 20, 2014 [R402]**

**MARS POLAR PROCESSES AND ATMOSPHERE CONNECTION**
8:30 a.m. Waterway Ballroom 4

**Chairs:** Melissa Trainer
Patrick Russell

8:30 a.m. Titus T. N. * Cushing G. E.
*Monitoring the Mars Polar Caps During Mars Years 24–28 [2177]*
We focus on the advance and retreat of the Mars seasonal polar cap edges between Mars Years 24–28. We compare results from TES to MOC and OMEGA images.

8:45 a.m. Trainer M. G. * Franz H. B. Mahaffy P. R. Wong M. H. Atreya S. K. et al.
*Seasonal Variation of Atmospheric Mixing Ratios on Mars Measured by the MSL SAM Instrument [2233]*
Seasonal trends in atmospheric mixing ratios have been monitored on Mars by the MSL/SAM QMS; implications for seasonal migration of CO$_2$ will be discussed.

9:00 a.m. Smith I. B. * Spiga A. Holt J. W.
*Correlation of Retreating Martian South Polar CO$_2$ Ice Cap with Low Altitude Clouds: A Control on Annual Accumulation [1741]*
We find that SPLD trough clouds migrate with the retreat of the seasonal CO$_2$ ice cap and are instrumental in determining where interannual accumulation occurs.
9:15 a.m. Andrieu F. * Schmidt F. Douté S.  
*CO₂ Ice Composition and Evolution on Mars: A Radiative Transfer Inversion [#1148]*  
We will present the results and the method of a radiative transfer inversion designed for CO₂-ice-covered surfaces on Mars. We use CRISM spectroscopic data.

9:30 a.m. Pankine A. A. * Tamppari L. K.  
*Vertical Distribution of Water Vapor in the Martian Polar Atmosphere [#2300]*  
Combined MGS TES day and night data suggest that water vapor vertical extent is limited to 6–10 km during summer in the northern polar region of Mars.

9:45 a.m. Becerra P. * Byrne S. Brown A. J.  
*Transient Bright “Halos” on the South Polar Residual Cap of Mars: Implications for Mass Balance [#1388]*  
We present observations and modeling of bright features that appeared on the SPRC in MY28, and discuss their implications for the mass balance of the SPRC.

10:00 a.m. Russell P. S. * Byrne S. Dawson L. C.  
*Active Powder Avalanches on the Steep North Polar Scarps of Mars: 4 Years of HiRISE Observation [#2688]*  
Spatial, temporal, morphological, and dynamical analysis of avalanche-cloud events: nature, source, related features, CO₂ scarp processes, and measured velocities.

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**Thursday, March 20, 2014**  
**[R403]**  
**TECHNIQUES AND CHALLENGES IN THE SEARCH FOR LIFE BEYOND EARTH**  
*Waterway Ballroom 4*

**Chairs:** Sanjoy Som  
Shawn Domagal-Goldman

10:30 a.m. Williams A. J. * Sumner D. Y. Alpers C. N. Campbell K. M. Nordstrom D. K.  
*Biogenic Iron Mineralization at Iron Mountain, CA, with Implications for Detection with the Mars Curiosity Rover [#2589]*  
Modern and ancient mineral filament preservation in oxidized iron environments provides insight into biosignatures detectable by the Curiosity rover on Mars.

10:45 a.m. Schultz P. H. * Harris R. S. Clemett S. J. Thomas-Keprta K. L. Zárate M.  
*Preserved Flora and Organics in Impact-Melt Breccias [#2002]*  
Impact-melt breccias of different ages from Argentina not only captured plant materials (down to micrometer-size) but also aromatic organics.

11:00 a.m. Sobron P. * Sanz A. Thompson C. Cabrol N. 2013 PLL Team  
*Underwater Laser Raman Spectroscopy for Characterizing Organic Content in Lakes: Implications for Titan Exploration [#2736]*  
We have used laser Raman spectroscopy for characterizing the organic content of Laguna Negra, Chile. We have identified carotenoids and triglycerides.

11:15 a.m. Vitek P. * Jehlicka J. Edwards H. G. M. Ascaso C. Wierzchos J.  
*Search for Pigments as Biomarkers in Rocks from Extreme Environments of the Atacama Desert and Mojave Desert Using Miniaturized Raman Spectrometers and Raman Imaging [#1873]*  
Evaporites from Atacama and Mojave were studied as martian analogs using the miniaturized Raman systems and Raman imaging to detect molecular traces of life.
Both H\textsubscript{2}S and SO\textsubscript{2} are chemically short-lived in virtually all types of atmospheres on terrestrial exoplanets, based on models of H\textsubscript{2}, N\textsubscript{2}, and CO\textsubscript{2} atmospheres.

In this presentation, we discuss the possibility for abiotic processes to produce O\textsubscript{2} and O\textsubscript{3}, and examine how to discriminate between false and true positives.

We describe the mineralogy of aqueously-altered enstatite chondrites, found as components of the Kaidun meteorite.

We present results of in situ isotopic mapping of the Cold Bokkeveld meteorite and implications for the evolution of isotopically anomalous meteoritic organics.

Elemental ratios in the noble gas component Q might be altered during aqueous alteration. We use IOM in clasts of Tagish Lake to characterize such effects.

CI falls contain similar amounts of phyllosilicate, magnetite, and sulfide, but Antarctic CI-like meteorites are distinct, having experienced thermal alteration.

TEM studies of olivine strongly suggest significant post-shock annealing and high temperature (syn-metamorphic) deformation for some ordinary chondrites.

Using FIB-TEM techniques we have identified dmisteinbergite intergrown with biopyriboles as alteration products in two CAIs from the Allende CV3 chondrite.
10:00 a.m. Cuvillier P. * Leroux H. Jacob D.  
*Fe-Mg Interdiffusion Profiles in Isolated Forsterites in the Allende Matrix. Evidence for a Parent Body Origin: Time-Temperature Constraints Deduced from a TEM Study [#1708]*  
TEM analysis of diffusion profiles into forsterites and Fe-rich rims in Allende supports a secondary origin for the Fe-rich olivines from the Allende matrix.

10:15 a.m. Abreu N. M. * Bland P. A. Rietmeijer F. J. M.  
*Effects of Shock Metamorphism on the Matrix of CR Chondrites: GRA 06100 [#2753]*  
GRA 06100 matrix records impact-induced mineral formation resulting in deformed SiO₂, Fe-silicides, Fa and Fs, non-stoichiometric ferromagnesiosilica grains.

10:30 a.m. Schwinger S. * Dohmen R. Schertl H.-P.  
*An Integrated Diffusion and Thermal Modeling Approach to Determine the Thermal History of Chondrite Parent Bodies [#1952]*  
We determined metamorphic peak temperatures of the CO3 chondrite Kainsaz combining diffusion modeling with thermal modeling of the parent body evolution.

10:45 a.m. Garenne A. * Beck P. Montes-Hernandez G. Bonal L. Quirico E. et al.  
*The Redox State of Iron in Primitive, Aqueously Altered, and Thermally Metamorphosed Chondrites by XANES [#1941]*  
XANES is used to measure the redox state of iron in chondrites. A dichotomy between the aqueously altered and thermally processed meteorites is observed.

11:00 a.m. Telus M. * Huss G. R. Ogliore R. C. Nagashima K.  
*²⁶Al-²⁶Mg Systematics of Plagioclase in H4 Chondrites: Implications for the H-Chondrite Parent Body [#2697]*  
We evaluate the influence of ratio bias on ²⁶Al-²⁶Mg systematics of H4 chondrites and discuss how this data fit into the onion-shell H-chondrite parent body model.

11:15 a.m. Friedrich J. M. * Kimura M. Perrotta G. C.  
*Compositions, Geochemistry, and Origins of Recrystallized LL Chondrites: Implications for the Primitive Achondrites [#1795]*  
We examine the origins of several recrystallized LL chondrites whose compositions and textures are similar to those found in primitive achondrites.

11:30 a.m. Van Niekerk D. * Scott E. R. D. Taylor G. J.  
*Constraints on the Thermal and Impact History of Ordinary Chondrites from Two-Pyroxene Equilibration Temperatures [#2374]*  
Pyroxene equilibration temperatures and inferred cooling rates, for H5-6 chondrites, provide more evidence for fast cooling to 700°C due to parent body disruption.
8:45 a.m. Wilson L. * Head J. W. III Tye A. R.  
**Lunar Regional Pyroclastic Deposits: Evidence for Eruption from Dikes Emplaced into the Near-Surface Crust [#1223]**  
We show that gas concentration in foam layers at the top of the magma in dikes intruded to shallow depth can explain the observed dispersal of lunar pyroclasts.

9:00 a.m. Sunshine J. M. * Petro N. E. Besse S. Gaddis L. R.  
**Widespread Exposures of Small Scale Spinel-Rich Pyroclastic Deposits in Sinus Aestuum [#2297]**  
Small-scale exposures of spinel-rich deposits are far more expansive than previously reported, suggesting longer-lived volcanism sustained by enhanced Th.

**Magma Ascent at Lunar Impact Basins: Effects of Lithospheric Tectonic Stress Gradients, Brittle Failure, and Volatile Generation [#2771]**  
We combine models of lithospheric stress, melt buoyancy, and volatile generation to determine regions of enhanced magma ascent around lunar impact basins.

9:30 a.m. Pasckert J. H. * Hiesinger H. van der Bogert C. H.  
**Lunar Mare Basalts In- and Outside of the South Pole-Aitken Basin [#1968]**  
We mapped 103 mare deposits in and outside the South Pole-Aitken Basin and derived absolute model ages for 50 of those mare basalts.

9:45 a.m. Edwards C. S. * Asimow P. D. Ehlmann B. L. Stewart-Mukhopadhyay S.  
**Testing the Impact-Induced Decompression Melting Hypothesis for Rocky, Mafic Infilled Crater Floors on Mars [#2644]**  
Mafic, lava-filled rocky craters are pervasive on Mars. We present two models to test the conditions needed for impact-induced decompression melting to occur.

10:00 a.m. Lillis R. J. * Dufek J. Kiefer W. S. Bleacher J. E. Manga M.  
**Mystery of Intrusion History at Syrtis Major: Clues from Multiple Data Sets [#2135]**  
Gravity, magnetic field, and mineralogical data imply a complex eruptive history of Syrtis involving different styles of magmatism.

10:15 a.m. Platz T. * Jodlowski P. Fawdon P. Michael G. G. Tanaka K. L.  
**Amazonian Volcanic Activity at the Syrtis Major Volcanic Province, Mars [#2524]**  
The Syrtis Major volcanic province was also volcanically active in the Amazonian Period. Here we show first results of its eruption frequency record.

10:30 a.m. Skok J. R. * Mustard J. F.  
**Glaciation and Volcanic Interaction to form the Modern Northeast Syrtis Region of Mars [#1924]**  
An examination of a channel and basins system in Northeast Syrtis to investigate the geologic and climatic history of this key region of stratigraphic exposure.

10:45 a.m. Hamilton C. W. * Bleacher J. E. Irwin R. P. Mazarico E. M.  
**Sinuous Channels East of Olympus Mons, Mars: Implications for Volcanic and Fluvial Processes [#1555]**  
Geomorphological mapping of channels east of Olympus Mons reveals episodes of aqueous flooding and erosion interspersed with Late Amazonian effusive volcanism.

11:00 a.m. Dundas C. M. * Kesztthelyi L. P.  
**Emplacement and Erosive Effects of a Turbulent Lava Flow in Kasei Valles, Mars [#2211]**  
Turbulent flood lava in Kasei Valles caused locally significant erosion, but the scale indicates that similar flows did not erode major outflow channels.
11:15 a.m. Morgan G. A. * Campbell B. A. Carter L. M. Plaut J. J.
Tomographic Reconstruction of a Sequence of Eruptive Events in Elysium Planitia, Mars [2377]
We will present 3-D visualizations of multiple buried flow units derived from SHARAD data and
assess the volume of lava associated with each eruption.

11:30 a.m. Rhodes N. * Hurtado J. M. Jr.
A GPR Survey of Kilbourne Hole, Southern New Mexico: Implications for Near Surface Geophysical
Exploration of Mars and the Moon [2912]
We conduct an analysis of pyroclast size distribution using ground penetrating radar (GPR) to make a
quantitative estimate of the presence of past groundwater.

Thursday, March 20, 2014 [R451]
LUNAR IGNEOUS PROCESSES
1:30 p.m. Waterway Ballroom 1

Chairs: Amy Fagan
Timothy Fagan

1:30 p.m. Day J. M. D. * Nowell G. M. Pearson D. G. Taylor L. A.
A Sr-Nd-Hf Isotope, Trace-Element, and Petrological Study of Apollo Mare Basalts and Low-Ti Mare
Basalt Meteorites [1336]
Comprehensive petrological, geochemical, and isotopic study of mare basalts reveals petrogenetic
processes and the compositional evolution of the Moon.

1:45 p.m. Elardo S. M. * Shearer C. K. McCubbin F. M. Bell A. S.
Experimental Constraints on the Thermal State of the Lunar Mantle and the Compositions of Mare
Basalt Sources Three Billion Years Ago [2745]
Petrologic experiments on two basaltic lunar meteorite compositions are used to constrain their origin
and the pressure and temperature conditions of melting.

2:00 p.m. Sonzogni Y. * Treiman A. H.
Petrology of a Very-Low Titanium Basalt (or Picrite) Clast in Lunar Highland Regolith
Breccia 15295 [1030]
A holocrystalline clast in regolith breccia 15295 is mineralogically similar to VLT mare basalt but has
a bulk composition like those of Apollo green glasses.

2:15 p.m. Stopar J. D. * Hawke B. R. Lawrence S. J. Robinson M. S. Giguere T. A.
Basaltic Cones: A Relatively Common and Distinct Style of Lunar Volcanism [1425]
Lunar volcanic cones are more numerous than previously recognized. Cones 1–2 km in diameter in
nearside maria formed from basaltic cinder, spatter, and/or lava.

2:30 p.m. Simon S. B. * Sutton S. R. Grossman L.
Valence of Ti in Lunar Igneous Rocks: The First Direct Measurements [1063]
XANES analysis provides insight into the valence state and coordination of Ti in pyroxene and olivine
in a diverse suite of lunar igneous rocks.

2:45 p.m. Donohue P. H. * Neal C. R.
The Provenance of High-Titanium Cumulate 71597 [2731]
New mineral trace-element analyses support a cumulate origin of 71597 within a high-Ti basalt flow,
likely of Type B1 composition.
3:00 p.m. Fagan T. J. *

Effect of Titanium Abundance on Silica vs. Iron Enrichment in Lunar Basalts: Modeling and Comparisons with Northwest Africa 773 [#1599]
Models show that high-Ti in lunar basalt stabilizes Fe-oxide, leading to Ti-Fe-depletion and Si-enrichment. NWA 773 clasts show Ti-Fe-enrichment of VLT origin.

3:15 p.m. North - Valencia S. N. * Jolliff B. L. Korotev R. L.
Ferroan Gabbro and Leucogabbro Lithologies in NWA 3170, Possible Petrogenetic Link and Comparison to NWA 2727 [#2858]
We examined the ferroan gabbro and leucogabbro lithologies in NWA 3170 and compare them to NWA 2727 using pyroxene and plagioclase compositions.

3:30 p.m. Zeigler R. A. * Jolliff B. L. Korotev R. L.
Apollo 16 Evolved Lithology Sodic Ferrogabbro [#2005]
Petrography and geochemistry of two SFG-like Apollo 16 soil particles compared to recent analyses on the type specimen of SFG from lunar breccia 67915.

3:45 p.m. Roberts S. E. * Neal C. R.
Taking Off the Potassium Coat: A New Hypothesis for VHK Petrogenesis [#1282]
New hypothesis for impact-generated K enrichment in VHK basalts.

4:00 p.m. Clegg R. N. * Jolliff B. L. Boyd A. Hawke B. R.
Compositional Constraints on Lunar Silicic Volcanic Regions Using LROC NAC Photometry [#1256]
Photometric studies provide evidence to support the presence of highly reflective minerals such as alkali feldspar and quartz at lunar silicic volcanic regions.

Remote Sensing Studies of Hansteen Alpha [#1730]
LROC and Clementine images + LRO Diviner data were used to investigate the composition and geology of Hansteen A, a Th-rich, silicic, spectral anomaly on the Moon.

4:30 p.m. Lawrence S. J. * Robinson M. S. Hawke B. R. Sato H. Denevi B. W. et al.
Remote Sensing and Geologic Observations of “Red Spots” in the Cognitum Region [#2279]
We use LROC NAC images and DTMs and LROC WAC multispectral data to study lunar red spots in the Cognitum/Procellarum region, focusing on the Herigonius feature.

Thursday, March 20, 2014
WIND STIRRED, NOT SHAKEN:
EOLIAN PROCESSES ON EARTH-LIKE PLANETS
1:30 p.m. Waterway Ballroom 4

Chairs: James Zimbelman
Matthew Chojnacki

1:30 p.m. de Silva S. L. * Spagnuolo M. G. Bridges N. T. Zimbelman J. R. Neely E. M.
Gravel-Mantled Aeolian Bedforms from the Puna of Argentina: Origin, Classification, and Relevance to Mars [#2582]
Large gravel-mantled bedforms on Earth provide useful insight aeolian features on Mars. However, they challenge traditional classification criteria.

Namib Sand Sea Field Analogues to the Linear Dunes of Titan [#2365]
We present field work in the Namib Sand Sea as an analog to the tens of thousands of dunes seen on the surface of Titan by Cassini.
<table>
<thead>
<tr>
<th>Time</th>
<th>Authors *</th>
<th>Title</th>
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<tbody>
<tr>
<td>2:00 p.m.</td>
<td>Lucas A. S.</td>
<td>New Insights on Origin of Dune's Orientation on Titan [#2041]</td>
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<td>Rodriguez S.</td>
<td>We address the question on the growth mode of the dunes by combining</td>
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<td>Narteau C.</td>
<td>image processing, GCM, and retool a recent theoretical framework on</td>
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<td>Charnay B.</td>
<td>dunes’ modes of orientation.</td>
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<td>Garcia A. et al.</td>
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<td>2:15 p.m.</td>
<td>McDonald G. D. *</td>
<td>Examining Effects of Orbital Forcing on Titan's Dune Orientations</td>
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<td>Hayes A. G.</td>
<td>We explore the possibility that the orientations of Titan’s equatorial</td>
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<td>Ewing R. C.</td>
<td>dunes reflect integrative winds over orbital timescales of tens of</td>
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<td>Tokano T.</td>
<td>thousands of years.</td>
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<td>Lucas A. et al.</td>
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<td>2:30 p.m.</td>
<td>Quintana S. N. *</td>
<td>The Formation of Crater-Related Blast Wind Streaks on Mars [#1971]</td>
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<td>Schultz P. H.</td>
<td>Crater-related permanent wind streaks on Mars may be formed by</td>
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<td>impact-generated winds, which we test with computational modeling and</td>
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<td>laboratory experiments.</td>
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<td>2:45 p.m.</td>
<td>Daubar I. J. *</td>
<td>Changes in New Impact Blast Zones over Three Martian Years [#2762]</td>
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<td>Geissler P. E.</td>
<td>Blast zones of new martian craters change over time: some a lot,</td>
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<td>Dundas C. M.</td>
<td>many surprisingly little. We explore how (much) they change,</td>
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<td>Byrne S. et al.</td>
<td>controlling factors, and lifetimes.</td>
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<td>3:00 p.m.</td>
<td>Dapremont A. *</td>
<td>The Gale Crater Mound in a Regional Geologic Setting: Comparison</td>
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<td>Allen C.</td>
<td>Study of Wind Erosion in Gale Crater and Within a 1000 km Radius</td>
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<td>Runyon C.</td>
<td>[#1288] New yardangs were compared in Gale Crater and in the Medusae</td>
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<td>Fossae formation within 1000 km. MFF yardangs are most closely</td>
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<td>related to the upper mound of Gale.</td>
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<td>3:15 p.m.</td>
<td>Bridges N. T. *</td>
<td>Surface Monitoring of Dune Changes from MSL: Current Results and</td>
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<td>Le Mouélic S.</td>
<td>Upcoming Campaigns [#1849] This abstract reports on initial</td>
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<td>Herkenhoff K. E.</td>
<td>observations of sand dunes with combined M100 and RMI images.</td>
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<td>Newman C. et al.</td>
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<td>3:30 p.m.</td>
<td>Chojnacki M. *</td>
<td>Persistent Aeolian Activity at Endeavour Crater, Meridiani Planum,</td>
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<td>Johnson J.</td>
<td>Mars; New Observations from Orbit and the Surface [#2775] New</td>
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<td>Michaels T.</td>
<td>orbital and surface observations of migrating dunes, variable</td>
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<td>Fenton L.</td>
<td>submeter sediment movement confirm a high degree of aeolian activity</td>
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<td>Moersch J.</td>
<td>in Endeavour Crater.</td>
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<td>3:45 p.m.</td>
<td>Runyon K. D. *</td>
<td>Aeolian Provinces and Activity in Herschel Crater, Mars [#1495]</td>
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<td>Bridges N. T.</td>
<td>Herschel crater has a broad range of aeolian bedforms. Our change</td>
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<td>Ayoub F.</td>
<td>detection analysis shows</td>
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<td>Mattson S.</td>
<td>substantial ripple and dune migration rates and sand fluxes.</td>
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<td>4:00 p.m.</td>
<td>Banks M. E. *</td>
<td>Preliminary Global Trends in Aeolian Bedform Mobility on Mars [#2857]</td>
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<td>Geissler P. E.</td>
<td>Emerging trends in the global distributions of active and</td>
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<td>Bridges N. T.</td>
<td>apparently inactive bedforms as revealed by repeat HiRISE image</td>
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<td>coverage.</td>
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<td>4:15 p.m.</td>
<td>Geissler P. E. *</td>
<td>The Birth and Death of Transverse Aeolian Ridges on Mars [#1621]</td>
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<td>We propose that TARs are indurated dust deposits, primary deposition</td>
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<td>al bedforms that were</td>
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<td>subsequently indurated and eroded to their current states.</td>
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<td>4:30 p.m.</td>
<td>Sullivan R. *</td>
<td>Numerical Modeling of Wind-Driven Evolution of Martian Fines [#1604]</td>
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<td>Hallet B.</td>
<td>Sand bouncing across hard martian ground (not dunes) can affect</td>
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<td>Herkenhoff K.</td>
<td>several types of geomorphic settings</td>
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<td>Kocurek G.</td>
<td>and evolve to a regolith “end state” grain size-frequency.</td>
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<td>Kok J.</td>
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EVOLUTION OF THE PROTOSOLAR DISK: MODELS AND METEORITES
1:30 p.m.  Waterway Ballroom 5

**Chairs:** Maria Schönbächler
Hiroko Nagahara

**1:30 p.m.**  Boss A. P. *  Keiser S. A.
*Short-Lived Radioisotope Injection into the Solar Nebula: First 3D Calculations of Shock Interactions with Rotating Presolar Cloud Models [#1022]*
3D AMR hydro models show how a supernova shock can trigger the collapse of a rotating dense cloud core and inject shock wave isotopes into the solar nebula.

**1:45 p.m.**  Gounelle M. *
*Aluminium-26 in the Early Solar System: A Probability Estimate [#2113]*
Taking into account new dynamical and cosmochemical constraints, we evaluate the probability for the solar system to be born in an environment rich in $^{26}$Al.

**2:00 p.m.**  Young E. D. *
*Short-Lived Radionuclides in the Early Solar System: Not so Unusual After All [#1258]*
Including Wolf-Rayet winds accounts for abundances of short-lived radionuclides in the early solar system with a residence time in molecular clouds of 200 m.y.

**2:15 p.m.**  Fischer-Gödde M. *  Kleine T.  Burkhardt C.  Dauphas N.
*Origin of Nucleosynthetic Isotope Anomalies in Bulk Meteorites: Evidence from Coupled Ru and Mo Isotopes in Acid Leachates of Chondrites [#2409]*
Correlated anomalies for Ru-Os and Mo-W in acid leachates of Murchison contrast with correlated Ru-Mo and lacking W and Os anomalies of bulk meteorites.

**2:30 p.m.**  Fu R. R. *  Lima E. A.  Weiss B. P.  Harrison R. J.  Ebel D. S.  et al.
*Nebular Magnetism Recorded in the Semarkona Meteorite [#1420]*
The Semarkona chondrite records solar nebula magnetic fields. The field intensities support weak-field mechanisms of chondrule formation.

**2:45 p.m.**  Taillifet E. *  Baillié K.  Charnoz S.  Aléon J.
*Origin of Refractory Inclusion Diversity by Turbulent Transport in the Inner Solar Nebula [#2086]*
We show that many types of CAIs could have formed in a single environment by thermal reprocessing in the disk due to the stochastic motion induced by turbulence.

**3:00 p.m.**  Estrada P. R. *  Cuzzi J. N.
*The Influence of Evaporation Fronts on the Global Evolution of Solids and Gas in the Protoplanetary Nebula [#2642]*
Solids migrate in / Its too hot, too hot baby / Vapor migrates out.

**3:15 p.m.**  Yokoyama T. *  Fukami Y.  Nagai Y.  Nakamoto T.
*Volatility Control of Isotope Heterogeneity in the Early Solar System [#2588]*
We discuss the origin of nebular isotope heterogeneity based on previously published isotope data for heavy elements in bulk meteorites and their components.

**3:30 p.m.**  Nagahara H. *  Ozawa K.
*Radial Mixing in the Proto-Solar Disk and Chemical Composition of Meteorites [#1147]*
Evolution of radial mixing in the protosolar disk was studied. Early formed planetesimals in the inner regions are rich in refractory components.

4:00 p.m. Mane P. * Brennecka G. A. Romaniello S. J. Wadhwa M. * Mg and U Isotopic Systematics in Allende CAIs: Implications for the Origin of Uranium Isotopic Variation in Refractory Inclusions [#1685] We report mass-dependent Mg-isotopic variations in a suite of Allende CAIs to evaluate the causes of variation in uranium isotopes in these same samples.

4:15 p.m. Williams N. H. Schönbachler M. * Fehr M. A. Akram A. M. Parkinson I. J. Different Heterogeneously Distributed Titanium Isotope Components in Solar System Materials and Mass-Dependent Titanium Isotope Variations [#2183] Novel Ti double spike data reveal correlated $^{46},^{47},^{50}$Ti anomalies in solar system materials and nucleosynthetic $^{47},^{50}$Ti variations in some CAIs and chondrites.

4:30 p.m. Dauphas N. * Chen J. H. Zhang J. Papanastassiou D. A. Burkhardt C. et al. The Earthlings that Made the Earth [#1272] We have discovered widespread $^{48}$Ca isotope anomalies in chondrites and achondrites that provide important constraints on the nature of Earth’s building blocks.

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**Thursday, March 20, 2014**

**PLANETARY CORES: GETTING TO THE HEART OF THE MATTER**

1:30 p.m. Waterway Ballroom 6

**Chairs:** Marc Hirschmann
Mathieu Touboul

1:30 p.m. Kruijer T. S. * Touboul M. Fischer-Gödde M. Bermingham K. R. Walker R. J. et al. Protracted Core Formation in Protoplanets Inferred from Hf-W Chronometry of Iron Meteorites [#1814] Small $^{182}$W variations between iron meteorite parent bodies indicate distinct times of core formation, but coeval accretion at 0.2–0.7 m.y. after CAI formation.

1:45 p.m. Worsham E. A. * Bermingham K. R. Touboul M. Walker R. J. Crystallization History and Chronology of Metal Segregation in the IAB Iron Meteorite Complex: New Insights from W and Os Isotopes, and Highly Siderophile Element Abundances [#2395] W- and Os-isotope and HSE abundance data from IAB iron meteorites are used to constrain the chronology and crystallization history of IAB subgroups.


2:15 p.m. Fei Y. * Shibazaki Y. Percolative Behavior of Immiscible Liquids at High Pressure and Temperature: Implications for Composition of Planetary Cores [#1232] We investigated the percolative behavior of immiscible liquids in olivine, providing a novel mechanism for compositional separation during core formation.
2:30 p.m. Rückriemen T. * Breuer D. Spohn T.

*Key Characteristics of the Fe-Snow Regime in Ganymede’s Core [#2454]*

Fe-snow regime in Ganymede’s core leads to a stably-stratified snow zone below which we propose the existence of the dynamo region.

2:45 p.m. Martin A. M. * Van Orman J. Hauck S. A. Chen B. Sun N. et al.

*In Situ Determination of the Eutectic Melting Temperature of Fe-FeS-Fe3C Between 4.5 and 24.5 GPa and Implications for Mercury’s Core [#2854]*

We performed multi-anvil experiments on a synchrotron to determine the role of carbon and sulfur on the eutectic melting temperature of Mercury’s core.

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Thursday, March 20, 2014

**PLANETARY TECTONICS AND DYNAMICS**

3:15 p.m. Waterway Ballroom 6

**Chairs:**

Michael Bland
James Roberts

3:15 p.m. Clark J. D. * Hurtado J. M. Jr. Hiesinger H. van der Bogert C. H.

*Investigation of Lobate Scarps: Implications for the Tectonic and Thermal Evolution of the Moon [#2048]*

Investigating lunar thrust faults to constrain the timing of faulting events and to improve understanding of the stress state and thermal evolution of the Moon.

3:30 p.m. Klimczak C. * Byrne P. K. Solomon S. C.

*Limits on the Brittle Strength of Planetary Lithospheres Undergoing Global Contraction [#1542]*

Planets cool and shrink / Strong rock resists high stresses / More shrinkage needed.

3:45 p.m. Craft K. L. * Lowell R. P. Germanovich L.

*Is Sudden Permeability Change from Dike Emplacement the Cause of Flood Outbursts at Athabasca Valles, Mars? [#2915]*

We analyze how the change in permeability from dike intrusion could contribute to the formation of Athabasca Valles, Mars.

4:00 p.m. Debaille V. * O’Neill C. Brandon A. D. Haenecour P. Yin Q.-Z. et al.

*Delayed Onset of Plate Tectonics on Earth and Implications for the Martian Mantle [#2167]*

We set up a model showing that in the absence of plate tectonics, a convective mantle remains poorly mixed. This model can be applied to the Archean Earth and Mars.

4:15 p.m. Bland M. T. * McKinnon W. B.

*Deep Faulting, Stress Release, and Mountain Formation on Io [#2502]*

Despite the global compressive stress regime, deeply formed thrust faults on Io naturally give rise to regions of surface tensile stress and extensional strain.

4:30 p.m. Walker C. C. * Schmidt B. E. Bassis J. N.

*Breaking the Ice: On the Application of Fracture System Mechanics and Fragmentation Theory to the Chaos Regions of Europa [#2659]*

We consider two processes in rupturing Europa’s ice shell and associated water escape: (1) propagation of fracture arrays, (2) collapse/fragmentation events.

4:45 p.m. Roberts J. H. *

*Warming the Frozen Heart of Enceladus [#2549]*

Cold Enceladus / Ice fills holes in rubbly core / Heated while frozen.
LUNAR REGOLITH PROCESSES: WET, DRY, AND SWIRLY
8:30 a.m. Waterway Ballroom 1

**Friday, March 21, 2014**

**45th LPSC Program**

**MON ORALS**

**TUES ORALS**

**WED ORALS**

**THUR ORALS**

**FRI ORALS**

**Friday, March 21, 2014 [F501]**

**LUNAR REGOLITH PROCESSES: WET, DRY, AND SWIRLY**

**8:30 a.m. Waterway Ballroom 1**

**Chairs:** Annemarie Pickersgill

Wu Yunzhao

**8:30 a.m.** Elsila J. E. * Callahan M. P. Glavin D. P. Dworkin J. P. Noble S. K. et al. **Distribution of Amino Acids in Lunar Regolith** [#1127]

Amino acids were detected in lunar regoliths. Contamination is possible, but the presence of an acid-hydrolyzable extraterrestrial precursor is suggested.

**8:45 a.m.** Pieters C. M. * Moriarty D. P. III Garrick-Bethell I. **Atypical Regolith Processes Hold the Key to Enigmatic Lunar Swirls** [#1408]

Instead of low space weathering for swirls, we propose local collapse of regolith fairy castle and minor redistribution of lunar dust by local electric fields.

**9:00 a.m.** Hemingway D. * Garrick-Bethell I. **Space Weathering at Lunar Swirls and at High Lunar Latitudes** [#1979]

Space weathering effects are found to vary systematically with latitude in a way that resembles the unusual weathering trends observed at lunar swirls.


We investigate effects of space weathering at UV wavelengths, focusing on variability in the highlands indicative of differences in the degree of impact shock.

**9:30 a.m.** Pickersgill A. E. * Flemming R. L. Osinski G. R. **Streak Lengthening in Chi ([χ]) from Micro-X-Ray Diffraction Patterns of Shocked Lunar and Terrestrial Plagioclase** [#2595]

μXRD for the purpose of quantifying shock level is being applied for the first time to the feldspar group using both terrestrial impactites and Apollo samples.

**9:45 a.m.** Molaro J. L. * Byrne S. **Grain-Scale Thermoelastic Stresses on Airless Bodies and Implications for Rock Break-Down** [#1179]

We model thermoelastic stresses generated near surfaces on the Moon and Vesta, and discuss implications for regolith production on these bodies.

**10:00 a.m.** Bandfield J. L. * Hayne P. O. Paige D. A. **What is the Surface Temperature of the Moon?** [#1519]

Lunar surface temperatures separated by just a few centimeters can vary by nearly 200 K. No single “correct” temperature exists for retrieval of spectral properties.

**10:15 a.m.** Koeber S. D. * Robinson M. S. Speyerer E. J. **LROC Observations of Permanently Shadowed Regions on the Moon** [#2811]

We will present preliminary analysis of NAC images of the permanently shadow regions of the Moon.

**10:30 a.m.** Patterson G. W. * Bussey D. B. J. Stickle A. M. Cahill J. T. S. Carter L. M. et al. **Mini-RF and the Curious Case of Cabeus Crater** [#2765]

Bistatic radar observations of the crater Cabeus indicate anomalous scattering behavior associated with its floor (behavior not observed with monostatic data).
Upper-Latitude Hydration of the Moon’s Southern Poleward-Facing Slopes [2931]
We illustrate evidence that a pervasive hydration of the Moon’s poleward-facing slopes reaching to –60° latitude.

Lunar Polar Craters — Icy, Rough or just Sloping? [1853]
What do circularly polarized radar data tell us about the possible presence of water ice deposits in permanently shaded lunar polar craters?

Active Particle-Induced X-ray Spectrometer for Chang’e-3 YuTu Rover Mission and its First Results [1699]
The Active Particle-induced X-ray Spectrometer onboard the Yutu rover of the Chang’e-3 mission got its first spectrum of lunar regolith around the landing site.

Local Geology of Chang’e-3 Landing Site from Analysis of the CE-3 Descent Camera and LROC NAC Images [1116]
Chang’e-3 landed on the rim of a young 450-m crater so the regolith there should be immature and its material originated from the depth down to 40–50 m.

Friday, March 21, 2014 [F502]
MARS ORGANICS AND VOLATILES IN THE CRUST AND ATMOSPHERE
8:30 a.m. Waterway Ballroom 4

Chairs: Caroline Freissinet
Jeremie Lasue

From SAM Instrument Background to Martian Signal: Challenges of Solid Sample Analyses on Mars [2796]
Chlorohydrocarbons have been identified with the SAM instrument onboard Curiosity. These organic molecules are thought to be indigenous to the martian sample.

Origin of Chlorobenzene Detected by the Curiosity Rover in Yellowknife Bay: Evidence for Martian Organics in the Sheepbed Mudstone? [1157]
Chlorobenzene detected by the Curiosity rover in Yellowknife Bay provide possible evidence for martian organics in the Sheepbed mudstone.

Martian analog fine-grained sediments are analyzed with reflectance spectroscopy to understand detection limits for organics in relation to mineral assemblage.

Water Uptake by Mars Salt Analogs: An Investigation of Stable Aqueous Solutions Using Raman Microscopy [2863]
Instant Mars particles initiate stable and metastable aqueous solutions under present-day Mars relevant temperature and relative humidity conditions.
*Content of Water and Chlorine in the Martian Soil Along the Traverse of “Curiosity”, as Measured by the Active Neutron Instrument DAN Onboard the Rover [*1436*]

The data analysis of the DAN active measurements onboard the Curiosity rover is presented for 154 individual points along 1900 meters of the rover traverse.

9:45 a.m.  Usui T. * Jones J. H.  Simon J. I.  Alexander C. M. O’D.  
*Evidence from Hydrogen Isotopes in Meteorites for a Martian Permafrost [*1623*]

This study provides evidence for a massive ground-ice/permafrost that has existed relatively intact over geologic time (>3 G.y.).

10:00 a.m.  Sun T. * Niles P. B.  Socki R. A.  Bao H. M.  
*Mass Dependency of Isotope Fractionation of Gases Under Thermal Gradient and its Possible Implications for Planetary Atmosphere Escaping Process [*2477*]

We report no non-mass-dependent isotope fractionation for neon and high-pressure O₂ gas under thermal gradient, discuss its relevance for planetary atmosphere.

*The Deuterium to Hydrogen Ratio in the Water that Formed the Yellowknife Bay Mudstones in Gale Crater [*1251*]

D/H in thermally evolved water and hydrogen from Yellowknife Bay mudstones using the SAM mass spectrometer and tunable laser spectrometer on MSL.

10:30 a.m.  Franz H. B. * Mahaffy P. R.  Stern J.  Eigenbrode J.  Steele A.  et al.  
*Carbon and Sulfur Isotopic Composition of Yellowknife Bay Sediments: Measurements by the Sample Analysis at Mars (SAM) Quadrupole Mass Spectrometer [*2184*]

We will discuss carbon and sulfur isotopic analyses of gases released by thermal processing of martian surface samples by the SAM instrument on Curiosity.

10:45 a.m.  Dottin J. W. III * Farquhar J.  Hoek J.  Franz H. B.  
*Isotope Evidence for Links Between Sulfate Assimilation and Oxidation of Martian Melts from Meteorites MIL 03346, MIL 090030, MIL 090032, and MIL 090136 [*2420*]

We present data for sulfur extractions from MIL 090136, MIL 090030, and MIL 090032 and compare our results with data from MIL 03346 to study oxidation reactions.

11:00 a.m.  Ding S. D. * Dasgupta R. D.  Lee C-T. L.  Wadhwa M. W.  
*New Bulk Sulfur Measurements of Martian Meteorites - Implications for Sulfur Cycle and Crust Formation [*1717*]

We measured bulk S contents of seven martian meteorites and have attempted to estimate the plausible S budgets of the martian mantle, crust, and atmosphere.

11:15 a.m.  Forni O. * Gaft M.  Toplis M.  Clegg S. M.  Ollila A.  et al.  
*First Fluorine Detection on Mars with ChemCam On-Board MSL-Curiosity [*1328*]

We report the first detection of fluorine at the surface of Mars with ChemCam. Chlorine is also detected. We present an interpretation for their presence.

11:30 a.m.  Lasue J. * Maurice S.  Cousin A.  Forni O.  Meslin P. Y.  et al.  
*ChemCam Analysis of Martian Fine Dust [*1224*]

This work shows how ChemCam/MSL data on single-element calibration targets can be used to retrieve and analyze in detail the fine dust chemical composition.
Friday, March 21, 2014
EARLY SOLAR SYSTEM CHRONOLOGY:
A SHORT-LIVED RADIONUCLIDE PERSPECTIVE
8:30 a.m. Waterway Ballroom 5

Chairs: Justin Simon
Qing-Zhu Yin

8:30 a.m. Krot A. N. * Nagashima K. Bizzarro M.
Aluminum-Magnesium Isotope Systematics of Porphyritic Chondrules and Plagioclase Fragments in
CH Carbonaceous Chondrites [#2142]
CHs accreted diverse types of materials and may represent accretionary breccias that sampled the
protoplanetary disk during a debris stage of its evolution.

8:45 a.m. Wadhwa M. * Kita N. T. Nakashima D. Bullock E. S. MacPherson G. J. et al.
High Precision $^{26}\text{Al-}^{26}\text{Mg}$ Systematics for an Almost Pristine Refractory Inclusion: Implications for
the Absolute Age of the Solar System [#2698]
We report high-precision Al-Mg data for a refractory inclusion that may be the most pristine one for
which chronological investigations have been made thus far.

9:00 a.m. Dunlap D. R. * Wadhwa M. Romaneillo S. R.
$^{26}\text{Al-}^{26}\text{Mg}$ Systematics in the Unusual Ungrouped Achondrite NWA 7325 and the
Eucrite Juvinas [#2186]
In this work, high-precision $^{26}\text{Al}^{26}\text{Mg}$ systematics are reported for NWA 7325, a recently recovered
ungrouped mafic achondrite, and Juvinas, a basaltic eucrite.

Initial $^{26}\text{Al}^{27}\text{Al}$ Ratios of Characterized Chondrules from CV Chondrites by MC-ICP-MS [#1997]
Without knowledge of the initial $\mu^{26}\text{Mg}$*, model $^{26}\text{Al}^{27}\text{Al}$ ratios of chondrules are compromised. An
altered Allende AOA has a subcanonical model $^{26}\text{Al}^{27}\text{Al}$ ratio.

9:30 a.m. MacPherson G. J. * Davis A. M. Zinner E. K.
Distribution of $^{26}\text{Al}$ in the Early Solar System: A 2014 Reappraisal [#2134]
We present a survey of all data for extinct $^{26}\text{Al}$ in early solar system materials, comprising (so far) over
5200 data points.

9:45 a.m. Kruijer T. S. * Kleine T. Fischer-Gödde M. Burkhardt C. Wieler R.
Hf-W Isochron for Bulk CAI: Evidence for Homogeneity of $^{26}\text{Al}$ and $^{182}\text{Hf}$ [#1786]
Our new Hf-W isochron for bulk CAI brings Al-Mg and Hf-W ages of angrites in agreement,
suggesting that $^{26}\text{Al}$ was homogeneously distributed in the solar nebula.

10:00 a.m. Budde G. * Kruijer T. S. Fischer-Gödde M. Irving A. J. Kleine T.
Chronology of Melting and Differentiation on the Ureilite Parent Body Inferred from
Hf-W Systematics [#1988]
New Hf-W data for ureilites demonstrate that melting within the ureilite parent body began within
2 Ma of CAI formation and may have continued for several Ma.

10:15 a.m. Breton T. * Quitté G.
Aqueous Alteration of Carbonaceous Chondrites and Effects on Tungsten Mass Dependent
Isotope Fractionation [#1810]
Tungsten stable isotopes were analyzed on altered carbonaceous chondrites. We present our results and
discuss them in terms of alteration processes.
10:30 a.m. Pravdivtseva O. * Meshik A. Hohenberg C. M. Krot A. N. Amelin Yu.
*I-Xe Age of a Non-Porphyritic Magnesian Chondrule from the Hammadah al Hamra 237
CB Carbonaceous Chondrite: Validation of Absolute I-Xe Ages [#2456]
New I-Xe age of the HH237 chondrule (4562.0 ± 0.4 Ma) is in agreement with the Pb-Pb ages of
CB chondrules, and may reflect closure at the chondrule formation time.

10:45 a.m. Crowther S. A. * Fitlness M. J. Gilmour J. D.
*Early I-Xe Ages of Clasts and Chondrules from the L6 Chondrite Barwell [#2031]
Very early ages for Barwell clasts and chondrules imply they must have originated from a previous
generation of planetesimals and not been altered since.

11:00 a.m. Mayer B. * Humayun M. Wittig N.
Cosmogenic and Nucleosynthetic Anomalies Resolved in IVB Meteorites Using
Palladium Isotopes [#2581]
We revealed nucleosynthetic and cosmogenic anomalies of Pd isotopes in IVB iron meteorites that are
consistent with Pt-, Os-, W-, Ru-, and Mo-isotope anomalies.

11:15 a.m. Matthes M. * Fischer-Gödde M. Kruijter T. S. Leya I. Kleine T.
Rapid Cooling of the IIIAB Iron Meteorite Parent Body Inferred from Pd-Ag Chronometry [#2197]
We present new Pd-Ag ages indicating rapid crystallization and cooling of IIIAB iron meteorites,
consistent with impact exposure of the IIIAB core.

11:30 a.m. Borg L. E. * Brennecka G. A. Marks N. E. Symes S. J. K.
Neodymium Isotopic Evolution of the Solar System Inferred from Isochron Studies of
Planetary Materials [#1037]
A summary of $^{146}$Sm-$^{142}$Nd isochron studies are used to evaluate the $^{146}$Sm half-life and initial Sm and
Nd isotopic compositions of the solar system.

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**Friday, March 21, 2014**

**THE LIFE AND DEATH OF COMET ISON**

8:30 a.m. Waterway Ballroom 6

**Chairs:** Stefanie Milam  
Carey Lisse

8:30 a.m. Lisse C. M. * CIOC Team
Initial Results from the Comet ISON Observing Campaign (CIOC) [#2692]
We present an overview of observing results and lessons learned from the Comet ISON Observing
Campaign for C/2012 S1 (ISON) during its 2012–2013 apparition.

8:45 a.m. Weaver H. A. * A’Hearn M. F. Bodewits D. Combi M. R. Dello Russo N. et al.
Ultraviolet Spectroscopy of Comet ISON (2012 S1) with the Hubble Space Telescope [#2903]
We performed ultraviolet spectroscopy of Comet ISON with the Hubble Space Telescope.

9:00 a.m. McKay A. J. * Cochran A. L.
High Resolution Optical Spectroscopy of Comet C/2012 S1 ISON from R=1.6-0.4 AU
Pre-Perihelion [#2303]
We present high spectral resolution optical spectroscopy of Comet C/2012 S1 ISON taken during
October–November 2013.
The Chemical Composition of Comet C/2012 S1 (ISON) as Measured with CSHELL at the NASA-Infrared Telescope Facility

The recent apparition of C/2012 S1 (ISON) provided the rare opportunity to conduct compositional studies to R = 0.34 AU using CSHELL at the NASA-IRTF.

First Cometary Observations with ALMA: C/2012 F6 (Lemmon) and C/2012 S1 (ISON)

We present results from the first cometary observations using the ALMA telescope, including images of HCN, H$_2$CO, and CH$_3$OH in Comets S1 (ISON) and F6 (Lemmon).

Observations of Comet C/2012 S1 (ISON): The Rise and Fall of a Great Comet

We will present molecular and continuum submillimeter observations of Comet C/2012 S1 (ISON) pre-perihelion, during outbursts, and the final break-up event.

The Breakup of Comet C/2012 S1 (ISON) Through Differential Sublimation Pressure

Exploring the breakup of Comet ISON through a new mechanism, whereby the pressure of sublimating gas at the surface overcomes the comet’s tensile strength.

A Study of 21 Comets Discovered by WISE/NEOWISE

Twenty-one comets / Discovered by WISE mission / We present results.

Asteroid 951 Gaspra’s Three Micrometer Region Spectral Features

Galileo Near Infrared Mapping Spectrometer observations of asteroid 951 Gaspra has detected spectral absorption features at 2.8 and 3.4 µm.

Identifying ‘Bad’ Asteroid Spectra: A Cross-Correlative Database Study

Compositionally significant inconsistencies were discovered between the SMASS I, SMASS II and S3OS2 spectral survey datasets for a number of asteroids.

Asteroid-Meteorite Connections in the Hungaria Background Population: Correlations with Primitive Achondrites?

Two principal meteorite groups are spectrally analogous with Hungaria background asteroids: unmelted L chondrites, and partially-melted primitive achondrites.

Toward an Understanding of Phyllosilicate Mineralogy in the Outer Main Belt Region

We applied 3-µm spectral indicators in CM/CI chondrites to OMB asteroids in order to provide more details on phyllosilicate mineralogy of these asteroids.
We analyzed the continuous 3-µm spectra of dark asteroids using PCA, suggesting that the shape of absorption band around 2.7 µm may be controlled by serpentine.

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**Friday, March 21, 2014**

**LUNAR HIGHLANDS AND BENEATH: COMPOSITION FROM ORBIT**

1:30 p.m. Waterway Ballroom 1

**Chairs:** Kerri Donaldson Hanna  
Makiko Ohtake

**1:30 p.m.**  
Lawrence D. J. * Maurice S.  Peplowski P. N.  Prettyman T. H.  
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**Bulk Hydrogen Abundances in the Lunar Highlands: Measurements from Orbital Neutron Data [#1565]**  
Lunar Prospector neutron measurements have been combined with data from LRO’s Diviner instrument and lunar highland hydrogen concentrations are derived.

**1:45 p.m.**  
Donaldson Hanna K. L. * Thomas I. R.  Greenhagen B. T.  Bowles N. E.  Pieters C. M.  
* * * * *

**Characterization of Apollo Soil Samples Under Simulated Lunar Conditions [#2345]**  
Spectral characterization of Apollo bulk soil samples under simulated lunar conditions across thermal infrared wavelengths.

**2:00 p.m.**  
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**Matching Regolith Breccia and Soil Compositions Using Lunar Prospector Data [#1424]**  
We have developed a new software application in the Python programming language that matches sample elemental composition to the 2°/pixel LP-GRS dataset.

**2:15 p.m.**  
Lemelin M. * Lucey P. G.  Song E.  
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**Reassessment of Lunar Central Peak Mineralogy and Iron Content Using the Kaguya Multiband Imager [#2343]**  
Central peak compositions derived from Kaguya MI data show only weak correlation of plagioclase with proximity to the mantle derived from GRAIL data.

**2:30 p.m.**  
Song E. * Lemelin M.  Lucey P. G.  Greenhagen B. T.  
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**Lunar Crater Central Peak Mineral Maps — Near- and Thermal-Infrared Spectroscopy [#2486]**  
Mineral maps derived from the Kaguya Multiband Imager of lunar crater central peaks are augmented using Diviner CF maps to better represent plag/pyx/olv abundances.

**2:45 p.m.**  
Ohtake M. * Kobayashi S.  Takeda H.  Morota T.  Ishihara Y.  et al.  
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**Solidification of the Lunar Magma Ocean Observed by Mg Number and Thorium Abundance Correlation of the Highland Crust [#1578]**  
This study investigated correlation of Mg# and Th abundance on the lunar highland to understand solidification and composition of the lunar magma ocean.

**3:00 p.m.**  
Yamamoto S. * Nakamura R.  Matsunaga T.  Ogawa Y.  Ishihara Y.  et al.  
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**Global Distribution of High-Ca Pyroxene on the Lunar Highland Revealed by SELENE Spectral Profiler [#1285]**  
We report the global distribution of high-Ca pyroxene on lunar highland regions revealed by the Spectral Profiler onboard the lunar explorer SELENE (Kaguya).
High Fidelity Mineral Maps of Moscoviense Basin Integrating Thermal and Near Infrared Multispectral Imaging [#2641]  
We present new mineral maps of Moscoviense Basin. The mineralogical diversity present makes MB a compelling target for future exploration and sample return.

Characterisation of a Terrestrial Low-Iron Pink Spinel as an Analogue to Support Thermal Infrared Observations of the Moon [#1806]  
We show terrestrial sourced spinel can be used as a lunar analog and can be measured for the first time at thermal infrared wavelengths to support Diviner data.

3:45 p.m. Moriarty D. P. III * Pieters C. M.  
Evaluation of Stratigraphy at the South Pole-Aitken Basin: From Local to Regional [#2516]  
Several regions within SPA are analyzed with M³ spectral parameters to evaluate stratigraphy. Systematic variations in pyroxene composition are observed.

4:00 p.m. Crites S. T. * Lucey P. G. Norman J. A. Taylor G. J. Hawke B. R. et al.  
The Mafic Component of the Lunar Crust [#2126]  
We constrain the amount of mantle in the crust and the depth-diameter ratio of the largest basins using mineral mixing models and a small crater spectral survey.

4:15 p.m. Arnold J. A. * Glotch T. D. Lucey P. G. Song E.  
Comparison of M³ (VNIR) and Diviner (MIR) Data of Olivine-Bearing Regions of the Moon [#2470]  
We use lab and Diviner mid-IR data along with spectral mixture analysis of M³ data to characterize areas of the Moon that are olivine-bearing and pyroxene-poor.

4:30 p.m. Sun Y. * Li L.  
Global Investigation of Olivine Bearing Crater Central Peaks with M³ Images [#1653]  
Global investigation of olivine-bearing central peaks indicates that most of the olivine originates from plutonic events and sources of olivine may vary with depth.

Friday, March 21, 2014 [F552]  
MARS GLACIERS AND GROUND ICE  
1:30 p.m. Waterway Ballroom 4

**Chairs:** Joseph Levy  
Nadine Barlow

1:30 p.m. Stuurman C. M. * Osinski G. R. Brothers T. C. Holt J. W. Kerrigan M.  
SHARAD Reflectors in Utopia Planitia, Mars Consistent with Widespread, Thick Subsurface Ice [#2262]  
A large reflecting interface has been discovered in SHARAD data in Utopia Planitia. Analysis suggests an ice-rich layer ~100 m thick overlies the interface.

1:45 p.m. Levy J. S. * Fassett C. I. Schwarts C. Watters J. L. Head J. W.  
Estimating the Volume of Non-Polar Ice on Mars: Geometric Constraints on the Volume of Midlatitude Debris Covered Glaciers [#1600]  
We present a global inventory of the estimated volume of glacial landforms on Mars (LDA, LFV, CCF) that constrains the water mass of Amazonian glaciations.
2:00 p.m.  Kurokawa H. * Usui T.  Demura H.  Sato M.
* Thickness of Martian Ground Ice: Implication from Multi-Water-Reservoir Model [#1815]
Recent observations propose the existence of ground ice on Mars. Our model suggests that the thickness is at least a few hundred meters based on D/H data.

2:15 p.m.  Petitjean M. * Clifford S. M.  Costard F.
* Geomorphologic Evidence for the Presence of Massive Ground Ice in the Northern Plains of Mars [#2794]
Supporting the hypothesis of a global ice-rich permafrost on Mars, this geomorphologic study helps to better understand its structure and repartition.

2:30 p.m.  Parsons R. A. * Holt J. W.
* Determining the Age and Physical Properties of Martian Lobate Debris Aprons Using High-Resolution Topography, SHARAD Observations, and Numerical Ice Flow Modeling: A Case Study at Euripus Mons [#1484]
HRSC + SHARAD + ice flow model predicts 1° basal slope below an LDA in N. Euripus, constraining the ice rheology and age (~100 m.y.s for 5 mm ice grain size).

2:45 p.m.  Kargel J. S. *
* Glacial Alpine Erosion in Argyre, Mars: A Lunar Contrast and Terrestrial Similarity [#2467]
Argyre, unlike the lunar Orientale basin and like terrestrial glaciated mountains, has undergone deep erosion and deposition by warm-based glaciers.

3:00 p.m.  Soare R. J. * Conway S. J.  Dohm J. M.  El-Maarry M. R.
* Possible Hydraulic (Open-System) Pingos in and Around the Argyre Impact Basin, Mars [#1121]
Groups of small-sized mounds whose key characteristics and geological context are suggestive of open-system pingos on Earth occur in and around the Argyre impact basin, Mars.

3:15 p.m.  Barlow N. G. * Bodin M.  Geist M.  Landis M. E.
* The Influence of Volatiles on Crater Morphology in Arabia Terra, Mars [#1221]
Impact craters provide insights into the history of subsurface and surficial volatiles in Arabia Terra, Mars.

3:30 p.m.  Bramson A. M. * Byrne S.  Putzig N. E.  Mattson S.  Plaut J. J.  et al.
* Thick, Excess Water Ice in Arcadia Planitia, Mars [#2120]
We have used SHARAD subsurface reflections in conjunction with terraced craters to constrain the thickness and composition of an extensive layer of ice on Mars.

3:45 p.m.  Jawin E. R. * Head J. W.  Marchant D. R.
We review terrestrial paraglacial processes and geomorphology as an analog for young features found in martian craters associated with glaciation.

4:00 p.m.  Weiss D. K. * Head J. W.
* Noachian Highland Crater Degradation on Mars: Assessing the Role of Regional Snow and Ice Deposits in a Cold and Icy Early Mars [#1077]
We reevaluate the degradation state of Noachian highland craters to assess whether their degradation state can be attained in a cold and dry climate.

4:15 p.m.  Cassanelli J. P. * Head J. W.
* Firn Densification on Late Noachian Mars: Implication for Ice Sheet Formation and Thermal Characteristics [#1265]
We assess the densification of firm, predicted to accumulate during the Late Noachian period, and its implications for melting in response to transient heating.
GCM results for Late Noachian climates predict extensive ice accumulation in the southern highlands. We provide a model of ice sheets that may have existed then.

**Friday, March 21, 2014**

**SOLAR SYSTEM WORKINGS:**

**LINKING METEORITES TO PLANETARY BODIES AND PROCESSES**

1:30 p.m. Waterway Ballroom 5

**Chairs:**

Rhiannon Mayne  
Edward Scott

1:30 p.m. Scott E. R. D. * Bottke W. F. Marchi S. Delaney J. S.  
*How Did Mesosiderites Form and Do They Come from Vesta or a Vesta-Like Body?* [#2260]  
Mesosiderites may have formed beneath HEDs on Vesta following early impact of a molten metallic body and were then cooled slowly through 3.8 Ga.

*Oxygen Isotope Variations in Main Group Pallasites and HEDs* [#2390]  
High-precision O-isotope data of MG pallasites resolve them into two subgroups, high-$\Delta^{17}$O and low-$\Delta^{17}$O pallasites that have not been previously reported.

2:00 p.m. Lindsay F. N. Delaney J. S. Turrin B. D. Herzog G. F. Park J. et al.  
*Component Chronology of Kapeota: Ar-Ar Systematics* [#1969]  
Young $^{40}$Ar/$^{39}$Ar ages (0.63–1.25 Ga) of seven 3–10-µg feldspars from Kapeota straddle a reported crater count age (~1 Ga) of Vesta’s Rheasilvia Basin.

2:15 p.m. Hublet G. Debaille V. Wimpenny J. Yin Q.-Z.  
*Chronology of Differentiation and Magmatic Activity in 4-Vesta Using $^{26}$Al-$^{26}$Mg Model Age* [#2597]  
Al-Mg model ages were performed on eucrites and diogenites. The results show that differentiation of Vesta from a chondritic precursor occurred rapidly.

2:30 p.m. Mittlefehldt D. W. Peng Z. X. Mertzman S. A. Mertzman K. R.  
*Petrology and Geochemistry of Unbrecciated Harzburgitic Diogenite MIL 07001: A Window into Vestan Geological Evolution* [#1613]  
MIL 07001 is an unusual unbrecciated, olivine-bearing diogenite. Our petrological and compositional studies aim to put it in vestan differentiation context.

*Bunburra Rockhole: Exploring the Geology of a new Differentiated Basaltic Asteroid* [#1650]  
We present new O- and Cr-isotope and bulk chemistry for Bunburra Rockhole. It comes from a different parent than basaltic eucrites.

3:00 p.m. Sutton S. R. Wirick S. Goodrich C. A.  
*Ungrouped Achondrite NWA 7325: Titanium, Vanadium and Chromium XANES of Mafic Silicates Record Highly-Reduced Origin* [#1275]  
Titanium, V, and Cr XANES spectra of olivine and pyroxene in ungrouped achondrite NWA 7325 indicate a highly-reduced origin.
Oxygen Isotope Compositions of Mineral Separates from NWA 7325 Suggest a Planetary (Mercury?) Origin [#2215]  
Precise triple O-isotope work on major minerals from NWA 7325 supports the evidence that this meteorite belongs to a larger planetary body, could be Mercury.

3:30 p.m. Weber I. Morlok A. * Bischoff A. Hiesinger H. Helbert J.  
Mineralogical and Spectroscopic Studies on NWA 7325 as an Analog Sample for Rocks from Mercury [#1323]  
We investigated the petrology of the ungrouped achondrite NWA 7325 as an analog sample for rocks from Mercury with EMPA, SEM, FTIR, and Raman.

3:45 p.m. Kita N. T. * Sanborn M. E. Yin Q.-Z. Nakashima D. Goodrich C. A.  
The NWA 7325 Ungrouped Achondrite — Possible Link to Ureilites? Oxygen and Chromium Isotopes and Trace Element Abundances [#1455]  
NWA 7325 might be derived from a previously unsampled asteroid, which might have undergone a similar differentiation processes to the ureilite parent body.

4:00 p.m. Sanders I. S. * Scott E. R. D.  
Taking the Mystery out of Ureilites: Attributing Correlated Fe/Mg and $\Delta^{17}$O to Isotopically Heavy Ice in the Parent Body [#1877]  
Accretion of high $\Delta^{17}$O ice to the cold ureilite parent body may have led to the otherwise enigmatic correlation between $\Delta^{17}$O and Fe/Mg in ureilite olivine.

A Carbon-Rich Region in Ureilite Miller Range 091004 [#2304]  
Recent Antarctic ureilite find Miller Range 091004 contains an incredible carbon-rich region, and has important implications for ureilite petrogenesis.

4:30 p.m. Goodrich C. A. * Wilson L.  
Feldspathic Clast Populations in Polymict Ureilites: Determining the Compositions of Melts and the Mode of Melt Extraction on the Ureilite Parent Body [#1342]  
New data and modeling for feldspathic clasts in polymict ureilites constrain the compositions of melts and mode of melt extraction on the ureilite parent body.

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**Friday, March 21, 2014**  
**FORMATION OF HABITABLE WORLDS**  
**AND FATE OF HABITABLE ENVIRONMENTS**  
**1:30 p.m. Waterway Ballroom 6**

**Chairs:** Alexander Pavlov  
Aaron Burton

1:30 p.m. Johnson T. V. * Mousis O. Lunine J. I. Madhusudhan N.  
Exoplanet Habitability: Effects of Planetary Carbon Chemistry [#1438]  
The amount of water available beyond the snow line in exoplanet systems depends on the host star’s C/O in the circumstellar nebula.

1:45 p.m. Henderson B. L. * Gudipati M. S.  
Two-Color MALDI-TOF Detection of Complex Organics in Electron-Irradiated Astrophysical Ice Analogs [#2512]  
Bonds break, form, combine / Complexity from nothing / In the void of space.
The Effects of Thermal Metamorphism on the Amino Acid Content of the CI-Like Chondrite Y-86029

The CI-like chondrite Y-86029 was found to be depleted in amino acids compared to other CI chondrites, likely due to metamorphism in the presence of water.

Stable nitrogen-isotopic compositions of amino acids from CI1 Yamato 980115 and CO3 Allan Hills A77003 and the implications for their formation pathways.

A high power laser shock experiments of chondrites at 400 GPa were conducted. The produced volatiles included H2, C1–C6 hydrocarbons, and S-bearing compounds.

The biosynthesis pathways of the 20 amino acids of the genetic code were investigated to provide more information into the origin of the standard genetic code.

Reactive transport modeling is applied to high-P martian rocks to gain insight into martian phosphate availability and the implications for potential life.

Formation of aqueous minerals through the alteration of igneous rocks and its implications for the past habitability of Mars.

Investigating the use of ion-selective optical sensors for characterizing biologically significant water chemistry in extreme environments.

We describe detections of phyllosilicates and carbonates in CRISM data by a new method of discrimination of minerals and we reconstruct a crustal cross-section.

The SAM instrument suite on the Curiosity Rover detected both reduced and oxidized Ni-bearing compounds at Yellowknife Bay in Gale Crater.
*Sam Measurements of Krypton and Xenon on Mars [#2366]
SAM has measured krypton and xenon in the atmosphere of Mars from the Curiosity rover using a semi-static operating mode of its quadrupole mass spectrometer.

4:30 p.m. Pavlov A. A. * Eigenbrode J. Glavin D. Floyd M. 
Rapid Degradation of the Organic Molecules in Martian Surface Rocks Due to Exposure to Cosmic Rays. Severe Implications to the “Extinct” Life on Mars [#2830]
Organic molecules are degraded effectively by cosmic rays in the top few meters of the martian rocks. SiO$_2$ matrix greatly increases the rate of degradation.
POSTER SESSION I
Tuesday, 6:00 p.m.  Town Center Exhibit Area

EDUCATION AND PUBLIC OUTREACH:
SCIENTIST ENGAGEMENT IN E/PO — A PLETHORA OF POSSIBILITIES  [T601]

Grier J. A.  Buxner S. R.  Hsu B.  Shupla C.  Dalton H.  et al.
POSTER LOCATION #1
Engaging Scientists in NASA Education and Public Outreach: Resources and Tools for Scientists  [#2087]
A host of resources and tools have been developed by the NASA SMD Planetary Sciences Forum and its partners to facilitate scientist involvement in E/PO efforts.

Buxner S. R.  Grier J.  Gross N.  Low R.  Schultz G.  et al.
POSTER LOCATION #2
Supporting Scientist Engagement in Education and Public Outreach: Resources for Higher Education  [#2373]
We present resources for higher education faculty provided by the NASA SMD Forums including collections of instructional resources and professional development.

Boonstra D.  Ristvey J.  Weeks S.  Klug Boonstra S.  Buxner S.  et al.
POSTER LOCATION #3
NASA SMD Planetary Science E/PO Forum Efforts to Support Scientists in Reaching K–12 Formal Education Audiences  [#2916]
Planetary science has provided many opportunities for scientists and E/PO professionals to increase their understanding of best practices in K–12 education.

LaConte K.  Jones A.  Bartolone L.  Nichols M.
POSTER LOCATION #4
Engaging Scientists in NASA Education and Public Outreach: Informal Science Education and Outreach  [#2682]
Scientists! Come learn! / Informal education: / How to get involved!

Klug Boonstra S.  Boonstra D. W.  Ristvey J.  Shipp S.
POSTER LOCATION #5
NASA Data in Education: Opportunities and Challenges for Scientists and NASA’s Education and Public Outreach Community  [#2914]
NASA scientists have a great opportunity to provide data for K–12 classrooms to help enable more authentic science learning.

EDUCATION AND PUBLIC OUTREACH: USING PLANETARY DATA AND RESOURCES FOR STUDENT AND CITIZEN SCIENTIST ENGAGEMENT  [T602]

POSTER LOCATION #6
Pursuing STEM: How Mars Exploration Student Data Teams (MESDT) Students are Preparing for Their Future in Science, Technology, Engineering and Math (STEM) Related Careers Through Authentic Mars Research  [#1557]
Through the MESDT program, students learn how to conduct research using authentic NASA data and learn how they can pursue STEM-related careers.

Million C.  Sullivan R.  St. Clair M.
Hayes A.  NASA RPIF Network Node Directors and Man
POSTER LOCATION #7
Extraterrestrial Virtual Field Experience  [#1568]
The Extraterrestrial Virtual Field Experience is an educational activity that places users in the first person role of a space mission science team member.

POSTER LOCATION #8
How We Used NASA Lunar Set and NSSDC Lunar Orbiter Photographs in a Multi-Hierarchical Lunar Sample and Stratigraphical Layer Study  [#1426]
NASA lunar sample set and NSSDC Lunar Orbiter photographs were used to arrange important lunar events into a structural hierarchy multilevel system.
Howes N. Fisher P-Y. Roche P. Miles R. **POSTER LOCATION #9**

*Cometary Body Pro-AM Collaborations with the Faulkes Telescopes, and the Benefit to Education, Science and Outreach* [#2497]

Amateur astronomers have increasingly been working with schools suggesting projects that have provided valuable scientific input to professional astronomers.

Gay P. L. Lehan C. Moore J. Bracey G. Gugliucci N. **POSTER LOCATION #10**

*CosmoQuest: A Cyber-Infrastructure for Crowdsourcing Planetary Surface Mapping and More* [#2927]

The CosmoQuest virtual research facility crowdsources the mapping of craters on rocky bodies. Results show they are accurate and motivated to learn.

Otake H. Masuda K. Ishihara Y. Kageyama K. Fujita T. et al. **POSTER LOCATION #11**

*Data Utilization Promotion and Education/Public Outreach Activity of SELENE (Kaguya)* [#2801]

This is an introduction of our activity for education/public outreach about the Japanese SELENE mission.

Chang G. W. Day B. H. Law E. S. **POSTER LOCATION #12**

*Moon Tours: Mobile Applications for Exploring the Moon* [#2156]

Moon Tours, the Lunar Mapping and Modeling Portal (LMMP) mobile application, makes Moon information accessible to people of all ages for lunar exploration.

Graff P. V. Allen J. Willis K. J. Runco S. **POSTER LOCATION #13**

*Using NASA-Unique Lunar Sample Disks and Resources to Inspire and Promote Scientific Inquiry* [#2662]

Through the use of NASA lunar sample disks and resources, NASA has the unique ability to prepare and inspire the next generation of scientific explorers.

Crown D. A. Buxner S. R. Anderson S. W. Baldridge A. M. Berglin R. S. et al. **POSTER LOCATION #14**

*Instructional Rock Kits for Earth and Space Science Education* [#2090]

The Planetary Science Institute has developed four instructional rock kits to illustrate core concepts in Earth and space science for use in K–12 classrooms.

**EDUCATION AND PUBLIC OUTREACH:**

**ENGAGING THE PUBLIC THROUGH DIVERSE VENUES AND MEDIA** [T603]

Shupla C. LaConte K. Shipp S. Shaner A. Halligan E. et al. **POSTER LOCATION #15**

*Sharing Mission Resources Through Libraries: A New Model* [#2261]

LPI is exploring a new training model for librarians, repeating workshops in regional clusters with returning participants serving as librarian mentors.

Bleacher L. V. Meinke B. Soeffing C. Hauck K. Spitz A. **POSTER LOCATION #16**

*NASA Science4Girls and Their Families: Connecting Local Libraries with NASA Scientists and Education Programs to Engage Girls in STEM* [#1767]

NASA Science4Girls and Their Families utilizes research-based approaches to effectively engage girls in NASA STEM content in partnership with local libraries.


*OSIRIS-REx, JWST, and Girl Scouts Partner with Local Libraries for Women’s History Month and Beyond* [#2475]

The OSIRIS-REx mission partnered with JWST, the Girl Scouts of Southern Arizona, and the Pima County Library System beginning with Women’s History Month in 2013.

Jones A. J. P. Hsu B. C. Bleacher L. V. Alima Ali N. Hauck K. et al. **POSTER LOCATION #18**

*Invisible Mars: The MAVEN Education and Public Outreach Science on a Sphere Program* [#2691]

The MAVEN Invisible Mars SOS program is designed to help the public better understand the story of water on Mars, and how we are learning more about it.
Albin E. F. M.  
2014 Opposition of Mars: Educational Opportunities and Public Outreach [#2932]  
Mars opposition timeline and educational opportunities are considered, with emphasis on programs presented at Fernbank Science Center in Atlanta, Georgia.

Boros-Óláh M.  
Roving to Mars form Pannon Csillagda — Planetary Science Education and Outreach in Hungary [#1387]  
Planetary science related outreach methods at a new institute are presented, where exhibitions, planetaria video, and telescopic demonstrations are used together.

Cohen J. P.  Sable J.  Ding W.  Li R.  Stepinski T.  
Mars and Beyond: Human Spaceflight at the Museum of Science Boston [#1643]  
In the third year of this ongoing outreach project we grew to include many speakers from the community and focused on the challenges to human spaceflight.

Artistic Research on Freedom in Space and Science [#2808]  
This ArtScience Research project with support from ESA/ESTEC and ILEWG describes an artistic biodome installation as paradigm for freedom in space and science.

Molaro J. L.  Keane J. T.  
The Art of Planetary Science: An Exhibition — Bringing Together the Art and Science Communities to Engage the Public [#1397]  
We will present “The Art of Planetary Science,” an exhibition bringing art and science communities together to celebrate the beauty and elegance of science.

Morris M. A.  Garvie L. A. J.  Dock M.  Hines R.  Wadhwa M.  
The Fruitful Marriage of Art and Science [#2832]  
We describe three upcoming exhibitions resulting from partnership with the City of Tempe/Tempe Center for the Arts.

Dyches P.  Goods D.  Kirchner D.  Kurth W.  
Hi Juno: Contacting a Passing Spacecraft with Amateur Radio [#1530]  
A public engagement activity in which NASA’s Jupiter-bound Juno spacecraft was sent a simple message via amateur radio.

Kelley S. P.  Rothery D. A.  Schwenzer S. P.  
Moons: A MOOC and an Open Educational Resource with Games and a Microscope [#1340]  
We have created a media-rich Massive Open On-line Course (MOOC) based on a theme of moons of the solar system, including on-line activities, games, and videos.

Planetary Lake Lander: An Online E/PO Campaign Using Social Media Tools to Address the General Public [#2419]  
Using social media to share our excitement for a robotics, climate change, and adaptive science project relevant to Titan’s exploration from the Chilean Andes.

Spitz A. H.  Dykhuis M.  Platts S.  Keane J. T.  Roper H.  et al.  
OSIRIS-REx Launches 321Science — Engaging the Public in Science and Engineering Through YouTube Videos [#2464]  
The OSIRIS-REx mission launched OSIRIS-REx Presents 321Science, a series of short videos on YouTube in December 2013. This is our core outreach product.
**EDUCATION AND PUBLIC OUTREACH: EVALUATING OUR IMPACT**

**POSTER LOCATION #29**

Shebby S. M.  Shipp S.  Buxner S. R.


This presentation will include formative and summative findings from an evaluation of the Planetary Science SEPOF in their work to coordinate the E/PO community.

**POSTER LOCATION #30**

Hsu B. C.  Buxner S.  Shaner A.  Wenger M.

*InOMN Coordinating Committee Lessons Learned from 4 Years of International Observe the Moon Night [#2657]*

InOMN amazes / Come on out and see the Moon / We like what we do!

**POSTER LOCATION #31**


*Earth Camp: Using Satellite Images to Explore Earth Change and Model Scientific Practices [#2798]*

Earth Camp engages participants in exploring their world through expert-guided investigations and participant-driven field and remote sensing studies.

**POSTER LOCATION #32**

Horodyskyj L. B.  Buxner S. R.  Ben-Naim D.  Semken S.  Anbar A. D.

*Transforming the Online Classroom via an Innovative Astrobiology Course [#1984]*

Arizona State University’s Habitable Worlds, an online intro lab course, introduces students to the breadth of science in an innovative, interactive manner.

**EVOLUTION OF THE PROTOSOLAR DISK: MODELS AND NUCLEOSYNTHETIC SIGNATURES**

**POSTER LOCATION #33**

Morlok A.  Anand M.  Lisse C. M.  Mason A. B.  Bullock E. S.  et al.

*Dust from Planet Formation in Debris Disks: A Comparison with Planetary Materials [#1770]*

We compare infrared spectra of astronomical observations of dust from planet formation in debris disks with laboratory spectra of planetary materials.

**POSTER LOCATION #34**

Cuzzi J. N.  Hartlep T.  Weston B.  Shariff K.

*Turbulent Concentration of mm-size Particles in the Protoplanetary Nebula: Scale-Dependent Multiplier Functions [#2764]*

Giant tornados spin gently / Dust clouds form / Look! primitive bodies.

**POSTER LOCATION #35**

Delaney J. S.

*Mixing of Nebular Components in the Earliest Solar System and “The Road Not Taken” [#2155]*

Very early hydration reactions between ices and silicates define oxygen-isotope signatures, alkali depletion, and redox state of primitive meteorite components.

**POSTER LOCATION #36**

Fischer-Gödde M.  Schwander D.  Ott U.  Kleine T.

*Ruthenium Isotope Composition of Allende Refractory Metal Nuggets [#2062]*

Ruthenium-isotope data of Allende refractory metal nuggets show a deficit in $r$-process nuclides and record an early isotope heterogeneity of the solar nebula.

**POSTER LOCATION #37**

Steele R. C. J.  Boehnke P.

*Titanium Isotope Source Relations and the Extent of Mixing in the Early Solar System Examined by Independent Component Analysis [#1287]*

We have used independent component analysis to examine the nucleosynthetic source relationships between chondritic hibonite inclusions and bulk chondrites.
Bermingham K. R.   Meyer B.   Mezger K.  
*POSTER LOCATION #38*

*Origins of Nucleosynthetic Isotopic Heterogeneity in the Solar System [2252]*

Results from a time-dependent multi-reservoir mixing code are used to constrain the origin(s) of nucleosynthetic isotope variations on the whole rock scale.

Brennecka G. A.   Borg L. E.   Wadhwa M.  
*POSTER LOCATION #39*

*The Gadolinium and Dysprosium Isotopic Composition of a Supernova Injection Inferred from Allende CAIs [2280]*

We present the first Gd and Dy isotopics of CAIs, helping to define the isotopic fingerprint of a supernova injection at the start of the solar system.

Chen J. H.   Papanastassiou D. A.  
*POSTER LOCATION #40*

*Endemic 64Ni Effects in Allende Ca-Al-Rich Inclusions [2327]*

New, large 64Ni isotope anomalies in non-FUN Allende CAI give evidence of correlated effects for n-rich isotopes, for all elements Ca-Zn, from Type Ia supernovae.

*POSTER LOCATION #41*

*Evidence for Deposition of Interstellar Material on the Lunar Surface [1778]*

A high concentration of 60Fe suggests the deposition of supernova debris on the lunar surface.

*POSTER LOCATION #42*

*Strontium Isotope Heterogeneity Within Single CAI from Allende [1913]*

We performed Sr-isotope measurement for a single CAI grain with mineral description to discuss the relationship between mineralogy and Sr-isotopic composition.

Fukami Y.   Yokoyama T.   Okui W.  
*POSTER LOCATION #43*

*Tellurium Isotope Anomaly in Acid Resistant Fraction of Allende Meteorite [1663]*

We present a Te-isotope anomaly in an acid-resistant fraction of Allende and discuss the origin of the isotope anomaly.

**STRUCTURE AND EVOLUTION OF SOLAR SYSTEMS**  

*POSTER LOCATION #45*

*High-Resolution Oscillator Strength Measurements of the v’ = 0,1 Bands of the B–X, C–X, and E–X Systems in Five Isotopologues of Carbon Monoxide [1249]*

Absorption measurements for several long-wavelength isotopic CO bands show very weak dependence on isotope, consistent with the CO self-shielding hypothesis.

Chakraborty S.   Yanchulova P.   Thiemens M. H.  
*POSTER LOCATION #46*

*Role of Symmetry in Mass-Independent Oxygen Isotopic Composition in Laboratory Synthesized Silicates [2387]*

Oxygen-isotope data from laboratory experiments and model results of silicate synthesis through gas phase reaction demonstrating slope 1 as that of CAIs.

*POSTER LOCATION #47*

*Are Organic Macromolecules in Meteorites Formed Within the Solar System? [2452]*

New VUV photolysis data of N2 along with model simulation results are presented deciphering the high 15N values in organic phases in meteorites.

Kimery J. B.   Matthews L. S.   Hyde T. W.  
*POSTER LOCATION #48*

*Photophoretic Force on Fractal Aggregates in a Protoplanetary Disk [2073]*

Photophoresis can sort dust in a PPD by composition. The force acting on and drift velocity of fluffy aggregates is smaller than for spheres of the same mass.
*POSTER LOCATION #49*

**Carbon-Rich Planet Formation Below the Snowline in Protoplanetary Disks [#1089]**

We explore the possibility of forming a giant planet with an atmospheric C/O ratio higher than that of its parent star.

Tóth Z. Nagy I.  
*POSTER LOCATION #50*

**Constraints on the Dynamical Stability of a Planet in the Habitable Zone of the Star Gliese 581 [#1489]**

We investigate the dynamical stability of a planet in the HZ of Gliese 581. A low-mass planet could be stable in the HZ on circular or a near-circular orbit.

Varga T. N. Szabó Gy. M. Simon A.  
*POSTER LOCATION #51*

**Constraining the Orbital Alignment of KOI-1152.01: A Short Period Transiting Companion with High Obliquity and Eccentric Orbit [#2603]**

We aim to reconstruct the sky-projected orbital obliquity of the transiting Kepler companion KOI-1152.01 by utilizing the spot activity of its host star.

*POSTER LOCATION #52*

**On the Lower Radius Limit of Exoplanets [#1636]**

We consider the maximum density of an chthonian (stripped core) exoplanet. Impurities (Si, S) reduce bulk density almost as much as having a silicate mantle.

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**REFRACTORY INCLUSIONS IN CHONDRITES [#T607]**

Komatsu M. Fagan T. J. Mikouchi T.  
*POSTER LOCATION #53*

**TEM Study of LIME Silicates in Y-81020 Primitive Chondrite [#1852]**

TEM study combined with SEM and EPMA analyses shows that MnO and FeO in AOA olivines can be sensitive indicators of both condensation and alteration conditions.

Han J. Brearley A. J.  
*POSTER LOCATION #54*

**Hibonite-Spinel Inclusions from the ALH A77307 CO3.0 Chondrite: A FIB/TEM Approach [#2125]**

We describe the microstructure and textural relationships of refractory phases in hibonite-spinel inclusions from ALH A77307 by utilizing FIB/TEM.

Ma C. Krot A. N. Nagashima K. Tschauner O.  
*POSTER LOCATION #55*

**Discovery of a New Scandium Aluminate Mineral, Ca$_2$Sc$_6$Al$_6$O$_{20}$: An Ultra-Refractory Phase in Refractory Inclusions from Murchison and Vigarano [#1196]**

We present a new refractory mineral, Ca$_2$Sc$_6$Al$_6$O$_{20}$ with P-1 rhornite structure. It formed in an $^{16}$O-rich reservoir, likely as a condensate or evaporative residue.

Bullock E. S. Bouvier A. Wadhwa M. MacPherson G. J. Kita N. T.  
*POSTER LOCATION #56*

**Mineralogy and Petrology of an Unusual Large Type A CAI from NWA 6991 [#1919]**

Pristine CAIs / Canonical isotopes / Remelted early.

*POSTER LOCATION #57*

**In Situ Trace Element Analysis of an Allende Type B1 CAI: EK-459-5-1 [#2523]**

We present in situ major and trace element analyses of a Type B1 CAI from Allende. We discuss the causes for coexisting Tm and Yb anomalies in CAI phases.

*POSTER LOCATION #58*

**Stable Magnesium Isotope Variation in Melilite Mantle of Allende Type B1 CAI EK 459-5-1 [#2874]**

Stable Mg-isotopic profiles of two melilite mantle transects are presented along with a petrographic discussion of a type B1 CAI of Allende.

Shornikov S. I. Yakovlev O. I.  
*POSTER LOCATION #59*

**A Study of Complex Gaseous Oxides over the CaO–MgO–Al$_2$O$_3$–TiO$_2$–SiO$_2$ Melts [#1624]**

We have considered the regularities of complex gaseous oxides over the CMATS–melts at the redox conditions and the condensed phase changes at evaporation.
Ireland T. R. Sapah M. S. Avila J. N. Holden P. Amelin Y. et al. POSTER LOCATION #60
Oxygen Isotope Compositions of CAI from NWA 4502 CV3 Chondrite [#1671]
Oxygen-isotopic compositions have been measured from CAI from the NWA 4502 CV3 chondrite. The range in oxygen isotopes is similar to other CV3 chondrites.

Daly L. Bland P. A. Dyl K. A. Forman L. V. Ryan C. G. POSTER LOCATION #61
In Situ Analysis of Refractory Metal Alloys in Carbonaceous Chondrites: Implications for Early Solar System Processes [#2071]
RMNs have been assumed to be uniquely associated with CAIs. Here we present evidence that RMNs are associated with all components of carbonaceous chondrites.

Williams C. D. Mendybaev R. A. Ushikubo T. Bullock E. S. Janney P. E. et al. POSTER LOCATION #62
Mass-Dependent Mg and Si Isotopic Fractionation of Allende FUN CAI CMS-1: Implications for Thermal and Chemical Evolution of the Early Solar System [#2146]
In situ Mg-isotopic data for CMS-1 are reported along with a new set of vacuum experiments that were performed on its estimated precursor composition.

CHONDRULES, METALS, AND SULFIDES [T608]

Singerling S. A. Brearley A. J. POSTER LOCATION #63
Iron-Nickel Sulfide Exsolution Textures in CM2 Carbonaceous Chondrites [#2132]
We present textural groupings of sulfides in the CM2 meteorites based on their fine-scale exsolution features.

Zhang A. C. Itoh S. Yurimoto H. Hsu W. B. Guan Y. B. et al. POSTER LOCATION #64
Origin of P, O-Rich Sulfide in CM Chondrites: More Constraints from Mineralogy and Oxygen Isotopic Compositions [#1360]
P-O-rich sulfide in CM chondrites is an object whose origin is still a subject of debate. Here, we report its mineralogical features and O-isotope compositions.

Lehner S. W. Nemeth P. Petaev M. I. Buseck P. R. POSTER LOCATION #65
Redox State of Partly Sulfidized EH3 Chondrule Constrained by Fe Exsolution from Olivine [#2196]
Exsolution of chromite and Fe metal from partly sulfidized forsterite constrains chondrule conditions to above 1700 K with log $f_{O_2}$ changing from IW-2 to -7.

Archer G. J. Ash R. D. Bullock E. S. Walker R. J. POSTER LOCATION #66
Highly Siderophile Elements and $^{187}$Re-$^{187}$Os Isotopic Systematics of the Allende Meteorite Record both Primary Nebular and Late-Stage Parent Body Alteration Processes [#1463]
The highly siderophile elements constrain formation processes of chondritic components. The Re-Os system provides evidence for Allende open-system behavior.

Chaumard N. Humayun M. Zanda B. Hewins R. H. POSTER LOCATION #67
Cooling Rate of a Type I Chondrule from the Renazzo CR2 Chondrite Inferred from Cu and Ga Diffusion Profiles in Metal Grains [#2448]
We determined the cooling rate of a Type I chondrule in Renazzo to provide additional constraints on the heating mechanisms proposed for chondrule formation.

Ustunisik G. Ebel D. S. Nekvasil H. POSTER LOCATION #68
Vapor Evolution During Degassing of Alkalis in Cl-Free and Cl-Bearing Melts: Experimental Insights into Chondrule Formation [#2171]
Cl-free and Cl-bearing heating/degassing experiments ( at <1 bar for 10 min, 4 h, 6 h) on Al3509 chondrule melt reveals the systematic role of Cl on alkali volatility.
Cuvillier P.  Chaumard N.  Leroux H.  Zanda B.  Hewins R. H.  et al.  POSTER LOCATION #69  
A TEM Study of Exsolution in Ca-Rich Pyroxenes from the Paris Meteorite: Determination of Type I Chondrule Cooling Rates [#1711]

Type I chondrules cooling rates were determined by a TEM study of exsolution in Ca-rich pyroxenes revealing different cooling rates, as for type II chondrules.

Ishida H.  Itoh S.  Yurimoto H.  Nakamura T.  POSTER LOCATION #70  
Oxygen Isotopic Compositions of Chondrules from the Primitive CV3 Chondrite RBT 04143 [#1673]

We report the results of mineralogical and oxygen-isotopic studies of chondrules from the primitive CV3 chondrite Roberts Massif 04143.

Needham A. W.  Nakamura-Messenger K.  Rubin A. E.  Choi B.-G.  Messenger S.  POSTER LOCATION #71  
Timing of Formation of a Wasonite-Bearing Chondrule [#2162]

Chronologically-relevant Mg-isotope data are presented for a chondrule bearing the only known natural occurrences of wasonite, ideally stoichiometric TiS.

Okui W.  Yokoyama T.  Usui T.  Iwamori H.  Uno M.  POSTER LOCATION #72  
Strontium Stable Isotope Anomalies in Allende Chondrules [#2560]

We simultaneously determine the extent of nucleosynthetic anomalies and mass-dependent fractionation for Sr in chondrules from Allende.

Chaumard N.  Humayun M.  Zanda B.  Hewins R. H.  POSTER LOCATION #73  
Igneous Differentiation Preserved in a Large Isolated Metal Grain from the Renazzo CR2 Chondrite [#2469]

Despite solid-state secondary processes, a metal grain in Renazzo displays igneous features formed by the fractional crystallization of a CR-type liquid metal.

Ziegler K.  Agee C. B.  Connolly H. C. Jr.  POSTER LOCATION #74  
The Oxygen Isotope Systematics of the L3.00 Ordinary Chondrite NWA 7731, and a Comparison to LL3.00 Semarkona [#2468]

We present oxygen-isotope data on the first and only approved L3.00 chondrite, NWA 7731, and compare it with oxygen-isotopic systematics in other UOCs.

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EARLY SOLAR SYSTEM CHRONOLOGY  [T609]

Amelin Y.  Merle R. E.  Yin Q. Z.  Yamashita K.  Nagashima K.  et al.  POSTER LOCATION #75  
The Potential of Multi-Step Dissolution in Pb Isotopic Dating of Individual Chondrules [#2646]

Step leaching allows Pb-isotopic dating individual chondrules containing “insoluble” initial Pb by reducing the Pb-isotopic system to a two-component mixture.

Tang H.  Dauphas N.  POSTER LOCATION #76  
$^{60}$Fe-$^{60}$Ni Systematics in Semarkona Chondrules and Sahara 99555: New Constraint on $^{60}$Fe in the Early Solar System [#1529]

We present the chronological application of a $^{60}$Fe-$^{60}$Ni system to constrain the time of chondrule formation on Semarkona and internal isochron on Sahara 99555.

Telus M.  Huss G. R.  Ogliore R. C.  Nagashima K.  Tomkins A.  POSTER LOCATION #77  
Synchrotron XRF Mapping of Fe, Ni and Other Elements in UOC Chondrules: Implications for Interpreting $^{60}$Fe-$^{60}$Ni Data [#2559]

We collected high-resolution XRF maps of chondrules to evaluate whether the $^{60}$Fe-$^{60}$Ni system remained closed in UOC chondrules.
Liu M.-C.  
*Prolonged Irradiation as a Possible Solution for the Decoupling of Be-10 and Ca-41 in Meteoritic Refractory Inclusions [1637]*
The production of $^{41}\text{Ca}$ by prolonged energetic charged particle irradiation was evaluated to understand the decoupling between $^{41}\text{Ca}$ and $^{10}\text{Be}$.

Paque J. M., Burnett D. S., Beckett J. R., Guan Y.  
*CAL Refractory Lithophile Trace Element Distributions: Implications for Radiogenic Isotopes [2176]*
We deconvolve inclusion contributions from melilite for refractory elements. Be in melilite reflects fractional crystallization, favorable for isotope analysis.

*Silica Excess in Anorthitic Plagioclase from Type 3.00 Chondrite Chondrules: Evidence for Retaining Primary $^{26}\text{Al}-^{26}\text{Mg}$ Systematics [1187]*
The presence of excess Si in An-rich chondrule plagioclase indicates retention of primary crystallization features, meaning Al-Mg isotope systematics are sound.

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**SAMPLE CHARACTERIZATION TECHNIQUES [T610]**

Mann P., Cloutis E. A.  
*Development of a New Technique to Acquire Diffuse Reflectance Spectra from Single Mineral Grains [2349]*
Here we report our progress of developing methodologies required for collecting a diffuse reflectance spectrum of an individual mineral grain.

Fries M., Welzenbach L.  
*Rapid Classification of Ordinary Chondrites Using Raman Spectroscopy [2519]*
The unclassified / Those ordinary chondrites / Photons will name them.

Freeman P. M., Ishikawa S. T., Gulick V. C.  
*Automated Classification of Geological Samples Using High Resolution Macro Images [2739]*
We re-imaged our rock sample database at higher magnification and resolution to test potential improvements of our algorithms to classify igneous rocks.

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**PRESOLAR, INTERPLANETARY, AND COMETARY DUST [611]**

Davidson J., Nittler L. R., Alexander C. M. O’D., Stroud R. M.  
*Presolar Materials and Nitrogen Isotope Anomalies in the Unique Carbonaceous Chondrite Miller Range 07687 [1376]*
We report high presolar grain abundances (O- and C-anomalous) in the carbonaceous chondrite MIL 07687 indicating that it is of very low petrographic type.

Liebig B., Liu M. C.  
*A Search for Presolar Grains in the Murchison Meteorite [1631]*
The recently established Cameca NanoSIMS 50L ion probe was used to search for grains of presolar origin in a slab of the Murchison meteorite.

*Chromium-54 Carriers in a Tagish Lake Residue: A NanoSIMS Study [1195]*
We found four grains with $^{54}\text{Cr}$ excesses up to five times solar in a Tagish Lake residue. They may account for the isotopic variations of chondrites.
Liu N.  Gallino R.  Bisterzo S.  Davis A. M.  Savina M. R.  et al.  
P
POSTER LOCATION #88

Zirconium Isotope Abundances in Single Mainstream SiC Grains and the $^{13}$C Pocket Structure in AGB Models [#1292]

We compare previous single mainstream SiC grain data with postprocessing AGB nucleosynthesis model predictions with different $^{13}$C pockets for Zr-isotope ratios.

Fujiya W.  Hoppe P.  Zinner E.  Pignatari M.  Herwig F.  
P
POSTER LOCATION #89

A Born-Again AGB Star Origin of Type AB Silicon Carbide Grains Inferred from Radiogenic Sulfur-32 [#1515]

We found presolar SiC grains of Type AB with $^{32}$S enrichments. It is likely that these grains originate from born-again AGB stars.

Jadhav M.  Nagashima K.  Huss G. R.  
P
POSTER LOCATION #90

A SIMS Trace Element Study of Presolar Graphite Grains from Orgueil [#1015]

We present SIMS trace-element data (Mg, Si, Ca, Sc, Ti, V, Fe, Ni, Rb, Sr, Y, Zr, Nb) for low-density graphite grains from Orgueil.

Monson N. N.  Morris M. R.  Young E. D.  
P
POSTER LOCATION #91

New Measurements of Silicon Isotope Ratios Across the Galaxy with Implications for Galactic Chemical Evolution [#2689]

Reporting on the first new radio astronomy measurements of silicon isotope ratios across the galaxy in nearly 30 years.

Yu T.  Meyer B. S.  Fedkin A. V.  Grossman L.  
P
POSTER LOCATION #92

Condensation in Ejecta from Dense Thermonuclear Supernovae [#2247]

When dense, neutron-rich layers of Type Ia supernovae mix with unburned oxygen, they can condense perovskite, a possible carrier of $^{48}$Ca and $^{50}$Ti.

Ishizuka S.  Kimura Y.  Sakon I.  
P
POSTER LOCATION #93

Evolving the 10 $\mu$m Band of Silicates Nanoparticles During Homogeneous Nucleation and Subsequent Growth [1598]

We developed a new IR technique directly comparable to astronomical observations and investigated spectra of as-grown free-flying cosmic dust analogues.

Heck P. R.  Rout S. S.  Pellin M. J.  Davis A. M.  Isheim D.  et al.  
P
POSTER LOCATION #94

Atom-Probe Tomography in Cosmochemistry [1811]

Atom-probe tomography is an analytical method that has considerable potential in cosmochemistry. We summarize results from nanodiamonds and presolar SiC.

Stephan T.  Davis A. M.  Pellin M. J.  Rost D.  Savina M. R.  et al.  
P
POSTER LOCATION #95

CHILI — The Final Stages of Building a Challenging Instrument [2242]

We have been designing and building CHILI at the University of Chicago, which is poised to perform well beyond the capabilities of previous RIMS instruments.

P
POSTER LOCATION #96

Development of an X-Ray Microcalorimeter for Spectroscopic Imaging and Trace Element Analysis of Cometary and Interstellar Particles Returned by Stardust [2635]

A microcalorimeter is being developed to measure trace elements in cometary and interstellar particles returned by Stardust.

Butterworth A. L.  Tyliszczak T.  Westphal A. J.  Gainsforth Z.  
P
POSTER LOCATION #97

Iron–L3 Spectroscopic Analysis of Stardust Interstellar Dust Candidate 11043,1,30 (Orion) [2746]

Characterizing Fe an interstellar dust particle by synchrotron X-ray absorption.
Bardin N., Slodzian G., Wu T.-D., Baklouti D., Dartois E. et al.  
POSTER LOCATION #98
*D/H Measurements in Ultracarbonaceous Antarctic Micrometeorites Using Polyatomic Ions with SIMS* [#2647]
We designed a calibration protocol for D/H ratios by NanoSIMS with polyatomic ions. We then applied it to analyze an ultracarbonaceous Antarctic micrometeorite.

Wiesman H., Floss C., Haenecour P., Wang A.  
POSTER LOCATION #99
*Search for Ultra-Carbonaceous Particles in the Interplanetary Dust Collection* [#1509]
A survey of “low Z” stratospheric particles typically classified as terrestrial contaminants identified several with textures and compositions similar to IDPs.

Henkel T., Lyon I. C.  
POSTER LOCATION #100
*Organic Material in Aerogel Samples from the Stardust Mission* [#2655]
High abundances of heterogeneously distributed organic material from the production process in the aerogel tiles hamper detection of cometary organic material.

Price M. C., Bridges J. C., Wozniakiewicz P. J., Hicks L. J.  
POSTER LOCATION #101
*Results from Raman Analyses of Thirty-Six Stardust Cometary Grains from Tracks 170, 176, 177, 178* [#1252]
A Raman spectroscopic study of four cometary tracks from the Stardust collector has revealed the presence of >36 subgrains (diameter ~1 µm) of varying composition.

Hicks L. J., Bridges J. C., Hansford G. M., Gurman S. J.  
POSTER LOCATION #102
*XRD Analyses of Stardust Tracks 176, 177, 178: Terminal Grains from Magnetite-Rich, Chondrite-Like Matrix* [#2051]
XRD, XAS of Track #178 shows terminal magnetite grains. Iron oxides in Stardust tracks are fragments of magnetite grains, perhaps from chondrite matrix material.

White A. J., Ebel D. S., Greenberg M.  
POSTER LOCATION #103
*Nondestructive Three-Dimensional Confocal Imaging and SXRF of Whole Stardust Tracks in Aerogel* [#2292]
We present optical LSCM and X-ray maps of Tracks 131, 143, and 169 for morphological and chemical analysis of Stardust materials.

Hu Z. W., Winariski R.  
POSTER LOCATION #104
*Nondestructive Mapping of Distinctive Features in a Likely Thermally Altered Interplanetary Dust Particle* [#2708]
Distinctive morphological, textural, and microstructural 3-D features are noninvasively uncovered on the nanoscale in a likely thermally altered IDP.

Frank D. R., Zolensky M. E., Le L.  
POSTER LOCATION #105
*Origins and Distribution of Chondritic Olivine Inferred from Wild 2 and Chondrite Matrix* [#2643]
Wild 2 and matrix olivine compositions reveal the diverse origins of KBO material: AOA s, rare relict grains, KBO processes, and chondrules from various regions.

Spring N. H., Busemann H., Crowther S. A., Gilmour J. D., Engrand C. et al.  
POSTER LOCATION #106
*Xenon in Antarctic Micrometeorites (AMMs) and Interplanetary Dust Particles (IDPs)* [#2923]
I will present Xe abundance and isotopic compositions from very small IDP and AMM samples.

Ogliore R. C., Gainsforth Z., Huss G. R., Nagashima K.  
POSTER LOCATION #107
*Reproducibility of Ion Probe Oxygen Isotope Measurements in Stardust Cometary Samples* [#2651]
We remeasured the O-isotopic composition of Stardust grains using the UH Cameca ims 1280 ion probe to investigate the contribution of systematic uncertainties.

Croat T. K., Floss C., Haas B. A., Burchell M. J., Kearsley A. T.  
POSTER LOCATION #108
*Survival and Condition of Micron-Scale Refractory Grains in Stardust-Analog Al Foil Craters* [#1508]
FIB-TEM studies of refractory Stardust analogs show that surviving crystalline material is better preserved in 1-µm-sized, single-grain impact Al foil craters.
Impacts on the Hubble Space Telescope Wide Field and Planetary Camera 2: Microanalysis and Recognition of Micrometeoroid Compositions [#1733]
Micrometeoroid remains can be identified by X-ray analysis of hypervelocity impact residues on an Al alloy plate coated by complex zinc orthotitanate paint.

Colaux J. L.  Grime G. W.  Palitsin V. V.  Jeynes C.  Webb R. P.  et al.  POSTER LOCATION #110
Micrometeoroid Impacts on the Hubble Space Telescope Wide Field and Planetary Camera 2: Ion Beam Analysis of Subtle Impactor Traces [#1727]
Ion beam (Particle Induced X-ray Emission, or PIXE) analysis shows subtle micrometeoroid impactor compositions on samples returned from the Hubble Space Telescope.

Ross D. K.  Anz-Meador P.  Liou J. C.  Opiela J.  Kearsley A. T.  et al.  POSTER LOCATION #111
Micrometeoroid Impacts on the Hubble Space Telescope Wide Field and Planetary Camera 2: Smaller Particle Impacts [#1514]
Small impacts on the HST-WFPC2 have been characterized using SEM, EDS, and PIXE analysis. The type of impactor was determined, when possible, using these data.

Kearsley A. T.  Grime G. W.  Colaux J. L.  Palitsin V. V.  Jeynes C.  et al.  POSTER LOCATION #112
Micrometeoroid Impacts on the Hubble Space Telescope Wide Field and Planetary Camera 2: Larger Particles [#1722]
Millimeter-scale impact features on the radiator of Wide Field and Planetary Camera 2 of the Hubble Space Telescope reveal diverse micrometeoroid compositions.

Price M. C.  Kearsley A. T.  Wozniakiewicz P. J.  Spratt J.  Burchell M. J.  et al.  POSTER LOCATION #113
Impacts on the Hubble Space Telescope Wide Field and Planetary Camera 2: Experimental Simulation of Micrometeoroid Capture [#1466]
Hypervelocity experiments using mineral powders validate analytical methods for recognition of micrometeoroid impacts on painted alloy surfaces in Earth orbit.

Matteini M.  Hauser N.  Cabaleri N.  Cuadro F. A.  Magaldi T. T.  et al.  POSTER LOCATION #114
Upper Jurassic Micrometeorites from Cañadón Asfalto Fm., Patagonia, Argentina [#2482]
The aim of this abstract is to present morphological and textural data of melted micrometeorites from sediments of the upper Jurassic Cañadón Asfalto basin.

Wozniakiewicz P. J.  Bradley J. P.  Price M. C.  Zolensky M. E.  Ishii H. A.  et al.  POSTER LOCATION #115
Initial Results from the Kwajalein Micrometeorite Collections [#1823]
Here we describe the Kwajalein micrometeorite collection, the preparation method required for their analysis, and report on the initial results.

EMERGING WORLDS: PLANETARY DIFFERENTIATION [T612]

Bennett N. R.  Fei Y.  POSTER LOCATION #116
The Effect of Thermal Gradients on the Major and Trace Element Distribution in Fe-Ni-O Melts: Implications for Chemical Redistribution During Planetary Accretion [#1273]
Fe-Ni-O melt subject to a thermal gradient develops a compositional profile. The magnitude of this profile helps describe element partitioning during accretion.

McDermott K. H.  Burchell M. J.  Cole M. J.  Price M. C.  POSTER LOCATION #117
Melting and Mixing of Fe/Ni Projectiles and Chondritic-Like Target Bodies During Impact [#1850]
Hypervelocity impact experiments set out to test the current formation theories for the silicate-bearing IIE iron meteorites.
Chabot N. L. Wollack E. A. McDonough W. F. Ash R.  
\textit{POSTER LOCATION #118}

\textit{The Effect of Light Elements in Metallic Liquids on Partitioning Behavior [\#1165]}

Partitioning behaviors in the Fe-Ni system were determined experimentally and used in new parameterization expressions for the S-, P-, and C-bearing systems.

Zhang H. Hirschmann M. M.  
\textit{POSTER LOCATION #119}

\textit{Effect of Pressure on Fe^{3+}/Fe^{2+} in Silicate Liquids, Accurate Determination of Fe^{3+}/Fe^{2+} in Silicate Glasses by Mössbauer Spectroscopy, and Applications to Magma Oceans [\#2442]}

We determine Fe^{3+}/Fe^{2+} accurately in silicate glasses and investigate the pressure effect on \(f_{O_2}\) in a magma ocean, with consequences for planetary differentiation.

Armstrong L. S. Hirschmann M. M. Stanley B. D. Jacobsen S. D.  
\textit{POSTER LOCATION #120}

\textit{Speciation and Solubility of C-O-H Volatiles in Reduced Basaltic Melts: Implications for Planetary Volcanism and Magma Oceans [\#2591]}

Most C in lunar and martian basalts may be contained in reduced CO-species; a potentially N- and C-bearing species is important for a terrestrial magma ocean.

Moore W. B. Simon J. I. Webb A. A. G.  
\textit{POSTER LOCATION #121}

\textit{Heat Pipe Planets [\#1951]}

When volcanism dominates heat transport, a terrestrial body enters a heat-pipe mode, in which hot magma moves through the lithosphere in narrow channels.

Davenport J. D. Longhi J. Neal C. R. Bolster D. Jolliff B. L.  
\textit{POSTER LOCATION #122}

\textit{Simulating Planetary Igneous Crystallization Environments (SPICEs): A Suite of Igneous Crystallization Programs [\#1111]}

Long-established, reliable programs for calculating magma evolution have been given a facelift and used for modeling the crystallization of Apollo 17 basalts.

\begin{center}
\textbf{Venus} \hspace{1cm} [T613]
\end{center}

Leung A. Ernst R. E. Samson C. Grosfils E. B.  
\textit{POSTER LOCATION #123}

\textit{Identifying Cryptic Magmatic Centres in the Galindo Region of Venus by Mapping Graben-Fissure Systems [\#1294]}

Radiating graben-fissure systems (dyke swarms) can identify cryptic magmatic centers, in other words, those with no obvious tectono-magmatic construct.

Grosfils E. B. Albright J. A. Baxter J. Ferrin P. C. McGovern P. J.  
\textit{POSTER LOCATION #124}

\textit{Using Mapping-Derived Quantitative Strain Estimates to Test Uplift Versus Dike Emplacement Models for Giant Radial Lineament System Formation on Venus [\#1506]}

We demonstrate a new technique for quantifying hoop strain at RFCs on Venus as a tool for testing whether their formation requires subsurface dike emplacement.

Prunty A. C. King S. D.  
\textit{POSTER LOCATION #125}

\textit{Modeling Venutian Resurfacing Mechanisms: Progressive Surface Volcanism Versus Catastrophic Mantle Overturtn, and a Comparison to Observed Venus Topography, Geoid, and Thermal Emissivity Anomalies [\#2147]}

We model catastrophic mantle overturn and progressive surface volcanism as end-member, global resurfacing mechanisms to infer the thermal evolution of Venus.

Matiella Novak M. A. Buczkowski D. L.  
\textit{POSTER LOCATION #126}

\textit{Determining Relative Ages of Structural Features Around Irnini Mons, Venus — A Comparison of Four Type Locations to Resolve the Timing of Cross Cutting Features [\#2569]}

An study of the timing of structures around Irnini Mons at 75 km/pixel resolution is likely to shed light on the deformation history of this region of Venus.
Kundargi R. K.  Hall P. S.  POSTER LOCATION #127
Geographic Patterns of Volcanism: Comparing Venus Coronae to Terrestrial Intra-Plate Volcanism [#2161]
Volatiles in diapers on Venus facilitate the creation of a buoyant and depleted residuum, distributing melting in a circular pattern and manifesting as coronae.

Lang N. P.  Thomson B. J.  Kelly N. J.  POSTER LOCATION #128
Possible Vent Alignments in Four Venusian Shield Fields: A Test of a MATLAB Statistical Tool [#2219]
We used a MATLAB-derived statistical tool to examine potential vent alignments in venusian shield fields. Results highlight shield field stress orientations.

Thomson B. J.  Lang N. P.  POSTER LOCATION #129
Unraveling the Emplacement History of Shield Fields Using Two Statistical Methods [#2347]
Two MATLAB models are presented for detecting anisotropy in venusian shield fields. The results will permit more insight into the shields' emplacement history.

Kelly N. J.  Lang N. P.  Thomson B. J.  POSTER LOCATION #130
An Examination of Four Venusian Shield Fields [#2884]
We have geologically mapped four shield fields on Venus. The poster will show the data collected from each location.

Li F.  Hao W. F.  Xu L. Y.  Yan J. G.  POSTER LOCATION #131
A Refined Gravity Field Model of Venus Based on Topography: VGM2013 [#1847]
We refined the venusian gravity by the residual terrain model (RTM) method in consideration of isostatic compensation correction.

Kukkonen S.  Aittola M.  Öhman T.  POSTER LOCATION #132
The Structural Control of Venusian Impact Crater Formation — Tectonic Case Studies [#2859]
Large diameters of coronae and uplifted annuli seem to favor the formation of dominating fracture patterns and the formation of venusian polygonal impact craters.

Ferrari S.  Helbert J.  Maturilli A.  Müller N.  Dyar D. M.  et al.  POSTER LOCATION #133
The Surface of Venus After VIRTIS on Venus Express: Laboratory Analogs and the Venus Emissivity Mapper [#1775]
Venus Express VIRTIS heritage and new laboratory emissivity data provide a baseline for future Venus mission instrument concepts as the Venus Emissivity Mapper.

Ghail R. C.  POSTER LOCATION #134
Geomechanical Restoration as a Tool to Understand the Strain History of Geological Structures on Venus [#2522]
Forward modeling of inferred structural history using sequential restoration provides useful insights into the strain history of tectonic terranes on Venus.

Guandique J.  Kohler E.  Chevrier V.  POSTER LOCATION #135
Results of high-temperature experiments on radar-reflective material is presented to constrain the origins of the venusian radar anomalies.

Smrekar S. E.  Pauken M.  Morgan P.  Chase J.  Fleurial J-P.  POSTER LOCATION #136
Measuring Heat Flow on Venus: Instrumentation and Rationale [#2825]
Venus is the only active terrestrial planet with a stagnant lid and thus key to understanding planetary evolution. Heat flow is a window into this process.
THE CRATERING PROCESS: MECHANICS AND SCALING

Hagerty J. J. Gaither T. A. POSTER LOCATION #138
Compositional Contradictions Recorded Within Impact-Generated Materials from Meteor Crater, Arizona: Implications for Crater Formation [#2397]
Compositional analyses of impact-derived materials demonstrate that Meteor Crater is compositionally complex and therefore is far from a “simple” impact crater.

Sommer F. D. Winkler R. Poelchau M. H. Deutsch A. Kenkmann T. POSTER LOCATION #139
Jetting in Experimental Impacts [#1804]
The remnants of the jetting process of experimental impacts were collected. Glass-like spherules of micrometer size with varying composition were detected.

Runyon K. D. Barnouin O. S. POSTER LOCATION #140
Experimental Ejecta Emplacement: Early Results [#1071]
Initial experimental ejecta curtains and deposits appear similar to natural ejectas. Early results show high potential for erosion via ejecta emplacement.

Anderson J. L. B. Cintala M. J. Johnson M. K. POSTER LOCATION #141
A Comparison of Crater-Size Scaling and Ejection-Speed Scaling During Experimental Impacts in Sand [#2668]
We compare the results of crater-size scaling and ejection-speed scaling relationships as the projectile size and average grain size of the target are varied.

Wasem J. V. Schill W. Owen J. M. POSTER LOCATION #142
A Combined Computational/Theoretical Approach to Extending Impact Scaling Formulas [#2557]
We examine a combination of fundamental theory approaches and direct numerical simulation of impact events to extend impact scaling laws beyond leading order.

Holsapple K. A. Housen K. R. POSTER LOCATION #143
Cratering in Blocky Regoliths [#2538]
Craters in small bodies are largely unaffected by the presence of large blocky regoliths, even when the blocks are many times the impactor size.

Housen K. R. Holsapple K. A. POSTER LOCATION #144
Momentum Transfer During Impacts into Rocky Rubble-Pile Asteroids [#2528]
Impact experiments in granular materials determine the momentum delivered to the target. Momentum transfer is insensitive to the “coarseness” of the material.

Krüger T. Sturm S. Kenkmann T. POSTER LOCATION #145
The Lunar Craters Bessel and Euler — Calculation of Ejecta Thickness and Structural Uplift for Complex Crater Rims [#1834]
We investigated the lunar complex craters Euler and Bessel and calculated the ejecta thickness and structural uplift at their crater rims.

Milbury C. Johnson B. C. Melosh H. J. Blair D. M. Collins G. S. POSTER LOCATION #146
The Effects of Porosity on Lunar Crater Formation and the Transition from Complex Crater to Peak Ring Basin Morphology [#2270]
We model the transition from complex to peak-ring basin morphology using the iSALE hydrocode and report the effect of porosity on results of the simulations.

Huang Y. H. Minton D. A. Richardson J. E. POSTER LOCATION #147
Modeling Topographic Changes by Ballistic Sedimentation from Orientale Ejecta [#2551]
Energetic ejecta emplacement would alter lunar terrain significantly. A quantitative modeling of sedimentation process will help understanding this process.
Compositional Criteria for Identifying Impact Melt Sheets: Assessing the Bushveld Igneous Complex and the South Pole-Aitken Basin Floor [\#2014]
Compositional criteria (bulk composition, isotopic heterogeneity) can be used to identify impact melt sheets (IMS). The Bushveld Igneous Complex is not an IMS.

Evolution of the Presence of Impact Melt at the Near-Surface of the Moon [\#2410]
We examine the long-term effect of the impact gardening process on the presence of impact melt of different ages at the near-surface of the Moon.

Modification-Stage Tectonics Prior to Melt Sheet Emplacement: Constraints from the Manicouagan Impact Structure [\#2255]
Presence of a sedimentary cover to Precambrian metamorphic basement at the time of impact at Manicouagan allows us to constrain modification-stage tectonics.

Craters: Inventory, Imagery, and Morphology [T615]

The Structural Inventory of Mid-Sized Complex Impact Craters Formed in Sedimentary Targets [\#1724]
This is a review-type presentation of the macro-scale deformation inventory of terrestrial craters, but it also includes aspects of martian and lunar craters.

Mineral and Lithologic Spectral Mapping of the Tunnunik Impact Structure in the Canadian Arctic Using LANDSAT ETM 7+ and ASTER Data [\#2354]
Mineral and lithologic spectral mapping of the Tunnunik impact structure in the Canadian Arctic using LANDSAT ETM 7+ and ASTER data.

The Variability of Crater Identification Among Expert and Community Crater Analysts [\#1675]
All crater counters / May identify different / Numbers of craters.

Recent Impacts on the Moon [\#2769]
Newly discovered impact features on the Moon are allowing for an assessment of the current lunar cratering rate down to the resolution of the LROC NACs.

Regolith Thickness Estimation over Sinus Iridum Using Morphology and Size-Frequency Distribution of Small Craters from LROC Images [\#1347]
Regolith thickness over the Sinus Iridum region is estimated using morphology and size-frequency distribution of small impact craters from LROC NAC images.

A Reevaluation of Lunar Impact-Related Pit Craters [\#2901]
We reevaluated lunar pit craters by analyzing morphology and morphometry of these features and determined relations of pits to volatile concentrations.

Analyzing Rim Crest Variations in Lunar Impact Craters [\#2484]
High-resolution imagery from the LRO is used to analyze morphological variations in lunar impact craters for insight into lunar geology and the impact process.
Byrne C. J.  
*Bridging the Gap Between Two Methods of Measuring Impact Features* [#1028]
Impacts are measured in two ways, based on the apparent crater or on the rim. Conversion algorithms are found for comparing datasets that used different ways.

Calla O. P. N.  Jangid M.  Mathur S.  
*Analysis and Classification of Oppenheimer Crater as a Class Floor-Fractured Craters* [#1793]
Analyzing Oppenheimer Crater using the Mini-RF and LOLA datasets with physical and electrical parameters helps classify the crater class under FFC subclasses.

Sriram Saran  Anup Das  Pandey D.  Raj Kumar  Chakraborty M.  
*Regolith Properties in the North Polar Region of the Moon from 12.6-cm Radar Polarimetry* [#1985]
We examine several new features at the north pole of the Moon (>70°N) with images at optical and radar wavelengths which were not previously observed.

We present technical development and mapping results for using secondary impact landforms to identify potential source-secondary relationships on the Moon.

Bandeira L.  Salamunićar G.  Hare T. M.  
*Global Crater Catalogues of the Moon, Mars and Phobos* [#2088]
This abstract presents the conversion and redistribution of three global crater catalogs for the Moon, Mars, and the small martian moon Phobos.

Palucis M. C.  Dietrich W. E.  
*How Small is too Small? A Simple Model for Assessing Uncertainties of Individual Crater Age Measurements for Martian Surfaces* [#2353]
We developed a model to address uncertainties within an individual crater model age measurement, focused on determining errors in ages derived from small areas.

Golombek M.  Bloom C.  Wigton N.  Warner N.  
*Constraints on the Age of Corinto Crater from Mapping Secondaries in Elysium Planitia on Mars* [#1470]
Mapping of secondary craters, constrains the age of the fresh-rayed Corinto crater in Elysium Planitia, Mars to between 0.1 and 1 Ma and 2.8 ± 0.5 Ma.

Piatek J. L.  Tornabene L. L.  Osinski G. R.  
*In Search of Pristine Martian Impact Crater Ejecta Deposits* [#2813]
Crater ejecta / Thermal, visible images / What is “young” on Mars?

Schwegman R. D.  Osinski G. R.  Jones E.  Tornabene L. L.  
*Assessing the Morphology of Double Layered Ejecta Craters at Equatorial Regions on Mars* [#2385]
We assess the morphology of DLEs found at equatorial regions on Mars and compare them with more common DLE morphologies at northern latitudes.

Bart G. D.  Daubar I. J.  Spinolo P. L.  
*Dependence of Martian Airblast Diameter on Crater Diameter* [#2852]
We examine small martian airblast features and their central craters to ascertain what controls the diameter of the airblast.

Watters W. A.  Radford A. C.  
*3-D Morphometry of Martian Secondary Impact Craters from Zunil and Gratteri* [#2836]
Statistical study of shape characteristics measured from stereo HiRISE-derived elevation models of the secondary craters of two recent primary craters on Mars.
Melting Mars with Impacts: Proximal Melt Deposits and Their Compositions as Determined by Remote Sensing [\#1954]
Impact-induced melting of different target compositions leads to predictable melt mineralogies detected on the surface in many different locations.

Study of Breccia Types in the Central Peak of an Unnamed Complex Crater on Mars [\#1762]
The fragmentation of target rocks of impact craters has important mechanical implications. We mapped a martian crater that shows different types of breccias.

Structural Uplift and Ejecta Measurements Along the Crater Wall of an Unnamed 16 km-Diameter Complex Impact Crater on Mars [\#1801]
We calculated the structural uplift and ejecta thickness along the crater wall of a complex martian impact crater situated in Marte Valles.

A Revised, Rated and Dated Inventory of Very Large Candidate Impact Basins on Mars [\#1892]
MOLA topography, the most recent crustal thickness model, and large-scale geology are used to revise, rate, and date the inventory of very large basins on Mars.

Automated Crater Detection in the Surface of Mercury in MDISC-NAC Imagery [\#2472]
This abstract is about development of automated methods for detect impact craters on Mercury’s surface from digital images.

The Role of Target Properties and Projectile Velocity on Final Crater Morphology of Craters on Mercury [\#1276]
The variations in depth of impact craters on Mercury may be the result of two different major geologic terrains and a large range of projectile velocities.

Size-Frequency Distributions of Small Impact Craters on Vesta - Implications for Secondary Cratering [\#1712]
We measured size-frequency distributions of small impact craters on the protoplanet Vesta to investigate probabilities of contamination by secondary craters.

An Examination of Noble Gas Geochronology and Thermochronology in the Context of Dating Impact Events [\#2670]
Low-temperature (U-Th)/He and \(^{40}\)Ar/\(^{39}\)Ar thermochronometers show great potential to increase the number of impact events we can accurately and precisely date.

Where Have All the Craters Gone? [\#2414]
Combining the age of Earth’s crust with estimates of bombardment rate lets us quantify the number of surviving large craters expected to still exist today.

Estimating Erosion Rates on Earth from the Number of Impact Craters [\#1351]
The crater record on Earth is strongly affected by erosion. We use the resulting incompleteness to estimate the long-term erosion rate on a regional scale.
Kurosawa K.   Kuwahara H.  \textit{POSTER LOCATION #179}
\textit{Abiotic O$_2$ Production from CI-Like Impactors During the Late Heavy Bombardment Period} [\#1920]
We investigated the gas products after >30 km/s impacts based on recent laser shock data, suggesting that abiotic O$_2$ production may occur on the Earth and Mars.

Kuwahara H. K.   Sugita S. S.  \textit{POSTER LOCATION #180}
\textit{Impact Generation of Methane-Rich Atmospheres on Early Terrestrial Planets} [\#1687]
We theoretically assessed the molecular composition of the impact-induced vapor of chondrites that cools adiabatically.

Lock S. J.   Stewart S. T.   Mukhopadhyay S.  \textit{POSTER LOCATION #181}
\textit{Was the Atmosphere Lost During the Moon-Forming Giant Impact?} [\#2843]
The high angular momentum Moon formation scenarios remove most of the atmosphere and fractionate surface volatiles; the canonical impact scenario does not.

Misra S.   Mazumder A.   Andreoli M. A. G.   Ray D.  \textit{POSTER LOCATION #182}
\textit{Large Meteorite Impacts, Volcanism and Possible Environmental Disruption at the Jurassic-Cretaceous Boundary} [\#1017]
In this review we showed that biological extinction at the Jurassic-Cretaceous boundary appears to be more related to marine volcanism than asteroid impacts.

Shuvalov V. V.   Svetsov V. V.  \textit{POSTER LOCATION #183}
\textit{Risk Assessments for Small Asteroid Impacts on Land} [\#1086]
We try to choose the most dangerous impact events in the range of asteroid diameters from 10 to 300 m.

Kuznetsova D.   Gritsevich M.  \textit{POSTER LOCATION #184}
\textit{Identification of Meteorite-Producing Events in Martian and Terrestrial Atmosphere} [\#1220]
We develop the theory describing a meteoroid entry into a planetary atmosphere and apply it to the atmosphere of Mars deriving the condition for meteorite fall.

Korycansky D. G.   Palotai C.  \textit{POSTER LOCATION #185}
\textit{Modeling the Chelyabinsk Impact} [\#1269]
We present results for numerical hydrodynamical and fragmentation models of the Chelyabinsk impact of February 2013.

Vinnikov V.   Gritsevich M.   Kuznetsova D.   Turchak L.  \textit{POSTER LOCATION #186}
\textit{Empirical Fragment Distributions in Meteorites} [\#1439]
We report that masses of meteorite fragments after atmospheric disruption best follow Weibull, Grady, or lognormal distribution.

\textit{The Shapes of Fragments from Catastrophic Disruption Events: Effects of Target Shape and Impact Speed} [\#2224]
To examine the effects of target shape in impact outcome we conducted impact experiments on spherical and irregularly-shaped targets of basaltic material.

Huber M. S.   Artemieva N.  \textit{POSTER LOCATION #188}
\textit{Impact Accretionary Lapilli in Nature and in Numerical Models} [\#1689]
Impact ejecta sometimes contain accretionary lapilli. We present data from the Sudbury impact event and a novel numerical model to describe their formation.

Ramkissoon N. K.   Price M. C.   Kearsley A. T.   Cole M. J.   Burchell M. J.  \textit{POSTER LOCATION #189}
\textit{Examining Impact Induced Mineral Devolatilisation Using Raman Spectroscopy} [\#1891]
Results from impact-induced devolatilization of minerals show the degree of devolatilization is dependent on both the velocity and the size of the projectile.
Ivanov B. A.  Melosh H. J.  McEwen A. S.  
New Small Craters in High Resolution HiRISE Images - IV [#1812]
Martian small craters dated by HiRISE/CTX help us to estimate the modern cratering rate. Here we analyze how atmosphere changes the crater SFD.

Ivanov B. A.  
Planar Impacts: Scaling of Shock Pressure Decay [#1813]
Planar (1-D) impact modeling reveals deviations from simple exponential scaling laws. The case is illustrated with a study of the shock pressure decay.

Collins G. S.  Melosh H. J.  
Improvements to ANEOS for Multiple Phase Transitions [#2664]
To aid equation-of-state development, we present modifications to ANEOS for treating melting in conjunction with one or more solid-solid phase transitions.

Stickle A. M.  Kimberley J.  Ramesh K. T.  
The Dynamic Strength of Basalt Under General Stress States: Experiments for Impact Model Development and Validation [#2841]
We present strength data from dynamic failure experiments on basalt that can be used to fit existing material models or benchmark and validate impact models.

An Experimental Study of Shock-Induced Devolatilization of Calcite: Dependence on the Ambient Pressure [#2140]
We conducted shock-induced gas recovery experiments of calcite. Our results show that the degree of devolatilization strongly depends on the container volume.

Artemieva N.  
From the Moon to the Earth Without Jules Verne — Lunar Meteorites and Lunar Dust Delivery [#1659]
Numerical modeling of ejecta escaping the Moon and arriving to Earth. Survivability of 3He in these ejecta.

Svetsov V. V.  Shuvalov V. V.  
On the Problem of Lunar Impact-Vapor Condensate [#1133]
Using numerical simulations and equations of state for quartz and dunite, we calculated masses of condensates produced by the impacts of asteroids on the Moon.

---

**Terrestrial Craters and Impact Products: Sample Analyses** [T617]

Mayne R. G.  Jaret S. J.  Herrmann B. C.  
When Classification Gets Complicated: The Ingalls “Impact-Like” Structure [#1035]
Classification is complex and rigor is necessary. The Ingalls Structure cannot officially be classified as an impact crater, but what else could it be?

Beauford R. E.  Evans K. R.  
Preliminary Reconnaissance of the Belton Structure, a Possible Impact Crater in Cass County, Missouri [#1217]
Evaluation of digital elevation models and rock samples justifies tentative consideration of Missouri’s Belton Structure as a possible impact crater.

Agoudal (High Atlas Mountains): Confirmation of Remnants of a Post Mid-Jurassic Impact Structure in Morocco [#2053]
Agoudal (High Atlas Mountains, Morocco) site is the first discovery of an impact structure in Morocco. In this area, was discovered Agoudal IIAB iron meteorite.
Xie W. X.  Schimit D. S.  
High Resolution Seismic Imaging of a Potential Eroded Impact Structure [#2299]
The geophysical seismic technique including reflection and refraction methods are being applied to characterize the detailed features of Bow City Structure.

Milam K. A.  Trygstad P.  
Structural Expression of the Crater Rim at the Heavily-Eroded Serpent Mound Impact Structure [#1444]
This study highlights structural evidence suggesting that the Serpent Mound impact structure is much larger than the 7–8-km-diameter as originally proposed.

King D. T. Jr  Ormo J.  Petruny L. W.  Lepinette A.  
Wetumpka Impact Structure (Alabama):  Tsunami Generation and Subsequent Resurge [#2139]
At Wetumpka’s marine target impact crater, Upper Cretaceous target chalk has been eroded and redeposited as a post-impact resurge unit near and within the crater.

Lugo Centeno C. M.  Cavosie A. J.  
First Report of Shocked Zircon at the Santa Fe Impact Structure (USA) [#1839]
This is the first report of shocked zircon at the Santa Fe impact structure. The presence of planar fractures in detrital zircon grains has been documented.

Colón Lugo D.  Cavosie A. J.  
Detrital Shocked Muscovite from the Santa Fe Impact Structure (USA) [#2033]
A classification for kink bands was determined based on the geometry of the microstructures found in mica grains from the Santa Fe impact structure.

Cavosie A. J.  Lugo Centeno C.  
Shocked Apatite from the Santa Fe Impact Structure (USA):  A New Accessory Mineral for Studies of Shock Metamorphism [#1691]
We report the occurrence of detrital shocked apatite crystals with planar microstructures from colluvium at the Santa Fe impact structure in New Mexico, USA.

Kerrigan M. C.  Clayton J.  Nuhn A. M.  Pickersgill A. E.  Osinski G. R.  
The Slate Islands Impact Structure, Lake Superior, Canada; Field and Petrographic Observations of Impact Breccias [#1588]
The Slate Islands are the central uplift of a 30-km-diameter complex crater. We report on recent fieldwork focusing on the variety of impact breccias there.

Greenberger R. N.  Mustard J. F.  Osinski G. R.  
Tornabene L. L.  Marion C. L.  et al.  
Spectral Mapping of Alteration Phases Within a Hydrothermal Vug at the Haughton Impact Structure [#1923]
Mapping hydrothermal mineralization and later weathering products provides insights into impact-generated hydrothermal systems and their subsequent evolution.

Weirich J. R.  Osinski G. R.  Pentek A.  Bailey J.  
Sudbury Breccia of the East Range:  Sudbury Impact Structure, Canada [#1838]
Most work on Sudbury breccia has been on the north and south ranges. We present results from the east range, finding it to have an igneous origin.

Pilles E.  Osinski G. R.  Bailey J.  Smith D.  
Emplacement of the Foy Offset Dyke at the Sudbury Impact Structure, Canada [#1044]
Field observations provide insight into the formation of impact-related dykes at the Sudbury impact structure.
Ghosh S.  Ray D.  
POSTER LOCATION #210  
*Microtextures and Geochemistry of Glass and Clast Lithologies of Impact-Melt from Lonar Crater, India*  
Aerodynamic shape of the impact glass bomb has flow structures within shock glass. Clasts within Lonar shock glass include both mineral and lithic fragments.

Jaret S. J.  Woerner W. R.  Phillips B. P.  Wright S. P.  Glotch T. D.  
POSTER LOCATION #211  
*Maskelynite: How Isotropic Is It?*  
Although maskelynite is optically isotropic and X-ray and NMR amorphous, infrared spectroscopy of rotated grains reveals preserved orientation effects.

Fernandes V. A. S. M.  Hopp J.  Schwarz W.  
Trieloff M.  Reimold W. U.  et al.  
POSTER LOCATION #212  
*Progress Report on the Re-Evaluation of the Chesapeake Bay and Popigai Crater Impact Ages: New ⁴⁰Ar-³⁹Ar Step Heating Results from Popigai Impactites*  
Preliminary Ar-Ar data for Popigai impactites. Careful SEM and EMP inspection of ~2-mm thick sections permitted identification of areas mostly of impact melt.

Chanou A.  Grieve R. A. F.  Osinski G. R.  
POSTER LOCATION #213  
*Textural Comparison Between Popigai and Ries Impact Structures*  
Textural similarities between surficial impact melt-bearing breccias from the Popigai and Ries impact structures reveal similar formation processes.

Poelchau M. H.  Schleip L.  Wöhrl J. P.  Kenkmann T.  
POSTER LOCATION #214  
*Planar Fractures and Feather Features as Indicators for the Orientation of the Deviatoric Stress Field in the Shock Wave*  
Feather features are microstructural indicators of differential stress in the shock wave. Planar fractures and possibly PDFs are aligned to this stress field.

Chang Y.  Goto K.  Sekine Y.  Tajika E.  
POSTER LOCATION #215  
*Vertical Profile of PDF Orientations and Grain Size Distribution of Shocked Quartz in the Yaxcopoil-1 Core, Chicxulub Impact Structure, Mexico: Constraints on the Ejecta Deposition Process*  
In this study, we report the vertical profile of shocked quartz grains and discuss the depositional processes of the Yaxcopoil-1 core in Chicxulub Crater.

Simpson S. L.  Lee M. R.  Lindgren P.  
POSTER LOCATION #216  
*Impact-Generated Hydrothermal Circulation and Metasomatism of the Rochechouart Astrobleme: Mineralogy and Major and Trace Element Distribution*  
Mineralogical evidence of impact produced hydrothermal alteration and metasomatism within the Rochechouart structure in south-central France.

Arana Morales A.  Cavosie A. J.  
POSTER LOCATION #217  
*A Study of Shocked Quartz in Breccia from the Rock Elm Impact Structure*  
With the presence of shocked quartz in the unusual breccia found in the Rock Elm impact structure it is possible to confirm the impact origin of the sample.

Montalvo Jimenez P. E.  Cavosie A. J.  Valley J. W.  
POSTER LOCATION #218  
*A Constraint on Shocked Mineral Abundance in the Jack Hills Zircon Suite*  
A constraint on shocked mineral abundance in the Jack Hills zircon suite.

POSTER LOCATION #219  
*Near-Infrared Spectra of Glassy Impactites from Terrestrial Impact Structures*  
Glasses produced by hypervelocity impact may be responsible for some spectral properties heretofore attributed to space weathering or acidic leaching processes.
Neil L. A. Howard K. T.  
**POSTER LOCATION #220**
*Rare Inclusions in Darwin Glass: Partial Melts [#1932]*
We are reporting the discovery of partially molten rock fragments in Darwin glass that may help to confirm the impact origin of Darwin Crater.

Tagle R. Goderis S. Fritz J. Bartoschewitz R. Artemieva N. et al.  
**POSTER LOCATION #221**
*An Extraterrestrial Component in Australasian Tektites [#2222]*
Target-projectile mixing processes were identified in Ni-rich Australasian tektites and studied by high-resolution numerical models.

Povenmire H.  
**POSTER LOCATION #222**
*A Spectacular New Georgia Tektite from Dooly County, Georgia [#1144]*
A synopsis on the field research of the Georgia Tektite Strewn Field; additional specimens found have expanded the strewn field.

**POSTER LOCATION #223**
*New Data on the Fe Oxidation State and Water Content of Belize Tektites [#2322]*
Fe$^{3+}$ and water content of eight Belize tektites, determined by XAS and FTIR, are comparable with literature data on tektites. Larger spread of Fe redox is remarked.

Akhter R. Shirai N. Ebihara M.  
**POSTER LOCATION #224**
*Chemical Characteristics of Dalat Tektites [#1886]*
We analyzed 13 tektites from Dalat in Vietnam and according to our results, Dalat tektites are rich in Cr, Co, and Ni. We verify the reason for this enrichment.

Huber M. S. Ventura Bordenca C. Goderis S. DeBaille V. Claeys P.  
**POSTER LOCATION #225**
*New Micrometeorite Collection Site Discovered at Wideroefjellet, Antarctica [#2108]*
Here we report the discovery of a new accumulation site in the Antarctic continent with an excellent preservation of micrometeorites and cosmic spherules.

**POSTER LOCATION #226**
*Petrology and Geochemistry of Archean Spherule Layer Occurrences in the BARB 5 ICDP Drill Core, Barberton Greenstone Belt [#1356]*
First petrographic and geochemical results for a set of new samples of spherule layer intersections from the Barberton Greenstone Belt, South Africa.

Davatzes A. K. Swartz N. G.  
**POSTER LOCATION #227**
*Paraburdoo Spherule Layer Spinel Composition [#1593]*
Results of geochemical analyses from the Paraburdoo Spherule Layer and comparison to earlier Precambrian impacts.

Lai T. L. Davatzes A. K. D.  
**POSTER LOCATION #228**
*Petrographic and SEM Analyses of Proterozoic Impact Spherules from the Grænseso Layer, Greenland [#1472]*
Petrographic and SEM analyses of spherules in the upper part of the Grænseso Formation in South Greenland reveal diversity in size, shape, and chemical makeup.

Ormö J. Nielsen A. T. Alwmark C.  
**POSTER LOCATION #229**
*Evidence for an Early Cambrian Proximal Impact Ejecta Layer in the North-Swedish Caledonides [#1025]*
A hidden crater under Caledonian nappes may hold information on the Early/Mid Cambrian paleoenvironment of the area at the time of impact.
Belza J. Goderis S. Montanari A. Roose K. Vanhaecke F. et al. POSTER LOCATION #230

Textural and Geochemical Characterization of Ferromagnesian Microkrystite Spherules at the K-Pg Boundary and Similarities with Chondrules: A Comparative Approach [1716]

This work reports textural and geochemical characteristics of microkrystite spherules from the K-Pg boundary and its striking similarities with chondrule textures.

LUNAR IMPACTS [T618]

Minton D. A. Richardson J. E. Fassett C. I. POSTER LOCATION #231

Re-Examining the Main Asteroid Belt as the Primary Source of Ancient Lunar Craters [2660]

We test the hypothesis that the lunar highland craters were primarily created by main-belt asteroids and find a poor match due to the number of large basins.

Schultz P. H. Crawford D. A. POSTER LOCATION #232

Lunar Impact Basin Impactor Sizes [1961]

Projectile sizes responsible for lunar impact basins are determined from first-contact features and compared with a CTH hydrocode model of Moscoviense Basin.

Watkins C. E. Hayne P. O. Bandfield J. L. POSTER LOCATION #233

Ballistic Cascading as a Formation Mechanism for Lunar Cold Spot Craters: Constraints on the Impact Process from Diviner Thermal Measurements [2310]

Diviner identified a class of craters surrounded by cold regions. We developed a power law for the density profile of the area and tested models of formation.

Fassett C. I. Combellick J. R. POSTER LOCATION #234

The Rate of Crater Degradation and Topographic Evolution on the Moon: Results from the Maria and Initial Comparisons with the Highlands [1429]

Craters on the Moon / Slowly become shallower / Eroding with time.

Ramos M. D. Barlow N. G. POSTER LOCATION #235

Impact Crater Morphology of the Moon: Eastern Nearsise (45°S-45°N, 0°-90°E) [1126]

This project characterizes lunar impact crater morphology on the eastern nearside through use of new Lunar Reconnaissance Orbiter imagery and GIS analysis.

Nuno R. G. Mahanti P. Boyd A. K. Robinson M. S. POSTER LOCATION #236

Automated Classification of Copernican and Eratosthenian Craters Utilizing LROC WAC Normalized Reflectance [1751]

An automated method of separating Copernican and Eratosthenian crater populations using LROC WAC normalized reflectance map.

Williams J.-P. Paige D. A. Plescia J. B. Pathare A. V. Robinson M. S. POSTER LOCATION #237

Crater Size-Frequency Distributions on the Ejecta of Giordano Bruno [2882]

Images from LROC and data from the Diviner Lunar Radiometer Experiment reveal the heterogeneous nature of the ejecta of Giordano Bruno.

McBride M. J. Frey H. V. POSTER LOCATION #238

Improving Techniques for Determination of Lunar Basin Crater Retention Ages [2150]

Different approaches were taken to determine the crater retention ages of 89 lunar basins. These were compared to ages of small areas of likely oldest crust.

Shankar B. Osinski G. R. POSTER LOCATION #239

The O’Day and Birkeland Impact Craters as Probes into the Interior of the South Pole-Aitken Basin [2552]

Multispectral study of two complex impact craters within the South Pole-Aitken (SPA) Basin. Potential of revealing more information about the SPA melt sheet.
Madden J. H. Neish C. D. Carter L. M. Hawke B. R. Giguere T. A. POSTER LOCATION #240
The Discovery of New Impact Melts Using Mini-RF on LRO [#1271]
Using LRO data, we surveyed the Moon looking for new impact melt flows. We present 24 new flows discovered and highlight some new flows of interest.

Dhingra R. D. Dhingra D. Carlson L. POSTER LOCATION #241
Evaluating the Extent of Impact Melt on Central Peaks of Lunar Complex Impact Craters [#1754]
Impact melt on central peaks of lunar craters is mapped to assess if it covers a significant peak area, which could affect mineralogical assessment of lunar crust.

Johnson K. E. Kramer G. Y. POSTER LOCATION #242
The Prevalence of Secondary Cratering Through Analysis of Recent Impacts on the Moon [#2725]
There’s a really fresh 7-km crater with ~1 million secondaries >1 m on the rim of a 40-km crater on the rim of a basin on the edge of the surface of the Moon.

Martin-Wells K. S. Campbell D. B. Campbell B. A. Carter L. M. POSTER LOCATION #243
Debris Flow and Lunar Secondary Cratering [#2673]
An examination of the geomorphology of lunar secondary craters with radar circular polarization ratio enhancements provides evidence of debris flows.

Meyer H. M. Denevi B. W. Boyd A. K. Robinson M. S. POSTER LOCATION #244
Lunar Light Plains Near the Orientale and Imbrium Basins: Results and Implications for Other Planetary Bodies [#2350]
Insight into the origin of lunar light plains using spatial distribution, crater-size frequency distributions, and morphological relationships.

Martin D. J. P. Spudis P. D. POSTER LOCATION #245
New Geological Map of the Orientale Basin [#1368]
A new geological map is presented with descriptions and analyses of units both inside and outside the basin. Properties of impact and melt sheet are discussed.

Morse Z. R. Osinski G. R. Tornabene L. L. POSTER LOCATION #246
Analysis of Orientale Basin Ejecta and Evidence for Multistage Emplacement [#2360]
Research and mapping of the ejecta deposits of Orientale Basin with the goal of achieving a better understanding of ejecta emplacement around multiring basins.

Ghent R. R. Carter L. M. Bandfield J. L. Hayne P. O. Paige D. A. POSTER LOCATION #247
Physical Properties of Lunar Impact Ejecta: Constraints from LRO Diviner and Mini-RF Observations [#2339]
Here we summarize new insights into the physical properties of lunar impact products and their evolution based on analysis of LRO Diviner and MRF data.

Stickle A. M. Patterson G. W. Bussey D. B. J. Cahill J. T. S. Mini-RF Team POSTER LOCATION #248
Characterization of Mare Ejecta Emplacement Diversity: Insights from Mini-RF [#2726]
Using Mini-RF, CPR information from young lunar craters reveals diversity in mare crater ejecta and isolates surface expressions of discrete subsurface layering.

Thompson T. W. Ustinov E. A. POSTER LOCATION #249
Specular Radar Scattering from Buried Crater Ejecta [#1166]
Modeling of radar echoes from buried crater ejecta seen in the Apollo core tubes produces results consistent with a special 1960s lunar radar experiment.

Thomson B. J. Bussey D. B. J. Cahill J. T. S. POSTER LOCATION #250
Identifying Variations in Basin Ejecta Thickness Using LRO Mini-RF Data [#2520]
The distribution of impact craters with radar-bright halos suggests it is notably nonuniform, suggestive of effects due to basin impact ejecta layers, e.g., SPA.
Mini-RF Observations of the Radar Scattering Properties of Young Lunar Crater Ejecta Blankets [2720]
With the Mini-RF instrument onboard LRO, we explore potential contributions to radar scattering properties of ejecta from 24 young lunar craters.

LUNAR DATA CALIBRATION AND LABORATORY GROUNDTRUTHING [T619]

Ling Z. C.  Zhang J.  Wu Z. C.  Li B.  Liu J. Z.  POSTER LOCATION #253
The Spectral Calibration of Chang‘e-1 IIM Dataset [#1831]
We present a new spectral calibration method to correct the sample-direction nonuniform of the Chang‘e-1 Imaging Interferometer (IIM) dataset.

Nefian A. V.  Coltin B.  Fong T.  POSTER LOCATION #254
Apollo Metric Imagery Registration to Lunar Orbiter Laser Altimetry [#1679]
We address the registration of images from the Apollo metric camera to altimetry data from the Lunar Reconnaissance Orbiter’s Lunar Orbiter Laser Altimeter.

Merging Digital Elevation Models from the Lunar Orbiter Laser Altimeter and Kaguya Terrain Camera [#1635]
We have registered the TC DEM to the LOLA geodetic framework with RMS elevation residuals as low as a few meters.

Edmundson K. L.  Alexandrov O.  Archinal B. A.  Becker T. L.  Moratto Z. M.  et al.  POSTER LOCATION #256
Photogrammetric Control of Oblique Apollo 15 Metric Camera Images [#1915]
We address the photogrammetric control of oblique metric camera images acquired by the photogrammetric mapping system flown onboard Apollo 15.

Shirley K. A.  Glotch T. D.  POSTER LOCATION #257
A Correction to the Thermal Bands for the Diviner Lunar Radiometer Experiment [#2399]
We develop a correction to Diviner data in the long wavelength thermal bands and evaluate its usefulness in compositional analyses of the lunar surface.

Nagihara S.  Nakamura Y.  Kiefer W. S.  Hager M. A.  Williams D. R.  et al.  POSTER LOCATION #258
Recovery of ALSEP Raw Instrument Data and Metadata [#1153]
We report our recent progress in extracting raw instrument data from 450 ALSEP data archival tapes we recently found and digitally cataloging ALSEP metadata.

Jackson C. R. M.  Cheek L. C.  Williams K. B.  Donaldson Hanna K.  Pieters C. M.  et al.  POSTER LOCATION #259
Visible to Near-Infrared Spectra of Iron-Bearing Spinel with Application to Sinus Aestuum and Lunar Spinel Anorthosite [#1561]
V-NIR spectra of Fe-bearing, synthetic spinel are discussed in the context of remote sensing observations of Sinus Aestuum and lunar spinel anorthosite.

Isaacson P. J.  Gillis-Davis J. J.  Jackson C.  Prissell T. C.  Parman S.  et al.  POSTER LOCATION #260
Experimental Space Weathering of Synthetic Spinels [#1612]
Lunar analog spinels are space weathered with laser irradiation. The results have important implications for remote analyses of lunar spinel-rich deposits.

Moriarty D. P. III  Pieters C. M.  POSTER LOCATION #261
LSCC Samples as Ground Truth: Using Spectral Parameters Developed for M³ Data to Assess Composition and Maturity [#2532]
New parabola fits to mafic bands are consistent with existing MGM analyses. Correlations (or lack thereof) between npFe and spectral properties are discussed.
Warren T. J.  Thomas I. R.  Bowles N. E.  POSTER LOCATION #262

The Oxford Space Environment Goniometer [1874]

Initial results from the Oxford Space Environment Goniometer, designed to support thermal infrared remote sensing measurements of airless bodies.

Mann P.  Cloutis E. A.  Greenberger R. N.  Millikin R. E.  Hiroi T.  et al.  POSTER LOCATION #263

An Interlaboratory UV/VIS/NIR Wavelength Calibration Study [2392]

Here we report our results of circulating a set of wavelength calibration standards to multiple facilities to assess the accuracy of ASD spectrophotometers.

Hibbitts C. A.  Dyar M. D.  Greenspon A. S.  POSTER LOCATION #264

Ultraviolet Reflectance Spectra of Material Relevant to Airless Bodies [2611]

Vacuum ultraviolet to visible wavelength reflectance spectra can be used to estimate total iron abundance.

Izawa M. R. M.  Applin D. M.  Cloutis E. A.  Cuddy M.  Mann P.  POSTER LOCATION #265

Spectroscopic Studies of Pristine Lunar Regolith Under H2O, O2, and CO2 Controlled Conditions [1526]

Reflectance spectra of pristine lunar regolith samples were studied in an inert atmosphere. Hydration features similar to spacecraft observations were detected.

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Thorium on the Lunar Highlands Surface: Insights from Chang ’e-2 Gamma-Ray Spectrometer [1237]

The new global Th map derived from CE-2 GRS indicates a possible indigenous Th on the lunar highlands besides the Imbrium impact contribution.

Chin G.  Sagdeev R.  Milikh G. M.  Usikov D.  Su J. J.  et al.  POSTER LOCATION #270

Determining the Magnitude of Neutron and Galactic Cosmic Ray (GCR) Fluxes at the Moon Using the Lunar Exploration Neutron Detector (LEND) During the Historic Space-Age Era of High GCR Flux [1704]

The LRO was launched June 18, 2009 during an historic spaceage era of minimum solar activity and maximum GCR flux that coincided with the operation of LEND.

Athiray P. S.  Kusuma K. N.  Narendranath S.  Sreekumar P.  POSTER LOCATION #271

Direct Evidence of Enhanced Sodium Content on the Moon Around Tycho Region: C1XS Observations [1857]

X-ray observations of Chandrayaan-1 X-ray Spectrometer (C1XS) showing the direct evidence of enhanced sodium on the lunar surface around the crater Tycho.

Wilson J. K.  Schwadron N.  Spence H. E.  Golightly M. J.  Case A. W.  et al.  POSTER LOCATION #272

Detecting Low-Contrast Features in the Cosmic Ray Albedo Proton Map of the Moon [2206]

The albedo proton map of the Moon shows localized regions with slightly higher yield that may be correlated with elemental abundances in the lunar regolith.

Bodnarik J. G.  Mitrofanov I. G.  Boynton W. V.  POSTER LOCATION #273

LEND CSETN Circular and Elliptical Orbital Data Processing [2925]

The data reduction procedures that reduce the LEND raw elliptical orbit CSETN neutron data into corrected higher-level derived data products are presented.

Bhattacharya S.  Chauhan M.  Chauhan P.  POSTER LOCATION #274

Compositional Heterogeneity of Crater Aristoteles as Revealed by Chandrayaan-1 Moon Mineralogy Mapper (M') Data [1845]

We have studied the complex heterogenetic lithological association of dunitic-noritic-grabbroic compositions at Crater Aristoteles with olivine-rich exposures.
Donaldson Hanna K. L. Pieters C. M. Cheek L. C. Bowles N. E. Dhingra D. POSTER LOCATION #275
Shocked Anorthosite: Puzzling over Its Whereabouts [#2231]
Shocked anorthositic material and its relationship to crystalline anorthositic material is mapped within highland craters as well as across the lunar surface.

Dhingra D. Pieters C. M. Head J. W. POSTER LOCATION #276
Impact Melt Mineralogy at Lunar Complex Craters: Systematics of Melt Emplacement and Evolution [#2138]
The mineralogy of impact melt is diverse. Coupled with its pervasive nature, impact melt likely played a role in the compositional diversity of the lunar crust.

Dhingra D. Pieters C. M. Head J. W. POSTER LOCATION #277
Nature and Distribution of Olivine at Copernicus Crater: New Insights About Origin from Integrated High Resolution Mineralogy and Imaging [#1117]
Olivine occurrence at Copernicus is enriched by new floor exposures and a different morphological form of olivine in the northern wall compared to the peaks.

Zhang Y. Z. Zhou C. Chen S. B. Li C. L. Huang Z. J. et al. POSTER LOCATION #278
Spatial Distribution of Olivine the Sinus Iridium Using M^3 Data [#1141]
Here we present an olivine survey of the Sinus Iridium using M^3 data.

Corley L. M. McGovern P. J. Kramer G. Y. POSTER LOCATION #279
Olivine Exposures on the Moon: Origins and Mechanisms of Transport to the Lunar Surface [#1564]
We identified olivine at several areas with the Moon Mineralogy Mapper and examined the geophysical settings using GRAIL data.

Isaacson P. J. Lucey P. G. Sunshine J. M. Klima R. L. POSTER LOCATION #280
Remote Compositional Analyses of Lunar Olivines [#1709]
Compositions of lunar olivines are estimated using MGM-based techniques. Our approach provides rough but absolute compositional assessments.

Chauhan M. Bhattacharya S. Chauhan P. POSTER LOCATION #281
New Locations of Fe-Mg-Spinel-Bearing Lithologies on the Moon as revealed by Chandrayaan-1 Moon Mineralogy Mapper (M^3) Observations [#1829]
We have reported Fe-Mg-spinel-bearing lithologies from three new locations on the Moon at Crater Letronne, Montes Teneriffe, and Moretus Crater at the SPA Basin.

Ultraviolet Characteristics of the Lunar Compton-Belkovich Region from LRO/LAMP [#2790]
We discuss FUV results of the Compton-Belkovich region using the LRO UV spectrograph. This region displays redder FUV spectra than anywhere else on the Moon.

LRO Lyman Alpha Mapping Project (LAMP) Investigation of the Lunar Albedo Far-UV Spectral Inversion [#1191]
Comparing mare and highland regions measured within the 57–196 nm spectral range of the LAMP instrument.

NEW PERSPECTIVES OF THE MOON: ENABLING FUTURE LUNAR MISSIONS [T621]

Kokhanov A. A. Karachevtseva I. P. Zubarev A. E. Kozlova N. A. Kreslavsky M. A. POSTER LOCATION #284
GIS-Based Analysis in Support of Future Russian Lunar Missions [#1235]
The main task of our work is to develop photogrammetric technique and geoanalysis methods for lunar landing site characterization.
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Kumamoto A. Ishiyama K. Kobayashi T. Oshigami S. Haruyama J.  
**POSTER LOCATION #295**

*Determination of the Effective Dielectric Constant of the Lunar Surface Based on the Echo Intensity Observed by the Kaguya [#1701]*

For estimation of the bulk density of the lunar uppermost layers, the effective dielectric constant has been determined by using the Kaguya radar sounder data.

Vijayan S. Mohan S. Murty S. V. S.  
**POSTER LOCATION #296**

*Simulated Lunar Brightness Temperature in L- and S-Band and Regolith Thickness Estimation Using an Index-Based Approach [#1682]*

Simulated lunar brightness temperature in L- and S-band and regolith thickness estimation using an index-based approach.

French R. A. Jurdy D. M. Robinson M. S. Watters T. R.  
**POSTER LOCATION #297**

*Provenance of Boulders Along Lunar Wrinkle Ridges [#2489]*

Boulders and high reflectance material along wrinkle ridge slopes may be related to seismic activity from impacts and recent tectonic activity.

Petro N. E. Klima R. L.  
**POSTER LOCATION #298**

*Moon Mineralogy Mapper Views of the Sculptured Hills: Implications for the Origins of the Station 8 Boulder from Apollo 17 [#2604]*

Moon Mineralogy Mapper data reveal mafic units within the Sculptured Hills near the Apollo 17 landing site. The origin of the Station 8 boulder is considered.

Wagner R. V. Robinson M. S. Speyerer E. J. Plescia J. B.  
**POSTER LOCATION #299**

*Locations of Anthropogenic Sites on the Moon [#2259]*

Precise coordinates have been determined for lunar impactors and landers (including Chang`e-3) using the LROC NAC. Uncertainties range from 2 to 13 meters.

Berman P. A. Williams D. R.  
**POSTER LOCATION #300**

*Shadowing on Apollo 12 Solar Cells and Possible Movement of the ALSEP Central Station [#2786]*

Examination of the shadowing on an Apollo 12 solar cell indicates possible movement of the ALSEP central station over a seven year period.

**POSTER LOCATION #301**

*Comparison of a New Lunar Radiometric Model Based on SELENE/SP with Satellite Observing Lunar Images [#1302]*

The ability of a new lunar reflectance model from the Spectral Profiler onboard SELENE to accurately validate relative sensor degradation in space has been confirmed.

Sato H. Denevi B. W. Hapke B. Robinson M. S. Boyd A. K.  
**POSTER LOCATION #302**

*Photometric Experiments Using LROC WAC Oblique Observations [#2281]*

We estimate fitting residuals using the new WAC pitch observations to examine how the current Hapke parameter maps are accurate for uncovered low phase ranges.

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**CHANG’E 3**

**POSTER LOCATION #303**

*The Active-Particle-X-Ray-Spectrometer Onboard the Chang’e-3 Rover [#1373]*

The APXS onboard the CE-3 rover is described here, and the spectrum of lunar dust excited by the radioactive source is described.

Robinson M. S. Plescia J. B. Wagner R. V.  
**POSTER LOCATION #304**

*Imaging of the Chang’e 3 Landing Site [#1859]*

An LROC NAC image (pixel scale of 160 cm) of the Chang’e 3 landing site was acquired on 25 December 2013; the lander and rover were positively identified.
POSTER LOCATION #305
Wu Y. Z.  Head J. W. III  Pieters C. M.  Basilevsky A. T.  Li L.  et al.
Regional Geology of the Chang’e-3 Landing Zone [#2613]
We report on a trilateral analysis of NW Imbrium combining orbital remote sensing and lunar rover exploration (Luna 17/Lunokhod 1 and Chang’e-3/Yutu).

POSTER LOCATION #306
Abdrakhimov A. M.  Basilevsky A. T.  Head J. W. III
Local Geologic Settings Along the Lunokhod-1 Traverse as Analogs for Characteristics of the Chang’e-3 Landing Site [#1239]
Local geologic settings along the Lunokhod-1 traverse are considered as analogs for characteristics of the Chang’e-3 landing site.

POSTER LOCATION #307
Zou X. D.  Li C. L.  Liu J. J.  Mu L. L.  Ren X.  et al.
The Preliminary Analysis of the Crater X Near Chang’e-3 Landing Site [#2403]
The first results and research plans of geological and morphological analysis of the crater X near the Chang’e-3 landing site.

POSTER LOCATION #308
Qiao L.  Xiao L.  Xiao Z. X.
Thickness of Mare Basalts at the Landing Site of Chang’e-3, the Northern Mare Imbrium [#1832]
We estimate the thickness of basalts of the Chang’e-3 landing site to be ~41–46 m, which would be verified by the ongoing subsurface measurements by Chang’e-3.

POSTER LOCATION #309
Clegg R. N.  Jolliff B. L.  Boyd A.  Robinson M. S.  Plescia J. B.
Photometric Characterization of the Chang’e 3 Landing Site Using LROC NAC Images [#1625]
We use LROC images to quantify reflectance changes caused by rocket exhaust at the Chang’e-3 landing site and compare the effect to other landing sites.

POSTER LOCATION #310
Zhang J.  Ling Z. C.  Li B.
Preliminary Photometric Analysis of the Chang’e-3 Landing Site [#2816]
We analyze the photometric behavior of the possible Chang’e-3 lunar rover traverse area so as to support further photometric modeling of the VNIS spectral data.

POSTER LOCATION #311
Li H.  Li C. L.  Liu J. J.  Ren X.  Mu L. L.  et al.
Locating and 3D Digital Terrain Model Reconstruction of the Chang’e 3 Landing Site [#2921]
We located the CE-3 Chang’e-2 (CE-2) images and constructed 3-D terrain models of the landing area. Some of the preliminary results are presented here.

POSTER LOCATION #312
Sternovsky Z.  Gagnard S.  Gathright D.  Gruen E.  James D.  et al.
Modeling the UV Signal Scattered into the Lunar Dust Experiment (LDEX) from the Surface [#2740]
The LDEX instrument on the LADEE spacecraft is sensitive to the UV scattered back from the lunar surface. The measured UV background contribution is modeled.

POSTER LOCATION #313
Poppe A. R.  Halekas J. S.  Delory G. T.  Angelopoulos V.
ARTEMIS Observations of Anisotropic Ion Sputtering of the Lunar Surface: Implications for LADEE [#1385]
We report ARTEMIS observations of anisotropic sputtering of the lunar surface due to both reflected solar wind protons and heavy pickup ions from the exosphere.

POSTER LOCATION #314
Halekas J. S.  Poppe A. R.  McFadden J. P.
Long-Term Trends in the Lunar Exosphere Derived from ARTEMIS Pickup Ion Measurements [#1549]
ARTEMIS measures the ionized constituents of the exosphere, providing a long-term exospheric dataset covering ~2.5 years, including the LADEE mission.
Grava C. Chaufray J.-Y. Retherford K. D.  
Gladstone G. R. Greathouse T. K. et al.  
**POSTER LOCATION #315**

*Simulation of Lunar Exospheric Argon: Insights on Loss Processes, Cold-Trapping, and Sudden Release Events [#2889]*

We will present results of simulations of argon in the lunar exosphere in order to investigate cold trapping in the permanently shaded regions.

Tenishev V. Rubin M. Shou Y. Combi M. R.  
**POSTER LOCATION #316**

*Kinetic Modeling of Neutral and Ionized Sodium in the Moon’s Exosphere [#1305]*

We present first results of our simulation of neutral and ionized sodium in the Moon’s exosphere coupled with a global model of the solar wind/Moon interaction.

Hurley D. M. Killen R. M. Colaprete A.  
**POSTER LOCATION #317**

*Sodium in the LROSS Plume from Two Views [#2174]*

Apply the best fit model for the LROSS vapor plume to the evolution of Na. Compare the model to Earth-based telescopic observations and overhead SSC data.

**POSTER LOCATION #318**

*Possible Detection of Argon in the Lunar Atmosphere as seen by the LAMP Instrument on the Lunar Reconnaissance Orbiter [#2788]*

We will discuss the possible detection of Ar as observed by LRO’s LAMP instrument.

Cudnik B. M. Day B. H.  
**POSTER LOCATION #319**

*Ground Based Observations of Lunar Meteors in Support of the LADEE Mission: A Status Update [#2645]*

We update the current state of a groundbased observing campaign to videotape impact flashes to correlate them with changes in lunar exospheric dust abundances.

**POSTER LOCATION #320**

*LADEE PDS Archive: Active Mission Pipeline Development Using PDS4 [#2460]*

LADEE will archive in the PDS using the new PDS4 standards. PDS and LADEE instrument teams are developing pipelines to meet the new standards.

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**LUNAR GEOPHYSICAL EVOLUTION: GRAIL AND MORE [T624]**

Macke R. J. Kiefer W. S. Britt D. T. Consolmagno G. J. Irving A. J.  
**POSTER LOCATION #321**

*New Lunar Sample Density and Magnetic Susceptibility Measurements [#1949]*

As part of a study to constrain lunar gravity models, we report new densities and magnetic susceptibilities for 21 lunar samples from NASA JSC.

Goossens S. Lemoine F. G. Sabaka T. J. Nicholas J. B. Mazarico E. et al.  
**POSTER LOCATION #322**

*Global Gravity Field Models of the Moon Using GRAIL Primary and Extended Mission Data [#1619]*

We present high-resolution gravity field models of the Moon using GRAIL primary and extended mission data.

Sori M. M. Zuber M. T.  
**POSTER LOCATION #323**

*The Nature of Lunar Isostasy [#1630]*

We investigate the relative importance of Airy and Pratt isostasy on the Moon using a combination of recent gravity, topography, and geochemistry datasets.

**POSTER LOCATION #324**

*Constraints on Impact-Induced Fracturing and Brecciation of the Lunar Crust from Grail [#2213]*

We use GRAIL data to constrain the extent of brecciation and subsurface fracturing associated with the formation of lunar impact craters.

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100 45th LPSC Program
Jozwiak L. M.  Head J. W.  Phillips R. J.  Zuber M. T.  Smith D. E.  et al.  **POSTER LOCATION #325**
Lunar Floor-Fractured Craters: Intrusion Emplacement and Associated Gravity Anomalies [#1464]
We analyze the process of magmatic intrusion emplacement beneath lunar floor-fractured craters including surface morphologies and Bouguer gravity anomalies.

Blair D. M.  Johnson B. C.  Freed A. M.  Melosh H. J.  **POSTER LOCATION #326**
Modeling the Geophysical History of Very Large Impact Basins: The Gravity Anomalies of the Orientale Basin [#2105]
We model the geophysical history of Orientale Basin, using GRAIL and LRO/LOLA data as constraints and accounting for the effects of the curvature of the Moon.

Excavation of the Mantle in Basin-Forming Events on the Moon [#1828]
Hydrocode modeling shows that the largest basins on the lunar nearside and Moscoviense basin on the farside could have exposed mantle materials at the surface.

Ishihara Y.  Nakamura R.  **POSTER LOCATION #328**
Re-Examination of Excavation Cavity of the Impact Basins of the Moon Based on GRAIL Based Crustal Thickness Model [#1641]
We estimate excavation cavity for lunar impact basins based on the GRAIL-based crustal thickness model and examine depth-to-diameter ratio of cavity.

Keane J. T.  Matsuyama I.  **POSTER LOCATION #329**
The Contribution of Mascons to the Lunar Figure [#2676]
The lunar figure is significantly out of hydrostatic equilibrium. We modeled the contribution of mascons to see if they could explain the Moon’s odd figure.

Williams J. G.  Konopliv A. S.  Lemoine F. G.  Goossens S.  Asmar S. W.  et al.  **POSTER LOCATION #330**
A Glimpse of Lunar Core Shape and Deep Gravity Field [#2267]
A GRAIL S21 value implies a misalignment of principal axes derived by Lunar Laser Ranging. A fluid outer core shaped by internal gravity can affect axes.

Barker M. K.  Mazarico E.  Neumann G. A.  Smith D. E.  Zuber M. T.  **POSTER LOCATION #332**
Detection of the Lunar Body Tide by the Lunar Orbiter Laser Altimeter [#1629]
We use LOLA altimetric crossovers as a global set of measurements to detect surface tidal deformation on the Moon.

Qin C.  Zhong S.  Wahr J. M.  **POSTER LOCATION #333**
Constraining Long-Wavelength Elastic Structure of the Lunar Mantle Using GRAIL Tidal Love Numbers [#2761]
The reported GRAIL $k_{20}, k_{31}, k_{22}$ Love numbers differ by ~1–3%. We seek for long-wavelength elastic structure in the Moon to account for the variations in $k_2$’s.

Yamada R.  Noda H.  Araki H.  **POSTER LOCATION #334**
Distributions of Seismic Moments of Deep Moonquakes and Estimation of Lunar Mantle Structure [#1700]
We present distributions of seismic moments of deep moonquakes derived from three stations data, and discuss a new lunar mantle Q model to explain the moments.
Evaluation of Observation Bias of Apollo Seismic Observation Network [#2564]

We will carry out a quantitative evaluation of the Apollo Seismic Network and discuss the source distribution of the deep moonquakes.

Global Distribution of Lobate Scarps on the Moon: Implications for the Current Stress State [#2163]

The distribution of young thrust fault scarps on the Moon may be the result of global contraction in combination with tidal stresses.

Surveying the South Pole-Aitken Basin Magnetic Anomaly for Remnant Impactor Metallic Iron [#2253]

Here we examine the lunar surface in and around the SPA basin for any evidence of the metallic iron remnants of its impactor.

Characteristics of Small-Scale Magnetic Anomalies Outside of Mare Crisium [#1965]

We observed unusual small-scale magnetic anomalies in the vicinity of Crisium using the magnetometer on LP. We have presented a map of these anomalies.

Evolution of the Moon’s Core in the Fe-Snow Regime [#2546]

We model the Fe-snow regime in the Moon’s core and show that it can stop dynamo action and explain the observed remnant magnetization.

The Lunar Magnetic Field Environment: New Science from Apollo Data [#2780]

Recently restored Apollo magnetic field data have revealed ion cyclotron waves on the lunar surface. Enhancements on these data can foster further discoveries.

Simulations of Particle Impact at Lunar Magnetic Anomalies and Comparison with Spectral Observations [#2510]

Study of magnetic anomalies at the Moon and origin of lunar swirls using particle tracking and spectral analysis.

Initial ARTEMIS Time Domain Electromagnetic Sounding Results from Night-Side Transient Events [#2734]

We use transient within low nightside ARTEMIS magnetic field measurements with forward modeling to constrain the electrical conductivity of the lunar interior.

Constraints on Lithospheric Stresses and Subduction Initiation from Steady-State Convection: Application to Terrestrial Planets [#1298]

To understand the mechanisms of subduction of planetary lithospheres, we develop scaling laws for the lithospheric stresses from sublithospheric convection.

Constraining Viscosity Layering on Mars Using Geoid and Topography from Mantle Convection Models [#2445]

Mantle convection modeling on Mars to analyze the geoid and topography constrained by viscosity layering, Rayleigh number, and internal heating parameters.
Plesa A. C. Breuer D. Grott M. Tosi N.  
**POSTER LOCATION #345**

*Constraining the Amount of Radiogenic Elements in the Interior of Mars from the HP3 Heat Flow Measurement [#2527]*

A model is presented that allows calculation of the present heat production rate from the measured heat flow using Urey ratio systematics from convection modeling.

Kamata S. Nimmo F.  
**POSTER LOCATION #346**

*Basin Relaxation as a Probe of Pluto’s Thermal History [#1736]*

The basin relaxation state on Pluto is mainly controlled by the reference viscosity of ice, not by the presence of a subsurface ocean.

Mazarico E. Genova A. Goossens S. J. Lemoine F. G. Smith D. E. et al.  
**POSTER LOCATION #347**

*The Gravity Field of Mercury from MESSENGER [#1863]*

We present an update to the gravity field obtained from MESSENGER radio tracking data, as well as other geophysical parameters (obliquity, tidal Love number).

**POSTER LOCATION #348**

*Mars Gravity Field and Thermosphere from Mars Reconnaissance Orbiter [#2479]*

The static gravity field and the thermosphere of Mars from radio science data of the Mars Reconnaissance Orbiter (MRO) mission.

Ojha L. Smrekar S. Nunes D.  
**POSTER LOCATION #349**

*Geophysical Investigation of the InSight Landing Site [#2181]*

We sought to conduct a local fit to the crustal thickness using admittance modeling, and examine the possible origin of gravity anomalies in Elysium Planitia.

Yamamoto Y. Y. Yamada R. Y. Nakamura Y. N.  
**POSTER LOCATION #350**

*Restoration and Verification of Seismic Data Record on Viking Lander 2 Mission [#1808]*

We recover the Viking seismic data and confirm the validity comparing with the data on a report.

Weber R. C. Schmerr N. C.  
**POSTER LOCATION #351**

*GRAIL Refinements to Lunar Seismic Structure [#2008]*

We use gravity data recorded by the GRAIL mission to refine analyses of the Apollo seismic data, in order to improve our understanding of the Moon’s structure.

Suavet C. Weiss B. P. Lima E. A. Gattacceca J. Grove T. L.  
**POSTER LOCATION #352**

*Controlled-Atmosphere Thermal Demagnetization and Paleointensity Analyses of Lunar Rocks [#2092]*

Oxygen fugacity control during heating prevents alteration of magnetic minerals in mare basalts, but troilite is unstable, which prevents paleofield estimation.

Ditty M. L. Ravat D.  
**POSTER LOCATION #353**

*Mars Paleopole and Magnetization Estimates from Magnetization Edge Effects: A New Method [#2075]*

We present a new method of determining magnetization vector and paleopole location of magnetic sources with long edges adjacent to non-magnetic regions on Mars.

**POSTER LOCATION #354**

*MARSIS Subsurface Radar Sounding of Meridiani Planum, Mars: Implications for the Properties of the Plains Deposits [#2521]*

Subsurface reflectors in the Meridiani Planum plains deposits detected by the MARSIS radar sounder.

Putzig N. E. Foss F. J. II Campbell B. A. Phillips R. J.  
**POSTER LOCATION #355**

*Interior of Mars’ Planum Boreum Fully Imaged in a 3-D Volume of SHARAD Data [#2624]*

We apply the migration process to a 3-D volume of radar observations from 1579 orbits to fully image the internal structure of the icy polar layered deposits.
A Physical Model for the Depth Profile of Thermal Conductivity in the Megaregolith of Airless Bodies: Implications for Interior Thermal Structure and Evolution [2918]

A physical model of thermal conductivity for planetary regolith is applied to estimate the vertical temperature profile in the megaregolith of airless bodies.

Reanalysis of the Penetration Data Provided by Lunokhod Rover on the Moon [1533]

We reanalyzed the penetration data provide by the Lunokhod rover for possible subsurface interpretations.

Catalogue of Lunar Thermal Anomalies [2208]

Total 266 thermal anomalies on the nighttime lunar surface were identified from the CE-2 37-GHz TB data. The heating and cooling in a lunation was studied.

Magnetic Signatures from the Interiors of Jupiter and Saturn [1628]

We derived implications for the interior structures (core size, helium redistribution) and dynamics of Jupiter and Saturn from their intrinsic magnetic fields.

Comparing Geologic Data Sets Collected by Planetary Analog Traverses and by Standard Geologic Field Mapping: Desert Rats Data Analysis [1023]

A geologic map was produced from data collected during an analog mission using Apollo-style traverses. This will be compared to a standard geologic field map.

Mapping Planetary Volcanic Deposits: Identifying Vents and Distinguishing Between Effects of Eruption Conditions and Local Lava Storage and Release on Flow Field Morphology [2504]

Our field mapping demonstrates a need for caution when inferring planetary eruption conditions from morphology due to effects of local lava storage and release.

Comparing and Reconciling Traditional Field and Photogeologic Mapping Techniques: Lessons from the San Francisco Volcanic Field, Arizona [2913]

This abstract offers basic insights into how geologic maps created from different tactics can be reconciled in support of exploratory missions.

Comparing Geologic Data Sets Collected by Planetary Analog Traverses and by Standard Geologic Field Mapping: Implications for Planetary Exploration Planning [2078]

We consider the science operations implications comparing “Apollo-style” site investigations with the same site investigated with conventional geologic mapping.

Subsurface Life in the Atacama: Overview of the First Autonomous Traverse of a 1-m Rover-Mounted Drill [1185]

The LiTA project is developing and field testing a 1-m drill mounted on an autonomous rover in the Atacama desert.
Planetary Lake Lander: Year 3 Science Overview

PLL is a step toward robotic awareness without constant human oversight. It is applied here to the concept of adaptive exploration of Titan’s seas.

Planetary Lake Lander: Adaptive Science Initial Results

The PLL robotic probe, an analog to future missions to the lakes and seas of Titan, uses onboard autonomous science data understanding to drive its behavior.

ARTEMIS Simulation of Curiosity Rover Traverses

A fully dynamic model developed to model Curiosity rover traverses has been validated using field test data and is used to simulate actual rover drives.

The Activities of the Ibn Battuta Centre (Morocco) and the Sahara as Large-Scale Mars Analogue

The Ibn Battuta Centre deals with both scientific and operational analogs. It takes advantage of the remarkable geological and geomorphological diversity.

Results from ILEWG EuroMoonMars Analogue Field Research Campaigns

We discuss results of field analog research campaigns (ILEWG EuroMoonMars) in support of Mars astrobiology studies, and Moon/Mars robotic and human missions.

A Large Lunar Surface Testbed from Low Cost Material

A 30 × 30-meter analog surface was built at MSFC using 225 tons of Merriam Crater ash and cinder. Transportation, sources, construction, and health are discussed.

Multispectral Imaging of Hydrothermal Alteration Terrains Using an ExoMars PanCam Prototype

Results of a field test of an ExoMars PanCam prototype in terrain typified by small-scale hydrothermal alteration products.

Automated Core Sample Analysis by the Mars Microbeam Raman Spectrometer (MMRS) On-Board the Zoe Rover in Atacama: A Terrestrial Test for Mars Exploration

MMRS performed well in the first autonomous life in the Atacama campaign. Minerals were unambiguously identified; different depth distributions were observed.

The Persistence of a Chlorophyll Spectral Biosignature from Martian Evaporite and Spring Analogues Under Mars-Like Conditions

Following exposure to Mars-like conditions, chlorophyll in spring sediment and evaporite endolith samples is detectable using Mastcam and Pancam spectra.

Raman (532 nm) Spectroscopy of Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons exhibit differences in both 532-nm induced fluorescence spectra and the positions of Raman peaks as a function of composition.
Izawa M. R. M.  Applin D. M.  Cloutis E. A.  
Detection Limits of Polycyclic Aromatic Hydrocarbons (PAHs) in Martian Soil Simulant JSC-Mars-1 [#1572]
Fluorescence, reflectance, and Raman spectroscopic techniques for the detection of PAHs in martian regolith simulant show detection limits as low as tens of ppm.

Pommerol A.  Thomas N.  Jost B.  Beck P.  Okubo C.  et al.  
Visible Spectro-Photometry of Dry, Wet and Frozen Mars Soil Analogs [#2168]
Spectrophotometric characterization of various Mars analogs in the VIS spectral range and implication for remote-sensing studies of the martian surface.

Ryan A. J.  Piqueux S.  Christensen P. R.  
Radiometric Determination of Thermal Conductivity of Complex Particulate Materials Under Mars-Like Conditions [#2220]
Mars surface properties (e.g., grain size, induration, layering, chemistry) strongly affect thermal conductivity. Lab improves interpretation of temperature datasets.

Esposito F.  Popa C. I.  Di Achille G.  Molfese C.  Cozzolino F.  et al.  
Field Test Campaign in the Morocco Desert as Analog for the DREAMS Experiment On-Board ExoMars 2016 Mission [#2411]
Preliminary results of a field test campaign in the Moroccan desert for the study of dust lifting processes and its relation with atmospheric electric properties.

Scanning 3-Axis Magnetometry can Detect Ancient Martian Lightning Strikes: Field Trials on a Native America Petroglyph [#2178]
A rover-borne magnetometer can characterize ancient martian lightning strikes, constraining paleoclimate and informing biomarker sample selection.

CALIBRATING OUR DESTINATIONS: LABORATORY STUDIES OF TERRESTRIAL MATERIALS AS ANALOGS FOR PLANETARY ENVIRONMENTS AND MATERIALS [T628]

Martone A. A.  Glotch T. D.  
The Effect of Grain Size and Abundance on the Deconvolution of Mixtures Using the Shkuratov Model [#2295]
We use the Shkuratov radiative transfer model to determine mineral optical constants and test the model’s ability to deconvolve reflectance spectra of mixtures.

Matsumoto T.  Miyamoto H.  Nishibori T.  Manabe T.  Ito T.  et al.  
On the Heterogeneities of Electro-Magnetic Properties of Rocks [#2089]
A technique for measuring the permittivity of heterogeneous materials.

Carli C.  Roush T.  Capaccioni F.  
Retrieving Optical Constants and Grain Size of Glasses by Hapke Modeling [#1840]
We retrieved the optical constants of synthetic volcanic glasses, and we investigated how those calculations are affected by grain size distribution.

Rucks M. J.  Glotch T. D.  
Mid-IR Optical Constants of Enstatite and Hypersthene [#2333]
Optical constants are an essential input into scattering models used in remote sensing. This study determined the optical constants of two orthopyroxenes.

Rhind T. R.  Cloutis E.  Mann P.  
Spectral Reflectance Properties of Garnets [#2173]
Systematic study of the spectral properties of garnets to determine the presence of various optically-active cations for differentiation and identification.
Serventi G. Carli C. Sgavetti M.  
**POSTER LOCATION #388**

*The Effect of Very Fine Particle Sizes on Plagioclase-Mafic Mineral Mixtures [#1339]*

In this abstract, we analyze mixtures composed of plagioclase and mafic minerals at very fine particle sizes, comparable to those found on the lunar regolith.

Rhind T. R. Cloutis E. Mertzman S. A.  
**POSTER LOCATION #389**

*The Effects of Composition and Structure of Magnetites on Their Spectral Properties [#2107]*

Understanding mineral structure data from XRD analysis and chemical variation from XRF analysis and their effect on magnetite reflectance spectra.

Patmore E. B. Strait M. M. Flynn G. J. Durda D. D.  
**POSTER LOCATION #390**

*Compression Strength of Pumice [#2429]*

Analysis of the density and compression strength of pumice as a porous asteroid analog.

Morlok A. Ahemdi M. Hiesinger H.  
**POSTER LOCATION #391**

*MERTIS/IRIS: A Mid-Infrared Study of Red Suevite Impact Rocks for Planetary Applications [#1888]*

We studied the mid-infrared properties of red suevite impact melt rocks from the Nördlinger Ries impact crater for remote sensing applications.

Jack S. J. Strait M. M. Flynn G. J. Durda D. D.  
**POSTER LOCATION #392**

*Using Porous Material to Simulate Asteroid Disruption [#2430]*

Disruption characteristics of pumice as a highly porous asteroid analog.

Clayton A. N. Strait M. M. Flynn G. J. Durda D. D.  
**POSTER LOCATION #393**

*Disruption Experiments with an Artificially Hydrated Ordinary Chondrite [#2799]*

Disruption experiments with artificially created hydrous meteorite analogs.

Cockell C. C. Changela H. G. Bryce C. Brearley A. J.  
**POSTER LOCATION #394**

*SEM-TEM Study of Icelandic Palagonite: Application to Hydrated Silicate gel Interfaces in the Nakhlaite Meteorites and Secondary Processes on Mars. [#2890]*

This SEM-TEM study compares the zoned gel-silicate assemblages in terrestrial Icelandic palagonite with those found in the martian meteorites.

Woods-Robinson R. E. Paige D. A.  
**POSTER LOCATION #395**

*Low Temperature Thermal Properties of Lunar Soil [#2003]*

Physically-based lunar soil thermal properties at 20–100K are derived from measurements of analog materials and theory for the lunar regions in permanent shadow.

Bell M. S.  
**POSTER LOCATION #396**

*Experimental Alteration of Basalt to Support Interpretation of Remote Sensing and In Situ Measurements from Mars [#2822]*

Results of alteration experiments designed to provide the foundation for subsequent experiments on laboratory shocked basalt are described.

Jensen H. B. Sklute E. C. Rogers A. D. Reeder R. J.  
**POSTER LOCATION #397**

*Synthesis Pathways and Spectral Discrimination of Amorphous Ferric Sulfates on Mars [#2781]*

Possible structural effects of formation pathways on spectral character using amorphous ferric sulfates were synthesized in four ways and observed via IR.

Sklute E. C. Jensen H. B. Rogers A. D. Reeder R. J.  
**POSTER LOCATION #398**

*Visible and Infrared Spectral Characteristics and Morphology of Amorphous Iron Sulfates [#2709]*

The synthesis of amorphous Fe sulfates made through the dehydration of deliquesced Fe$^{3+}$ and crystalline Fe$^{2+}$ sulfates is described and products characterized.
Murphy N. W.  Jakosky B. M.  Mellon M. T.  Budd D. A.  **POSTER LOCATION #399**

*Thermophysical Properties of Four Terrestrial Indurated Materials and Their Implications for Martian Duricrusts [#2690]*

From examining terrestrial indurated materials, we find that granular fabric has a significant effect on the bulk thermophysical properties of Mars duricrusts.

Brugman B. L.  Culp L.  Gibson J.  Hicks L.  Lecos K.  et al.  **POSTER LOCATION #400**

*Grain Shape and Size Analysis of Sand- and Silt-Size Sediment in a Terrestrial Periglacial Landscape: A Possible Process Analog for Sand and Silt Imaged by the Phoenix Optical Microscope at the Phoenix Mars Lander Landing Site [#2626]*

Shape and size analysis of terrestrial sand and silt grains from a periglacial landscape geomorphically analogous to the site imaged by Phoenix Mars Lander.

Farrand W. H.  Wright S. P.  Glotch T. D.  **POSTER LOCATION #401**

*Determining the Provenance of Altered Basaltic Clastics Based on VNIR and TIR Spectroscopy: Relevance for Mars [#1597]*

Altered basaltic hydrovolcanic, glaciovolcanic, and explosive ashes are examined with VNIR, TIR, and XRD spectroscopy. Differences are linked to mode of origin.

Roush T. L.  Brown A.  Bishop J. L.  Blake D.  Bristow T.  **POSTER LOCATION #402**

*Optical Constants of Mars Candidate Materials Used to Model Laboratory Reflectance Spectra of Mixtures [#1380]*

End-member optical constants, estimated from different particle size distribution representations, are used to model measured lab spectra of their mixtures.

Parthasarathy G.  Sarkar P. K.  **POSTER LOCATION #403**

*High Pressure Temperature Studies of Phyllosilicates from the Deccan Trap, India: Implications to Martian Mineralogy and Near Subsurface Processes [#1326]*

This is the first report on the high-pressure and high-temperature investigations on the natural phyllosilicates relevant to the martian near surface processes.

Greenberger R. N.  Mustard J. F.  Cloutis E. A.  Mann P.  Wilson J. H.  et al.  **POSTER LOCATION #404**

*Remote Sensing of Volcano-Lacustrine Interactions: Implications for Mars [#1543]*

Mineralogic, chemical, and oxidative changes in hydrothermally altered basalts relate to degrees of water-rock interactions and are identified with spectroscopy.

Fraser S. A.  Cloutis E. A.  Mann P.  Applin D.  **POSTER LOCATION #405**

*Long-Term Monitoring of Water-Bearing Minerals Exposed to Mars Surface Conditions [#2083]*

Observation of hydrated minerals exposed to Mars surface conditions provide insights to their detectability and the climatic and geologic history of the planet.

Socki R. A.  Niles P. B.  Sun T.  Fu Q.  Romanek C. S.  et al.  **POSTER LOCATION #406**

*Martian Cryogenic Carbonate Formation: Stable Isotope Variations Observed in Laboratory Studies [#2757]*

Laboratory experiments were performed where calcium bicarbonate was frozen under Mars-like conditions to form calcium carbonate for stable-isotope analyses.

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**VISIT THE PLANETS WITHOUT LEAVING HOME:**

**TERRESTRIAL GEOLOGY AS AN ANALOG FOR PLANETARY ENVIRONMENTAL PROCESSES [#T629]**


*Methane Dynamics and Microbial Communities in Small, Seasonally Ice-Covered Arctic Lakes in Western Greenland: Insights into Early Pluvial Periods on Mars [#2223]*

Variations in aquatic chemistry, methane dynamics and microbial communities are observed in small ice-covered lakes. Lakes on Mars would also exhibit variation.
Wilks R. P. A.  Apolin D. M.  Cloutis E. A.  Bandfield J. L.  

**POSTER LOCATION #408**  
Spectral Properties of Shocked and Unshocked Granites: Implications for Detection on Mars  
A spectroscopic-structural-compositional study of shocked and unshocked granites was conducted to understand evolutionary pathways for granitic rocks on Mars.

Nikitzczuk M. P. C.  Schmidt M. E.  Flemming R. L.  

**POSTER LOCATION #409**  
Eruptive, Depositional and Hydrothermal Conditions of Basaltic Tuffs: Setting the Stage for a Habitable Environment  
Textural and mineralogical investigations of basaltic tuffs reveal a succession that lead to habitable conditions as evidenced by endolithic microbore.

Cable M. L.  Amador E. S.  Schwiegerman E.  Jacobsen M. B.  Yin C.  et al.  

**POSTER LOCATION #410**  
Icelandic Lava Fields as a Terrestrial Analog for Mars: Investigation of Habitability, Productivity and Microbial Diversity  
Where to look for life? / Iceland as an analog / Lessons learned for Mars.

Scheidt S. P.  Hamilton C. W.  Zimbelman J. R.  Bleacher J. E.  Garry W. B.  et al.  

**POSTER LOCATION #411**  
Lava-Rise Plateaus and Inflation Pits Within the McCartys Flow, New Mexico  
The fracture patterns of lava flows exhibit unique structure associated with emplacement, shown here from high-resolution 3D models generated from field photos.

Noguchi R.  Höskuldsson Á.  Saruya T.  Friðriksson Á.  Gjerløw E.  et al.  

**POSTER LOCATION #412**  
Double Rootless Cones Around Lake Myvatn in Iceland, as Analogues to Double Cones in Athabasca Valles, Mars  
Here we report field investigations on Myvatn (northern Iceland) rootless cones in comparison with the martian rootless cones.

Arp G.  Head J.  

**POSTER LOCATION #413**  
Post-Impact Crater Lake Formation on Earth and Mars: Stages in the Evolution from Closed-Basin to Open-Basin Lake in the Ries Crater, Germany  
The 15 Ma old Ries crater exhibits a chemical evolution of its lake due to the erosion of different ejecta layers and a change from a closed to an open basin.


**POSTER LOCATION #414**  
Highly-Reduced, HSE-Rich Metallic-Fe Deposits in the Siberian Trap Basalts: An Analog of Extraterrestrial Conditions?  
We present new HSE native-Fe results and compare and contrast terrestrial and extraterrestrial native-Fe occurrences and their formation histories.


**POSTER LOCATION #415**  
Preliminary Results from a Field Study of the Mineralogy of the White Sands National Monument Dune Field  
Blowing wind moves sand / Gypsum, carbonate, and quartz / But which is preserved?

Lafuente B.  Bishop J. L.  Fenton L. K.  King S. J.  Blake D.  et al.  

**POSTER LOCATION #416**  
Mineralogical Characterization by XRD of Gypsum Dunes at White Sands National Monument and Application to Gypsum Detection on Mars  
A field portable XRD instrument was used to perform analyses of White Sands dunes to characterize gypsum and minor abundances of quartz, dolomite, and calcite.
King S. J.  Bishop J. L.  Garcia G. C.  LaFuente B.  Fenton L. K.  
**POSTER LOCATION #417**

*VNIR Spectra of Gypsum-Rich Field Samples from White Sands New Mexico as an Analog Study for Olympus Undae, Mars [#2284]*

This is an analog comparison study using visible/near-infrared spectra to compare field samples of White Sands New Mexico with known lab samples.

**POSTER LOCATION #418**

*Sediments and Soil Profiles of Upper Wright Valley, Antarctica [#1707]*

Chemistry and mineralogy of soils from Taylor and Wright Valleys contribute to models of calcium and chlorine weathering and distribution on Mars.

Sizemore H. G.  
**POSTER LOCATION #419**

*Soil Permeability: Accuracy of the Kozeny-Carman Equation in Shallow Flow Problems on Mars and Earth [#1902]*

I compare permeabilities measured in Mars-analog soils to values calculated via five forms of the Kozeny-Carman equation.

Hynek B. M.  McCollom T. M.  McHenry L. J.  Alvarado G. E.  
**POSTER LOCATION #420**

*Assessing Hydrothermal Alteration on Early Mars Through Analog Environments in Nicaragua, Costa Rica, Iceland, and Hawaii [#2172]*

Field studies of active acidic volcanos in Nicaragua, Costa Rica, Iceland, and Hawaii are used to infer paleoconditions of relic hydrothermal systems on Mars.

**POSTER LOCATION #421**

*Preservation of Highly Hydrated Salts in Subsurface at a Hyperarid Region on Tibet Plateau [#2636]*

Salt mineralogy of a stratigraphic section suggests three episodes of brine intrusion, with subsurface salts having high hydration degree in this hyperarid region.

Goudge T. A.  Mustard J. F.  Head J. W.  Russell J. M.  
**POSTER LOCATION #422**

*Source to Sink Mineralogy in Lake Towuti, Indonesia: Perspectives on Open-Basin Lakes on Mars [#1190]*

Analysis of input sediment and lacustrine core mineralogy from a terrestrial lake offers insight into potential alteration processes in martian paleolakes.

Levy J. S.  Fountain A. G.  Head J. W.  Dickson J. L.  
**POSTER LOCATION #423**

*How to Build a Gully in a Day and Erase it in a Year: Observations of Small Scale Fluvial Erosion and Deposition in Antarctic Buried Ice Landscapes as Analogs for Martian Gullies and RSL [#1592]*

Rapid erosion and deposition, by wet and dry processes, illustrate landform formation and removal mechanisms under Mars-analog environmental conditions.

Pellicer X. M.  Bourke M.  
**POSTER LOCATION #424**

*Eskers in Ireland, Analogs for Mars Landforms [#1917]*

Eskers are dominant landforms of the Irish landscape. Exposures and research available make Irish eskers an excellent analog for esker-like ridges in Mars.

De Hon R. A.  
**POSTER LOCATION #425**

*Alcoves as Protected Sites for Martian Life [#1027]*

Terrestrial alcoves provide analogs for martian sheltered sites that could have harbored early biota or might serve as basecamps in future exploration.

Kereszturi A.  Dulai S.  Marschall M.  Pócs T.  Pócs T.  
**POSTER LOCATION #426**

*The Chott el Jerid Mars Analog Expedition [#1357]*

Analog expedition in Tunisia to collect cryptobiotic crust samples with cyanobacteria for survival tests, to analyze fluvial networks and test ground truth.
Information on Subsurface Stratigraphy Derived from Martian Single and Double Layered Ejecta Craters [1008]

We regionally examine martian single and double layered ejecta craters and present a regional model of subsurface layering that is consistent with observations.

Morphology of Radial Grooves on the Inner Ejecta Layer of Martian Double Layered Ejecta Craters [1589]

The morphometry of grooves on the inner layer of martian DLE craters suggests that they were produced by either high-speed granular flow or explosion surge.

A New Phenomenological Ejecta Excavation and Emplacement Model for DLE Craters [1792]

A new ejecta excavation and emplacement model for DLE craters is developed on the basis of morphological, morphometric, and hyperspectral analyses.

Ejecta Mobility of Layered Ejecta Craters on Mars: Assessing the Influence of Surface Snow and Ice Deposits [1078]

We test the idea that the morphologic differences between Pd, DLE, and LARLE craters may result from gradations in crater diameter and icy substrate thickness.

Mapping Variations in Sediment Thickness in the Chryse Impact Basin Using Quasi-Circular Depressions from MOLA Data [1102]

Quasi-circular depressions (QCDs) from MOLA data are used to show significant variations in likely sediment thickness within the Chryse Impact Basin.

Analysis and numerical modeling of the Firsoff filled crater in Arabia Terra. Estimate of materials involved in erosional and depositional processes.

Little is known about the pre-valley network Noachian environment. The landform evolution model was used to constrain a possible long-term Noachian environment.

Large (D > 15 km) impact craters in Hesperia Planum were mapped and superposed craters were measured to constrain relative ages and to develop a geochronology.

Geologic Map of the Meridiani Region of Mars [2193]

We have drafted a geologic map of the Meridiani region, Mars, for USGS publication; placing MER Opportunity results in the broader spatial and temporal contexts.
**POSTER LOCATION #438**
*Towards Automated Global Color Mosaicking of HRSC Images of Mars [#1899]*
We discuss our approach toward automatically combining hundreds of the MarsExpress/HRSC panchromatic or color images together to construct a global mosaic.

Wigton N. R.  Warner N.  Golombek M.  
**POSTER LOCATION #439**
*Terrain Mapping of the InSight Landing Region: Western Elysium Planitia, Mars [#1234]*
Twenty-two potential landing sites were investigated for potential hazards. From the 22 ellipses, 4 were selected to be carried through downselection.

Neesemann A.  van Gasselt S.  Walter S.  
**POSTER LOCATION #440**
*Detailed Geomorphologic-Tectonic Mapping of the Tempe Terra Region, Mars Under Consideration of Chronostratigraphic Aspects [#2313]*
We have completed a new 1:3,000,000 geomorphologic map of Tempe Terra along with parts of surrounding units of Kasei Valles, Tharsis, and Arcadia Planitia.

**MARS ROVER SCALE GEOLOGY AND GEOMORPHOLOGY [T632]**

Calef F. J. III  Arvidson R.  Sletten R.  Williams R.  Grotzinger J.  
**POSTER LOCATION #441**
*Surface Roughness Derived from HiRISE Visible Imagery: A Case Study at the MSL Landing Site [#1614]*
Surface roughness helps discriminate terrain types and is useful for assessing rover traverse on Mars. We use HiRISE image texture to evaluate this parameter.

Jacob S. R.  Rowland S.  Calef III F. J.  Stack K. M.  MSL Team  
**POSTER LOCATION #442**
*Characteristics and Origin of a Cratered Unit near the MSL Bradbury Landing Site (Gale Crater, Mars) Based on Analyses of Surface Data and Orbital Imagery [#1395]*
The MSL landing ellipse was mapped into six units, one being the cratered surfaces. This project focuses on subdividing this unit and determining its origin.

Le Mouélic S.  Gasnault O.  Herkenhoff K. E.  Bridges N. T.  Langevin Y.  et al.  
**POSTER LOCATION #443**
*Using ChemCam Remote Micro-Imager Onboard MSL for Long Distance Reconnaissance Campaigns [#1361]*
This abstract describes the first imaging experiments performed at infinity focus with the ChemCam instrument onboard Curiosity.

**POSTER LOCATION #444**
*Determining Grain Characteristics in the Shaler Outcrop with ChemCam Remote Micro-Imager Mosaics [#2342]*
Analysis of grain size distribution from RMI mosaics (Curiosity) are used to better define variations in grain size and facies in the Shaler outcrop.

**POSTER LOCATION #445**
*Closing in on a Martian Mudstone [#2488]*
Explains the steps by which the first martian mudstone was identified, and how eolian erosion experiments help to deduce texture from images.

**POSTER LOCATION #446**
*Mars: Looking for Link Between Local Micro-Morphology Diversity Along the Rover Curiosity Traverse in the Gale Crater and Variability of the DAN Active Mode Measurements [#1240]*
We will report about correlation between a variability in the DAN active mode measurements and local diversity of surface micromorphology and regolith texture.
Hollowed Spherules Identified with the MER Opportunity Near and at Cape York, Western Rim of Endeavour Crater, Mars [1566]
We report the identification of a new type of spherules not previously described in Meridiani: hollowed spherules.

Martian Spherule Size Distribution Between Eagle and Endurance Craters from Opportunity Rover MI Images [2026]
A look at the size distribution of martian spherules including “blueberries” as well as other spherule types from Opportunity Rover at Meridiani Planum.

Pancam photometric multispectral observations were acquired between Sols 500 and 1525 along the Spirit and Opportunity traverses that augment previous analyses.

The Endeavour rim mountains are bounded by an apron of reworked surfaces and sediment onlaps resembling terrestrial lakeshores that are tilted into the crater.

A Complete Catalogue of Landslides in Valles Marineris, Mars [1601]
A map of 202 landslides was compiled in Valles Marineris, including ample data on landslide characteristics and their relationships and spatial distribution.

Structure and Geometry of the Interior Layered Deposits Within Hebes Chasma, Valles Marineris, Mars [1900]
Small-scale fractures as well as topographic features, including landslide scars, were examined to better understand the structure of Hebes Chasma’s ILD mound.

This study focuses on Hebes Mensa, the chasma’s main ILD mound and several outlying ILDs. Measurements of these ILDs’ attitudes and thicknesses were collected.

Layer Thickness Measurements, Structural Analysis, and Mineralogical Investigation of the Ganges Chasma Interior Layered Deposit, Valles Marineris, Mars [1577]
Layering within HiRISE images covers 2.5 km of stratigraphy with average layer thicknesses of 1.04 m. Soft sedimentary deformation is visible near the ILD base.

Results from mapping the geology of Central Valles Marineris, Mars. Eight material categories are mapped based on geomorphic expressions and geologic origins.
EXOMARS LANDING SITE GEOLOGY

Pacifici A.  Ori G. G.  Cannarsa F.  Murana A.  Aboudan A.  et al.  POSTER LOCATION #457
Geological and Geomorphological Map of ExoMars 2016 Landing Site [#1531]
A geological-geomorphological map of ExoMars 2016 (ESA-Roscosmos) landing ellipse has been realized in order to support the engineering constraints analysis.

Ori G. G.  Aboudan A.  Portigliotti S.  Marcera A.  Lorenzoni L.  et al.  POSTER LOCATION #458
The Analysis of the ExoMars 2016 Landing Site [#1787]
The landing ellipse of ExoMars 2016 lander is located at Meridiani Planum. The ellipse is 110 km long and 25 km large and cover a flat area.

Silvestro S.  Vaz D. A.  Di Achille G.  Esposito F.  Popa C.  POSTER LOCATION #459
Eolian Characterization of the 2016 ExoMars Landing Site: Implications for the DREAMS (Dust Characterization, Risk Assessment and Environment Analyzer on the Martian Surface) Experiment [#1887]
We report the presence of active and relict eolian bedforms and further estimate wind directions in the ExoMars landing site through analysis of TARs and dunes.

Kereszturi A.  Újvári G.  Bradák B.  POSTER LOCATION #460
Estimating the Origin and Transport Process of Grains Expected to find During the Drill of ExoMars Rover Mission [#1496]
We outline how the data from the drilled samples by the ExoMars rover will provide information on the source, tranport, and paleoenvironment of the particles.

Aboudan A.  Pacifici A.  Murana A.  Allemand P.  Ori G. G.  et al.  POSTER LOCATION #461
Automatic Rocks Detection and Classification on High Resolution Images of Planetary Surfaces [#1705]
This work describes a Rock Automated Detector algorithm developed for the analysis of ExoMars 2016 mission landing site, its validation, and performances.

MARS DATA CALIBRATION AND ANALYSIS TECHNIQUES

Mu Y.  Ding W.  Ren X.  Oberlin E.  Kounaves S.  POSTER LOCATION #463
Gaussian Noise Removal for Wet Chemistry Data from the Phoenix Mission [#1142]
We proposed an approach to remove white noise influence from the WCL data to obtain correct sensor readings, and to identify other chemical species present.

Bramble M. S.  Flemming R. L.  McCausland P. J. A.  POSTER LOCATION #464
A 2-D XRD grain size estimation is performed on minerals of known sieve fraction grain sizes, and then applied to 2-D XRD data from the Mars Science Laboratory.

The Combustion Experiment on the Sample Analysis at Mars (SAM) Instrument Suite on the Curiosity Rover [#2694]
The combustion experiment on the Sample Analysis at Mars (SAM) suite on Curiosity will heat a sample of Mars regolith in the presence of oxygen.

Malespin C. A.  Mahaffy P. R.  Farley K. A.  Grotzinger J. P.  Vasconcelos P. M.  et al.  POSTER LOCATION #466
Methods for In Situ Radiometric Dating on Mars with Curiosity and Future Landers [#2424]
In situ radiometric dating of the martian surface was done by MSL/SAM. One application of this result is to compare the K-Ar date with crater counting models.
Clegg S. M. Anderson R. Forni O. Lasue J. Dyar M. D. et al. *POSTER LOCATION #467*

*Expansion of the ChemCam Calibration Database* [#2378]
The ChemCam laboratory testbed has been used to compile an expanded calibration database that better represents many of the martian observations.

Dobosh P. A. Dyar M. D. *POSTER LOCATION #468*

*Software Tools for Exploring and Analyzing ChemCam Data* [#1188]
Software (in Matlab) to allow rapid, flexible review of ChemCam data via graphs and tabular summaries to distinguish single and multiple phase targets.

Mezzacappa A. Melikechi N. Cousin A. Lasue J. Lanza N. et al. *POSTER LOCATION #469*

*Effects of Distance Correction on ChemCam LIBS Measurements (Sols 13 to 360)* [#1517]
We discuss the impact of observation distance on ChemCam LIBS measurements and provide a method using martian dust to correct individual emissions for distance.

Schröder S. Meslin P.-Y. Gasnault O. Cousin A. Maurice S. et al. *POSTER LOCATION #470*

*ChemCam Data Processing: Dark Spectra and Their Role in the Detection of Hydrogen* [#1928]
Raw data are processed by subtracting a dark spectrum, which comprises a H absorption line from the solar spectrum. Discussion of implications for H detection.

Rapin W. Meslin P.-Y. Schroder S. Maurice S. Gasnault O. et al. *POSTER LOCATION #471*

*Study Towards the Calibration of the Hydrogen Signal with Water Content as Measured by ChemCam in Martian Soils* [#1982]
Description of lab experiment using ChemCam EQM, preliminary results, and plans to help interpret the LIBS hydrogen signal acquired in martian soils.

Lewin É. Lasue J. Forni O. Tokar R. Blaney D. et al. *POSTER LOCATION #472*

*Comparing LIBS Spectra from ChemCam Instrument on Board Curiosity (MSL) : How Different Can They Be and Still Be “The Same”?* [#2817]
Reproducible measuring defines how different duplicate measurements can be. Stats allow such metric construction even with a planetary instrument such as ChemCam.

Wagstaff K. L. Lanza N. L. Wiens R. C. *POSTER LOCATION #473*

*Unusual ChemCam Targets Discovered Automatically in Curiosity’s First Ninety Sols in Gale Crater, Mars* [#1575]
We analyzed ChemCam spectra from MSL’s first 90 sols with the DEMUD prioritization algorithm. It flagged samples with unusual Ca, Na, Si, Al, and Mg peaks.

Parente M. Saranathan A. M. Wiseman S. Ehlmann B. L. Pan L. *POSTER LOCATION #474*

*Denoising CRISM Images: A New Look* [#2900]
We explore the potential of a novel denoising technique for CRISM data that addresses both column-dependent and spatially-localized spectral distortions.

Schmidt F. Legendre M. Le Mouelic S. *POSTER LOCATION #475*

*LINMIN: Minerals Detection Tool for Hyperspectral Images* [#1791]
We propose a new algorithm tool for minerals detection using linear unmixing under constraints. We validated it on synthetic and real hyperspectral images.

Viviano-Beck C. E. Seelos F. P. Murchie S. L. Kahn E. G. Seelos K. D. et al. *POSTER LOCATION #476*

*Revised CRISM Spectral Parameters and Summary Products* [#2444]
We assemble type spectra of the known diversity of minerals identified using CRISM data to update and fine-tune CRISM hyperspectral parameter formulations.
Pitman K. M.  Wolff M. J.  Cloutis E. A.  
**POSTER LOCATION #477**  
*Building More Realistic Grain Shapes in Radiative Transfer Models of Mars Regolith [##2627]*  
We show numerical models replacing spheres with cubes and prisms as fundamental scatterers for Mars. Such edges remove resonance structure in phase functions.

Berard G. M.  Cloutis E. A.  Mann P.  
**POSTER LOCATION #478**  
*Effects of Simulated Martian Impact Heating on Reflectance Spectra of Various Mars-Relevant Minerals [##2480]*  
The reflectance spectra of 47 different martian surface minerals were measured after heating to temperatures commonly observed after impact events.

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**MARS SCIENCE LABORATORY CHEMISTRY [T636]**

Hardgrove C.  Moersch J.  Mitrofanov I.  Litvak M.  Behar A.  et al.  
**POSTER LOCATION #479**  
*Modeling of Mars Science Laboratory Curiosity’s Dynamic Albedo of Neutrons Instrument Data Using Elemental Geochemistry [##1664]*  
DAN data acquired in and around Yellowknife Bay are modeled using full elemental geochemistries from APXS and SAM.

Gellert R.  Berger J. A.  Boyd N.  Campbell J. L.  Elliott B.  et al.  
**POSTER LOCATION #480**  
*APXS Measurements Along the MSL Traverse at Gale Crater, Mars [##1876]*  
The MSL APXS identified various new rock types along the traverse at Gale Crater during the first 450 sol. These will be presented and compared to MER.

Lee R. E.  Schmidt M. E.  Gellert R.  Campbell J. L.  King P. L.  et al.  
**POSTER LOCATION #481**  
*Linking MAHLI and APXS to Analyze Dust Coverage on Yellowknife Bay Rock Targets [##2144]*  
Using MAHLI and APXS we have determined a correlation between dust coverage and APXS chemical composition data.

Fisk M.  Dyar M. D.  Cousin A.  Bridges N.  Bridges J.  et al.  
**POSTER LOCATION #482**  
*Silica-Fe-Rich Components of Rocks, Gale Crater, Mars [##1674]*  
Chemcam on Mars Science Laboratory analyzed mixtures of iron-rich and iron-poor phases in rocks. The mixtures average 56 ± 4 wt.% SiO$_2$ and 36 ± 2 wt.% FeO.

Sautter V.  Fabre C.  Forni O.  Topliss M.  Cousin A.  et al.  
**POSTER LOCATION #483**  
*Mafic to Felsic Igneous Rock in Hummocky Plain at Gale Crater: A ChemCam Campaign (Sol 13–45 and Sol 326–359) [##1369]*  
ChemCam (Curiosity) analyzed igneous rocks at Gale such as alkaline feldspar-bearing rocks present as ejecta, alluvial fan detritus, coming from the crater rim.

**POSTER LOCATION #484**  
*ChemCam Results from the Shaler Outcrop in Gale Crater, Mars [##2380]*  
We present ChemCam results from the Shaler outcrop, including average composition of the different facies and inferences about sediment source and alteration.

Cousin A.  Clegg S. M.  Dehouck E.  Fabre C.  Forni O.  et al.  
**POSTER LOCATION #485**  
*ChemCam Blind Targets: A Helpful way of Analyzing Soils and Rocks Along the Traverse [##1278]*  
This study is focused on data acquired in blind mode by ChemCam. This is a great way to increase the statistics on rocks and soils during the drive.

**POSTER LOCATION #486**  
*Rocknest and Beyond: Iron Bearing Cemented Sediments in Gale Crater from ChemCam Observations [##2122]*  
Iron cements are present in multiple locations at Gale.
Ollila A. M.  Newsom H. E.  Wiens R. C.  Maurice S.  Sautter V.  et al.  
**POSTER LOCATION #487**

*Trace Element (Strontium, Barium, Rubidium and Lithium) Analyses by ChemCam for the First 360 Sols in Gale Crater, Mars [#2490]*

Sr, Ba, Rb, and Li results from ChemCam for the first 360 sols in Gale Crater, Mars.

Wiens R. C.  Mangold N.  Forni O.  Ollila A.  Johnson J. R.  et al.  
**POSTER LOCATION #488**

*Chemical and Textural Observations by ChemCam of Conglomerates in Gale Crater [#1171]*

Conglomerate clasts display distinct compositional trends corresponding to their locations on Bradbury Rise, likely indicating different source regions.

Dehouck E.  McLennan S. M.  Meslin P.-Y.  Cousin A.  Rampe E. B.  et al.  
**POSTER LOCATION #489**

*Exploring the Composition and Nature of the X-Ray Amorphous Components of Martian Soil and Rocks at Gale Crater, Mars [#1454]*

Using mass-balance calculations, we explore the possible chemical compositions of amorphous components in martian soil and rocks analyzed by the Curiosity rover.

Nachon M.  Clegg S. M.  Mangold N.  Schröder S.  Kah L. C.  et al.  
**POSTER LOCATION #490**

*Calcium Sulfate Characterized by ChemCam/Curiosity at Gale Crater, Mars [#2006]*

Ca-sulfates material detected and characterized by the ChemCam instrument onboard Curiosity, within the Yellowknife Bay sedimentary formation, Gale Crater.

**POSTER LOCATION #491**

*Sulfur-Bearing Compounds Detected by MSL SAM Evolved Gas Analysis of Materials from Yellowknife Bay, Gale Crater, Mars [#2257]*

Sulfur species evolved from Yellowknife Bay materials during MSL SAM pyrolysis are likely derived from sulfides and amorphous phases.

**POSTER LOCATION #492**

*Detection of Nitric Oxide by the Sample Analysis at Mars (SAM) Instrument. Implications for the Presence of Nitrates [#2909]*

The release of NO from soils and rocks by the SAM instrument at Gale Crater is examined and its possible origin is discussed.

Eigenbrode J. L.  Bower H.  Archer P. Jr.  
**POSTER LOCATION #493**

*Decarboxylation of Carbon Compounds as a Potential Source for CO2 and CO Observed by SAM at Yellowknife Bay, Gale Crater, Mars [#1605]*

Partially oxidized, small organic molecules will decarboxylate during EGA to produce CO₂ at temperatures comparable to that observed for the Sheepbed mudstone.

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**MARS SURFACE PHYSICAL PROPERTIES [#T637]**

Hanna R. D.  Hamilton V. E.  
**POSTER LOCATION #495**

*Correlating Thermal Inertia and Olivine Abundance on Mars with THEMIS [#2576]*

We are examining olivine-bearing areas to test for correlations between THEMIS-derived thermal inertia and olivine abundance.

Gondet B.  Audouard J.  Bibring J-P.  
**POSTER LOCATION #496**

*OMEGA/MARS Express Observations over Curiosity at Gale Crater [#2129]*

in this paper we focus on comparaisons between OMEGA/MEX observations over Gale Crater and other instruments: REM/MSL, CHEMCAM/MSL, MAHLI/MSL, THEMIS/Odyssey.
Audouard J. Arvidson R. E. Poulet F. Vincendon M. Gondet B.  
**POSTER LOCATION #497**

**Thermophysical Properties of Gale Crater Plains Along Curiosity Traverse** [1784]

We use GTS/REMS data onboard Mars Science Laboratory and an energy balance model to study the thermophysical properties of Gale Crater plains.

Simurda C. M. Ramsey M. S.  
**POSTER LOCATION #498**

**Correcting Topographic Shadowing Errors in Apparent Thermal Inertia Images** [2400]

This work explores corrections for topographic shadowing errors arising in thermal inertia data of a Mars analog site.

Cole S. B. Herkenhoff K. E. Yingst R. A. Squyres S. W.  
**POSTER LOCATION #499**

**Similar Microtextures in Watchtower and Comanche Class Rocks at Gusev Crater** [1652]

Watchtower Class and Comanche Subclass outcrops appear remarkably similar when viewed by one (and only one) of Spirit’s instruments: the Microscopic Imager.

Hanley J. Mellon M. T. Arvidson R. E.  
**POSTER LOCATION #500**

**Mechanical Strength of Martian Analog Soils** [2879]

Cohesion and angle of internal friction are measured for various water and salt concentrations in martian analog soils and compared to Mars missions results.

Williamson T. J.  
**POSTER LOCATION #501**

**The Effect of Porosity on the Thermal Inertia of Light and Dark Gravel** [2189]

This study involves the data compiled about the relationship between porosity and albedo when sediments are heated under near-martian conditions.

**POSTER LOCATION #502**

**The Effect of Porosity on Thermal Inertia of Sediments (Preliminary Results)** [1964]

The Mars Outreach for NC Students program investigated the effects of changes in porosity on thermal inertia of sediments and found very slight increases.

Puri V. Youngstorm D. Zuo R. Cox M. Jiang H. et al.  
**POSTER LOCATION #503**

**The Effects of Porosity on the Thermal Inertia of Sand** [2853]

The experiment explores whether porosity is a factor of thermal inertia.

Baker S. Breitfeld A. Quiambao R. Hassan M. Hassan R. et al.  
**POSTER LOCATION #504**

**The Effect of Porosity on the Thermal Inertia of Pebble Gravel** [1297]

The Mars Outreach for North Carolina Students (MONS) team measured the effect of porosity on thermal inertia and found no definitive link between the two.

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**MARS MINERALOGY** [T638]

Weitz C. M. Bishop J. L. Baker L. Berman D. C.  
**POSTER LOCATION #506**

**Fresh Exposures of Allophane in Association with Channels and Debris Aprons in Coprates Chasma, Mars** [1386]

We have discovered relatively fresh Fe-allophane signatures that correspond to debris and debris aprons along the wallrock slopes in Coprates Chasma, Mars.

Bishop J. L. Rampe E. B.  
**POSTER LOCATION #507**

**The Importance of Nanophase Aluminosilicates at Mawrth Vallis** [2068]

Nanophase species including allophane, imogolite, and hisingerite are important components of both the Al-rich and Fe-rich phyllosilicate units at Mawrth Vallis.
Velbel M. A. Goetz W. Hecht M. H. Hvid S. F. Madsen M. B. et al.  
**POSTER LOCATION #508**

*Preliminary Identification of Minerals in Silt- and Sand-Size Grains on Mars from Phoenix OM Images Using Three-Channel Color Photometry [#2043]*

Brown grains in the very-fine sand and coarse silt size range at the Phoenix landing site consist of olivine (Fo < 41), nanohematite, and possibly jarosite.

Popa C. Carrozzo F. G. DiAchille G. Silvestro S. Esposito F. et al.  
**POSTER LOCATION #509**

*Evidences for Copper Minerals in Shalbatana Valley, Mars [#2340]*

We report a case of direct identification of copper minerals related to supergene like alteration in Shalbatana Valley on Mars and their geological implication.

Wiseman S. M. Ehlmann B. L. Mustard J. F.  
**POSTER LOCATION #510**

*Characterization of Carbonate Compositions and Mineral Assemblages to Constrain Geochemical Conditions [#2249]*

Characterizing carbonate compositions and mineral assemblages is crucial for interpreting geochemical conditions and understanding martian paleoenvironments.

Gross C. Noel A. Bishop J. L. Al-Samir M. Flahaut J. et al.  
**POSTER LOCATION #511**

*Investigating the Mineralogy, Morphology and Stratigraphy of Mound B in Juventae Chasma, Mars Using Multiple Datasets [#1918]*

We investigate the mineralogy, morphology, and stratigraphy of sulfate-bearing interior layered deposits in Juventae Chasma using CRISM, HRSC, CTX, and HiRISE data.

Lai J. C. Horgan B. Bell J. F. III  
**POSTER LOCATION #512**


We use near- and thermal-infrared remote sensing to infer the mineralogy of martian volcanic edifices via “windows” through the surface dust cover.

**POSTER LOCATION #513**

*Mineralogy and Geochemistry of an Icelandic Fumarole: Analog to Mars Hydrothermal Alteration [#2815]*

A mineralogical transect across an Icelandic fumarole yields a range of soluble sulfates comparable to the Columbia Hills at Gusev Crater.

**POSTER LOCATION #514**


We report the occurrence of a hematite-bearing breccia on Mauna Kea as a potential mineralogical and process analog for the Gale Crater hematite ridge.

**POSTER LOCATION #515**

*Chlorine and Cl Isotope Composition of the Martian Surface: A Perspective from Martian Regolith Breccia Sample NWA 7034 [#2302]*

We explore the mineralogical reservoirs of Cl in the martian surface by examining the Cl concentration and isotopic composition in apatite from NWA 7034.

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**MARS PETROLOGY [#T639]**

**POSTER LOCATION #516**

*Determining the Nature of Olivine Zoning in Nakhlites by In-Situ Mg and Fe Isotopic Analyses [#2797]*

We show Mg and Fe isotopic profiles in olivines in six nakhlites, measured using SIMS. The profiles are used to constrain the thermal histories of nakhlites.
Corrigan C. M. Velbel M. A. Vicenzi E. P. Konicek A.  
**POSTER LOCATION #517**
Modal Mineralogy and Chemistry of Nakhlite Northwest Africa (NWA) 5790: How it Stacks up with the rest of the Nakhlites [#2128]
We examine the mineralogy and mineral chemistry of this “high-mesostasis” nakhlite and what they suggest in terms of emplacement within the nakhlite stack.

Collinet M. Medard E. Vander Auwera J. Charlier B.  
**POSTER LOCATION #518**
Alkaline Primary Melts from the Primitive Mantle of Mars [#2839]
The primitive martian mantle is rich in Na and K. Experiments show that its melting has implications for the origin of alkaline rocks on Mars.

Medard E. Collinet M.  
**POSTER LOCATION #519**
Shergottites: Partial Melts of a Depleted Martian Mantle [#2840]
Shergottites are interpreted as partial melts of a residual depleted mantle, formed by extraction of the martian crust.

Chen Y. Liu Y. Patchen A. Barry P. Taylor L. A.  
**POSTER LOCATION #520**
Mineralogy and Petrology of New Shergottites LAR 12011, LAR 12095, and LAR 12240 [#2880]
This abstract describes the mineralogy and petrology of three new olivine-phyric shergottites: LAR 12011, LAR 12095, and LAR 12240.

Gross J. Filiberto J.  
**POSTER LOCATION #521**
Granitic Compositions in Gabbroic Martian Meteorite NWA 6963 and a Possible Connection to Felsic Compositions on the Martian Surface [#1440]
We report mineralogy, petrology, and texture of two types of granitic compositions from gabbroic meteorite NWA 6963, with implications to felsic surface compositions.

**POSTER LOCATION #522**
Petrology of the new Enriched lherzolitic Shergottite NWA 7397: Two Stages of Formation [#1310]
We present a two-stage formation model for NWA 7397 to account for a distinct change in pressure of crystallization and the HREE profile of the parental magma.

He Q. Xiao L.  
**POSTER LOCATION #523**
Preliminary Petrographic and Melt-Inclusion Studies on the Northwest Africa 7397: Another Enriched “Lherzolitic” Shergottite [#1668]
NWA 7397 is another enriched “lherzolitic” shergottite that is similar to RBT 04262/1 and GRV 020090.

Park J. Herzog G. F. Turrin B. Lindsay F. N. Delaney J. S. et al.  
**POSTER LOCATION #524**
$^{40}$Ar/$^{39}$Ar Studies of Martian Meteorite RBT 04262 and Terrestrial Standards [#1609]
$^{40}$Ar/$^{39}$Ar ages of six ~30-µg RBT 04262 maskelynites range from 40 to 313 Ma, but form a 244-Ma isochron. We discuss interpretations and standards.

Kuchka C. R. Herd C. D. K. Walton E. L.  
**POSTER LOCATION #525**
Hematite in Tissint Shock Melt Glass: Investigating the Possibility of a Martian Near-Surface Component in Shergottites. [#2693]
Raman identification of hematite associated with shock melt pockets in Tissint is documented as possible evidence for a near-surface component in shergottites.

Moriwaki R. Usui T. Yokoyama T. Simon J. I. Jones J. H.  
**POSTER LOCATION #526**
Preliminary Report on U-Th-Pb Isotope Systematics of the Olivine-Phyric Shergottite Tissint [#1773]
This study proposes the possibility that Tissint would have experienced a minor assimilation of the ancient martian crust.
Kiefer W. S. Macke R. J. Britt D. T. Irving A. J. Consolmagno G. J.  
**POSTER LOCATION #527**
The Density, Porosity, and Magnetic Susceptibility of Martian Meteorites as Constraints on Gravity Models [#2028]
Density and porosity measurements of martian meteorites help to constrain gravity models of martian crustal structure.

**POSTER LOCATION #528**
Identification of Martian Regolith Sulfur Components in Shergottites Using Sulfur K XANES and Fe/S Ratios [#1524]
Sulfur speciation in shergottite impact glasses provides strong evidence for the occurrence of small amounts of martian regolith in these meteorites.

Selin R. J. Gross J. Filiberto J.  
**POSTER LOCATION #529**
Water, Fluorine, and Chlorine Fugacity Ratios of the Martian Interior Derived from Apatite in Gabbroic Shergottite NWA 6963 [#1462]
We report apatite compositional data from gabbroic shergottite NWA 6963 and calculate F₂, Cl₂, and H₂O fugacity ratios for its parental magma.

**POSTER LOCATION #530**
Valence State Partitioning of V Between Pyroxene and Melt for Martian Melt Compositions Y 980459 and QUE 94201: The Effect of Pyroxene Composition and Crystal Structure [#1029]
The goal of this study is to examine the significant variation in the partitioning of vanadium between pyroxene and melt with changing Wo content in pyroxene.

Burger P. V. Shearer C. K. Papike J. J. McCubbin F. M. Bell A. S.  
**POSTER LOCATION #531**
Crystal Chemistry of Merrillite from Martian Meteorites: Mineralogical Recorders of Magmatic Processes and Planetary Differentiation [#2272]
We examine major-/trace-element variation in merrillites from a variety of martian samples to decipher the petrogenetic significance of their crystal chemistry.

**POSTER LOCATION #532**
Water Contents of Coexisting Merrillite and Apatite in the Shergotty Meteorite: Implications for Merrillite in Hydrous Magmas [#2774]
H₂O abundances of merrillite and apatite from the Shergotty meteorite were determined to show that merrillite can form from H₂O-rich magmas.

Udry A. McSween H. Y. Jr.  
**POSTER LOCATION #533**
We investigate degassing of water from parental magmas of different types of shergottites by analyzing lithium zoning in pyroxene and olivine.

**POSTER LOCATION #534**
Petrogenesis of a Vitrophyre in the Martian Meteorite Breccia NWA 7034 [#1948]
We present the study of a unique vitrophyric clast in the martian breccia NWA 7034, which represents an impact melt with Humphrey-like composition.

**POSTER LOCATION #535**
Oxygen Isotope Study of Northwest Africa (NWA) Shergottites [#2191]
New O-isotope data of shergottites fall on the MFL. Minor slope variations in triple O-isotope plots of maskelynite and pyroxene are observed.

Santos A. R. Agee C. B. McCubbin F. M. Shearer C. K.  
**POSTER LOCATION #536**
An Investigation of Pyroxenes Within Different Lithologic Domains in Martian Meteorite NWA 7034 [#2513]
Major and minor elements in pyroxenes from different domains within NWA 7034 were used to explore the petrogenetic relationships between each domain.
Zircons in Northwest Africa 7034: Recorders of Crustal Evolution on Mars [#2020]

We report U-Pb data obtained with the NanoSIMS ion probe on zircons and baddeleyites in martian meteorite Northwest Africa 7034, and discuss their implications.

Examining the Petrology of “Martian” Meteorite NWA 7034: A Polymict Fragmental Breccia [#2924]

The odd “Black Beauty” / Is polymict and fragmental / But is it from Mars?

Possible Identification of Surviving Interplanetary Dust Particles in a Mars Regolith Breccia [#1959]

We identified Ni hot spots in Mars regolith breccia NWA 7034, consistent with surviving interplanetary dust, and discuss implications for regolith production.

Possible Identification of Surviving Interplanetary Dust Particles in a Mars Regolith Breccia [#1959]

We identified Ni hot spots in Mars regolith breccia NWA 7034, consistent with surviving interplanetary dust, and discuss implications for regolith production.

The nature of hydration products in the martian meteorite NWA 7533 enables us to unravel the hydration of surface dust and the 3-µm band of Mars.

XRD, XAS, TEM of nakhlites show ferric saponite similar to that in Gale Crater and ferric serpentine. Weakly crystalline gel veins don’t show significant XRD.

NWA7533 with its age of 4.4 Gyr and DO17 at 0.57 means the O isotopes and ages of Mars meteorites and CI are now indistinguishable. The CI are from Mars!

Experimental derivation of adsorption kinetics for basalt and montmorillonite and their role in the variations observed in diurnal atmospheric water vapor.

Development of a Mars simulation chamber to be used for experiments in adsorption, diffusion, and deliquescence to understand the planet’s diurnal water cycle.

We will discuss carbon-isotopic measurements of the martian atmosphere determined by the SAM quadrupole mass spectrometer since Curiosity landed on Mars in 2012.

Comparison of optical depth derived from Mars Express’ HRSC and the Mars Exploration Rovers. A considerable correlation is found even between remote areas.
Moores J. E. Lemmon M. T. Francis R.
MSL Environmental Theme Group MSL Science Team et al. POSTER LOCATION #547
Update on MSL Atmospheric Monitoring Movies Sol 100–360 [1567]
The Mars Science Laboratory Atmospheric Monitoring Campaign using the Engineering Cameras is updated along with Line-of-Sight Optical Depths within Gale Crater.

Francis R. Navarro López S. Newman C. Moores J. McIsaac K. et al. POSTER LOCATION #548
Observation of Winds at Gale Crater: Preliminary Comparison of Results from Mars Science Laboratory’s NavCam and REMS Instruments [1468]
Who has seen the wind? / Neither I nor you / But when NavCam at zenith stares / The clouds reveal a clue />
Neither you nor I / But MSL has REMS+cams / To watch the wind go by.

Niles P. B. Mahaffy P. R. Atreya S. Pavlov A. A. Trainer M. et al. POSTER LOCATION #549
Reconciling the Differences Between the Measurements of CO$_2$ Isotopes by the Phoenix and MSL Landers [2573]
This preliminary study suggests a potential basis for agreement between the TEGA and SAM datasets regarding the isotopic composition of martian atmospheric CO$_2$.

Halevy I. Head J. W. III POSTER LOCATION #550
Climatic Consequences of Episodic Eruptions on Early Mars [2278]
Brief and strong volcanic eruptions injected large amounts of SO$_2$ into early Mars’ atmosphere, leading to above-melting tropical, but not global temperatures.

ACCRETION AND IMPACTS: Icy Bodies [T641]
Throop H. B. Durda D. D. Shu A. Geiss R. H. Rice K. P. POSTER LOCATION #551
Hypervelocity Laboratory Impacts of Micron-Sized Dust into Foil and Meteoritic Targets [1690]
Tiny dust grains at crazy high speeds! We use impacts in a dust accelerator to simulate the formation of dusty planetary rings.

Cotto-Figueroa D. Asphaug E. I. Reufer A. POSTER LOCATION #552
Dynamical Fate of Clumps Formed in Satellite Mergers [2091]
We study the long-term dynamical fate of orbiting clumps formed in satellite mergers, by coupling N-body simulations with results of SPH models of collisions.

Movshovitz N. Korycansky D. G. Nimmo F. Asphaug E. Owen J. M. POSTER LOCATION #553
Outer-Planet Satellite Survival During the Late Heavy Bombardment (II) [2308]
With a Monte Carlo approach and utilizing scaling laws for destructive impacts, we investigate the effect of an LHB on outer solar system satellites.

Teodoro L. F. A. Korycansky D. G. Warren M. S. Fryer C. Rockefeller G. et al. POSTER LOCATION #554
A Ten Million SPH Particle Simulation of the Origin of Obliquity of Uranus [2542]
We present a new set of simulations of the origin of Uranus obliquity using the same method as Slattery et al. (1992) with mass resolution 1000 times better.

AT DAWN WE RIDE TO VESTA AND CERES [T642]
Palmer E. E. Sykes M. V. POSTER LOCATION #555
The Observational Bias of Thermal Spectra Due to Subpixel Variations [2441]
We evaluate the thermal spectrum of a rough terrain on Vesta. We identify that the observed irradiance is a mixture of hot and cold regions that are unresolved.
The Photometric Properties of Vesta and the Implications


POSTER LOCATION #556

We will discuss the photometric properties of Vesta from Dawn Framing Camera data, and the implications on the photometric studies of asteroids.

Dawn FC Color Data: Results of Advanced Processing for Vesta

Hoffmann M., Nathues A., Schäfer M., Christensen U., Sierks H., et al.

POSTER LOCATION #557

Dawn FC color images of Vesta reveal unprecedented lithologic detail shown by examples of nonlinear color ratios, which were derived using cluster analysis.

Distribution of Potential Olivine Sites on the Surface of Vesta by Dawn FC


POSTER LOCATION #558

We report about the most recent results of our olivine mapping of the vestan surface based on Dawn Framing Camera Data.

Olivine Rich Exposures in Bellicia and Arruntia Craters on Vesta Using Dawn FC


POSTER LOCATION #559

We present the most recent findings of olivine in the Bellicia and Arruntia crater on Vesta based on Dawn Framing Camera data.

A Meteorite Analog for Olivine-Rich Terrain in Unexpected Locations on Vesta


POSTER LOCATION #560

Here we test the hypothesis that olivine-rich impact melts in howardites represent the olivine-rich terrains identified in unexpected locations on Vesta.

An Earth-Like Hydrogen Isotopic Composition of Vesta as Revealed by Apatite

Sarafian A. R., Marschall H. R., Nielsen S. G., McCubbin F. M., Monteleone B.

POSTER LOCATION #561

We measured H isotopes in several eucrites and determined the source of hydrogen for Vesta is similar to carbonaceous chondrites.

Distribution of the Near-IR Spectral Signature of Olivine on Vesta with VIR/Dawn Data: The Ultramafic Side of Vesta’s Surface


POSTER LOCATION #562

We characterized and mapped the near-IR signature of olivine on Vesta with VIR/Dawn. Local enrichments in olivine are found. Their implications are discussed.

Marcia Crater, Vesta: Geology, Mineralogy, Composition, and Thermal Properties


POSTER LOCATION #563

Marcia Crater is the largest well-preserved young impact on Vesta. Its characteristics and relevance are presented.

Key Features of the Lucaria Quadrangle of Asteroid Vesta


POSTER LOCATION #564

A mineralogical analysis of the Lucaria quadrangle is performed, with particular care to Publicia and Aelia Craters, Lucaria Tholus, and equatorial troughs.

The Signature of Secondary Cratering on 4 Vesta and Tethys


POSTER LOCATION #565

We compare measured crater SFDs of Vesta, Mimas, and Tethys. Very steep distributions found on Vesta and Tethys may result from secondary cratering.

Geomorphology and Structural Geology of Saturnalia Fossae and Adjacent Structures in the Northern Hemisphere of Vesta


POSTER LOCATION #566

A structural mapping study shows that the Saturnalia Fossae and adjacent structural features in Vesta’s northern hemisphere form by impact-related processes.
Yamashita N. Prettyman T. H. Reedy R. C. POSTER LOCATION #567
Retrieving More Elements from Dawn’s Gamma-Ray Spectrometer [#2674]
We provide an overview of the processing steps of Dawn’s GRaND data that are required for further elemental analyses of Vesta’s Al, Mg, K, Th, and possibly Ni.

De Sanctis M. C. Ammannito E. Palomba E. POSTER LOCATION #568
Vesta Evolution from Surface Mineralogy: Mafic and Ultramafic Mineral Distribution [#1748]
Vesta, the HED parent body, experienced complex igneous processes, and olivine and diogenite distribution is a key to understand its evolution.

De Sanctis M. C. Formisano M. Capria M. T. Ammannito E. Capaccioni F. et al. POSTER LOCATION #569
Ceres Water Regimes: Simulation of Surface Temperatures and Water Sublimation [#1738]
Ceres is a key object to understand the water story in the solar system. We simulate the thermal surface properties and water sublimation regime.

Neumann W. Breuer D. Spohn T. POSTER LOCATION #570
Modelling of the Thermo-Chemical Evolution of Ceres [#2055]
We have tested the possibility of whether Ceres’ low density can be explained with a porous interior, and show that the porous structure is rather unlikely.

Neveu M. Desch S. J. Castillo-Rogez J. C. POSTER LOCATION #571
Modeling Core Cracking, a Key Factor in the Geophysical Evolution and Habitability of Ceres [#1120]
We model core cracking on icy bodies, a major (but so far overlooked) factor in their geophysical evolution and habitability. The model is applied to Ceres.

Europa and Enceladus: Active Worlds Giving Vent [T643]
Retherford K. D. Roth L. Saur J. Gladstone G. R. Nimmo F. et al. POSTER LOCATION #572
Europa’s Water Vapor Plumes: Discovery with HST and Plans for JUICE-UVS Observations [#1639]
Discovery of water vapor plumes on Europa obtained with HST, and updated plans for JUICE Ultraviolet Spectrograph (UVS) observations.

Roth L. Retherford K. D. Saur J. Strobel D. F. Feldman P. D. et al. POSTER LOCATION #573
Europa’s UV Aurora: Following Up on the Discovery of the South Polar Water Vapor Plumes with HST/STIS [#1488]
We report our discovery of water vapor plumes near the south pole of Jupiter’s moon Europa with HST/STIS and present new STIS observations from 2014.

CO₂ Venting and Ice Formation on Enceladus’ Surface [#1286]
The CO₂ frost on Enceladus’ surface is suggested to come from venting pockets of subsurface gas. This presentation traces the life cycle of such a gas pocket.

Abramov O. Spencer J. R. POSTER LOCATION #575
New Models of Endogenic Heat from Enceladus’ South Polar Fractures [#2878]
New thermal models, coupled with new observations from the Cassini CIRS and ISS instruments, further constrain tiger stripe vent temperatures and widths.

Schenk P. POSTER LOCATION #576
The Colors of Enceladus: From Plumes and Particles to Active Fractures [#2618]
A coat of many colors you wear / Yet a Haiku explains not / The wonders that lies beneath.
Buratti B. J. Dalba P. A. Hicks M. D. Chang J. P.  
Enceladus: Surface Texture and Roughness as Clues to What Lies Beneath [#2038]  
Surface texture and roughness provide clues for locating regions of activity on icy bodies.

INMS Measurements of Enceladus Plume Density [#2845]  
We show density profiles for six passes of the Cassini INMS through the Enceladus plumes. Mass-dependent effects complicate direct extraction of water density.

Experimental Evidence for High-Temperature Water–Rock Interactions in a Chondritic Core of Enceladus [#1714]  
Our experiments together with the discovery of silica nanoparticles in E-ring suggest the presence of recent hydrothermal activity at ≥100°C in Enceladus.

Zolotov M. Yu. Postberg F.  
Can Nano-Phase Silica Originate from Chondritic Fluids? The Application to Enceladus’ SiO₂ Particles [#2496]  
Cooing of chondritic fluids may not cause precipitation of silica.

Green A. P. Montesi L. G. J.  
Crystallization and Convection of the Outer Satellites’ Icy Shells in the Presence of Internal and Bottom-Driven Heating [#2248]  
A time-dependent crystallizing stagnant lid convection model is constructed to evaluate the thermal evolution of the icy shells of outer satellites.

Umurhan O. M. Moore J. M. Howard A. D. Schenk P. M.  
Model Helene: Reconstructing the Histories of Saturnian Trojan Satellites Using Landform Evolution Modeling [#2384]  
Helene and other E-ring Trojan satellites of Saturn exhibit puzzling surface geomorphology. We apply MARSSIM to account for their histories.

Kirchoff M. R. Schenk P.  
The Resurfacing and Bombardment History of Saturn’s Moon Dione from its Global Crater Database [#2149]  
Based upon our Dione crater database, we have determined there are seven different geologic units, which have complex resurfacing and bombardment histories.

Landry B. C. Munsill L. C. Collins G. C. Mitchell K. L.  
Observations About Boulders on the South Polar Terrain of Enceladus [#2317]  
Near the tiger stripes / Boulders are distributed / Exponentially.

Nahm A. L. Kattenhorn S. A.  
A Classification and Characterization Scheme for Tectonic Structures on Enceladus [#1072]  
Its faults and fractures / A classification scheme / For Enceladus.

Chilton H. Patthoff D. A. Pappalardo R. Thomas P.  
Analyses of Ridges on Enceladus from Limb Profiles and Additional Techniques [#2922]  
We use limb profiles of Enceladus complemented with additional methods to further characterize ridges and suggest constraints on deformation history.

Johnston S. A. Montési L. G.  
Stress Field Above an Ice Cauldron on Europa [#2517]  
Rise, melt, and then fall / The stresses could help reveal / Europan cauldrons.
Parro L. M.  Ruiz J.  Pappalardo R. T.  POSTER LOCATION #589
*Chaos Units in Argadnel Regio, Europa: Implications for Timing of Chaos Formation.* [#1570]
Study of chaos units, their relations with other features, and the implications for local geological history in Argadnel Regio, Europa.

Cole T.  Manchester A.  Schuman S.  POSTER LOCATION #590
*Examining the Presence of Cryovolcanism on Enceladus and Europa Through Surface and Crustal Comparisons* [#1291]
We examine Europa and Enceladus for the presence or absence of cryovolcanism to support the hypothesis that there may be active cryovolcanic geysers on Europa.

Nimmo F.  Spencer J. R.  POSTER LOCATION #591
*Powering Triton’s Recent Geological Activity by Obliquity Tides: Implications for Pluto Geology* [#1516]
Triton’s recent surface deformation is due to obliquity tidal heating in a subsurface ocean. Pluto does not experience such heating, so it will not be deformed.

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**TITAN: RETURN TO LAKE DISTRICT**  [T645]

Mitchell K. L.  Malaska M. J.  Horvath D. G.  Andrews-Hanna J. C.  POSTER LOCATION #592
*Karstic Processes on Earth and Titan* [#2371]
Earth and Titan karst / Fundamentally alike / Painful to model.

Gilliam A. E.  Jurdy D. M.  POSTER LOCATION #593
*Titan’s Impact Craters and Associated Fluvial Features: Evidence for a Subsurface Ocean?* [#2435]
In this study, we investigate Titan’s impact craters and their associated fluvial features as possible evidence of a subsurface ocean.

Leitner M.  Singh S.  Chevrier V. F.  POSTER LOCATION #594
*Solubility and Detectability of Acetonitrile in Titan Lakes* [#2658]
Through simulation of Titan conditions, we were able to gain a better understanding of the solubility of acetonitrile within Titan lakes.

Singh S.  Nna-Mvondo D.  Mege D.  Wagner A.  Chevrier V. F.  et al.  POSTER LOCATION #595
*Laboratory Infrared Spectroscopy of Titan Tholins in Liquid Methane and Ethane: Can Complex Organics in Titan’s Lakes be Detected?* [#2819]
We present the reactivity/solubility of Titan tholins with liquid hydrocarbons under simulated Titan conditions.

Choukroun M.  Vu T.  Gloeckner E.  Ibourichene A.  Smythe W.  et al.  POSTER LOCATION #596
*Effect of Ammonia on the Stability of Clathrate Hydrates: Experimental Study* [#2612]
We conducted experiments to investigate the influence of ammonia on the stability of clathrate hydrates and applications to Titan.

Luspay-Kuti A.  Chevrier V. F.  Singh S.  POSTER LOCATION #597
*Experimental Study of N₂ Dissolution in CH₄-C₂H₆ Mixtures Under Titan Surface Conditions* [#1897]
We present preliminary experimental results on the thermodynamics and kinetics of N₂ dissolution in liquid hydrocarbons under simulated Titan conditions.

Gainor M.  Singh S.  Wagner A.  Chevrier V. F.  POSTER LOCATION #598
*Hydrocarbon Ices Under Simulated Titan Surface Conditions* [#2381]
This study presents the first experimental investigations of the infrared properties of hydrocarbon ices under simulated Titan surface conditions.
Gilliam A. E.  Lerman A.  
*Methane and Ammonia in Titan’s Primordial and Cooling Atmosphere [1545]*

We propose a new model for Titan’s atmosphere post-accretion, and show how NH₃ and CH₄ could leave the primordial atmosphere by thermal escape as the only sink.

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**POSTER LOCATION #599**

**ATMOSPHERES AND EXPLORATION OF THE OUTER SOLAR SYSTEM [T646]**

Sharma S. K.  Porter J. N.  Misra A. K.  
*Remote Raman Spectroscopy of Salts and Organics in the Subsurface of Ice — A Potential Instrument for Exploring Europa [1678]*

Data from a remote Raman spectrograph on salts and PAHs in the sublayers of water ice at 120 m show the potential of the technique for future Europa missions.

Plaut J. J.  Barabash S.  Bruzzone L.  Dougherty M.  Erd C.  et al.  
*Jupiter Icy Moons Explorer (JUICE): Science Objectives, Mission and Instruments [2717]*

The JUpiter ICy Moons Explorer (JUICE) is an ESA mission that will fly by and observe the icy moons Europa, Ganymede, and Callisto, and finally orbit Ganymede.

Langevin Y.  Piccioni G.  Eng P.  Filacchione G.  Poulet F.  et al.  
*The MAJIS VIS-NIR Imaging Spectrometer for the JUICE Mission [2493]*

MAJIS is the VIS-NIS imaging spectrometer recently selected for the JUICE mission. It will provide critical information on Jupiter’s satellites and atmosphere.

Atkinson D. H.  Lunine J. I.  Simon-Miller A. A.  
*In Situ Probe Science at Saturn [1377]*

A shallow Saturn probe measuring key atmospheric abundances and isotope ratios can test competing theories of solar system and giant planet formation.

Mousis O.  Fletcher L. N.  Lebreton J.-P.  Wurz P.  Cavalié T.  et al.  
*Scientific Rationale of a Saturn Probe Mission [1261]*

We describe the main scientific goals to be addressed by future in situ exploration of Saturn.

*Possible Concepts for an In Situ Saturn Probe Mission [1244]*

We present Saturn entry probe concepts for in situ exploration informing us on the formation history of our solar system and the planet’s atmosphere processes.

Simon A. A.  Carlson R. W.  Sanchez-Lavega A.  
*Spectral Comparison and Stability of Red Regions on Jupiter [1033]*

Spectral slopes on Jupiter vary by region, but are temporally stable. A transient cyclone is more spectrally “red” than the Great Red Spot.

Kuznyetsova Yu.  Matsiaka O.  Shliakhetskaya Y.  
*Krushevskaya V.  Vid'machenko A.  et al.*  
*Spectral Researches of Uranus and Neptune Atmospheres [1836]*

We present the results of spectral observations of Uranus and Neptune during the years 2001–2012. Observations were carried out at the peak Terskol observatory.
ESA’s Planetary Science Archive is the repository for all data returned by ESA’s planetary explorers. All data holdings, activities, and plans are described.

We talk about a 3U CubeSat “S-CUBE” to observe UV-visible observations of meteors from space.

The Space Launch System (SLS) is the most powerful rocket ever built and provides a critical heavy-lift launch capability enabling diverse deep space missions.

We will describe a stepping stone approach that charts a path starting at ISS operations today and ultimately leading to a crewed mission to the surface of Mars.

The building has a tetrahedral outer frame supported by a tripod base, placeable on the lunar or martian surface, and suitable for Earth-based analog experiments.

We discuss instrumentation and technologies crucial for exploration of lunar polar regions as an analog for planet and exoplanet surfaces.

We have evaluated application of the CubeSat paradigm for deep space missions and developed the LWaDi Lunarcube mission.

We describe a CubeSat as one of the payloads for Korean Lunar Exploration to measure magnetic fields on the Moon.

Traverse options for a robotic and/or human assisted return sample mission to Schrödinger basin have been created to address important lunar scientific goals.

Traverse options for a robotic sample return mission to the northern portion of Schrödinger basin, addressing many NRC (2007) science goals and priorities.
Potts N. J.  Gullikson A.  Curran N. M.  Dhalwal J. K.  Chang G.  et al.  
POSTER LOCATION #618
Mapping Solar Irradiance Within Schrödinger Basin for Future Robotic Sample Return Missions [#1835]
Analysis of solar irradiance data from LMMP for the period January 2018 through December 2021 for a potential robotic mission to Schrödinger Basin.

POSTER LOCATION #619
Velocity of a Rover as a Function of Slope of Lunar Terrain [#2683]
Abstract outlines a derived model for the velocity of a rover as a function of the slope of lunar terrain. It can be used for more accurate mission planning.

Ghai R. C.  EnVision team  
POSTER LOCATION #620
EnVision: Taking the Pulse of our Twin Planet [#2547]
EnVision is an ambitious ESA M-class InSAR mission to measure rates of change in its interior, surface, and atmosphere, and the causative processes involved.

POSTER LOCATION #621
Sounding the Interior of Mars and Venus Using Existing Spacecraft and Future Landers [#2064]
Magnetic observations from orbiting and landed missions can be used to constrain the size of the metallic cores of Venus and Mars.

POSTER LOCATION #622
Phobos and Deimos and Mars Environment (PADME): A LADEE-Derived Mission to Explore Mars’s Moons and the Martian Orbital Environment [#2288]
PADME is a proposed rapid low-cost NASA Mars orbiter mission that will address longstanding unknowns about Mars’ two moons and the circum-martian environment.

Warner N. H.  Golombek M. P.  Bloom C.  Wigton N.  Schwartz C.  
POSTER LOCATION #623
Regolith Thickness in Western Elysium Planitia: Constraints for the InSight Mission [#2217]
The HP3 mole onboard InSight requires a regolith for successful penetration. We constrain regolith thickness at the landing site using rocky ejecta craters.

POSTER LOCATION #624
Final Four Landing Sites for the InSight Geophysical Lander [#1499]
InSight, the Discovery Program lander designed to determine the interior structure of Mars has downselected to four landing sites in Elysium Planitia.

Stooke P. J.  
POSTER LOCATION #625
Mars Sample Return via Robotic Collection, Phobos Cache and Human Retrieval [#1043]
Samples from Mars (+ Deimos, Mars trojans, etc.) cached on Phobos and retrieved in a first human Mars mission give the rehearsal flight a major science goal.

Khan M. S.  
POSTER LOCATION #626
Concept of Sample Return Rover for Mars Exploration [#2265]
The concept of Sample Return Rover to Mars focuses on the idea of transporting the martian samples for their physical analysis on Earth.

Bouchard M. C.  
POSTER LOCATION #627
Crewed Martian Traverses; Building on Lessons Learned from Apollo, Robotic Missions, and Planetary Analogs [#1580]
This abstract introduces a high level command and control architecture for the first human exploration mission to Mars based on lessons learned from the past.
Lauretta D. S. OSIRIS-REx Science Team  
**POSTER LOCATION #628**

*Strategy for Ranking the Science Value of the Surface of Asteroid 101955 Bennu for Sample Site Selection for OSIRIS-REx [2023]*

We summarize our strategy for selecting and characterizing sample sites on Bennu based on their primary science value.

**POSTER LOCATION #629**

*Precision Control of Autonomous Spacecraft During Close-Proximity NEO Operations Using Classical Control Methodologies [2226]*

The purpose of this work is to develop an autonomous, robust mission design and controller to enhance spacecraft performance in close-proximity NEO operations.

Jackson T. L. Zimmerman M. I. Farrell W. M.  
**POSTER LOCATION #630**

*Concerning the Charging of an Exploration Craft On and Near a Small Asteroid [2154]*

With this work we demonstrate how stationary and moving astronauts will charge when immersed in an airless plasma environment about a small asteroid.

Anderson R. C. Scheeres D. Chesley S. BASiX Team  
**POSTER LOCATION #631**

*Binary Asteroid In-Situ Explorer Mission (BASiX): A Mission Concept to Explore a Binary Near Earth Asteroid System [1571]*

The Binary Asteroid in-situ Explorer (BASiX) mission will actively probe a NEA and make the first quantitative measurements of a binary asteroid system.

**POSTER LOCATION #632**

*Journey to a Metal World: Concept for a Discovery Mission to Psyche [1253]*

We propose to visit an iron core by sending a mission to (16) Psyche, by far the largest exposed iron metal body in the solar system.

Asphaug E. Thangavelautham J.  
**POSTER LOCATION #633**

*Asteroid Regolith Mechanics and Primary Accretion Experiments in a Cubesat [2306]*

We are developing a satellite centrifuge platform AOSAT for low-cost asteroid regolith and primary accretion studies.

Mège D. Gurgurewicz J. Grygorczuk J. Wiśniewski Ł. Rickman H. et al.  
**POSTER LOCATION #634**

*The Highland Terrain Hopper: Scientific Exploration of Rugged Terrain on Low-Gravity Planetary Bodies [1262]*

This light and inexpensive mobile platform is designed to be dropped and do science on any terrain, regardless of its roughness. Examples are given.

**POSTER LOCATION #635**

*The Javelin Concept: A Swarm of Scientific Microprobes to the Clouds of Jupiter in 2030 [1418]*

A modular mission concept is presented for shallow micro-atmospheric penetrators at Jupiter that takes advantage of the in-system JUICE spacecraft in 2030.

**POSTER LOCATION #636**

*Science and Reconnaissance from the Europa Clipper Mission Concept [1655]*

Europa Clipper / Science and reconnaissance / Ice, water, and… life?

Tsou P. Anbar A. Atwegg K. Baross J. Brownlee D. et al.  
**POSTER LOCATION #637**

*LIFE — Enceladus Plume Sample Return via Discovery [2192]*

Whenever there is water on Earth, there is life. Enceladus is the second body that has water. Returning samples may well satisfy our yearning if we are alone.
Planetary probes capable of in situ measurements of gas and ice giants allow critical science measurements. Updated descent modules and payloads are discussed.

An Uranus Orbiter and a Probe mission concept.

Considerations of factors that may affect the science value of martian returned samples.

An update on the NASA Planetary Science Division Research and Analysis Program.

We analyzed models for sky brightness and seeing, calibrated by fitting to I-band data from the OGLE survey and RoboNet observations in 2011.
POSTER SESSION II  
Thursday, 6:00 p.m.  Town Center Exhibit Area  

**MERCUERY [R701]**  

**POSTER LOCATION #3**  
**Analysis of Magnetic Field Data from the Third Mariner 10 Flyby of Mercury: Comparison with MESSENGER Data and Constraints on Secular Variation [#1169]**  
Analysis of magnetic field data from the third Mariner 10 flyby of Mercury and comparison with MESSENGER data yields no evidence for secular variation.

Becker K. J.  Becker T. L.  Edmundson K. L.  
**POSTER LOCATION #4**  
**Progress Towards a Global Digital Elevation Model for Mercury [#2243]**  
A key objective of the MESSENGER mission is to collect and characterize global topographic measurements of Mercury. Global DEMs will be created from this work.

Klima R. L.  Izenberg N. R.  Murchie S. L.  
Holsclaw G. M.  McClintock W. E.  et al.  
**POSTER LOCATION #5**  
**Calibration Issues in Visible and Infrared Spectroscopic Observations of Mercury at High Temperature [#1978]**  
Vis/NIR spectra of Mercury have been collected at higher temperatures than expected. We describe the thermal effects and calibration strategy to mitigate them.

**POSTER LOCATION #6**  
**Correlation of Mercury Spectral Units with Geology and Elemental Abundance [#1216]**  
A preliminary Mercury map based on MESSENGER VIRS spectral reflectance is compared with geology and color from MDIS imagery and elemental abundance from XRS.

D’Amore M.  Helbert J.  Ferrari S.  Maturilli A.  Nittler L. R.  et al.  
**POSTER LOCATION #7**  
**Unsupervised Classification of Mercury’s Visible-Near-Infrared Reflectance Spectra: Comparison with Major Element Compositions [#1073]**  
Clustering analyses on MASC/MESSENGER results in a polar and equatorial distinct spectral unit. Comparison with an X-ray spectrometer shows elemental correlation.

Blewett D. T.  Denevi B. W.  Ernst C. M.  Chabot N. L.  Neish C. D.  
**POSTER LOCATION #8**  
**Mapping of Optical Maturity on Mercury [#1131]**  
A new method for mapping optical maturity on Mercury, useful for examining relative ages of rayed craters and identifying rays with a compositional component.

**POSTER LOCATION #9**  
**A Search for Regional Signatures of Space Weathering on Mercury [#1363]**  
This study examines possible regional variations in the space weathering of Mercury’s surface due to surface temperature and irradiation of the surface.

Vilas F.  Dominque D. L.  Helbert J.  D’Amore M.  Izenberg N. R.  et al.  
**POSTER LOCATION #10**  
**Dominici Crater Wall Hollows: Potential Spectral Evidence for Sulfide Mineralogy on Mercury [#1296]**  
MESSENGER MDIS photometry of hollows located on the south wall/rim of Mercurian crater Dominici shows evidence of a spectral absorption feature suggesting CaS.

Vander Kaaden K. E.  McCubbin F. M.  
**POSTER LOCATION #11**  
**A Synthesis of Experimental Data Describing the Geochemical Behavior of Lithophile Elements at Extremely Reducing Conditions Seen on Mercury [#1914]**  
Experiments are being conducted to determine the geochemical behavior of typically lithophile elements as a function of decreasing oxygen fugacity.
Lucchetti A.  Thomas R.  Cremonese G.  Massironi M.  Rothery D. A.  et al.  
POSTER LOCATION #12
Analysis and Numerical Modeling of a Pit Crater on Mercury [1723]
Analysis of an unusual feature within an impact crater on Mercury, even using the iSALE shock physics code, to confirm if it is due to pyroclastic volcanism.

Rothery D. A.  Thomas R. J.  Kerber L. 
POSTER LOCATION #13
Compound Volcanoes on Mercury — Implications for Vent Migration and Longevity [1854]
Mercury’s compound volcanoes are only hundreds of meters high. Some could have been active episodically for >1 Ga. Vents are explosively excavated and >1 km deep.

Di Achille G.  Zusi M.  Mazzotta Epifani E.  Popa C.  Galluzzi V.  et al. 
POSTER LOCATION #14
High Resolution Morphometry of Mercury’s Candidate Volcanic Vents Using Mercury Dual Imaging System (MDIS)-Derived Stereo Topography [2035]
We use MDIS NAC orbital images to derive high-resolution topography of Mercury’s candidate volcanic vents and study their morphometry.

Kerber L.  Besse S.  Head J. W.  Blewett D. T.  Goudge T. A. 
POSTER LOCATION #15
The Global Distribution of Pyroclastic Deposits on Mercury: The View from Orbit [2862]
Pyroclastic deposits are found to be widespread across the surface of Mercury. Associated morphologies range from deep pits to positive volcanic edifices.

Thomas R. J.  Rothery D. A.  Conway S. J.  Anand M. 
POSTER LOCATION #16
The Timing and Distribution of Pyroclastic Volcanism on Mercury [1123]
The first study to date pyroclastic activity on Mercury, dating the thickest deposits to 3.8–3.27 Ga and smaller-scale activity possibly within the last 1 Ga.

Whitten J. L.  Head J. W.  Denevi B. W.  Solomon S. C. 
POSTER LOCATION #17
Formation of Intercrater Plains on Mercury [1219]
Most intercrater plains were emplaced volcanically based on the unit distribution and the stratigraphic relationships between secondary craters and smooth plains.

Sehlke A.  Whittington A. 
POSTER LOCATION #18
Rheology of Lava Flows on Mercury: An Experimental Study [2275]
Rheology experiments on lava composition appropriate to Mercury.

Ackiss S. E.  Buczkowski D. L.  Ernst C.  McBeck J.  Edrich S.  et al. 
POSTER LOCATION #19
Knob Heights Within the Circum-Caloris Geologic Units on Mercury: Interpretations of the Geologic History of the Region [2328]
Circum-Caloris / Study formations with knobs / How high? How many?

Selvans M. M.  Watters T. R.  James P. B.  Solomon S. C. 
POSTER LOCATION #20
Statistical Analysis of the Distribution of Tectonic Features and Crustal Thickness in the Northern Hemisphere of Mercury [1442]
We assess the geographic relationship between faults and crustal thickness on Mercury. We find potential for influence of mantle flow on scarp localization.

POSTER LOCATION #21
The Mercury Thermal Radiometer and Thermal Infrared Spectrometer (MERTIS) for BepiColombo: A Status Report [1912]
We have built, calibrated, and delivered the MERTIS instrument to ESA for integration on the spacecraft. The instrument is now fully functional and integrated.
**POSTER LOCATION #22**

**What the MERCURY Radiometer and Thermal infrared Imaging Spectrometer (MERTIS) Instrument will see on Mercury — Creating Synthetic Data from MESSENGER Results [#1458]**

We have performed calibration measurement with analog materials at temperatures of up to 500°C with the MERTIS qualification and flight model at PEL at DLR.

**POSTER LOCATION #23**

**Determination and Uncertainty Analysis of Mercury Libration Using Bepi Colombo HRIC Images [#1696]**

BepiColombo HRIC images will be used to investigate Mercury’s interior measuring planet libration. Libration fitting method and its uncertainty are presented.

**POSTER LOCATION #24**

**Criteria for Identifying Mercurian Meteorites [#2013]**

We present new criteria for identifying meteorites from Mercury based on recent observations of Mercury by the MESSENGER spacecraft.

**AIRLESS BODY REGOLITH PROCESSES AND PRODUCTS [R702]**

**POSTER LOCATION #26**

**Proposed Investigations into the Connection Between Meteorites and Their Asteroid Parent Bodies Through Laboratory Simulations of Space Weathering by Solar Wind Ions [#2619]**

We describe proposed studies into the connection between meteorites and asteroids through laboratory simulations of space weathering by solar wind ions.

**POSTER LOCATION #27**

**Evolution of the Space Weathering — Laboratory Simulations [#1977]**

Most of the spectral changes related to space weathering and presence of iron nanoparticles evolve logarithmically with time.

**POSTER LOCATION #28**

**Solar Wind Sputtering of Lunar Soil Analogs: The Effect of Ionic Charge and Mass [#1186]**

We report total and mass resolved sputtering for H⁺ and Ar⁺q (q=1–9) ions incident on anorthite at 311 km/s, with enhanced O sputtering for Ar⁺9 compared to Ar⁺.

**POSTER LOCATION #29**

**Lunar Swirls and Plasma Magnetic Field Interaction in the Laboratory [#1742]**

A GEC cell has been used to investigate the interaction of plasma with a magnet. The results shall be used to help to understand the formation of lunar swirls.

**POSTER LOCATION #30**

**The Formation of Lunar Swirls: Results from Hapke’s Radiative Transfer Modeling [#1654]**

Lunar swirls are demonstrated to be depleted in smaller and larger SMFe, and the solar wind deflection model is preferred to explain the formation of lunar swirls.

**POSTER LOCATION #31**

**Solar-Proton Fluxes Recently Near the Earth [#2324]**

Solar-proton fluxes for 2009–13 were compiled and compared with earlier data. They are relative low, consistent with low recent solar activities.

**POSTER LOCATION #32**

**Determining the Regolith Histories of Lunar Meteorites [#1467]**

Determining the regolith history of lunar meteorites to see if they show a similar link between their formation age and their maturity, as Apollo samples do.
THUR POSTERS

Schelling P. K.   Britt D. T.   Bradley T.   Consolmagno G. J.   POSTER LOCATION #33
Space Weathering on Mercury and Vesta [2179]
A general theory of space weathering is developed, and applied to provide potential explanations for unique space weathering observed on Mercury and Vesta.

Thompson M. S.   Zega T. J.   POSTER LOCATION #34
An analysis of the oxidation states of individual iron nanoparticles in rims and agglutinates of a mature lunar soil through electron energy-loss spectroscopy.

Durga Prasad K.   Murty S. V. S.   POSTER LOCATION #35
Effect of Grain Size and Porosity on Surface Heat Influx on the Moon [1236]
Laboratory experiments carried out in a simulated lunar environment to understand the effect of grain size and porosity on lunar surface heat flow is reported.

Christoffersen R.   Noble S. K.   Keller L. P.   POSTER LOCATION #36
Nanoscale Compositional Relations in Lunar Rock Patina: Deciphering Sources for Patina Components on an Apollo 17 Station 6 Boulder [1939]
Sources for rock patina components on an Apollo 17 Station 6 boulder have been investigated based on analytical TEM compositional measurements.

Forman L. V.   Bland P. A.   Dyl K. A.   Daly L.   Ryan C. G.   et al.   POSTER LOCATION #37
Constraining the Compositional Variety of Impactors at 1 AU Over the Last ~3.5 Ga: In Situ Identification and Analysis of >200 Meteoritic Grains in a Lunar Soil [2680]
Extralunar grains are identified, characterised and analyzed in situ within an Apollo 14 sample, using a range of microanalytical techniques.

Frushour A. M.   Noble S. K.   Christoffersen R.   Keller L. P.   POSTER LOCATION #38
Alteration of Lunar Rock Surfaces Through Interaction with the Space Environment [2115]
Six lunar rock thin sections with patina are identified, described, and classified from petrographic microscope and SEM observations.

Inversion of Lunar Regolith Layer Thickness with CELMS Data using BPNN Method [1942]
The regolith layer thickness over the lunar surface is inversed using the BPNN method with CELMS data, surface roughness, slope, and (FeO+TiO2) abundance.

Unusual Microtopography on an Apollo 12 Soil Grain [2681]
We have observed the presence of a previously undescribed microtopography on the surface of a lunar grain from Apollo regolith sample 12070.29.

Investigation of Magnetic Anomaly and Optical Maturity at Mare Crisium [1763]
Mare Crisium contains magnetic anomalies and uncertain high albedo. We investigate their characteristics to identify any evidence swirl-like features.

Hogan J. D.   Plescia J.   Ramesh K. T.   POSTER LOCATION #42
Failure and Fragmentation of Meteorites and Basalt: Understanding Lunar Regolith Generation [2426]
Microstructure-dependent fragmentation mechanisms occurring during the compressive failure of meteorite (GRO 85209) and basalt are explored.
Sanin A. B. Mitrofanov I. G. Litvak M. L. Boynton W. V. Chin G. et al. **POSTER LOCATION #43**

*Estimation of Hydrogen Concentration in Lunar South Polar Regions [#1358]*

Results of LEND, LOLA, and Diviner multi-instrument data analysis to find minimal depth and low limit of hydrogen concentration in regolith will be presented.


*Evaluation of Time Variability of Water Frost in the South Pole Permanently Shaded Regions Using the LRO Lyman Alpha Mapping Project (LAMP) [#2412]*

We use data from the Lunar Reconnaissance Orbiter (LRO) Lyman Alpha Mapping Project (LAMP) to study seasonal variability of surface frost at the south pole.

Rickman D. Gertsch L. **POSTER LOCATION #45**

*Constraints on Transport and Emplacement Mechanisms of Labile Fractions in Lunar Cold Traps [#2695]*

Recent data allow some constraints to be identified for the mechanisms that transport and concentrate “volatile” molecules in lunar cold traps.

Aye K.-M. Paige D. A. Siegler M. A. Sefton-Nash E. Greenhagen B. T. **POSTER LOCATION #46**

*Diviner Monitoring of Coldest Lunar Polar Regions [#2893]*

Several years of DIVINER data monitoring the coldest lunar south polar regions have been recalibrated. New minimum brightness temperatures are between 25 and 30 K.

Su J. J. Sagdeev R. Boynton W. V. Chin G. Evans L. G. et al. **POSTER LOCATION #47**

*Fine Structure Neutron Suppression Structure in Lunar Polar Region [#2329]*

We demonstrate the results of applied deconvolution to reconstruct fine structures of PSRs (permanent shadowed regions) in Cabeus and Shoemaker.

Mazarico E. Nicholas J. B. Neumann G. A. Smith D. E. Zuber M. T. **POSTER LOCATION #48**

*Illumination Conditions at the Poles of the Moon and Mercury, and Application to Data Analysis [#1867]*

Modeling of the illumination conditions at the poles of the Moon and Mercury enable data calibration and analysis of other measurements (Ly-alpha, neutron).

Calla O. P. N. Jangid M. Mathur S. **POSTER LOCATION #49**

*Study of Shackleton Crater: Integration of Monostatic and Bistatic Observation from Mini-RF and Arecibo [#1803]*

Combined study bistatic and monostatic observation using CPR, phase angle, DoP, relative phase, etc., have been analyzed in order to explore Shackleton crater.

Fa W. Cai Y. **POSTER LOCATION #50**

*An Explanation of Anomalous Craters over the Lunar Polar Regions in Mini-RF Images Other than Water Ice [#1345]*

The elevated CPRs in the interior of anomalous craters are most probably caused by surface rocks, instead of water ice as pointed out in previous studies.

Farrell W. M. Hurley D. M. Zimmerman M. I. **POSTER LOCATION #51**

*Solar Wind Implantation into Lunar Regolith: H Retention in a Surface with Defects [#2039]*

We examine solar wind implantations and H retention times as a function of surface temperature and distribution of defect-related activation energy.

Livengood T. A. Boynton W. V. Chin G. Evans L. G. Litvak M. L. et al. **POSTER LOCATION #52**

*Neutron Remote-Sensing at the Moon: Modeling the Empirical Variation with Altitude of Neutron Flux for the Lunar Exploration Neutron Detector (LEND) [#2592]*

The portion of lunar-sourced neutrons detected by LEND in collimation can be deduced from altitude variation. It is needed to estimate H concentrations in PSRs.
Evidence for Diurnally Varying Hydration at the Moon’s Equator from the Lunar Exploration Neutron Detector (LEND) [#1507]

Water can be found at the Moon’s dawn terminator at the peak of a daily cycle of dehydration and rehydration, equivalent to a frost 0.2 mm thick.

Could Lunar Endogenic Hydrogen be Hiding in Plain Sight? [#2451]

An analysis of Lunar Prospector neutron data reveals elevated concentrations of hydrogen in KREEP-rich regions. Could a portion of this hydrogen be endogenic?

OOS Lithology and Detection of Magmatic Water at the Rim of Sinus Iridum in Association with Olivine of Possible Mantle Origin [#1816]

We report the presence of an orthopyroxene-olivine-spinel (OOS) suite of rocks from the rim of Sinus Iridium and detection of magmatic water associated with olivine.

Simultaneous Analysis of Abundance and Isotopic Composition of Helium, Neon, and Argon in Lunar Basalts [#2503]

Simultaneous multiple-step stepwise heating analyses of noble gases in lunar mare basalts, revealing lunar indigenous noble gas signatures in some samples.

Simultaneous Analysis of Abundance and Isotopic Composition of Nitrogen and Carbon in Lunar Basalts [#2529]

Simultaneous stepwise heating analyses of N and C in lunar mare basalts, revealing indigenous lunar N-isotopic composition and C/N ratios of the lunar mantle.

Apatite in Allan Hills 81005 and the Origin of Water in the Lunar Magma Ocean [#2413]

We present the first apatite water content and H-isotope results from an apatite-rich ferroan anorthosite-like lithology from meteorite Allan Hills A81005.

The Behavior of Volatiles in Mare Basalts. An Investigation of the Mineralogy of Linings in the Vugs and Vesicles in Lunar Basalt 12072 [#1409]

The overarching theme of this abstract is to illustrate the mineral assemblages in vesicles and vugs in mare basalt 12072 and to deduce their origin.

Temperature Program Desorption Measurements of Water Molecules on Lunar Samples 12001 and 72501 [#2283]

Laboratory experiments measuring desorption activation energies of water molecules adsorbed to lunar soil grains with application to lunar observations.

Reflectance spectra of ilmenite are examined across a range of compositions and grain sizes to address a gap of knowledge in ilmenite spectral variation.
Carpenter P. K.  Jolliff B. L.  Coman E. I.  

Mineralogy and Chemistry of Ti-Bearing Lunar Soils and Size Fractions [2787]  
We present results on ilmenite and TiO₂ content of lunar soils and grain size fractions with implications for remote sensing using UV/VIS spectral parameters.

Stockstill-Cahill K. R.  Blewett D. T.  Cahill J. T. S.  
Denevi B. W.  Lawrence S. J.  et al.  

Reflectance Modeling of Spectra of the Wells Lunar Glass Simulants [1934]  
Wells [1977] lunar glass simulant spectra were modeled using linear and linear-exponential influence of Fe-, Ti- abundances on the optical constants.

Donohue P. H.  Neal C. R.  Stevens R. E.  Zeigler R. A.  

Crystal Stratigraphy of Two Basalts from Apollo 16: Unique Crystallization of Picritic Basalt 60603,10-16 and Very-Low-Titanium Basalt 65703,9-13 [2648]  
Two crystalline fragments with end-member compositions (picritic and VLT) have unique textures, but mineral trace-element compositions support basaltic origin.

Ray D.  Misra S.  

Depth-Dependent Mantle Sources for High and Low Ti-Mare Basalts — An Investigation Through Trace Element Geochemistry [1091]  
Lunar mantle can be classified into two types: a deeper mantle depleted in Pb and U and a shallower mantle enriched in Pb and U.

Griffiths A. A.  Barnes J. J.  Tartèse R.  Potts N. J.  Anand M.  

Characterization of Mesostasis Areas in Mare Basalts: Petrography and Mineral Chemistry [1905]  
We have characterized the petrology and mineral chemistry of mesostasis areas in four Apollo mare basalts (10044, 12064, 15058, and 70035).


Characterization of Mesostasis Areas in Mare Basalts: Constraining Melt Compositions from Which Apatite Crystallizes [1946]  
Mesostasis modal abundances in mare basalts are presented, combined with MELTS and SPICEes modeling to constrain melt compositions in which apatite forms.

Cronberger K.  Neal C. R.  

Apollo 15 KREEP Basalts: An Integrated Approach to Determining Origin and Evolution [1622]  
Apollo 15 KREEP basalt are analyzed using a integrated approach to understand formation and evolution.

Cronberger K.  Neal C. R.  

Apollo 14 KREEP-Rich lithologies: Evidence for Magma Chamber Processes. [2394]  
Analysis of Apollo 14 KREEP samples are presented along with evidence for magma chamber processes.

North - Valencia S. N.  Jolliff B. L.  

Petrography and Mineral Compositions of 12013,165 [2663]  
We examined 12013,165 major and minor mineral compositions to find similarities and differences between the gray and black breccias.

Roberts S. E.  Neal C. R.  

New Insights into VHK Petrogenesis Through Quantitative Textural Analysis [1279]  
Crystall size distributions applied to VHK petrogenesis.

Alexander L.  Snape J. F.  Crawford I. A.  Joy K. H.  Russell S. S.  

A Petrological and Geochemical Analysis of Lunar Basaltic Fines 12070,891 and 12030,187 [1149]  
We present petrological and geochemical results for two basalt fines — 12070,891 and 12030,187 — as part of a study of diversity of basalts at the Apollo 12 site.

**POSTER LOCATION #74**

*Non-Basaltic Fragments in the Apollo Soil Sample 12003 [##1974]*

Analyses of two breccias and one granulitic impactite are presented. These data provide evidence of pre-Imbrium impact ejecta at the Apollo 12 landing site.

Mills R. D.  Simon J. I.  Alexander C. M. O’D.

**POSTER LOCATION #75**

*Chemical Zoning of Feldspars in Lunar Granitoids: Implications for the Origins of Lunar Silicic Magmas [##1547]*

Fine-scale zoning between plagioclase and alkali feldspar in lunar granitoids suggests a shallow plutonic origin.

Righter K.  Pando K. A.  Danielson L. R.

**POSTER LOCATION #76**

*Phase Equilibrium Experiments on Potential Lunar Core Compositions: Extension of Current Knowledge to Multi-Component (Fe-Ni-Si-S-C) Systems [##2111]*

This study aims to bridge the gap of relevant phase equilibria data for the Moon’s metallic core with new low-pressure experiments on multicomponent systems.

Bell A. S.  de Moor J. M.  Shearer C. K.

**POSTER LOCATION #77**

*Thermodynamic and Isotopic Constraints on the Gas Composition and Formation Temperature of Sulfide Replacement Assemblages in Lunar Breccias 67016, 294, 67016, 297, and 67915, 150 [##2187]*

Thermodynamic calculations and S isotopes are used constrain to the composition of the gas phase that formed sulfide replacement textures in lunar breccias.

Miley H. M.  Agee C. B.  Korotev R. L.  Muttik N.  Morgan M.

**POSTER LOCATION #78**

*Northwest Africa 8010: Feldspathic Regolith Breccia with Abundant Crystalline Lunar Spherules [##2823]*

Northwest Africa 8010 has an unusually high abundance of crystalline lunar spherules, which suggests that the component rock is derived from lunar regolith.

Kuehner S. M.  Irving A. J.  Korotev R. L.

**POSTER LOCATION #79**

*Petrology and Composition of Lunar Felsic Granulitic Breccia Northwest Africa 8022 and Occurrence of Forsterite in Lunar Breccia NWA 8001 [##2495]*

We characterize another example of a lunar granulitic breccia (more felsic than those known previously), and report the most Mg-rich olivine known from the Moon.

Korotev R. L.  Irving A. J.

**POSTER LOCATION #80**

*Keeping Up with the Lunar Meteorites — 2014 [##1405]*

Twelve new lunar meteorites are described.

Nekvasil H.  Coraor A. E.  DiFrancesco N.  Lindsley D. H.

**POSTER LOCATION #81**

*Reconsidering the Nature of Magmas and Processes Contributing to Lunar Highlands Formation: Insights from Lunar Felspars [##1213]*

A model is presented that permits simultaneous formation of ferroan anorthosite at depth and Mg-suite rock types at shallow levels from the same “sodic” LMO.

DiFrancesco N. J.  Nekvasil H.  Lindsley D. H.  Ustununig G.

**POSTER LOCATION #82**

*Low Pressure Crystallization of a Lunar Highlands Basalt: A Means for Producing Anorthosite Locally? [##1893]*

Fractional crystallization experiments on highlands basalt 14053 demonstrate the possibility of producing anorthosites locally on the lunar surface.


**POSTER LOCATION #83**

*Impact Contamination of Lunar Crustal Rocks [##1332]*

Impact melt coatings on lunar crustal rocks reveal new information on impactor compositions striking the Moon.
Blachut S. T.  Zellner N. E. B.  
*Statistical Analyses of Compositions and Ages of Lunar Impact Glasses* [#2631]
Compositions and ages of 185 lunar impact glasses from five Apollo landing sites have been statistically analyzed. Trends will be reported.

Sharp M.  Puchtel I. S.  Walker R. J.  
*Characterizing Impactor Signatures of Apollo 16 Impact Melt Rocks* [#1064]
This study provides new highly siderophile-element concentration and osmium isotopic data for four Apollo 16 impact melt rocks.

*Investigating a Potential Impact Pulse in the Earth-Moon System ~2Ga* [#1907]
We examine projectile relics in lunar regolith breccias to characterize the impactor population during a potential pulse of impact activity at ~2 Ga.

Zeigler R. A.  
*Nondestructive Analysis of Apollo Samples by Micro-CT and Micro-XRF Analysis: A PET Style Examination* [#2665]
We report micro-CT/micro-XRF analyses of Apollo 14 samples assessing the techniques usefulness for discovery of “new” Apollo samples and in future PET efforts.

*A Virtual Petrological Microscope for all Apollo 11 Lunar Samples* [#2747]
A means of viewing, over the Internet, polished thin sections of every rock in the Apollo lunar sample collections is described.

Prissel T. C.  Crow C. A.  Parman S. W.  McKeegan K. D.  
*A pink spinel speaks / Of ancient lunar magmas / And hot rocks melting.*

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**Protolunar Disk and Magma Ocean: Models and Sample Constraints**  [R705]

Pillinger C. T.  Greenwood R. C.  Johnson D.  
*Three Isotopes of Oxygen in Lunar Samples — The Same as Earth or Different?* [#2654]
High-precision oxygen-isotope analyses of lunar soil particles provide important information about the Moon’s early evolution.

Touboul M.  Walker R. J.  Puchtel I. S.  
*High-Precision W Isotope Composition of the Moon for Constraining Late Accretion and Lunar Formation* [#1851]
Here we present high-precision (<5 ppm) W-isotope data for lunar metals that is used to further constrain lunar formation and test late accretion hypothesis.

Togashi S.  
*A New Bulk Silicate Moon Model: Giant Impact-Fissions Enriched in Crustal Components of Proto-Earth and Moon Bodies* [#1776]
A bulk silicate Moon has subchondritic Sr/Ba, Sr/Al, Ti/Th, Ti/Ba, and Yb/La ratios. Impact fissions enriched in the crusts of protobodies could generate it.

Davenport J. D.  Neal C. R.  Snyder G. A.  Bolster D.  Longhi J.  
*Forward, Reverse and FXMOTR Modeling of the LMO: A Look at the Bulk Composition of the LMO* [#1112]
Using forward, reverse, and FXMOTR crystallization modeling of the LMO, we look at the initial bulk composition of the LMO and implications for lunar formation.
Parai R. Huang S. Jacobsen S. B. 
POSTER LOCATION #95
The Initial $^{87}$Sr/$^{86}$Sr of the Solar System and the Age of the Moon [#2629]
A comprehensive set of initial $^{87}$Sr/$^{86}$Sr in eucrites, angrites, lunar samples, and CAIs to better constrain the early history of the solar system.

Marks N. Borg L. Gaffney A. Shearer C. Burger P. 
POSTER LOCATION #96
Additional Evidence for Young Ferroan Anorthositic Magmatism on the Moon from Sm-Nd Isotopic Measurements of 60016 Clast 3A [#1129]
Results of Sm-Nd isotope measurements on a ferroan anorthosite (FAN) give an age of 4.3 Ga, implying that FAN magmatism occurred late in lunar history.

Armytage R. M. G. Brandon A. D. 
POSTER LOCATION #97
Collisional Erosion and Bulk Silicate Earth Refractory Lithophile Element Budgets [#1883]
We assess the viability of collisional erosion to generate a superchondritic BSE Sm/Nd based on Nd-isotopic constraints, and the implications for other RLEs.

Quarles B. Lissauer J. J. 
POSTER LOCATION #98
Dynamical Evolution of the Earth-Moon Progenitors [#2216]
We present our study of the Giant Impact to determine if a preferred region of parameter space exists for the Earth-Moon progenitors to originate.

Teodoro L. F. A. Warren M. S. Fryer C. Eke V. Zahnle K. 
POSTER LOCATION #99
A One Hundred Million SPH Particle Simulation of the Moon Forming Impact [#2703]
We present the first one hundred million SPH Particle Simulation of the Moon Forming Impact.

Zahnle K. J. Lupu R. E. Dobrovolskis A. R. 
POSTER LOCATION #100
The Tethered Moon [#2649]
Thermal blanketing by the atmosphere slowed Earth’s cooling after the Moon-forming impact, and altered the tidal evolution of the Earth-Moon system.

MARS CRYOSPHERE [R706]

Guidat T. Pochat S. Bourgeois O. Soucek O. 
POSTER LOCATION #101
Early Hesperian Warm-Based Glaciation in Isidis Planitia, Mars [#1800]
We propose to interpret the origin of Isidis Planitia landforms based on a new geomorphic mapping initiative that elucidates their interrelationship.

Fassett C. I. Levy J. S. Head J. W. Dickson J. L. 
POSTER LOCATION #102
Long-Lived Glaciation in the Northern Mid-Latitudes of Mars: New Constraints on Timing [#1494]
Landforms inferred to be the result of glaciation are common in the northern mid-latitudes of Mars. We focus here on the timing and persistence of glaciation.

Scanlon K. E. Head J. W. 
POSTER LOCATION #103
The Dorsa Argentea Formation: Synthesis of Glacial Features and History of Late Noachian-Early Hesperian Martian Climate Change [#1477]
We use the timing of ice advance and retreat recorded by glacial features in the DAF to synthesize a history of the ice sheet and early Mars climate change.

Scanlon K. E. Head J. W. Marchant D. R. 
POSTER LOCATION #104
Evidence for Local, Volcanism-Induced Wet-Based Glacial Conditions in the Amazonian Arsia Mons Fan-Shaped Deposit [#1480]
Several regions of the Arsia Mons Fan-Shaped Deposit show that volcano-ice interactions induced local wet-based behavior in the otherwise cold-based glacier.
Hughes A. C. G. Hauber E. Rossi A. P.

**POSTER LOCATION #105**

*Geomorphology of Glacial and Periglacial Landforms Within a Small Crater in Terra Cimmeria, Mars: Stratigraphy and Inferred Chronology of Processes [1211]*

We present a geomorphological map of a crater in Terra Cimmeria, Mars, and reconstruct the complex history of glacial and periglacial processes in this crater.

Johnsson A. Reiss D. Hauber E. Hiesinger H.

**POSTER LOCATION #106**

*Possible Slow Periglacial Mass Wasting on Interior Crater Walls on Southern Mars [1105]*

Small-scale lobate landforms that may be indicative of recent freeze-thaw activity are cataloged on the southern hemisphere on Mars.

Jawin E. R. Head J. W. Marchant D. R.

**POSTER LOCATION #107**

*Paraglacial Geomorphology on Mars: Application to Post-Glacial Features in Martian Impact Craters [2241]*

We apply paraglacial geomorphology to martian craters bearing evidence of glaciation to suggest young geologic features form in a post-glacial environment.

Chuang F. C. Crown D. A. Berman D. C.

**POSTER LOCATION #108**

*Glacial Modification of Eastern Nereidum Montes, Mars: Observations from Southern Hemisphere Mapping of Lobate Debris Aprons and Ice-Rich Flow Features [2066]*

Eastern Nereidum Montes is a region on Mars that appears to have experienced significant past glacial activity from THEMIS IR and CTX observations.


**POSTER LOCATION #109**

*Lobate Debris Aprons and Ice-Rich Flow Features in Eastern Hellas, Mars: Mapping Using THEMIS IR and CTX Data [2081]*

The mapping of lobate debris aprons (LDAs) and other ice-rich flow features in eastern Hellas, Mars, was significantly improved using THEMIS IR and CTX data.

Petersen E. I. Holt J. W. Berney J. E.

**POSTER LOCATION #110**

*A Comparative Study of Martian Lobate Debris Aprons to Assess Regional Differences in Surface Properties, Morphology, and Internal Composition [2784]*

A comparative study of LDAs across the dichotomy boundary region of Deuteronilus Mensae using radar, morphology, and topography to constrain regional trends.

Cardenas B. T. Lalich D. E. Petersen E. McKinnon E. A. Andry C. M. et al.

**POSTER LOCATION #111**

*Assessing the Potential of Debris-Covered Glaciers in the Uinta Mountains as Martian Analogs [2362]*

GPR and LiDAR scans of debris-covered glaciers in the Uinta Mountains, Utah, will assess their potential as terrestrial analogs to martian lobate debris aprons.

Berman D. C. Crown D. A. Chuang F. C.

**POSTER LOCATION #112**

*Preservation and Mobilization of Ice-Rich Mantling Deposits in Nereidum Montes, Mars [1553]*

Nereidum Montes on the northern rim of Argyre Basin contains extensive preservation of ice-rich mantling deposits and associated features.

Fastook J. L. Head J. W.

**POSTER LOCATION #113**

*Concentric Crater Fill: Rates of Glacial Accumulation, Infilling and Deglaciation in the Amazonian and Noachian of Mars [1227]*

A coupled ice-flow/advected-debris model is used to assess two formation scenarios: (1) A single persistent mantling event, (2) multiple transient mantling events.


**POSTER LOCATION #114**

*Meter-Scale Pits in Mars’ North Polar Layered Deposits [2431]*

We report the discovery in HiRISE images of meter-scale pits in the north polar layered deposits on Mars. Possible formation hypotheses are briefly discussed.
Landis M. E.  Byrne S.  Daubar I. J.  
Reinterpreting the Impact Craters of the North Polar Layered Deposits, Mars [#2661]
We use the Daubar et al. (2013) production function and updated HiRISE images to reinterpret the impact crater population of the north polar layered deposits.

Lalich D. E.  Holt J. W.  
Investigating Layer Properties of the Martian NPLD Using SHARAD Observations and Modeling [#2210]
We use a simple plane wave propagation model to estimate the dielectric properties of the upper martian NPLD.

Smith I. B.  Holt J. W.  
Regional Variability in the Spiral Troughs of the North Polar Layered Deposits, Mars, as Observed by SHARAD [#1392]
We conducted a cap wide study of NPLD spiral troughs with SHARAD. Regional diversity is discussed based on morphological and stratigraphic features.

Becerra P.  Byrne S.  Mattson S.  Herkenhoff K. E.  HiRISE Team  
Martian Polar Stratigraphy from HiRISE Stereo Topography [#2408]
We present a new method to analyze the stratigraphy of the polar layered deposits based on high-resolution Digital Terrain Models (DTM) and wavelet analysis.

Milkovich S. M.  
Surface Expression of Radar Reflections Within Promethei Lingula, South Polar Layered Deposits, Mars [#2098]
Intersection of / Layers and reflections lead / To polar insights.

Kreslavsky M. A.  Head J. W.  
Active Layer on Mars: When and Where? [#2715]
Active layer sorting cannot explain rock circles in Elysium Planitia. Solifluction lobes in several high N craters can result from a recent active layer episode.

Hansen C. J.  Diniega S.  Bridges N.  Byrne S.  Dundas C.  et al.  
Wind and Dry Ice: Agents of Change on Mars’ North Polar Erg [#1667]
Both wind and seasonal CO2 ice sculpt the dunes in Mars’ north polar erg in today’s climate.

Portyankina G.  Hansen C. J.  Aye K.-M.  
Differences in Seasonal CO2 Cover of Dune Slopes in Martian Northern Polar Erg [#2289]
We are investigating the connection between extensive spring activity in martian polar erg and the modification of the dunes observed by HiRISE.

Tyson S.  Lane S. J.  Wilson L.  Gilbert J. S.  
Magma-Cryosphere Interactions on Mars — An Experimental Investigation of Physical Processes [#1124]
We describe laboratory experiments on how simulated martian cryosphere reacts to heating by a sill-like intrusion causing ice melting and water/steam formation.

Cassanelli J. P.  Head J. W.  Fastook J. L.  
Late Noachian “Icy Highlands” Mars: Implications for Melting and Ground-Water Recharge Across the Tharsis Rise [#1501]
We investigate Late Noachian ice deposits across the Tharsis rise and the implications for melting in response to regionally elevated geothermal heat fluxes.

Following Subsurface Water Distribution in Past, Current and Future Mars Orbital and Surface Missions Based on the Neutron Spectroscopy Observations [#1842]
The comparison of orbital and surface studies of subsurface water distribution at equatorial latitudes of Mars based on neutron spectrometry measurements.
Bapst J. Bandfield J. L. Wood S. E.  
POSTER LOCATION #126  
*Investigating the Timing and Extent of Seasonal Surface Water Frost on Mars with MGS TES* [#1594]  
We investigate the timing and extent of seasonal water frost on Mars’ surface using spaceborne instruments and lander observations.

POSTER LOCATION #127  
*Climatological Growth and Recession Cycles of the Martian Seasonal Caps Using Thermal Emission Spectrometer (TES) and Mars Climate Sounder (MCS) Data* [#1975]  
We present climatological (i.e., median) seasonal CO₂ cap edge maps derived from eight Mars Years (MY) of surface observations by TES and MCS during clear years.

Pilorget C. Edwards C. S. Ehlmann B. L. Forget F. Millour E.  
POSTER LOCATION #128  
*Material Ejection by the Colds Jets and Temperature Evolution of the South Seasonal Polar Cap of Mars from THEMIS/CRISM Observations and Implications for the Surface Properties* [#1538]  
We have used CRISM and THEMIS data along with a thermal numerical model to quantify the amount of material ejected by the cold jets on the Mars polar caps.

Travis B. J. Feldman W. C.  
POSTER LOCATION #129  
*Factors Controlling Polygon Sizes in the Martian Near-Surface* [#2568]  
Numerical hydrothermochemical flow simulations indicate that soil permeability and salt content are major determinants of martian polygon features.

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<th>MARS FLUVIAL/LACUSTRINE ACTIVITY AND LAYERING</th>
<th>[R707]</th>
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Maw M. A. Hiesinger H. Erkeling G. Reiss D.  
POSTER LOCATION #131  
*Evidence for Large Reservoirs of Water/Mud in Acidalia and Utopia Planitiae on Mars* [#1080]  
Extensive mudflows occur in the central portion of Acidalia Planitia. The flows are similar to those in Utopia Planitia.

Williams R. M. E. Weitz C. M.  
POSTER LOCATION #132  
*Lacustrine History Within Southwestern Melas Basin, Mars* [#2432]  
Superposition relationships for the 11 fan deposits and associated layered beds enable reconstruction of various phases in the basin’s lacustrine history.

Zuschneid W. van Gasselt S.  
POSTER LOCATION #133  
*Fluvial Processes in Eastern Hellas Planitia — Results from Crater Counts* [#1937]  
Small fluvial features in Hellas Planitia, Mars, were dated using crater counts. The results indicate a major episode of fluvial activity 0.4 to 0.6 Ga ago.

Cardenas B. T. Mohrig D.  
POSTER LOCATION #134  
*Evidence for Shoreline-Controlled Changes in Baselevel from Fluvial Deposits at Aeolis Dorsa, Mars* [#1632]  
Two discrete episodes of baselevel fall and rise are recorded in valley-filling fluvial deposits at Aeolis Dorsa, Mars.

Lapotre M. G. A. Lamb M. P.  
POSTER LOCATION #135  
*Is the Width of Canyons a Diagnostic Indicator of the Discharge of Megafloods on Earth and Mars?* [#1422]  
We test the hypothesis that the morphology of flood-carved canyons is an indicator of flood hydraulics, and that their width is set by water discharge.

Rauhala A. I. Kukkonen S. Kostama V. -P.  
POSTER LOCATION #136  
*High-Resolution Mapping of the Palos Outflow Channel: Preliminary Results* [#2212]  
We have undertaken a geomorphological mapping of the “Palos outflow channel” in order to further characterize paleofluvial activity in the Amenthes region.
El-Maarry M. R. Watters W. McKeown N. K. Carter J. Noe Dobrea E. et al. POSTER LOCATION #137
Potential Desiccation Cracks on Mars: A Synthesis from Modeling, Analog-Field Studies, and Global Observations [#2530]
We present a review of the global distribution of desiccation-like polygons on the surface of Mars as well as their implication to the ancient climate of Mars.

El-Maarry M. R. Pommerol A. Thomas N. POSTER LOCATION #138
Analysis of Polygonal Cracking Patterns in Chloride-Bearing Terrains on Mars: Indicators of Ancient Playa Settings [#1848]
We investigate the cracking patterns that are associated with the chloride-bearing terrain on Mars. We suggest the patterns indicate the presence of smectites.

Head J. W. III Cassanelli J. P. POSTER LOCATION #139
Valley Network Formation: Predictions for Fluvial Processes in a Late Noachian Icy Highland Climate Regime [#1413]
We explore Late Noachian icy highlands atmospheric heating/ice melting scenarios and fluvial runoff, compared to the nature of valley networks.

Boatwright B. D. Fassett C. I. POSTER LOCATION #140
Exploring the Morphometry of Martian Valley Networks and Drainage Basins Using the MARSSIM Landform Evolution Model [#2478]
Description of the model; initial results using idealized ridge topography to understand how a variety of geomorphic parameters affect Hack’s exponent.

Salvatore M. R. Christensen P. R. POSTER LOCATION #141
Widespread and Episodic Sedimentation in the Northern Plains of Mars [#1925]
Sedimentary deposits associated with the circum-Chryse outflow channels are identified in the shallow subsurface of Chryse and Acidalia Planitia, Mars.

Kukkonen S. Kostama V.-P. Rauhala A. I. Raitala J. POSTER LOCATION #142
Evidence of Surface Modification by Water and Ice on the Harmakhis Vallis Region, Mars [#2596]
The CTX and HiRISE data-based work gathers the observations of water and ice influence on the Harmakhis Vallis region on Mars.

Wilson S. A. Grant J. A. Weitz C. M. Irwin R. P. POSTER LOCATION #143
Geologic Mapping of Vinogradov Crater on Mars: Ancient Phyllosilicates to Alluvial Fans [#2382]
The geologic history of Vinogradov crater and vicinity, located ~250 km northwest of Holden crater, preserves a long record of water-related activity.

Goudge T. A. Head J. W. Mustard J. F. Fassett C. I. POSTER LOCATION #144
A Transported Origin for Alteration Minerals Within the Jezero Crater, Mars Paleolake Basin: Evidence from Catchment and Delta Mineralogy [#1164]
Geomorphic mapping and mineralogic analysis of the Jezero crater paleolake and watershed indicate a transported origin of alteration minerals within the basin.

Erkeling G. Reiss D. Hiesinger H. Ivanov M. A. Hauber E. et al. POSTER LOCATION #145
Landscape Formation at the Deuteronilus Contact in Southern Isidis Planitia, Mars: Implications for an Isidis Sea? [#1334]
Our study of the Deuteronilus contact in Isidis revealed geologic evidence that possibly supports the existence of a Late Hesperian/Early Amazonian Isidis Sea.
Kraft M. D.  Salvatore M. R.  Edwards C. S.  Christensen P. R.  

**POSTER LOCATION #146**

*Occurrence, Distribution and Implications of Mafic Igneous Bedrock Throughout the Uzboi-Ladon-Margaritifer Fluvial System, Mars* [#2933]

The large ULM fluvial system on Mars has substantial amounts of olivine-rich bedrock, which has significant implications for fluvial and sedimentary history.

Wolfgang D. C.  Milam K. A.  

**POSTER LOCATION #147**

*A Geologic Characterization of Ladon Valles, Mars, and Vicinity* [#2908]

Ladon Valles, Mars, is an area that is integral to understanding the geologic history of Mars. This work helps to unravel its role in martian geomorphology.

Luo W.  

**POSTER LOCATION #148**

*Impact Cratering as a Major Factor Controlling Valley Dissection Density on Mars — A Geographical Detector Approach* [#2580]

An innovative geographical detector method revealed that impact cratering may have played a much more important role in controlling valley networks on Mars.

Kim J. R.  Schumann G.  Neal J.  Lin S. H.  

**POSTER LOCATION #149**

*The Hydraulics Analysis Based on a Multi-Resolution Stereo DTMs and LISFLOOD-FP Model Over Martian Fluvial Geomorphology* [#1779]

In this study, we tested the application of hydraulics analysis with multiresolution martian DTMs together with 2-D LISFLOOD-FP.

Arp G.  Head J.  

**POSTER LOCATION #150**

*Sedimentary Conglomerates Inside Impact Crater Lakes (Ries Crater, Germany): Pre-Processing, Provenance, Transport Distances and Implications for Gale Crater, Mars* [#1259]

Conglomerates derived from impact-shocked parent rocks in the 15-Ma-old Ries crater suggest short transport distances for similar conglomerates in Gale Crater.

Franchi F.  Rossi A. P.  Pondrelli M.  Cavalazzi B.  

**POSTER LOCATION #151**

*Fluid Escape Features in the Equatorial Regions of Mars: Landing Site Potential and Constrains of Early Mars Hydrology* [#1243]

ELDs once covered a vast area of the martian equatorial lowland. ELDs experienced interaction with fluids and could be thus compared with terrestrial analogs.

Grant J. A.  Wilson S. A.  Mangold N.  Calef F.  Grotzinger J. P.  

**POSTER LOCATION #152**

*The Timing of Alluvial Activity in Gale Crater, Mars* [#1487]

Crater statistics reveal most alluvial deposits in Gale were emplaced in the Hesperian. A younger period of fluvial activation in the Amazonian is possible.

Quinn D. P.  Ehlmann B. L.  

**POSTER LOCATION #153**

*Provenance of the Sulfate-Bearing Unit at Northeast Syrtis Major: Insights from Structural Geology* [#2312]

The original form of the layered sulfate unit at northeast Syrtis Major is examined using high-resolution stereo digital elevation models.

Kerber L.  

**POSTER LOCATION #154**

*The Distribution and Diversity of Layering Within the Medusae Fossae Formation* [#2672]

Layers, while not numerous, are widespread throughout the Medusae Fossae Formation. Their morphology and abundance is found to vary geographically.
Leone R. C.  Sylvest M. E.  Dixon J. C.  
Experimental Analysis of CO₂ Sublimation and Martian Gully Morphology [#2058] 
This experiment was an analysis of the effect of carbon dioxide sublimation on a simulated martian slope and the morphology of martian gullies.

Hernandez D. J.  Gulic V. C.  Narlesky C. A.  
Gullies on Mars: Fluvial Geologic Processes as Evidence for Liquid Water on Mars [#1198] 
Mars Reconnaissance Orbiter HiRISE images show insight into past and present martian geologic activities that provide evidence of present-day liquid water.

Narlesky C. A.  Gulick V. C.  
Geomorphic and Flow Analysis for Gullies in Palikir Crater [#2870] 
We present geomorphic analysis of 17 gullies in Palikir Crater using a HiRISE DTM and compare various sediment transport models.

Glines N. A.  Gulick V. C.  
Comparative Study of Gullies in Kaiser Crater on Mars [#2926] 
Gully morphologic studies using a HiRSE DTM of gullies in a small unnamed crater within Kaiser Crater are presented.

Dickson J. L.  Head J. W.  Levy J. S.  Morgan G. A.  
Multi-Phase, Punctuated Gully Erosion on Mars: Seasonal Insolation Effects on the Melting and Refreezing of Surface Ice in the McMurdo Dry Valleys [#1108] 
Insolation differences lead to significant ice concentration and flooding in Antarctic gullies. This multiphase model could help explain gullies on Mars.

Raack J.  Reiss D.  Appéré T.  Vincendon M.  Ruesch O.  et al.  
Present-Day Seasonal Gully Activity in a South Polar Pit (Sisyphi Cavi) on Mars [#1753] 
We identified modifications (dark flows and new deposits) of a gully, which are most likely formed by dry flows supported by ongoing CO₂ sublimation.

Schaefer E. I.  McEwen A. S.  Mattson S.  Ojha L.  
Quantifying Recurring Slope Lineae in Space and Time [#2800] 
We comprehensively document evolution of recurring slope lineae (RSL) at Tivat crater (45.93°S, 9.53°E) to constrain growth rates and inform modeling efforts.

Massé M.  Beck P.  Conway S. J.  Gargani J.  McEwen A.  et al.  
Laboratory Simulation of Martian Recurring Slope Lineae (RSL): Origin and Detectability of Liquid Brines [#2137] 
The aim of our study is to reproduce the composition and the triggering of recurring slope lineae with laboratory experiments.

Conway S. J.  Gourronc M.  Patel M.  
Laboratory Simulations of the Transport Capacity of Water and Brines Under Martian Conditions [#2458] 
We used a large low pressure chamber to perform flume experiments. We found that brines are more erosive than water, particularly under martian conditions.

Puga F.  Pagamisse A.  Silva E. A.  
Slope Streaks Detection on Mars from Digital Images [#1522] 
The aim of this work was to identify slope streaks from digital images using techniques of digital images processing.
Dundas C. M.  Diniega S.  McEwen A. S.  
POSTER LOCATION #165

Long-Term Monitoring of Martian Gully Activity with HiRISE [#2204]
Extensive activity in the martian southern hemisphere indicates that gullies are forming today.

Adams E. L.  Lozano C. G.  Duport L. G.  Davila A. F.  Fairen A. G.  
POSTER LOCATION #167

Unraveling the History of Water on Mars Using Lithium Isotope Fractionation Models [#2433]
We describe different case studies of Li-isotope fractionation in Mars that can be useful to determine the environmental conditions on the planet in the past.

Sexton M. R.  Swindle A. L.  Elwood Madden M. E.  
POSTER LOCATION #168

Conditions Favoring the Formation of Martian “Blueberries” by Freezing Aqueous Hematite Suspensions [#1980]
Formation of Mars analog hematite spherules through freezing likely requires nanometric platy hematite and slow ice crystallization.

Friedlander L. R.  Glotch T. D.  
POSTER LOCATION #169

Phyllosilicate Spectra Identified at Mawrth Vallis by Factor Analysis and Target Transformation are Consistent with Impact-Related Spectral Change [#2001]
We identify phyllosilicates at Mawrth Vallis using FATT and compare their VNIR reflectance spectra with spectra from nontronites after laboratory impacts.

Pan L.  Ehlmann B. L.  
POSTER LOCATION #171

Possible Formation Mechanisms of Phyllosilicates and Hydrated Silica in Acidalia Planitia [#1245]
The formation mechanisms of hydrated minerals detected in Acidalia knobby terrains imply long-term erosional and depositional processes in aqueous environments.

Craig P. I.  Ming D. W.  Rampe E. B.  
POSTER LOCATION #172

Sulfate Formation from Acid-Weathered Phyllosilicates: Implications for the Aqueous History of Mars [#1970]
Sulfates formed from acid-weathered phyllosilicates may help explain the geologic relationship between phyllosilicates and sulfates observed on Mars.

Jain N. S.  Bhattacharya S.  Chauhan P.  Ajai A.  
POSTER LOCATION #173

Study of Phyllosilicates and Carbonates from the Capri Chasma Region of Valles Marineris on Mars Based on Mars Reconnaissance Orbiter-Compact Reconnaissance Imaging Spectrometer for Mars (MRO-CRISM) Observations [#1821]
Aqueous minerals from Capri Chasma in Vallis Marineris on Mars give hints toward the study of the past environment history of Mars.

Yant M. H.  Rogers A. D.  Nekvasil H.  Zhao Y.-Y. S.  
POSTER LOCATION #174

Spectral Characterization of Acid Weathering on Martian Basaltic Glass and Rock [#1229]
Geochemical experiments of synthetic martian rock linked with spectral and chemical analyses to understand basalt weathering and regolith development on Mars.

Smith R. J.  Horgan B.  Christensen P. R.  Mann P.  Cloutis E. A.  
POSTER LOCATION #175

Acid Alteration of Basalts: Thermal-Infrared Spectra and Implications for High-Silica Phases on Mars [#2273]
Here we present TIR spectral evidence that the high-silica component of TES surface type 2 could be explained by weathering rinds on basalt glass.
Mars rocks and soil contain significant amounts of amorphous material. We explore how that material formed and was accumulated throughout martian history.

We present evidence for post-Noachian (3.81–3.13 Ga) clay formation in crater central peaks, as well as clays that have been uplifted or have ambiguous origins.

Martian global soil and mudstone drill fines analyzed by the MSL rover Curiosity all have about 50 wt.% XRD amorphous component.

Fe(II) smectites, structural analogs to the Sheepbed saponite, were synthesized and air-oxidized. Oxidative products were characterized by XRD, VNIR and XAFS.

Coordinated VNIR and TIR spectra were performed on clay-bearing rocks in order to compare these natural analogs with martian spectra from CRISM and TES.

We report on apparent iron reduction in sepiolite, nontronite, and montmorillonite under variable temperature and pressure conditions using VIS-NIR spectroscopy.

Trends established in laboratory analyses of Fe-rich clays allow for precise interpretation of the crystal chemistry of martian clays from remote infrared data.

Using a synchrotron source for micro-FTIR analysis of meteorite thin sections provides improved precision for generation of martian-specific mineral spectra.

This study focuses on the characterization of key radiative processes needed to describe the spectral features produced by thin mantles of dust in TIR datasets.
Rice M. S.  Bell J. F. III  POSTER LOCATION #186
Characterizing the Effects of Viewing Geometry on the Reflectance Spectra of Rock Coatings [#2866]
We examine the effects of viewing geometry (forward-scattering vs. backscattering) on the Vis-NIR spectral properties of natural silica and ferric rock coatings.

Fraeman A. A.  Arvidson R. E.  Jolliff B. L.  Morris R. V.  POSTER LOCATION #187
The Influence of the Textural Properties of Iron Oxides on Their Visible to Near Infrared Spectra and Applications to Mars [#1503]
We use iron oxide-bearing rocks that represent textural endmembers for martian materials to test current and next generation radiative transfer models.

Buz J.  Ehlmann B. L.  POSTER LOCATION #188
Effects of Grain Size on the Reflectance Spectroscopy of Olivine in the Vis-NIR and the Derivation of Olivine Composition Using Modified Gaussian Modeling [#2810]
Grain size has a significant effect on the reflectance spectroscopy of olivine and can be confounding when determining composition remotely through MGM.

Pilorget C.  Fernando J.  Ehlmann B. L.  Douté S.  POSTER LOCATION #189
Photometry of Particulate Mixtures: New Insight from Simulations of Light Scattering in a Compact Granular Medium [#1541]
We use a radiative transfer model to study the phase curve of different kinds of mixtures (spatial, intimate, and layered).

Pan C.  Rogers A. D.  POSTER LOCATION #190
We assess the applicability of partial least-squares analysis to TIR spectra of pressed pellet samples of <10-μm major primary and secondary mineral mixtures.

Ody A.  Cannon K. M.  Poulet F.  Mustard J. F.  Quantin C.  et al.  POSTER LOCATION #191
Search for Analogue Sites of New Martian Shergottite Spectra Using NIR Data [#2207]
We compare NIR spectra of new shergottites with NIR OMEGA spectra of the martian surface in order to better constrain their possible geological settings and ages.

Farrand W. H.  Johnson J. R.  Bell J. F. III  Rice M. S.  Wright S. P.  POSTER LOCATION #192
Comparison of Rock Spectral Classes Observed at Cape York and Solander Point on the Rim of Endeavour Crater by the Opportunity Pancam [#1596]
Multispectral imaging by Opportunity of rock surfaces on Cape York and Solander Point at Endeavour Crater is described and compared to terrestrial analogs.

Liu Y.  Glotch T. D.  POSTER LOCATION #193
Spectral Mixture Analysis of Hydrated Minerals in Southwest Melas Chasma [#2443]
We mapped the abundances of hydrated minerals derived by FATT in southwest Melas Chasma by doing a linear unmixing of retrieved CRISM single scattering albedos.

Jain N. S.  Bhattacharya S.  Chauhan P.  Ajai A.  POSTER LOCATION #194
Aqueous Minerals from Arsia Chasmata of Arsia Mons, Tharsis Region: Implications for Aqueous Alteration Processes on Mars [#1826]
Aqueous minerals from Capri Chasma in Vallis Marineris on Mars give hints toward the study of the past environment history of Mars.
Ehlmann B. L.  Buz J.  

**POSTER LOCATION #195**

*Hydrology and Aqueous Alteration in the Watershed of Gale, Sharp, and Knobel Craters: A Regional Context for Curiosity’s Exploration* [#2587]

Clay, chloride, and olivine units eroded by valley networks near Gale; timing of fluvial activity shows decreasing watershed size from Hesperian to Amazonian.

Horgan B.  Seelos F.  

**POSTER LOCATION #196**

*Constraints on the Geologic and Aqueous History of the North Polar Region of Mars from the Mineralogy of North Polar Sediments* [#2158]

The mineralogy of north polar sediments indicates northern plains sources for Planum Boreum materials, and constrains the ages of the north polar deposits.

Brunner A. E.  Mahaffy P. R.  McAdam A. C.  Stern J. C.  Ming D. W.  

**POSTER LOCATION #197**

*Evolution of Hydrogen During SAM Analyses of the Sheepbed Mudstone, Gale Crater, Mars* [#1158]

Rover-drilled mudstone’s / smectite clays degas when warmed: / SAM detects hydrogen.

Tate C. G.  Moersch J.  Jun I.  Hardgrove C.  Mischna M.  et al.  

**POSTER LOCATION #198**

*Water Equivalent Hydrogen Abundances Along the First 200 Sols of Curiosity’s Traverse Using Passive Data from the Dynamic Albedo of Neutrons Experiment* [#1173]

MSL DAN passive data is used to estimate water equivalent hydrogen abundances along Curiosity’s traverse in the shallow martian subsurface.


**POSTER LOCATION #199**

*Water-Equivalent Hydrogen Content of the Martian Surface* [#1765]

We use orbital spectroscopic data to estimate the water content of the martian surface. A global map is presented and hydration evolution is discussed.

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**MARS SALTS AND BRINES: SPECTROSCOPY, EXPERIMENTS, AND MODELS**  [R710]

Wang A.  Zhou Y.  

**POSTER LOCATION #201**

*Rates of Al-, Fe-, Mg-, Ca-Sulfates Dehydration Under Mars Relevant Conditions* [#2614]

Among Al-, Fe²⁺-, Fe³⁺-, Mg-, and Ca-sulfates with the highest hydration degrees, malenterite and epsmoite has the highest dehydration rates.

Connor K.  Wang A.  

**POSTER LOCATION #202**

*Origin of Martian Kieserite* [#2750]

Low T-RH evaporations of Mg-Cl-SO₄-H₂O brines with Cl:SO₄ ≤ 18:1 shows NO evidence of kieserite precipitation, thus dehydration is the origin of martian kieserite.

Miller J. L.  Elwood Madden M. E.  Elwood Madden A. S.  Pritchett B. N.  

**POSTER LOCATION #203**

*Temperature, pH, and Brine Effects on Alunite Dissolution: Implications for Mars* [#2344]

Alunite may indicate past liquid water on Mars. pH, temperature, and brine conditions affect the dissolution rate of alunite, and determine duration of water.

Dixon E. M.  Pritchett B. N.  Elwood Madden A. S.  Elwood Madden M. E.  

**POSTER LOCATION #204**

*Flow-Through Dissolution Rates of K-Jarosite in Water and Brines* [#1966]

This study is a comparison of dissolution rates of K-jarosite in water and brines in a flow-through reactor.

Steiner M. H.  Hausrath E. M.  Schofield R. E.  

**POSTER LOCATION #205**

*Dissolution of Nontronite by High Ionic Strength Brines and Implications for Habitable Environments on Mars* [#1510]

Aqueous signatures of brines may reflect longer time periods than similar signatures by more dilute solutions, with different implications for habitability.
Modeling and Experimental Analysis of Potential Martian Chloride Brines

Potential martian brines are modeled to high concentration, created, and allowed to evaporate. Resulting evaporites are analyzed with XRD and VNIR spectroscopy.

Measuring Mineral Dissolution Rates in Perchlorate Brines: Method Development and Applications

A new spectrophotometric method for the determination of Fe in high-salinity perchlorate solutions is described and applied to jarosite dissolution experiments.

Towards an Accurate Low-Temperature Thermodynamic Model for Perchlorate Brines on Mars

We have measured accurate freezing-point depressions for perchlorate brines and build a more accurate and thermodynamically consistent model for perchlorates.

Measuring Mineral Dissolution Rates in Perchlorate Brines: Method Development and Applications

A new spectrophotometric method for the determination of Fe in high-salinity perchlorate solutions is described and applied to jarosite dissolution experiments.

Thermodynamic Modeling of the Deliquescence of Perchlorate/Chloride Salt Mixtures Using Geochemist’s Workbench (GWB): Application to the Phoenix Surface Chemistry

We present the first thermodynamic numerical models of deliquescence of salts binary perchlorate/chloride mixtures relevant to the martian surface.

Diffuse Reflectance Spectra of Monohydrocalcite

Diffuse reflectance spectra of monohydrocalcite are presented.

Reflectance Spectroscopy of Hydrated Carbonate Minerals

The reflectance spectra of select hydrated carbonates are presented. Phase discrimination and comparison with anhydrous carbonates is discussed.
Harner P. L. Gilmore M. S.  
POSTER LOCATION #217
Are Martian Carbonates Hiding in Plain Sight? VNIR Spectra of Hydrous Carbonates [#2728]  
An examination of several Mars-relevant hydrated carbonates with VNIR spectra similar to other hydrated salts that might have been overlooked.

Melwani Daswani M. Schwenzer S. P. Reed M. H. Wright I. P. Grady M. M.  
POSTER LOCATION #218
Carbonate Precipitation Driven by Clay Leachates on Early Mars [#1280]  
Modeling shows secondary low T carbonates in ALH 84001 could not have formed in the host rock without components leached from clays in the martian surface.

Pitman K. M. Jamieson C. S. Noe Dobrea E. Z. Dalton J. B. III Abbey W. J.  
POSTER LOCATION #219
Reflectance Spectra and Optical Constants of Mars Calcium, Magnesium, and Iron Carbonate Analogs [#1590]  
We present laboratory reflectance spectra and optical functions from 0.35 to 5 μm for Ca-, Mg-, and Fe-carbonates for estimating surface abundances on Mars.

POSTER LOCATION #220
Spectral Properties of Na, Ca-, Mg- and Fe-Chlorides and Analyses of Hydrohalite-Bearing Samples from Axel Heiberg Island [#2145]  
VNIR reflectance spectra of several chloride salts and ices are presented that will enable CRISM analyses of the martian chloride units at low-albedo sites.

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**EOLIAN PROCESSES**

Arnold K. Radebaugh J. Christiansen E. H. Morris T. H.  
POSTER LOCATION #221
Sand Sea Area on Titan from Cassini SAR and ISS and a New Volumetric Estimation Method for Total Organic Inventory from Dunes [#2887]  
Total area of dunefields on Saturn’s moon, Titan, from Cassini SAR and ISS data is ~12 million km$^3$ or ~14% global coverage. A new volumetric method is given.

POSTER LOCATION #222
Deep in Sperrgebeit / Crater battles with sand dunes / Much like on Titan.

Lapotre M. G. A. Ehlmann B. L. Arvidson R. E.  
POSTER LOCATION #223
Quantitative Composition and Granulometry of Aeolian Bedforms in Endeavour and Gale Craters Inferred from Visible Near-Infrared Spectra [#1431]  
We invert for mineral abundances and grain sizes of aeolian dunes in Endeavour and Gale Craters from CRISM spectra and compare our results to rover data.

Michaels T. I.  
POSTER LOCATION #224
Further Characterization of the Aeolian Transport Environment Near Endeavour Crater [#2897]  
Mesoscale atmospheric modeling near Endeavour Crater is compared to observations and used to further characterize winds that drive aeolian change there.

Johnson M. B. Zimbelman J. R.  
POSTER LOCATION #225
Documentation of Sand Ripple Patterns and Recent Surface Winds on Martian Dunes [#1518]  
Using HiRISE images, we investigate martian sand dunes and document their surface ripple patterns in order to assess recent wind flows.

Bourke M. C. McGaley-Towle Z.  
POSTER LOCATION #226
Latitudinal Variation in Sand Furrows in the North Polar Region of Mars [#2716]  
Sand furrow density varies with latitude and topography. Seasonal ice thickness and wind regimes are important controls.
Liu Z.Y.-C. Zimbelman J. R.  
**POSTER LOCATION #227**

*Documentation of Recent Surface Winds on Small Sand Dunes West of Mars’ Hellas Basin [#2809]*

Used HiRISE images to map sand ripple orientations on martian small dunes; evaluated the recent local wind flow; results can facilitate martian wind modeling.

Garcia G. C. Fenton L. K.  
**POSTER LOCATION #228**

*Determining the Dune-Construction Wind Regime in Eastern Olympia Undae, Mars [#2792]*

North Polar Sand Sea / The geomorphology / Tells of a new wind.

Grindrod P. M. Warner N. H.  
**POSTER LOCATION #229**

*Landslides as Indicators of the Past Extent of Interior Layered Deposits in Valles Marineris [#1744]*

We use obstructed landslides to determine the previous extent and loss rate of interior layered deposits in Valles Marineris.

Day M. D. Kocurek G. A. Anderson W. E. Hamed A. Christensen K. T.  
**POSTER LOCATION #230**

*Aeolian Erosion of Filled Martian Craters [#2296]*

Several modeling techniques are used to determine whether aeolian erosion could remove material from filled craters and lead to central mound formation.

Brothers T. C. Holt J. W. Spiga A.  
**POSTER LOCATION #231**

*Ascertaining the Temporal Stability of Water Ice in Korolev Crater, Mars [#2536]*

The age of ice in Korolev Crater is crucial for understanding circumpolar water flux. Here we use the LMD atmospheric model to constrain age of Korolev’s ice.

Reiss D. Hoekzema N. M. Stenzel O. J.  
**POSTER LOCATION #232**

*Dust Deflation by Dust Devils on Mars Derived from Optical Depth Measurements Using the Shadow Method in HiRISE Images [#1994]*

Optical depth measurements of three individual dust devils and their surroundings with the shadow method in HiRISE images.

Reiss D.  
**POSTER LOCATION #233**

*Morphology, Formation and Distribution of Dust Devil Tracks on Mars: Insights from Terrestrial Analogs [#2011]*

Dust devil track morphologic types on Earth and Mars are summarized. Hypotheses of martian and terrestrial dust devil track formation are discussed.

Gadhiri S. V. Shah V. Krishna Mohan  
**POSTER LOCATION #234**

*Unchanging Desert Sand Dunes [#1769]*

A method of clustering and monitoring sand dunes through imagery captured by remote sensing sensors is presented.

Scheidt S. P. Zimbelman J. R. Johnson M. B.  
**POSTER LOCATION #235**

*Multiview Stereo Photogrammetry of Mars Aeolian Analogs [#1446]*

We summarize recent work applying multiview stereo photogrammetry to create 3D digital models of dunes, ripples, and TARs for the purpose of Mars analog studies.

Altomare C. M. Fagan A. L. Kring D. A.  
**POSTER LOCATION #236**

*Eolian Deposits of Pyroclastic Volcanic Debris in Meteor Crater [#1448]*

Mineral chemistry and potential sources of an pyroclastic vesicular volcanic ash and cinder within Barringer Meteorite Crater are determined.

Zimbelman J. R. Scheidt S. P. de Silva S. L. Bridges N. T. Spagnuolo M. G.  
**POSTER LOCATION #237**

*Roughness Height Measurements for Megaripples in the Puna of Argentina, Form Flow over the Largest Megaripples, and Implications for Mars [#1359]*

Wind-profile measurements indicate aerodynamic roughness heights of 1 to 3 cm for fields of gravel-coated megaripples that are up to 1 m in height.
Bridges N. T.  Spagnuolo M. G.  de Silva S. L.  Zimbelman J. R.  Neely E. M.  
**POSTER LOCATION #238**
Formation of Coarse-Grained Megaripples on Earth and Mars: Insight from Wind Tunnel Experiments and the Argentinean Puna [1855]
We report on wind speeds needed to move clasts of the specific size, density, and shape that we find in the Puna megaripples that are analogs to martian TARS.

Neely E. M.  Spagnuolo M. G.  de Silva S. L.  Bridges N. T.  Zimbelman J. R.  
**POSTER LOCATION #239**
Methodology of Wind Tunnel Experiments Applied to Gravel Megaripple Formation on Earth and Mars [2767]
The abstract discusses methodology of wind tunnel experiments conducted with gravel megaripple clasts from the Argentine Puna, as a terrestrial analog for Mars.

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**CHONDRITES: MATRIX, WATER, AND ACCRETING PARENT BODIES [R712]**

Utas J. A.  Rubin A. E.  Ziegler K.  
**POSTER LOCATION #241**
Willcox Playa 010: A Highly Reduced Lodranite [2555]
Willcox Playa 010 is compositionally similar to two other lodranites, but is significantly more reduced; oxygen fugacity varied independently from composition.

Ebel D. S.  Weisberg M. K.  Crapster-Pregont E. J.  
**POSTER LOCATION #242**
Element Redistribution in Metamorphism of CO Chondrites: Implications for Emerging Worlds [1206]
X-ray map analysis quantitatively shows Fe-Mg exchange between inclusions and matrix, both trending to bulk Mg/Si from CO3.0 to 3.7, without disturbance of Si.

McCoy T. J.  McKeown D. A.  Buechele A. C.  
**POSTER LOCATION #243**
Do Enstatite Chondrites Record Multiple Oxidation States? [1983]
Chromium in enstatite chondrites is Cr²⁺ in olivine and sulfides, consistent with reduction. Cr³⁺ in sulfides suggests S-S bonding in Cr-bearing sulfides.

Takenouchi A.  Zolensky M. E.  Nishiizumi K.  
**POSTER LOCATION #244**
On the Relationship Between Cosmic-Ray Exposure Ages and Petrography of CM Chondrites [1827]
We sought correlations between the cosmic-ray-exposure ages and the petrography of CM chondrites, and tentatively conclude that there are some correlations.

Lindgren P.  Lee M. R.  Simpson S. L.  
**POSTER LOCATION #245**
Impact Fracturing and Aqueous Alteration of the CM Carbonaceous Chondrites [1040]
Analysis of the petrofabrics of CM carbonaceous chondrites shows that many of them have evidence for both ductile and brittle deformation during impacts.

Hiroi T.  Kaiden H.  Imae N.  Yamaguchi A.  Kojima H.  et al.  
**POSTER LOCATION #246**
Visible and Near-Infrared Spectral Survey of CM Chondrite Samples of National Institute of Polar Research and Possible Discovery of Unusual 3-Micron Absorption Bands [1106]
We report preliminary results of our VNIR spectral survey of CM chondrite chips of NIPR, especially the discovery of unusual triplet 3-µm absorption bands.

Johnson C. L.  Gaffey M. J.  
**POSTER LOCATION #247**
Implications for the Band I Peak Feature Shift of Ordinary Chondrites [1432]
Survey of H-, L-, and LL-type chondrite peak between charge transfer and Band I feature shows promise for an additional constraint to asteroid characterization.

Berlanga G.  Hibbitts C. A.  Takir D.  
**POSTER LOCATION #248**
Spectral Nature of CO₂ Adsorption onto Carbonaceous Chondrite Meteorites [2773]
We investigate the adsorption of CO₂ by carbonaceous meteorites using infrared reflectance spectroscopy.
Collisional Disruption of a Layered, Differentiated CR Parent Body Containing Metamorphic and Igneous Lithologies Overlain by a Chondrite Veneer [2465]

We present new evidence that the CR parent body contained equilibrated chondritic lithologies and igneous plutonic bodies, and describe a unique new achondrite.

REE, Th and U Fractionation in R Chondrites [1825]

We determined REE, Th, and U and discuss the HREE-LREE and Th-U fractionations in R chondrites.

Phase Recognition and Volumetric Analysis of Meteoritic Samples Using Medical Micro-Computed Tomography [2616]

Laboratory medical CT imaging can provide relatively high resolution 3-D information on the distribution of density within meteorites.

Large Metal Grains in Ordinary Chondrites [2229]

The analyses in this study provide a comparison of siderophile-element concentrations and ratios between normal metal grains and nodules in meteorite samples.

Modal Abundances, Chemistry and Sizes of Clasts in the Semarkona (LL3.0) Chondrite by X-Ray Map Analysis [1423]

Fully segmented maps (1567124 pixels over ~157 mm²) reveal 2D sizes, 73% chondrules, and 27% matrix, and complementary Mg-Si and Ti-Al in chondrules and matrix.

Comparison of Chondrule and CAI Size Measured by Electron Microprobe (2D) and Computed Tomography (3D) [2263]

Combined analysis of 2-D area from EMP maps and 3-D CT-derived volumes shows promise for developing a conversion factor for both chondrules and CAIs independently.

Some chondrule mesostasis preserves an ultrarefractory HREE-enriched precursor that complements Group II HREE-depleted CAIs producing flat bulk CO REE patterns.

Photostimulated Luminescence Technique Applicable to Pre-Screening of K-Rich Materials in Chondrites [1692]

We have developed a photostimulated luminescence technique applicable to prescreening of K-rich rock fragments in chondritic breccias.

Modal Abundances and Chemistry of Clasts in the Renazzo (CR2) Chondrite by X-Ray Map Analysis [1225]

Fully segmented maps (3.3 × 10⁷ pixels over ~992 mm²) reveal 61% chondrules, 0.4% CAIs, 1% AOAs, 38% matrix and complementary Mg-Si in chondrules and matrix.

Strain Measurements of Chondrules and Refractory Inclusions in Allende [1309]

Traditional strain measurement techniques, combined with X-ray computerized tomography (CT), to evaluate petrographic evidence in the Allende CV3 chondrite.
*POSTER LOCATION #259*

Contrasting Size Distributions of Chondrules and Inclusions in Allende CV3 [2711]

Macroscale (25-cm-diameter sample) and high-resolution microscale sampling of the Allende CV3 chondrite to compare size frequencies for CAIs and chondrules.

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Ganino C.  Libourel G.  Delbo M.  Michel P.  
*POSTER LOCATION #261*

Reappraisal of Metasomatic Process Conditions of Allende CV3 Chondrite Using Thermodynamic and Schreinemakers Analyses [2749]

On the basis of equilibrium assemblage phases study we propose here alternative conditions of formation for both Allende matrix and dark inclusions.

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Bruck A. M.  Dunn T. L.  
*POSTER LOCATION #262*

Petrologic Subtype of Type 3 CK Chondrite, Dar al Gani-431 (DaG-431) [1608]

Similar techniques that are used to determine the petrologic subtype of ordinary chondrites will be used to determine the subtype of CK3 chondrite DaG 431.

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Miller K. E.  Thompson M. S.  Lauretta D. S.  Zega T. J.  
*POSTER LOCATION #263*

Conditions for Formation of Chalcopyrite in the Rumuruti Chondrites [1461]

Although rare in meteorites, chalcopyrite (CuFeS2) is seen in R chondrites. Thermodynamics predict it formed in aqueous conditions or by melt crystallization.

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Jilly C. E.  Huss G. R.  Nagashima K.  
*POSTER LOCATION #264*

Oxygen Isotope Fractionation Among Secondary Calcite and Magnetite in CR Chondrites [1642]

We present in situ O-isotope composition of secondary calcite and magnetite in CR chondrites to investigate the nature and evolution of the aqueous reservoir.

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*POSTER LOCATION #265*

The Valency of Iron in the Silicates of CR Chondrite Matrices: Observations and Experiments [2052]

We have performed aqueous alteration experiments of amorphous silicate and compared the Fe³⁺/Fe²⁺ ratio to that of CR chondrite matrices measured by STXM-XANES.

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*POSTER LOCATION #266*

The Early Stages of Aqueous Alteration in CM Chondrites — TEM-UltraSTEM-STXM Investigations of the Less-Altered Chondrite Maribo [1354]

We investigated the nanoscale mineralogy of alteration features in the CM Maribo by TEM-STEM. Maribo is one of the least-altered CM chondrites in our collection.

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Rubin A. E.  
*POSTER LOCATION #267*

Degree of Aqueous Alteration in CM2 Paris and the Petrography of its Refractory and Amoeboid Olivine Inclusions [1130]

In Paris (the first CM2.7 chondrite), aqueous alteration destroyed melilite in CAIs. Compound chondrule-CAI objects suggest mixing during chondrule formation.

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Horstmann M.  Vollmer C.  Barth M. I. F.  Chausson M.  Gurenko A.  et al.  
*POSTER LOCATION #268*

Tracking Aqueous Alteration of CM Chondrites — Insights from In Situ Oxygen Isotope Measurements of Calcite [1761]

SIMS analyses of 81 calcite grains in Maribo, Murchison, Cold Bokkeveld, Nogoya, and Banten are presented and discussed with implications for fluid evolution.

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*POSTER LOCATION #269*

The Extent of Aqueous Alteration Within the Jbilet Winselwan CM2 Chondrite [2386]

Identified are large differences in degrees of aqueous alteration of individual chondrules from the Jbilet Winselwan CM2 chondrite.
Turrin B. D.  Lindsay F. N.  Park J.  Herzog G. F.  Delaney J. S.  et al.  
POSTER LOCATION #270

$^{40}\text{Ar}/^{39}\text{Ar}$ Studies of Murchison (CM2) and Tagish Lake (2-ung) [#2485]

$^{40}\text{Ar}/^{39}\text{Ar}$ plateau and isochron ages indicate a $3.1 \pm 0.05$ Ga and $2.2 \pm 0.03$ Ga alteration event for Murchison and Tagish Lake meteorites, respectively.

POSTER LOCATION #271

High-precision results are obtained for bulk density, grain density, and porosity of frozen pristine fragments of the Tagish Lake meteorite.

Nakato A.  Brearley A. J.  Jones R.  Ziegler K.  
POSTER LOCATION #272

Implications for the Formation of Thermally Metamorphosed Carbonaceous Chondrites Based on Mineralogical Changes in Experimentally Heated Products of Tagish Lake [#2355]

We describe dehydration and reduction evidence of heating products of Tagish Lake, and compared them with thermally metamorphosed carbonaceous chondrites.

Haberle C. W.  Garvie L. A. J.  Domanik K.  Christensen P. R.  
POSTER LOCATION #273

Mineralogical Complexity of Altered Kamacite in Sutter’s Mill (SM3, Pre-Rain): Insights into Asteroidal Dehydration [#2818]

Kamacite surrounded by radially complex alteration products within the Sutter’s Mill meteorite sample SM3 (pre-rain).

Yesiltas M.  Kebukawa Y.  Mattson E.  Hirschmugl C. J.  Peale R. E.  
POSTER LOCATION #274

Micro-Infrared and Micro-Raman Spectroscopies of Sutter’s Mill Meteorite Grains [#1396]

We’ve analyzed multiple Sutter’s Mill meteorite grains with two microspectroscopy techniques, and an extremely heterogeneous state of the samples is revealed.

Davidson J.  Nittler L. R.  Alexander C. M. O’D.  Stroud R. M.  
POSTER LOCATION #275

Petrography of Very Primitive CO3 Chondrites: Dominion Range 08006, Miller Range 07687, and Four Others [#1384]

We present detailed petrography for DOM 08006 and the results of a petrographic study of six CO3 chondrites that appear to define the CO metamorphic trend.

Leroux H.  Cuvillier P.  Zanda B.  Hewins R. H.  
POSTER LOCATION #276

Sub-Micrometer Composition Fields of Acfer 094 and Paris Matrices [#1706]

Composition properties of matrices at a submicrometer scale are established for two primitive chondrites (Acfer 94 and Paris) and compared with that of GEMS in IDPs.

Lewis J. A.  Jones R. H.  
POSTER LOCATION #277

Nephelinization and Metasomatism in the Ordinary Chondrite Parnallee (LL3.6) [#1661]

We report the presence of CO-like nephelinization of primary anorthite in the LL3.6 Parnallee and examine the implications for OC parent body metasomatism.

Steer E. D.  Schwenzer S. P.  Wright I. P.  Grady M. M.  
POSTER LOCATION #278

Spatial Correlations Between Silicate and Metal Weathering in Antarctic Chondrites [#1958]

Effects of Antarctic alteration in silicates of the rim and interior of an L6 chondrite were studied and correlated with other minerals and distance from rim.

CHONDRITIC CARBON, ORGANICS, AND Q [R714]

Peeters Z.  Liebig B.  Liu M. C.  
POSTER LOCATION #281

Surface Mapping of Carbonaceous Chondrite Murchison in Search of Organic Carbon Inclusions [#1749]

NanoSIMS mapping of Murchison meteorite in search of large organic carbon inclusions. First results from new cosmochemistry lab at Academia Sinica in Taiwan.
Verchovsky A. B. Fisenko A. V. Semenova L. F.  
**POSTER LOCATION #282**

*Radiogenic, Cosmogenic and Q Noble Gases, and Carbon and Nitrogen in Fractions of Saratow (L4) Meteorite Obtained by Physical Separation Methods* [#2500]

We have separated the bulk Saratov meteorite into a number of fractions using physical separation methods and analyzed C, N, and noble gases in the fractions.

Verchovsky A. B. Hunt S. A. Montgomery W. Sephton M. A.  
**POSTER LOCATION #283**

*Reaction of Q to Thermal Metamorphism in the Parent Bodies: High-Pressure Experiments* [#2541]

We have performed three high-pressure experiments with HF/HCl residue from Orgueil in order to see how the planetary noble gas carrier, Q, reacts on that.

**POSTER LOCATION #284**

*Molecular Complexity of Interstellar Origin in Large Polymeric Compounds from Murchison* [#2575]

We present an Orbitrap FT-MS study that relates the molecular complexity of the soluble organic matter in Murchison with interstellar chemical processes.

Ivanova M. A. Lorenz C. A. Korochantsiev A. V. Zaitsev M. A. Gerasimov M. V.  
**POSTER LOCATION #285**

*A Large Dark Inclusion in the Efremovka Meteorite* [#1014]

We have studied the petrography, mineralogy, chemistry and organic compounds of one dark inclusion from the Efremovka CV3 chondrite from the reduced subgroup.

Changela H. G. Le Guillou C. Brearley A. J.  
**POSTER LOCATION #286**

*Organic Material in the Matrices of Unequilibrated Ordinary Chondrites: A Coordinated STXM-TEM Study* [#2608]

We performed a coordinated STXM-TEM study of organic material (OM) in unequilibrated ordinary chondrites and compare them with OM in carbonaceous chondrites.

Changela H. G. Le Guillou C. Brearley A. J.  
**POSTER LOCATION #287**

*The Evolution of Organic Material in the Matrices of the CR Chondrites* [#2393]

In a comprehensive STXM-TEM study of organic material (OM) in the CR chondrites, we show OM to have evolved an aromatic-poor carboxylic/aliphatic-rich fraction.

Gasda P. J. Hellebrand E. Taylor G. J.  
**POSTER LOCATION #288**

*Combined Raman and EPMA X-Ray Mapping of Carbon Phases in CR Chondrites* [#1558]

Raman spectroscopic maps of matrix areas of CRs are compared with new EPMA X-ray maps and quantitative analysis of carbon phases of the same matrix areas.

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**THERMAL AND SHOCK METAMORPHISM OF ASTEROIDS** [R715]

**POSTER LOCATION #289**

*Al Jawf 001, A New H-Chondrite Breccia* [#2481]

Al Jawf 001 is an ordinary chondrite genomic breccia that fell in the Al Jawf region of Northwest Saudi Arabia. It has been classified as an H4/5 chondrite.

Hill K. N. Bullock E. S. Corrigan C. M. McCoy T. J.  
**POSTER LOCATION #290**

*Unscrambling the History of Enstatite Chondrites* [#2622]

Enstatite chondrites / Underwent impact melting / Now have strange sulfides.

Howarth G. H. Pernet-Fisher J. F. Barry P. H.  
**POSTER LOCATION #291**

*Tupelo EL6 Chondrite: Lithophile-Element Abundances in Sulfides and Metals* [#1774]

We present trace-element data for sulfides and metals of the new EL6 chondrite, Tupelo. Sulfides are enriched in lithophile elements Si, Mn, Ti, V, Li, and Zr.
The Application of Electron Backscatter Diffraction to a Tridymite-Diopside-Enstatite Crystal Aggregate in Mason Gully (H5): Understanding its Formation and Implications for Metamorphism

We describe a rare ~1.5-mm object in Mason Gully (H5). EBSD data show diopside grew from a tridymite core. Implications for planetesimal evolution are discussed.

Thermal Histories of CB Meteorites: Evidence of Reheating from Cr-Rich Sulfides

Exsolution microstructures in Cr-rich sulfides from CBa and CBb meteorites record a low-temperature heating episode on the CB parent body.

An Unusual Dark Inclusion from the Bencubbin Breccia and Deformation in an Asteroid Regolith

A weird DI from Bencubbin has deformation that resembles sedimentary flame structures. Two hypotheses for its formation in an asteroid regolith are presented.

Nickel in Type II Chondrule Olivine as an Indicator of Petrologic Subtype in CK Chondrites

Here we examine nickel in Type II chondrule olivine as a possible indicator of thermal metamorphism in the type 3 CK chondrites.

Chondrule Textures in NWA-5011 L6 Chondrite

This study emphasizes original chondritic texture concluding original petrologic type, and shear deformation of chondrules.

An Unusual Unequilibrated Lithic Clast in NWA 7965 LL 5-6 Chondrite Breccia

Petrographic and compositional study of an unequilibrated impact melt breccia clast from an equilibrated OC breccia that experienced partial melting.

Back-Transformation of Ringwoodite in L5-6 Chondrite Mbale: Implications for the Preservation of Shock Effects in Highly Shocked Meteorites

Back transformation of high-pressure minerals in chondrite Mbale indicates the degrading of shock signature in very highly shocked samples.

Katol Meteorite: A Rare Shower of Troilite-Metal Nodule Bearing Shock Melted L6-7 Chondrite

Katol is unique due to its presence of a troilite-metal nodule, which is characterized by several shock-induced textures including melt brecias.

The Coexistence of Wadsleyite and Ringwoodite in L/LL Chondrite SAH 293: Constraints on Shock Pressure Conditions and Olivine Transformation

We interpret the presence of wadsleyite and ringwoodite in shock melt veins of SAH 293 as evidence for relatively low shock pressure of 15–18 GPa.

The Anomalous Enstatite Meteorites — Part 2: The Recrystallized EL Meteorites

The petrology, chemistry, and origins of the EL recrystallized meteorites Happy Canyon, MIL 090807, Zaklodzie, NWA 4301, and Ilafegh 009 are discussed.
An Analysis of Anomalous Meteorite Enon: Classification and Thermal History [1096]
Enon is currently classified as an anomalous stony-iron meteorite. This study reexamines Enon to better understand its thermal history and classification.

Cosmic Ray Exposure History and Pairing of the Miller Range Ungrouped Achondrites: MIL 090206, 090340 and 090963 [2450]
The CRE history of three brachinite-like achondrites from Antarctica is consistent with an origin on one of the A-type asteroids near the 5:2 resonance.

Petrology and Geochemistry of Achondrites LEW 88763, MIL 090206 and MIL 090405: Comparisons with Acapulcoite-Lodranites, Brachinites and Chondrites [2752]New petrology and chemistry of MIL 090405 and MIL 090206, and continued work on LEW 88763 is reported. We consider the two MIL samples as brachinite-like.

An Enigmatic Sodic Ferrogabbroic Achondrite from Morocco Containing Zirconolite, Baddeleyite, Fluorapatite and Copper Sulfides [2418]An unusual basaltic specimen found at low elevation in Morocco contains measurable levels of cosmogenic nuclides and may be a rare type of lunar meteorite.

Identifying Parent Asteroid of Ungrouped Achondrite Northwest Africa 6704: Lessons from Dawn at Vesta [1311]The mineralogy of NWA 6704 is retrieved from spectral data. Its band parameters are compared to the S-asteroid subtypes in the search for a possible parent asteroid.

Seeing Past Alteration: Revealing Spectral Signature of the Primary Mineralogy of GRA 06128/9 [1573]After reduction of weathering, the spectral signature of the primary mineralogy of GRA 06128/9 is characterized to support searches for possible parent bodies.

Petrology and Mineralogy of Ungrouped Achondrite NWA 7325 [1865]Our mineralogical and petrological study on ungrouped achondrite NWA 7325 suggested that it experienced shock melting and subsequent recrystallization.

Petrology of the NWA 7325 Ungrouped Achondrite — Meteorite from Mercury, the Ureilite Parent Body, or a Previously Unsampled Asteroid? [1246]
The NWA 7325 ungrouped achondrite resembles a Mg-An-rich feldspathic lithology in polymict ureilites in petrologic and oxygen isotope properties.

Exposure Ages of Ureilites: Radionuclides and Noble Gases [1618]
Cosmogenic neon, $^{36}$Cl, and $^{26}$Al in 15 Antarctic ureilites indicate mostly small meteoroids and exposure ages between 6 and 60 Ma.

Trapped Noble Gases in Thirteen Ureilites from Antarctica [2016]
Trapped noble gases in 13 ureilites from Antarctica show isotopic compositions similar to Q-gas, but slightly different isotopic ratios of Xe were observed.
Harrington R. S.  Righter K.  
*Ureilite Thin Section Preparation [#1103]*
The techniques used at NASA Johnson Space Center for preparing thin/thick sections of ureilite meteorites are explained in this abstract.

*POSTER LOCATION #313*
*Assessment of the Mesosiderite-Diogenite Connection and an Impact Model for the Genesis of Mesosiderites [#2554]*
Petrologic studies of many specimens from a large Northwest African fall suggest a genetic model involving collision of metal impactors with a diogenitic body.

Buchanan P. C.  Reddy V.  Cloutis E. A.  Mann P.  Le Corre L.  et al.  
*POSTER LOCATION #314*
*Effects of Varying Proportions of Glass on Reflectance Spectra of HED Polymict Breccias [#1525]*
This study examines the reflectance spectra of mixtures of varying proportions of a howardite and glass derived by melting a bulk sample of that howardite.

Macke R. J.  Consolmagno G. J.  Britt D. T.  
*POSTER LOCATION #315*
*Heat Capacity Measurements of HED Meteorites from the Vatican Collection [#1929]*
Using our new LN₂ immersion technique, we measured the heat capacities of 12 howardites, eucrites, and diogenites from the Vatican collection.

Dhaliwal J. K.  Day J. M. D.  
*POSTER LOCATION #316*
*Insights into the Pristinity of Unbrecciated Eucrites [#2833]*
Petrographic analysis of six unbrecciated eucrites to identify “pristine” samples with primary geochemical signatures for insight into magmatic evolution.

Sanborn M. E.  Yin Q.-Z.  
*POSTER LOCATION #317*
*Chromium Isotopic Composition of the Anomalous Eucrites: An Additional Geochemical Parameter for Evaluating Their Origin [#2018]*
We present high-precision Cr-isotopic data for five anomalous eucrites and discuss the implications for the origin and evolution of the eucrite group.

Lorenz C. A.  Khisina N. R.  Habler G.  Abart R.  Ntaflos Th.  et al.  
*POSTER LOCATION #318*
*Composition of a Pyroxenitic Fragment from the Yurtuk Howardite [#2320]*
A fragment of atypical unequilibrated orthopyroxenite from the Yurtuk howardite could be related to ferroan olivine diogenites and magnesian cumulate eucrites.

*POSTER LOCATION #319*
*Radioelements on Vesta: An Update [#2565]*
Abundances of radioelements K and Th measured by Dawn’s gamma-ray spectrometer are consistent with Vesta’s identification as the HED parent body.

Sedaghaipour F.  Teng F.-Z.  
*POSTER LOCATION #320*
*Magnesium Isotopic Composition of Achondrites and Behavior of Mg Isotopes During Magmatic Differentiation of Achondrite Parent Bodies [#2101]*
Magnesium-isotope analyses of achondrites are used to estimate the Mg-isotopic composition of achondrites and evaluate the degree of isotopic heterogeneity in the solar system.

Trappitsch R.  Leya I.  
*POSTER LOCATION #321*
*Depth-Dependant Solar Cosmic Ray Induced Cosmogenic Production Rates [#1894]*
We present a model for calculating depth-dependent solar cosmic-ray production rates in lunar samples and shergottites.
Wieler R., Huber L., Leya I., Trappitsch R.  
**POSTER LOCATION #322**
The Evidence for Solar Cosmic Ray Produced Neon in Shergottites, Acapulcoites/Idranrites, and Angrites Revisited [#1331]
We revisit the evidence for the ubiquitous presence of SCR-Ne in shergottites and some achondrite classes based on $^{22}\text{Ne}/^{21}\text{Ne}$ and GCR nuclide production models.

**POSTER LOCATION #323**
The D’Orbigny Angrite: Evidences For and Against a Final Thermal Event at $-1000^\circ\text{C}$ [#1833]
SEM and TEM observations give evidences for and against a final short-lived high-temperature event affecting the angrite D’Orbigny.

Hwang S. L., Shen P., Chu H. T., Chui T. F., Varela M. E., et al.  
**POSTER LOCATION #324**
Kuratite (IMA 2013-109): The “Unknown” Fe-Al-Ti Silicate from the Angrite D’Orbigny [#1818]
We report a detailed mineralogical study of the Fe-Al-Ti-Si phase from D’Orbigny that has been recently approved as a new mineral (kuratite) by the CNMNC.

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**PLANETARY CORES: DATA FROM IRON METEORITES**  
[R717]

**POSTER LOCATION #325**
The Formation of the IIE Iron Meteorites [#1910]
A study of the inclusions located some of the IIE iron meteorites has produced a formation mechanism dependent on the cooling rates within a impact melt pool.

Breen J. P., Rubin A. E., Wasson J. T.  
**POSTER LOCATION #326**
Shock Melting in IIE Iron Meteorites - Implications for Parent-Body History [#1582]
Impact-melt-produced inclusions with euhedral daubréelite, schreibersite, low-Ni kamacite, and vuggy troilite commonly occur in IIE Aliskerovo and Willow Creek.

Goldstein J. I., Scott E. R. D., Yang J.  
**POSTER LOCATION #327**
Thermal and Impact Histories of Iron and Stony-Iron Meteorites: Constraints from Kamacite-Taenite Interface Compositions [#1138]
Conventional ideas about the origins of differentiated meteorites must be modified to include catastrophic effects of early impacts on differentiated asteroids.

Zipfel J., Chaussidon M., Palme H.  
**POSTER LOCATION #328**
Depletion of Lithophile Elements in Iron Meteorites and the Search for Oxide Phases [#2402]
Concentrations of lithophile elements in iron meteorites are lower than predicted from metal/silicate partition coefficients and may have exsolved from metal.

**POSTER LOCATION #329**
Siderophile Element Abundances in Karavannoe: Implications for the Origin of the Eagle Station Pallasites [#2293]
Siderophile-element abundances by LA-ICP-MS confirm that Karavannoe is a new and more evolved member of the Eagle Station Pallasites.

Tarduno J. A., Cottrell R. D., Ferriere L., Scott E. R. D.  
**POSTER LOCATION #330**
Preliminary Paleomagnetic Analysis of the Eagle Station Pallasite [#1945]
Olivine from the Eagle Station pallasite contains minute magnetic inclusions capable of recording ambient magnetic fields during parent body cooling.

Murty S. V. S., Ranjith Kumar P. M.  
**POSTER LOCATION #331**
Volume Correlated Solar Noble Gases in Washington County Iron Meteorite [#1110]
Volume correlated and heterogeneously distributed solar noble gases are reported for the interior samples of Washington County, an ungrouped iron meteorite.
**THE CHELYABINSK METEORITE: STUDIES OF A TRULY NEAR-EARTH OBJECT**

- **Ash R. D. Walker R. J. Yamakawa A. Yin Q.-Z.**  
  *New Insights into the Origin of Lovina, a Mystery Metal [#1434]*  
  Lovina is classified as an anomalous, high-Ni ataxite. However, trace elements, Cr isotopes, and Os isotopes indicate a natural, terrestrially formed metal.

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  The well-documented airblast over Chelyabinsk, Russia, on 2/15/2013, resulted in an LL5 chondrite, with geochemistry in apatite of OH, δD, and 3Cl/35Cl values.

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  *Mineralogy, Reflectance Spectra, and Physical Properties of the Chelyabinsk LL5 Chondrite — Insight into Shock Induced Changes in Asteroid Regoliths [#1986]*  
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- **Beard S. P. Kring D. A. Isachsen C. E. Lapen T. J. Zolensky M. E. et al.**  
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- **Arai T. Abe S. Ohtsuka K. Hiroi T. Komatsu M. et al.**  
  *Mineralogical and Spectral Heterogeneity of Chelyabinsk Meteorite [#2860]*  
  Mineralogical and spectral reflectance study of the Chelyabinsk meteorite suggests possible compositional and spectral heterogeneity of the Chelyabinsk parent body.

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Busemann H., Toth E. R., Clay P. L., Gilmour J. D., Nottingham M. et al. **POSTER LOCATION #342**

*Noble Gases in the LL5 Chondrite Chelyabinsk [#2805]*

Noble gas data in various specimens of the Chelyabinsk meteorite are presented to assess its exposure in space and the chronology of events on the parent body.

Tappa M. J., Mills R. D., Ware B., Simon J. I. **POSTER LOCATION #343**

*A Procedure to Determine the Coordinated Chromium and Calcium Isotopic Composition of Astromaterials Including the Chelyabinsk Meteorite [#1908]*

Detailed methodology of a procedure developed to measure Cr and Ca isotopes. Data demonstrate that this method provides results consistent with other work.

Lapen T. J., Kring D. A., Zolensky M. E., Andrasen R., Righter M. et al. **POSTER LOCATION #344**

*Uranium-Lead Isotope Evidence in the Chelyabinsk LL5 Chondrite Meteorite for Ancient and Recent Thermal Events [#2561]*

U-Pb isotope systematics of phosphate from the Chelyabinsk meteorite indicate two periods of Pb loss, one at 4456 ± 18 Ma and another at 559 ± 180 Ma.

Yoshida S., Mikouchi T., Nagao K., Haba M. K., Hasegawa H. et al. **POSTER LOCATION #345**

*Mineralogical Variation of Chelyabinsk with Depth from the Surface of the Parent Meteoroid [#2509]*

We report mineralogical variation of Chelyabinsk fragments whose burial depths in the parent meteoroid were estimated (0–3 m) by noble gas compositions.

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**NEOS, METEORS, AND HAZARD MITIGATION:**

**WHEN THE SOLAR SYSTEM WANTS TO CRASH AT YOUR PLACE [R719]**

Sansom E. K., Bland P. A., Paxman J. **POSTER LOCATION #346**

*Automated Dynamic Modelling of Fireballs for the Australian Desert Fireball Network [#1591]*

A constrained dynamic optimization and an extended Kalman filter are used for analysis of fireballs from the Desert Fireball Network.

Vizi P. G., Bérczi Sz., Gucsik A., Hegedűs T., Lukács B. et al. **POSTER LOCATION #347**

*Fireball and Meteor Event 20130824190218UTC’Pilis’ [#2838]*

The medium-sized fireball events are mostly nondocumented analytically, because of the small amount of fallen mass. We try to document the 2013.08.24.Pilis event.

Narziev M. **POSTER LOCATION #348**

*The Forms of Ionization Curves Producing Bright Meteors [#1681]*

Identified five groups of ionization curves that vary in the form of electron line density distribution along a meteor trails.

Paxman J. P., Bland P. A. **POSTER LOCATION #349**

*Fireballs in the Sky: Improving the Accuracy of Crowd Sourced Fireball Observation Through the Application of Smartphone Technology [#1731]*

A fireball reporting system has been developed, using smartphone technology to improve accuracy, and increase the likelihood of successful meteorite recovery.

Plesko C. S. **POSTER LOCATION #350**

*The Response of Meteoritic and Cometary Materials to Neutron Bombardment [#2846]*

This work models the response of meteoritic and refractory cometary materials to neutron bombardment.

Weavew R. P., Gisler G. R., Plesko C. S. **POSTER LOCATION #351**

*An Overview of the Los Alamos PHO Mitigation Project [#1107]*

Los Alamos National Laboratory has a new project to perform computer simulations of the use of nuclear explosives to mitigate the threat from a PHO.
Lai H. R. Russell C. T. Wei H. Y. Delzanno G. L. Connors M. POSTER LOCATION #352
Identifying Potentially Hazardous 50-m Class Co-Orbiting Materials Associated with Known ‘Safe’ Near-Earth Objects [#1560]
Occurrence records of interplanetary field enhancements are used to trace interplanetary collisions and thus the spatial distributions of small objects.

Howley K. M. Owen J. M. Wasem J. V. POSTER LOCATION #353
Asteroid Threat Mitigation: An In-Depth Look at What Can Be Done in Three Real-Object Scenarios [#2276]
We model the response of asteroids 2008 EV5, Apophis, and 1998 KY26 to nuclear explosions and kinetic impactors and compare.

Mainzer A. Bauer J. Cutri R. Dailey J. Grav T. et al. POSTER LOCATION #354
NEOWISE: Preliminary Results from the Restarted Mission [#2724]
The NEOWISE project has recently resumed its survey for asteroids and comets at 3.4 and 4.6 µm.

Grav T. Mainzer A. Bauer J. M. Masiere J. R. Nugent C. R. et al. POSTER LOCATION #355
NEOWISE: The Distribution of the Large Primitive Asteroids [#2605]
The results of taxonomical classification of the large primitive asteroids from the outer main belt to the giant planets based on NEOWISE data.

Elvis M. Allen L. Christensen E. DeMeo F. Evans I. et al. POSTER LOCATION #356
LINNAEUS: Boosting Near-Earth Asteroid Characterization Rates [#1047]
LINNAEUS will take optical spectra of ~1500 NEOs/year within days of discovery using 50% of the KPNO 2.1 m, a clone of the SED-machine and dedicated pipelines.

Ness R. G. Emery J. P. POSTER LOCATION #357
Thermal Inertia Estimates of Four Near-Earth Asteroids from Spitzer Space Telescope Spectral Observations [#1430]
The goal of this work is to estimate thermal inertia values, albedos, and diameters for four near-Earth asteroids.

Schwartz S. R. Michel P. POSTER LOCATION #358
NEOShield Study of Hypervelocity Impacts into Small Bodies: Simulating the Fate of Ejecta [#2415]
We present simulation results of an ongoing NEOShield-sponsored study investigating the NEO threat mitigation technique of using nonexplosive targeted strikes.

Barnouin O. S. Noviello J. L. Ernst C. M. POSTER LOCATION #361
Are There Structural Lineaments on Itokawa? [#2221]
We assess whether or not Itokawa possess global or semi-global structural lineaments to understand the internal structure of this asteroid.

Le Corre L. Bhatt M. Becker K. J. Li J.-Y. Reddy V. POSTER LOCATION #362
Processing Hayabusa NIRS Spectrometer Data for Compositional Analysis of Asteroid Itokawa [#1314]
We will present processing of near-infrared data of Itokawa from the point spectrometer NIRS onboard the Hayabusa spacecraft, using data from the PDS and ISIS.

Reddy V. Bhatt M. Dunn T. L. Le Corre L. Becker K. J. et al. POSTER LOCATION #363
Extracting Olivine and Pyroxene Compositions from Hayabusa NIRS Spectrometer Data [#1401]
We present a method to extract olivine and pyroxene chemistries from spectra obtained by Hayabusa spacecraft of near-Earth asteroid Itokawa.
Yada T., Abe M., Uesugi M., Karouji Y., Okada T. et al.  
**POSTER LOCATION #364**

*Present Status of Hayabusa-Returned Samples — Initial Descriptions, International AOs and Consortium Studies [#1759]*

Present status of initial descriptions, international AOs, and consortium studies for Hayabusa-returned particles are presented, including their future plans.

**POSTER LOCATION #365**

*Mineralogy and Crystallography of some Itokawa Particles Returned by the Hayabusa Mission [#2239]*

Our mineralogical and crystallographic study on Itokawa particles further confirms their affinities to equilibrated LL chondrites with minor shock metamorphism.

Berger E. L., Keller L. P.  
**POSTER LOCATION #366**

*A Coordinated Focused Ion Beam/Ultramicrotomy Technique for Serial Sectioning of Hayabusa Particles and Other Returned Samples [#1485]*

Development of a hybrid technique combining traditional ultramicrotomy with FIB-SEM methods to maximize the information garnered from small particles.

Böttger U., Alwmark C., Bajt S., Busemann H., Gilmour J. D. et al.  
**POSTER LOCATION #367**

*Raman Micro-Spectroscopy of Hayabusa Particles [#1411]*

Noble gas studies in Itokawa samples were combined with Raman spectroscopy, IR spectroscopy, and SRXTM. Results of Raman spectroscopy are presented.

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**COMETS: PERIHELIAL PLUMAGE ON PARADE [R721]**

**POSTER LOCATION #370**

*GIADA (Grain Impact Analyser and Dust Accumulator): Activity Performed in Support to the Comet 67P/Churyumov-Gerasimenko Encounter [#2620]*

The Rosetta S/C on the January 20, 2014, will exit from the hibernation phase. Results on GIADA activities performed for the 67P/C-G encounter are reported.

**POSTER LOCATION #371**

*3-D DSMC Simulations of Comet 67P/Churyumov-Gerasimenko [#1764]*

Simulation of gas outflow from the Rosetta target comet has been performed using a 3-D code in preparation for the prime mission, which starts this year.

**POSTER LOCATION #372**

*Gas and Dust Redeposition on the Surface of Comet 67P/Churyumov-Gerasimenko [#1860]*

We investigate the redeposition of gas and dust back to Comet 67P’s surface and show how this increases the activity during the outbound part of the orbit.

**POSTER LOCATION #373**

*Chandra X-Ray Observatory Observations of Dynamically New Comet C/2012 S1 (ISON): First Detection of OVI Emission by the HRC-I from an X-Ray Bright Comet [#2065]*

We present 0.03–2.0 keV X-ray observations of the unexpectedly bright Comet ISON made by Chandra in Oct–Nov 2013, ~25 days before its perihelion disruption.

**POSTER LOCATION #374**

*SOFIA FORCAST Far-IR Photometry of Comet ISON and Constraints on Coma Grain Size Distribution [#2906]*

Thermal models to FORCAST observations of Comet ISON ($r_h = 1.2$ AU) at 11, 19 and 32 µm show the coma has a steep size distribution of carbon-rich 0.7–1-µm grains.
Results from the MESSENGER Imaging Campaign of Comets C/2012 S1 (ISON) and 2P/Encke [2585]
Wide- and narrow-angle camera images of Comets C/2012 S1 (ISON) and 2P/Encke were acquired by MESSENGER during the close passes of both comets by Mercury.


Spectral Observations of Comets C/2012 S1 (ISON) and 2P/Encke Obtained by MESSENGER [2553]
Spectral observations of Comets C/2012 S1 (ISON) and 2P/Encke were acquired by the MESSENGER spacecraft during the close passes of both comets by Mercury.


The Comet ISON [1070]
In this work the comet’s light curve and the orbital parameters are obtained using high-precision data. We have studied the comet since January 31, 2013.

Matzel J. E. P.  Ishii H. A.  Joswiak D.  Brownlee D.  Hutcheon I. D.

Mn-Cr Isotope Systematics of Fayalite-Silica Intergrowths from the Stardust Mission to Comet 81P/Wild 2 [1645]
We measured Mn and Cr isotopes from fayalite-silica intergrowths in a particle from Comet 81P/Wild 2, and did not observe excess $^{53}$Cr outside analytical error.

Gicquel A.  Milam S. N.  Cordiner M. A.  Villanueva G.  Charnley S. B.  et al.

Thermal Emission Photometry of Three Near-Earth Asteroids in L’ and M’ [1695]
We successfully acquired JKL’ M’ (1.2–4.7 µm) spectrophotometry of three sub-km near-Earth asteroid radar targets.

Burbine T. H.

Determining Band Centers from Asteroid Spectra [1646]
A MATLAB program has been written to determine band centers with uncertainties from S-type asteroid spectra.

Ryan E. L.  Noll K. S.  Woodward C. E.

An Optical Color Survey of Hilda Group Asteroids: Testing Giant Planet Migration Models [2812]
Various models of giant planet migration predict distinct source regions for the Hilda asteroids. We present preliminary optical colors to test these models.

Lust N. B.  Britt D. T.

Observations and Analysis of 2577 Litva [2571]
Over several weeks we have made observations of the binary asteroid 2577 Litva. We present our analysis using developed techniques for low S/N observations.
Vodniza A. Q. Pereira M. R.  
**Study of the Asteroid 1998 QE2 [1042]**
We captured a mutual event (eclipse) and we calculated the orbital elements of this asteroid. The parameters were calculated based on 191 observations.

Maturilli A. Helbert J. D’Amore M. Ferrari S.  
**On the Effect of Emerging Angle on Emissivity Spectra: Application to Small Bodies [1352]**
We studied the influence of emerging angle on emissivity spectra measured in air and in vacuum, with particular attention to asteroids-like conditions.

Okamura N. Hasegawa S. Usui F. Hiroi T. Ootsubo T. et al.  
**Spectroscopic Observations of Dark Main-Belt Asteroids in the 2.5–3.1 μm Range [1375]**
We report reflectance spectra of 33 dark asteroids observed by AKARI over 2.5–3.1 μm, which has not been observed before because of severe telluric atmosphere absorption.

**The Effects of Varying Environmental Conditions on the Emissivity Spectra of Meteorites [1989]**
An environmental simulation chamber was used to measure the emissivities of a selection of ground meteorites under isothermal and asteroid-like conditions.

Gaffey M. J. Reddy V. Fieber-Beyer S. Cloutis E.  
**Asteroid (354) Eleonora: Plucking an Odd Duck [1453]**
(354) Eleonora was previously identified as an anomalous S-asteroid. Our work has determined a probable composition and revealed problems with the CCD data.

Doressoundiram A. Roques F. Liu C.-Y. Maquet L.  
**MIOSOTYS: Exploring the Outer Solar System Small Bodies with Stellar Occultations [1214]**
MIOSOTYS is a ground-based instrument aimed at probing the transneptunian disk with stellar occultations. We present observing campaigns and results.

Noll K. S. Benecchi S. D. Ryan E. L. Grundy W. M.  
**Ultra-Slow Rotating Outer Main Belt and Trojan Asteroids: Search for Binaries [1703]**
The Hubble Space Telescope was used to search for companions to eight long-period outer main belt and Trojan asteroids. No companions were detected.

**Radar Shape Model of Binary Near-Earth Asteroid (285263) 1998 QE2 [1313]**
Asteroid and Moon / 1998 QE2 / With radar we model.

Mori Y. Hirata N. Hayabusa-2 Shape Reconstruction Study Group  
**Asteroid Shape Reconstruction by Open-Source Structure from Motion Tools [1760]**
Applicability of the open-source shape reconstruction tools, Bundler and PMVS2, to the exploration mission data is evaluated.

Mittal T. Goldstein D. Nugent P.  
**Detection and Characterization of the Sub-km Asteroid Population in the Main Asteroid Belt [2905]**
We present a novel algorithm for detection of subkilometer-scale asteroids in wide-field surveys (e.g., Dark Energy Survey) and deep imaging archives (e.g., Keck).

The binary, PHA, 2007 LE, is the first ever result where a specific meteorite has been linked to a NEO for which a mainbelt parent body has been identified.

Mid-Infrared Reflectance Spectroscopy of Calcium-Aluminium-Rich Inclusions: A Way to Detect Primitive Asteroids?

Mineral-specific features in mid-infrared reflectance spectra of CAI in primitive meteorites can be observed in asteroid spectra observed by space telescopes.

Update on Testing the Gefion Dynamical Family as a Possible Source of the L-Chondrites

The Gefion dynamical family has been proposed as the source for L chondrites. We update the spectral investigation undertaken to test this hypothesis.

Investigating the Geological History of Asteroid 101955 Bennu Through Remote Sensing and Returned Sample Analyses

NASA’s OSIRIS-REx mission will return samples of asteroid Bennu in 2023. We review our approach to unraveling the history of Bennu by returned sample analyses.

How Many Ore-Bearing Asteroids?

Using a Drake Equation formalism I estimate how many asteroids contain either platinum group metals or water suitable for commercial mining.

Gravitational Potential of Haumea with a Rocky Core

We present models of the internal structure of the rapidly rotating Kuiper belt object Haumea such that its rocky core and ice surface are equipotentials.

Lumping and Splitting of Small Bodies: Craters, Grooves, Regolith, and Body Dynamics

Contact Dynamics Methods to Study Regolith Processes

We demonstrate a contact dynamics model (a DEM-like method) that will be used in future work to study regolith processes and spacecraft-surface interactions.

Mars Ejecta in the Regolith of Phobos: Implications for Groove Formation from Secondary Impacts

The volume of ejecta from impacts on Mars is insufficient to produce grooves on Phobos as secondary craters by at least three orders of magnitude.

Morphometry of Large Craters on Phobos and Comparison with Other Bodies

A few large craters on Phobos are anomalously deep in comparison to other small bodies and lunar highlands.

Tidally Disrupted Small Bodies may form Grooves on Phobos

Instead of previous formational hypotheses, we propose that tidally disrupted small bodies form grooves on Phobos, which can explain the nature of the grooves.
Ramsley K. R.  Head J. W. III  **POSTER LOCATION #406**

*Constraints on the Age of Stickney Crater and Associated Features on Phobos* [#1414]

The age of the Stickney impact crater on Phobos may be determined from the nature of contemporaneous interrelated systematic processes and geological features.

Kneissl T.  Schmedemann N.  Neesemann A.  Raymond C. A.  Russell C. T.  **POSTER LOCATION #407**

*Crater Counting on Small Bodies — The Influence of Topography-Related Distortions* [#2398]

Projected image data of small bodies contain length and area distortions as a function of elevation. We demonstrate the effect on CSFDs and how to correct them.

Durda D. D.  Sanchez P.  Fischer A.  Devaud G.  Scheeres D. J.  et al.  **POSTER LOCATION #408**

*The Size Distribution of ‘Boulders’ Formed During Slope Failure in Piles of Self-Cohesive Powders: Application to the Morphology of Regoliths on Small Asteroids* [#2015]

We present results of analog experiments using cohesive powders in 1 g to examine the behavior of regoliths on the microgravity surfaces of small asteroids.

Scheeres D. J.  Sanchez P.  **POSTER LOCATION #49**

*Surface Stability of Rapidly Spinning Spheroids* [#1930]

Regolith on the surfaces of spheroidal, rapidly spinning asteroids preferentially fails toward the equator, yielding shapes consistent with observed asteroids.

Giacomini L.  Massironi M.  Aboudan A.  Bistacchi A.  Barbieri C.  **POSTER LOCATION #410**

*3D Study of Lutetia Lineaments: New Clues to Understand the Asteroid Origin* [#2157]

A 3-D mapping of Lutetia lineaments has been performed. This has allowed us to gain new clues about the internal structure and origin of the asteroid.

Laipert F. E.  Minton D. A.  Longuski J. M.  **POSTER LOCATION #411**

*Satellite Formation Around the Rapidly Rotating, Oblong Asteroid Kleopatra* [#2319]

We discuss the possibility that the oblong asteroid Kleopatra’s two satellites formed over time from impact ejecta influenced by the elongated gravity field.

Jacobson S. A.  Scheeres D. J.  Rossi A.  Marzari F.  **POSTER LOCATION #412**

*The Effects of Rotational Fission on the Main Belt Asteroid Population* [#2363]

From the results of a comprehensive asteroid population evolution model, we match the observed populations of binaries, asteroid pairs, and contact binaries.

Sonnett S.  Meech K.  Jedicke R.  **POSTER LOCATION #413**

*Rotation Properties of Neutral Trans-Neptunian Objects* [#2754]

Our survey of neutral-colored transneptunian objects suggests a similar collisional history to red TNOs, dissimilar history to Trojans/MBAs, and several binaries.

Hirabayashi M.  Scheeres D. J.  **POSTER LOCATION #414**

*Interior Stress Within the NEO Binary System 1999 KW4* [#1644]

The present study shows that 1999 KW4 Alpha’s failure mode is a vertical compression of the equatorial plane and the maximal stress changes 20% over a rotation.

Sánchez P.  Scheeres D. J.  **POSTER LOCATION #415**

*Cohesive Self-Gravitating Aggregates and Their Path of Disruption* [#1697]

Angle of friction and cohesive strength are used to study the disruption of rotating self-gravitating aggregates and a connexion between shedding and fission.

Carroll K. A.  **POSTER LOCATION #416**

*Asteroid Surface Gravimetry* [#2352]

Asteroid internal structure and composition can be explored via surface gravimetry. Gravimeter requirements are determined via analyzing several applications.
Decker M. C. Ahern A. A. Radebaugh J. Christiansen E. H. Williams D. A.  
**POSTER LOCATION #417**  
*Paterae on Io: Geologic Mapping and Experimental Models [R1626]*  
We are attempting to understand the formation of paterae using experimental models and comparing the results to our geomorphologic map of Tupan Patera.

Slezak T. Kesztthelyi L. P. Okubo C. Williams D. A.  
**POSTER LOCATION #418**  
*Paterae On Io: Compositional Constraints from Slope Stability Analysis [R1552]*  
The near-vertical slopes of scarps on Io provide clues into the upper crust. We investigate compositional constraints using numerical slope stability modeling.

White O. L. Schenk P. M.  
**POSTER LOCATION #419**  
*Topographic Mapping of Paterae and Layered Plains on Io Using Photoclinometry [R1540]*  
We have used photoclinometry to produce topographic maps of seven locations on Io, from which we have measured the relief of paterae and layered plains.

Davies A. G. White O. L. Schenk P.  
**POSTER LOCATION #420**  
*Ionian Patera Volumes and Implications for Formation Mechanism [R1953]*  
Considering the preferred formation process for Io’s paterae, for a sample of 23 paterae we estimate the volumes of silicate lava needed for patera excavation.

Jozwiak L. M.  
**POSTER LOCATION #421**  
*Constraining the Lithospheric Thickness of Io from a Modified Heat-Pipe Model [R1160]*  
We present a modified heat-pipe model for the lithosphere of Io. We find support for a lithospheric thickness cycle about a quasi-equilibrium value.

Tsang C. C. C. Rathbun J. A. Spencer J. R. Hesman B. E. Abramov O.  
**POSTER LOCATION #422**  
*Io’s Hotspots in the Near-Infrared Detected by LEISA During the New Horizons Flyby [R1163]*  
Analysis of LEISA from the New Horizons flyby in 2007 of Io’s active volcanism in the near-infrared.

Veeder G. J. Davies A. G. Matson D. L. Johnson T. V.  
**POSTER LOCATION #423**  
*Faint Thermal Sources on Io [R1255]*  
We identify nine new faint hot spots on Io. A near-infrared ratio technique applied to Galileo NIMS data is useful for detecting faint thermal sources.

Rathbun J. A. McGrath C. D. Spencer J. R.  
**POSTER LOCATION #424**  
*Groundbased Observations of Io in Support of JAXA’s SPRINT — A Mission [R1180]*  
Using IRTF / Studying Io’s volcanos / Compare to torus.

Gregg T. K. P. Panza E. Buford B.  
**POSTER LOCATION #425**  
*Can You Miss What You Don’t See? Erosion Patterns of Lavas and Ignimbrites on Earth and Mars [R2326]*  
We present characterizations of erosional patterns for terrestrial ignimbrites and lava flow fields for comparisons with eroded terrains on Mars.

**POSTER LOCATION #426**  
*Topographic and 3-D Analysis of Siloe Patera, Arabia Terra Suggest a Volcanic Origin [R2271]*  
Siloe Patera is a newly identified volcanic feature that contains multiple collapse events and possible lava flows.

Glaze L. S. Baloga S. M.  
**POSTER LOCATION #427**  
*Exploring Inflated Pahoehoe Lava Flow Morphologies and the Effects of Cooling Using a New Simulation Approach [R1410]*  
Lava cooling rates are incorporated into a new random walk model to explore the effects of volume flux rate on surface cooling, breakouts, and flow morphologies.
Sangha S.  Diniega S.  POSTER LOCATION #428
Quantitative Investigations of Relationships Between Tumuli Morphometrics and Lava Flow Emplacement [#1556]
Tumulus orientation is proposed as a good indicator of general/local flow direction.

Wood K. L.  Zimbelman J. R.  POSTER LOCATION #429
Inflated Lava Flows Near Elysium Mons, Mars [#2359]
Inflated lava flows were found west of Elysium Mons, Mars. They correspond to shallow slopes as they do on Earth.

Broz P.  Hauber E.  POSTER LOCATION #430
Small-Scale Post-Noachian Volcanism in the Martian Highlands? Insight from Terra Sirenum [#1104]
Young martian highland volcanism: Observation of small-scale volcanic landforms with outgoing lava flows as evidences for highly viscous lavas?

Plescia J. B.  Viviano-Beck C.  Murchie S.  Morgan F.  Seelos K.  POSTER LOCATION #431
Search for Mafic Bedrock in Tharsis and Elysium using CRISM Data [#2358]
CRISM data for dust-free areas in Tharsis and Elysium allow for recognition of bedrock mineralogy. Olivine, HCP, and LCP have been detected.

Ody A.  Quantin C.  Poulet F.  POSTER LOCATION #432
An Olivine Ocean in the Northern Plains of Mars [#2848]
Here we assess the mineralogy and 3-D stratigraphy of the northern plains of Mars in studying material excavated by craters using OMEGA and CRISM spectrometers.

Fawdon P.  Skok J. R.  Balme M. R.  Vye-Brown C. L.  Rothery D. A.  et al.  POSTER LOCATION #433
The Nili Patea Caldera; Evolving Magmas, Explosive Eruptions and Hydrothermal Deposits on Mars [#1967]
A geological history connecting: Caldera formation, with an ignimbrite or pluton base. Post-caldera dacite flows, resurgent dome, and mafic ring fault volcanism.

Salvatore M. R.  Kraft M. D.  Edwards C. S.  Christensen P. R.  POSTER LOCATION #434
Investigating the Origin of Circum-Chryse (Mars) Olivine Exposures Through Localized Geologic and Stratigraphic Analyses [#2110]
A local olivine-rich exposure provides insight into the relationship between widespread mafic exposures and the circum-Chryse chaos terrain and fluvial systems.

Chadwick D. J.  McGovern P. J.  Simpson M. C.  Reeves A. K.  POSTER LOCATION #435
Measurements of Lithospheric Flexure due to Late Amazonian Subsidence of Olympus Mons [#2748]
Paleotopography, flexural modeling, and crater retention ages were used to constrain the relatively recent subsidence of Olympus Mons on Mars.

Bernhardt H.  Hiesinger H.  Ivanov M.  Clark J. D.  Pasckert J. H.  POSTER LOCATION #436
Wrinkle Ridges on the Hellas Basin Floor, Mars: Morphological Assessment and Implications [#1366]
Morphometric analyses of wrinkle ridges on the eastern Hellas basin floor, Mars, indicate a ~2-km-thick basalt layer compressed by an isotropic stress field.

Williams J.-P.  Dohm J. M.  Lopes R. M.  Buczkowski D. L.  POSTER LOCATION #437
A Large Vent Structure Within Argyre Basin, Mars [#2807]
A vent-like feature is identified on the floor of Argyre consisting of a quasicircular rim of high-standing material forming a conic structure.

Crown D. A.  Mest S. C.  POSTER LOCATION #438
Geologic Mapping of the Tyrrenhus Mons Lava Flow Field [#2471]
Mapping of the Tyrrenhus Mons lava flow field using THEMIS and CTX images documents the distribution, nature, and diversity of volcanic and erosional features.
Geologic Mapping of Arsia and Pavonis Montes, Mars [*2133*]
This is an update on the geologic mapping progress of two of the three Tharsis Montes volcanos on Mars.

Potential Volcanic Constructs Associated with Fluvial Channels in the Hesperia-Hellas Trough, Mars [*2095*]
We describe several constructs in the Dao-Niger Valles system in the Hellas region of Mars. Based on morphology we interpret them as probable volcanic edifices.

Distinguishing Volcanic and Fluvial Activity in Mangala Valles, Mars via Geomorphic Mapping [*2440*]
Using CTX images to produce a map of Mangala Valles and to interpret and date each geological unit to determine the order of events in its geological history.

HiRISE Perspectives on the Flows of Hrad Vallis, Mars [*1139*]
HiRISE images and new 1:100K-scale mapping provide numerous insights into the origin and mode of emplacement of flows associated with Hrad Vallis, Mars.

Evidence for Possible Mechanical Erosion by Lava at Athabasca Valles, Mars, from HiRISE and CTX Images and Topography [*1683*]
We find multiple lines of evidence consistent with at least modest mechanical erosion by lava in Athabasca Valles.

Athabasca Valles, Mars: How Important was Erosion by Lava? [*1154*]
We model thermal erosion by turbulent lava at proximal Athabasca, Mars. Results suggest erosion by lava was unimportant, due to the eruption’s short duration.

Rimae Posidonius is a lunar sinuous rille. Ten-meter-thick turbulent lava flows likely produced erosion depths that match observations at its source and terminus.

Widespread past development of large volcanic channels on rocky bodies of the solar system suggests the possible early formation of analogous systems on Earth.

We discuss the absence of terrestrial plate tectonism in early Archean time: from fracture analyses and geochemical study of mare basalts on the lunar crust.

To investigate the formation of lunar silicic volcanism, Rhyolite-MELTS has been used for preliminary computer simulations for future partial melt experiments.
Staid M. Besse S.  
**Spectral and Stratigraphic Mapping of Basalts Near Lichtenberg Crater** [#2422]
The stratigraphy and mineralogy of basalts surrounding the lunar crater Lichtenberg are investigated using Moon Mineralogy Mapper spectral data.

Ostrach L. R. Robinson M. S.  
**Areal Crater Density Analysis of Volcanic Smooth Plains: Mare Imbrium, a Revised Approach** [#1266]
Volcanic units / Found with crater density / No color data. #cratercounting #agedating #smoothplains #LROC #Moon #Mercury.

Zhang F. Zou Y. L. Zheng Y. C. Fu X. H. Zhu Y. C.  
**Spectroscopic Investigations of Mare Basalts Within Imbrium Basin Using M3 Data** [#1586]
This abstract focuses on mineralogy and petrologic evolution interpretation from the diagnostic reflectance properties of individual flows in Imbrium.

**Mapping Lunar Maria Extents and Lobate Scarps Using LROC Image Products** [#2861]
Digital mapping of lunar mare and lobate scarps.

Chan N. W. Vaughan W. M. Head J. W.  
**Lunar Ina-Like Features: Maps and Morphometry** [#1001]
Hundreds of irregular pits on the Moon resemble the enigmatic lunar feature Ina. These pits and Ina likely formed by the same process.

**Geologic Studies of Volcanic Constructs in Eastern Mare Frigoris** [#1318]
Volcanic constructs are examined in E. Mare Frigoris. Geochemical and morphologic data support mare basalt composition for these low, steep-sided cones of spatter.

Chappaz L. Melosh H. J. Howell K. C.  
**Surface and Buried Lava Tube Detection with GRAIL Data** [#1746]
The high accuracy and resolution of the data collected by GRAIL potentially allows the detection of small-scale lunar features, specifically empty lava tubes.

Pasckert J. H. Hiesinger H. van der Bogert C. H.  
**Diverse Volcanic Activity In and Around the Lunar farside Crater Rosseland** [#1992]
We investigated 28 volcanic mare deposits in and around Rosseland Crater at the southern lunar farside. We got absolute model ages of 1.7–3.8 Ga.

Gustafson J. O. Gaddis L. R. Hawke B. R. Giguere T. A.  
**Pyroclastic Deposits Within Floor-Fractured Mersenius Crater** [#2044]
Small pyroclastic deposits in Mersenius Crater are studied with LROC and Kaguya MI data. A new deposit is identified, and composition/morphology are examined.

**Physical Properties of Lunar Localized Pyroclastic Deposits** [#2307]
We examine the rock concentration of lunar localized pyroclastic deposits with Diviner and Mini-RF and found that these deposits can be divided into two groups.

Gaither T. A. Gaddis L. R. Laura J.  
**The Orientale Annular Pyroclastic Deposit: Thickness Estimates from Crater Excavation Depths** [#1933]
We present an updated estimate of the thickness of the Orientale annular pyroclastic deposit using excavation depths of small lunar craters.
Allen C. C. Greenhagen B. T. Paige D. A.  
**POSTER LOCATION #460**
*Remote Analysis of Regional Lunar Pyroclastic Deposits — Consistency and Precision of LRO Diviner Estimates [#2447]*
A standard deviation of 0.03 µm is the precision of Diviner CF values for pyroclastic deposits. This corresponds to a precision of 2.2 wt.% FeO.

Gaddis L. R. Laura J. Horgan B. Bennett K. Hawke B. R. et al.  
**POSTER LOCATION #461**
*Compositions of Pyroclastic Deposits in Floor-Fractured Oppenheimer Crater [#2383]*
We describe the composition of pyroclastic deposits in the western floor of Oppenheimer crater determined using Kaguya Multiband Imager data.

**POSTER LOCATION #462**
*Regional Geology of Lunar Spinel-Rich Units in Sinus Aestuum [#2254]*
We describe the regional geology of the units with which the unique Fe/Cr spinels are associated on the Moon.

Weitz C. M. Staid M. Gaddis L. R. Besse S.  
**POSTER LOCATION #463**
*Geologic Investigation of Lunar Regional Dark Mantle Deposits [#2264]*
We analyzed multiple datasets to characterize and map lunar regional dark mantle deposits, search for potential vents, and explore eruption conditions.

Chauhan M. Bhattacharya S. Saran S. Chauhan P.  
**POSTER LOCATION #464**
We analyzed the morphology of pre-caldera domes, central caldera, ash-flow features, post-caldera effusive and eruptive features at Compton-Belkovich Complex.

Clenet H. Isaacson P. J. Gillet Ph.  
**POSTER LOCATION #465**
*Systematic Mapping of Mafic Minerals in the Copernicus Region, the Moon: An Improved Approach Based on Modified Gaussian Model Applied to M3 Data [#1822]*
We studied Copernicus Crater region with M3 data. MGM is used to study mafic rocks. Olivine is detected, as local variations in pyroxenes composition.

Brown S. M. Grove T. L.  
**POSTER LOCATION #466**
*Influence of Variable fO2 and TiO2 on the High Pressure Phase Equilibria of Lunar Ultramafic Glasses [#2867]*
Yellow glass experiments demonstrate that melt composition and fO2 exert strong, complex controls on melting processes by altering (Fe,Mg)-Ti melt components.

Ishiyama K. Kumamoto A. Ono T. Yamaguchi Y. Haruyama J. et al.  
**POSTER LOCATION #467**
*Estimation of the Bulk Permittivity and Porosity of the Lunar Uppermost Mare Basalt Based on the SELENE Observation Data [#1210]*
The bulk permittivity and porosity of the lunar uppermost basalt layer were estimated to be 4.2–5.2 and 21–33%. This porosity would be formed from three porosity sources.

Oshigami S. Watanabe S. Yamaguchi Y. Yamaji A. Kobayashi T. et al.  
**POSTER LOCATION #468**
*Mare Volcanism: Reinterpretation Based on Kaguya Lunar Radar Sounder Data [#1065]*
This paper aims at evaluating lava eruption volume and rate, and its secular change in order to understand the characteristics of lunar volcanisms.

Morgan G. A. Campbell B. A. Carter L. M. Hawke B. R. Campbell D. B.  
**POSTER LOCATION #469**
*Volcanic Feature Mapping in Mare Imbrium from Earth-Based Radar [#2758]*
200-m-resolution P-band radar offers a unique insight into Mare Imbrium, penetrating below ejecta rays and the regolith to reveal distinct volcanic features.
Carter L. M.  Ghent R. R.  Bandfield J. L.  Campbell B. A.  

**POSTER LOCATION #470**

*Near-Surface Vertical Structure of Lunar Volcanic Terrains from Radar and Infrared Data* [#2069]

We use data from multiple-wavelength regions to derive vertical structure profiles that provide an estimate of volcanic deposit thickness and regolith mixing.

Thorey C.  Michaut C.  Wieczorek M.  

**POSTER LOCATION #471**

*Gravitational Signatures of Lunar Floor Fractured Craters* [#2225]

We theoretically investigate the gravitational signature of floor-fractured craters and we compare our result with the gravitational observation.

Lauber C. G.  Zanetti M.  Jolliff B. L.  

**POSTER LOCATION #472**

*Small-Scale Thorium Anomalies on the Moon and Possible Volcanic Connections* [#2898]

Small, positive relief features are collocated with minor Th enhancements on the lunar surface, which we infer to be small silicic volcanic constructs.

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**FORMATION OF HABITABLE WORLDS AND FATE OF HABITABLE ENVIRONMENTS**  [R726]

Johnson T. A.  Park A.  Hand K. P.  

**POSTER LOCATION #473**

*The Workman-Reynolds Effect: An Investigation of the Ice-Water Interface of Dilute Salt Solutions* [#1672]

We report on experiments on the voltage potential that results from rapidly freezing dilute aqueous solutions. These results have application to icy satellites.

Taylor A. R.  Olsen A. A.  Haustrath E. M.  

**POSTER LOCATION #474**

*Serpentinite Dissolution: An Analog to Mantle-Ocean Interaction on Europa* [#1903]

Laboratory-based dissolution experiments between serpentinite rock and a variety of acids represent mantle-ocean interaction on the jovian moon, Europa.


**POSTER LOCATION #475**

*Using Geochemical Kinetics to Interpret Potential Habitability* [#2376]

Geochemical kinetics can help shed light on factors affecting habitability, including water, release of nutrients, redox, pH, temperature, and ionic strength.

Som S. M.  Fristad K. E.  Hoehler T. M.  

**POSTER LOCATION #476**

*An Integrative Approach to Assessing Habitability of H2 Metabolisms in Hydrothermal Springs* [#2828]

We present an ongoing project that surveys H2 from springs sourced in rocks of varying silica content and in parallel investigate habitability numerically.

Djordjevic S.  Mickol R. L.  Kral T. A.  

**POSTER LOCATION #477**

*Simulating Martian Conditions: Methanogen Survivability During Freeze-Thaw Cycles* [#2539]

Methanogens are obligate anaerobes that tolerate a wide range of conditions. It is proposed that these Archaea are able to persist in a martian environment.

Mickol R. L.  Kral T. A.  

**POSTER LOCATION #478**

*Approaching Martian Conditions: Methanogen Survival at Low Pressure* [#1602]

Four stains of methanogen were subjected to pressures of 67 mbar and 33 mbar in order to test survivability at conditions approaching martian pressures.

Mickol R. L.  Kral T. A.  Laird S. K.  

**POSTER LOCATION #479**

*Mesophile Methanogen Survival Under Freeze/Thaw Cycles* [#1603]

Two methanogen strains were subjected to freeze/thaw cycles between 55°C and –80°C to test survivability under martian temperature variations.
Buch A.   Szopa C.   Freissinet C.   Glavin D. P.   Coll P.   et al.  
Posters Location #480  
Impact of the Sample Preparation on the Organic Compounds Detected on Mars at JK and CB [#2886]  
Impact of the sample preparation on the organic compounds detected on Mars at JK and CB.

Buch A.   Pinnick V.   Szopa C.   Mahaffy P.  
Posters Location #481  
MOMA GC-MS Coupling [#2907]  
MOMA GCMS coupling.

Komatsu G.   Ishimaru R.   Miyake N.   Ohno S.   Matsui T.  
Posters Location #482  
Astrobiological Potential of Mud Volcanism on Mars [#1085]  
Martian mud volcanos involving water and gas provide potential landing sites for astrobiological missions, representing windows to the subsurface and the past.

Posters Location #483  
Impact of UVC Exposure on the Water Retention of the Lichen Buellia Frigida [#1260]  
We investigate the impact of irradiation on the water retention properties of lichen within the frame of the Biology and Mars Experiment (BIOMEX) at the ISS.

Barcena H. S.   Chen P.   Connolly H. C. Jr.  
Posters Location #484  
Microwave Synthesis of Sugars [#2459]  
Microwave irradiation of ices of formaldehyde and calcium chloride yielded sugars, which were studied by 2D NMR spectroscopy.

Sandford S. A.   Nuevo M.   Materese C. K.  
Posters Location #485  
Formation of Nucleobases from the UV Irradiation of Pyrimidine in Astrophysical Ice Analogs [#2461]  
We discuss how the nucleobases uracil, cytosine, and thymine can be made abiotically during ice photolysis.

Asaduzzaman A. M.   Zega T. J.   Runge K.   Muralidharan K.  
Posters Location #486  
Synthesis and Delivery of Amino Acids to the Early Earth via Surface Catalysis: A Computational Study [#1647]  
Surface-catalyzed synthesis of amino acid is studied using quantum chemical calculation; a possible mechanism for amino acid on early Earth.

Posters Location #487  
On the $^{238}\text{U}/^{235}\text{U}$ Paleoredox Proxy: A Word of Caution with Black Shales and the Need for Sequential Leaching of Carbonates [#2590]  
On the U paleoredox proxy we show (1) how to handle detrital contamination and (2) that bulk carbonates can record the $\delta^{238}\text{U}$ value of the seawater they form from.

Pasini D. L. S.   Price M. C.   Burchell M. J.   Cole M. J.  
Posters Location #488  
Survival of the Tardigrade Hypsibius Dujardini During Hypervelocity Impact Events up to 3.23 km s$^{-1}$ [#1789]  
We show for the first time that a complex multicellular microanimal (the tardigrade Hypsibius dujardini) can survive hypervelocity impacts up to 3.23 km/s.

Kohler E.   Mickol R. L.   Lacy C.   Chevrier V.   Kral T.  
Posters Location #489  
Using a Grey Body Model to Determine Metal Cloud Development in Extrasolar Atmospheres [#2290]  
A simple radiative-convective model was created to determine thermal profiles and metal cloud development for extrasolar planets.

Kurokawa H.   Kaltenegger L.   Nakamoto T.  
Posters Location #490  
Mass-Loss Evolution of Super-Earths: Effects of Stellar Types [#1355]  
We show evolution of super-Earths with H/He envelopes, considering XUV-driven escape and Roche-lobe overflow. Their compositions are shaped by mass loss.
Oehler D. Z. Walsh M. M. Sugitani K. House C. H.  
*POSTER LOCATION #492*

*Spindle-Shaped Microstructures: Potential Models for Planktonic Life Forms on Other Worlds [#1254]*

Spindle-shaped, organic microstructures are remnants of some of the oldest microorganisms on Earth. They may be analogs for early life forms on other worlds.

Craft K. L. Thielen P. Chaudhry Z. Verratti K. Bradburne C.  
*POSTER LOCATION #493*

*Detecting DNA in Soil, Aerosols and Ice — A Technique for Application to Future Mars, Venus, and Europa In-Situ Sample Analyses [#2929]*

We present results for new approaches to extracting DNA from three distinct planetary analog scenarios for Mars, the venusian troposphere, and Europa.

*POSTER LOCATION #494*

*Stand-Off Detection of Amino Acids and Organics Using a Compact Remote Raman Instrument [#2331]*

We have developed a compact remote Raman + fluorescence + LIBS system for daytime application. Remote detection of amino acids and organics from 8 m is demonstrated.

*POSTER LOCATION #495*

*Time-Resolved Raman Spectroscopy of Mars Analog Minerals and Organics [#1544]*

We present recent developments in Raman spectroscopy for Mars surface analysis, targeting identification of both minerals and organics.

Wei J. Wang A. Lu Y. Connor K. Bradley A. et al.  
*POSTER LOCATION #496*

*The Detection of Biosignatures by Laser Raman Spectroscopy for Mars Exploration [#2847]*

Potential biosignature molecules possess distinctive and strong bands in their Raman spectra. The detection limits were measured from mixtures with minerals.

*POSTER LOCATION #497*

*SHERLOC: Scanning Habitable Environments with Raman and Luminescence for Organics and Chemicals, an Investigation for 2020 [#2835]*

SHERLOC is a deep UV resonance Raman/fluorescence spectrometer that analyzes surfaces and boreholes without the need for rover arm repositioning/movement.

Applin D. M. Izawa M. R. M. Cloutis E. A.  
*POSTER LOCATION #498*

*Ultraviolet Reflectance and Fluorescence Spectroscopy of Solid State Polycyclic Aromatic Hydrocarbons [#1884]*

The ultraviolet reflectance and visible fluorescence spectra of select PAHs are presented. Instrumentation for detection by surface exploration is discussed.

*POSTER LOCATION #499*

*Mineralogical Characterization of Calcium Carbonate Polymorphs Biologically Precipitated During Heterotrophic Bacterial Growth [#1550]*

Biogenic calcium carbonate may be a biosignature of extinct life on Mars. We investigated the mineralogy and morphology of carbonate precipitated by microbes.

Johnson N. M. McCarthy M. Nuth J. A. III  
*POSTER LOCATION #500*

*Rate Comparisons of Magnetite and Iron Catalysts During Fischer-Tropsch-Type Reactions [#2702]*

Rate comparison data will be presented for the FTT reactions.

Sinha N. Kral T. A.  
*POSTER LOCATION #501*

*Stable Carbon Isotope Fractionation by Methanogens [#1136]*

Stable carbon isotope fractionation of methane by four different species of methanogens.
Isotopic Compositions and Mineral Residency of Nitrogen in Altered Terrestrial Glassy Basaltic Rocks: Implications for Astrobiology

POSTER LOCATION #502

Altered glass in some Earth basalts is enriched in N with sedimentary-organic isotope composition, indicating basaltic glass as potential astrobiological tools.

Introduction to an Updated Analysis of Planetary Protection “Special Regions” on Mars

Beaty D. W.  Rummel J. D.  Pratt L. M.  MEPAG SR2-SAG  
POSTER LOCATION #503

MEPAG has been asked to review and update the technical information that underlies NASA’s and COSPAR’s definition of special regions on Mars.

The Need for Planning the Future of Planetary Cartography

POSTER LOCATION #504

We highlight the need to restart NASA planetary cartography planning, a foundation of planetary science and exploration.

Online Planetary Data and Services at USGS Astrogeology

Hare T. M.  Kesztthelyi L.  Gaddis L. R.  
POSTER LOCATION #505

We provide an overview of Astrogeology software initiatives, planetary data products, online services, and infrastructure that support the planetary community.

Astropedia: Long-Term Access for Planetary Cartographic Products

Bailen M. B.  Hare T. M.  Shute J.  
POSTER LOCATION #506

The USGS Astrogeology Science Center houses a secure long-term access and storage facility for high-level planetary cartographic data products.

The PDS4 Archive: Integrated Migration of the Mars Phoenix Data

POSTER LOCATION #507

PDS4 represents the new planetary data archive. Migration of the Mars Phoenix data to PDS4 tests improved data user access under the new standard.

Accessing PDS Data in Pipeline Processing and Websites Through PDS Geosciences Orbital Data Explorer’s Web-Based API (REST) Interface

Bennett K. J.  Wang J.  Scholes D.  
POSTER LOCATION #508

NASA’s PDS Geosciences Node’s Orbital Data Explorer (ODE) supports accessing PDS data in pipeline processing and web sites using a web-based API (REST) interface.

POW: Update for the PDS Map Projection Web Service

Hare T. M.  Akins S. W.  Sucharski R. M.  Bailen M. S.  Shute J.  et al.  
POSTER LOCATION #509

In 2013 Astrogeology (USGS) released a tool called the Map Projection on the Web Service (POW). This online service converts PDS images to science-ready images.

Map-A-Planet 2 Mosaic Projection Web Service

Akins S. W.  Hare T. M.  Sucharski R. M.  Gaddis L.  Shute J.  et al.  
POSTER LOCATION #510

The USGS Astrogeology Science Center has developed Map-A-Planet 2 (MAP2), an update to the existing Map-A-Planet of the Planetary Data System (PDS).

PDS Analyst’s Notebook for MSL and MER

Stein T. C.  Arvidson R. E.  
POSTER LOCATION #511

The Analyst’s Notebook enriches data archives by integrating sequence information, engineering and science data, planning and targeting, and documentation.
We developed a custom layer for JMARS to show the traverse map of Mars rovers including Spirit, Opportunity, and Curiosity.

We want to improve HRSC data dissemination for scientific analysis by a dynamic mapserver for data queries and data products compliant to geospatial standards.

Our HRSC database will help to globally identify areas with multitemporal HRSC ND coverage and gives the option to easily detect surface changes.

New software allows scientists to work with HRSC Mars images in ISIS and make their own DTMs with SOCET SET.

We are developing tools to register Mini-RF bistatic images to other data and remove distortions, enabling quantitative comparisons to search for lunar ice.

Using 740,000 NAC image tiles we determined an empirical global photometric solution for the Moon and applied it to NAC images using a high-resolution NAC DTM.

Many improvements have been made to LROC NAC DTM production at ASU that reduces the amount of time required and increases the absolute accuracy of the DTMs.

LROC NAC images have been controlled to create high-resolution mosaics that provide an accurate cartographic resource for engineering and scientific studies.

Geometric refinements along with improved ephemeris enable seamless projection of LROC NAC image pairs (accuracy ~20 m) and subpixel projection of WAC images.
Isbell C. Gaddis L. Garcia P. Hare T. Bailen M.  
POSTER LOCATION #522
Kaguya Terrain Camera Mosaics [#2268]
Multiple near-global lunar mosaics derived from data acquired by the Selenological and Engineering Explorer (SELENE) “Kaguya” Terrain Camera (TC) instrument.

Sefton-Nash E. Williams J.-P. Paige D. A.  
POSTER LOCATION #523
Modeling, Gridding and Storage of Effective Fields of View for Terascale, Point-Based Planetary Datasets: Case Study — LRO Diviner [#2737]
We present a method to calculate, store, and make gridded map products from effective fields of view for large point-based planetary datasets.

Estes N. M. Hanger C. D. Licht A. A. Bowley K. S. Koeber S. et al.  
POSTER LOCATION #524
Lunaserv 3 Development and Usage Over the Past Year [#2180]
Lunaserv 3, developed by the LROC SOC, introduces simpler installation and more capabilities such as Lommel-Seeliger illumination and better WMS compatibility.

Moratto Z. M. McMichael S. T. Beyer R. A. Alexandrov O. Fong T.  
POSTER LOCATION #525
Automated and Accurate: Making DTMs from LRO-NAC Using the Ames Stereo Pipeline [#2892]
In this abstract we present a method to process all LRO-NAC imagery and how to correct their ephemeris.

Beyer R. A. Alexandrov O. Moratto Z. M.  
POSTER LOCATION #526
Aligning Terrain Model and Laser Altimeter Point Clouds with the Ames Stereo Pipeline [#2902]
We introduce the pc_align program, which aligns two 3-D point clouds to one another (laser altimetry, lidar, dense DTMs), and show examples of use.

Sylvest M. E. Dixon J. C. Leone R. C. Barnes A.  
POSTER LOCATION #527
DEM Extraction from Stereo Webcam Videos for Small-Scale Experimental Geomorphological Modeling [#2309]
This work discusses application of image processing and computer vision techniques to automate extraction of digital elevation models from HD webcam videos.

Re C. Roncella R. Cremonese G. Gwinner K.  
POSTER LOCATION #528
Using Advanced Geometric Models in Image Matching with High Resolution Space Images [#2291]
The paper describes the main features of the optimized version of Dense Matcher software, developed by the University of Parma, for planetary mapping.

Saleh R. A.  
POSTER LOCATION #529
Geometric Preprocessing and Automated Pattern Matching Techniques for Planetary Photogrammetric Mapping [#2462]
Describes work on geometric preprocessing with tests to examine impact of misalignment on matching success, quantify the impact, then implement modifications.

Clark C. S. Clark P. E.  
POSTER LOCATION #530
Using Boundary-Based Maps to Illustrate the Role of External and Internal Processes in Mercury’s Surface Formation [#1051]
We discuss the first application of Constant Scale Natural Boundary mapping to Mercury, and the implications for the origin of its major terranes.

Coleman E. A. Ishikawa S. T. Gulick V. C.  
POSTER LOCATION #531
Clickworkers Interactive: Progress on a JPEG2000-Streaming Annotation Interface [#2593]
We present progress on a new JPEG2000-streaming annotation web interface for classifying landforms and enabling pan/zoom capabilities using HiRISE images.
Influence of Map Projection on Directions Measured over HiRISE and MOC Images

We investigate the influence of map projection on directions measurements in MOC and HiRISE images and quantify the angular distortion.

Statella T. Bandeira L. Hare T.  

**POSTER LOCATION #532**

Montesi L. G. M.

**POSTER LOCATION #534**

Plate Boundary Localization: What Processes Active on Earth do not Apply to Other Planetary Lithosphere?

Localization can always occur in the upper mantle and upper crust, but only on Earth can micas form interconnected layers and localize midcrustal shear zones.

Matsuyama T.

**POSTER LOCATION #535**

Thermal Evolution and Possibility of the Early Plate Tectonics on Mars

This study modifies the previous thermal evolution theory with plate tectonics.

Roberts J. H. Arkani-Hamed J.

**POSTER LOCATION #536**

Impact Heating of Mars: Coupled Mantle Dynamics, Core Cooling and Dynamo Activity

A giant impact / The core dynamo pauses / Slowly, it returns.

Elder C. M. Showman A. P.

**POSTER LOCATION #537**

Melt Migration Through Io’s Convection Mantle

1D model of / Io’s mantle convection / And melt migration.

Williams N. R. Bell J. F. III Watters T. R. Banks M. E. Robinson M. S.

**POSTER LOCATION #538**

Timing and Controls of Tectonic Deformation in Mare Frigoris

LROC images and GRAIL gravity data provide new insights into the complex tectonic history of Mare Frigoris, including recent deformation in the basin.

Hauber E. Jonas T. Voelker M. Knapmeyer M. Grott M. et al.

**POSTER LOCATION #539**

Fault Scaling On Mars: Slip Distribution and Displacement-Length Relationship Derived from HRSC Data

The displacement/length ratio of normal faults on Mars was determined with HRSC data and is comparable to that of terrestrial faults (D_max ≈ 0.008 \times L).

Dasgupta N. Ruj T. Das A. Saran S.

**POSTER LOCATION #540**

Horizontal Forces Within Lunar Crust: Intriguing a Questioning Mind

We suggest from the study of en-echelon faults and related features, a local scale horizontal transport is visible in lunar crust, devoid of plate tectonics.

Kundu A. Ruj T. Dasgupta N.

**POSTER LOCATION #541**

A Simplistic Approach in Explaining the Formation of a So-Called Strike-Slip Fault Within the Thaumasia Planum, Mars

We propose thrust-related tear faulting through a single phase progressive deformation to explain the formation of an east-west-trending rift in Thaumasia Planum.

Yin A. Hansen V.

**POSTER LOCATION #542**

Styles of Strike-Slip Faulting in the Solar System and the Corresponding Modes of Thermal-Boundary-Layer Deformation

We use kinematic properties of strike-slip faults to test and quantify whether and to what extent plate-tectonic processes operate on solar-system bodies.
Gonzalez C. P.  Goreva Y. S.  Burnett D. S.  Woolum D.  Jurewicz A. J.  et al.  **POSTER LOCATION #544**


Cleanliness assessment of Genesis solar wind sample 60341 using optical imagery and ToF-SIMS mapping is monitored throughout several cleaning processes.

Rieck K. D.  Jurewicz A. J. G.  Burnett D. S.  Hervig R. L.  **POSTER LOCATION #545**

Internally Standardized Measurements of Solar Wind Sodium and Potassium in Genesis Diamond-Like Carbon Collectors [#1758]

We present standardized measurements of bulk solar wind Na and $^{39}$K abundances in Genesis Si and diamond-on-Si wafers using backside depth profiling by SIMS.

Goreva Y. S.  Gonzalez C. P.  Kuhlman K. R.  Burnett D. S.  Woolum D.  et al.  **POSTER LOCATION #546**

Genesis Solar Wind Collector Cleaning Assessment: 60336 Sample Case Study [#2245]

As a part of Genesis Cleaning Study effort, here we present results for sample 60336, subjected to extensive study via various techniques.

Kuhlman K. R.  Schmeling M.  Gonzalez C. P.  Allton J. H.  Burnett D. S.  **POSTER LOCATION #547**

Cellulose Acetate Replica Cleaning Study of Genesis Non-Flight Sample 3CZ00327 [#2030]

Cellulose acetate replica cleaning of Genesis samples is validated using control sample 3CZ00327. Residues are removed using hot xylene and acetone.

Goreva Y. S.  Humayun M.  Burnett D. S.  Jurewicz A. J.  Gonzalez C. P.  **POSTER LOCATION #548**

TOF-SIMS Investigation of the Effectiveness of Acid-Cleaning Procedures for Genesis Solar Wind Collectors [#2586]

In this work we present results of chemical cleaning of 6Li-implanted Genesis flight samples.

Westphal A. J.  Ogliore R. C.  Huss G. R.  Nakashima K.  Olinger C.  **POSTER LOCATION #549**

Mg Profile Correction in Genesis Si Collectors Using Rastered Ion Imaging [#2671]

We present a backside-profiling SIMS technique with imaging, which allows pixel-by-pixel depth correction, and present results for solar wind Mg in Genesis Si.

Gonzalez C. P.  Burkett P. J.  Rodriguez M. C.  Allton J. H.  **POSTER LOCATION #550**

Investigation of Backside Textures for Genesis Solar Wind Silicon Collectors [#2727]

Visual backside textures of Genesis silicon solar wind collectors were investigated as a potential way to distinguish silicon variety and vendor source.

Veryovkin I. V.  Zinovev A. V.  Tripa C. E.  Burnett D. S.  **POSTER LOCATION #551**

Depth Profiling of Genesis Diamond-on-Silicon Collectors: Direct Comparison Between Frontside and Backside Approaches [#2795]

We present a direct comparison between frontside and backside depth profiling applied to measure elemental abundances of Mg in diamond-on-Si Genesis samples.


Accurate Analysis of Shallow Solar Wind Ion Implants by SIMS Backside Depth Profiling [#1203]

Our technique is capable of analyzing nearly complete depth distributions of many solar-wind elements even in the presence of high levels of surface contamination.

Wimmer-Schweingruber R. F.  Berger L.  Köten M.  Bochsler P.  Gloeckler G.  **POSTER LOCATION #553**

The $^{13}$C/$^{12}$C Isotopic Ratio in the Solar Wind [#1114]

We present the long-term slow solar wind carbon isotopic ratio $^{12}$C/$^{13}$C ~ 97 ± 10 as derived from ACE/SWICS. The value is consistent with the terrestrial one.
Mandt K. E. Mousis O. Lunine J. I. Gautier D.  

**POSTER LOCATION #554**

*Improved Constraints on the Nitrogen Isotopes in the Protosolar Nebula: Implications for the Source of the Earth’s Nitrogen [#1955]*

Measurements of $^{14}$N/$^{15}$N in the solar system show two primordial inventories of nitrogen: N$_2$ with a ratio of ~435 and NH$_3$ and HCN with a ratio of ~150.

Heber V. S. McKeegan K. D. Bochsler P. Duprat J. Burnett D. S.  

**POSTER LOCATION #555**

*The Elemental Composition of Solar Wind with Implications for Fractionation Processes During Solar Wind Formation [#2117]*

We present bulk SW and SW regime elemental abundances measured in Genesis collectors comprising a wide range of masses and ionization properties.

Schmeling M. Hwang E. Choi Y. Eng P. J. Stubbs J. E. et al.  

**POSTER LOCATION #556**

*Analysis of Genesis Sample 60234 by Laboratory Total Reflection X-Ray Fluorescence Spectrometry and Synchrotron Grazing Incidence X-Ray Fluorescence [#2119]*

Genesis sample 60234 was characterized by laboratory TXRF and synchrotron GI-XRF. Surface contaminants were identified as well as elements within the bulk.

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**INSTRUMENT AND PAYLOAD CONCEPTS [#R731]**


**POSTER LOCATION #558**

*Validation of Suborbital Spaceflight Experiments Through Zero-G Flight Demonstration of Flight-Ready Hardware [#2102]*

We present results from planetary science experiment payloads flight tested on a zero-gravity research flight.

Sollitt L. S. Barrett D. Boodee R. Rhodes C. T. Vilas F.  

**POSTER LOCATION #559**

*The Atsa Suborbital Observatory: Concept and Current Status [#2236]*

A prototype suborbital telescope, the Atsa 1 Camera, has been built and fit-tested in the engineering cockpit for XCOR Aerospace’s Lynx Mark I spacecraft.

Arai T. Kobayashi M. Yamada M. Matsui T. COMETSS Project Team  

**POSTER LOCATION #560**

*Meteor Observation HDTV Camera Onboard the International Space Station [#1610]*

Chiba Institute of Technology will fly a HDTV camera dedicated to meteor observation onboard the International Space Station and operate it for two years.


**POSTER LOCATION #561**

*Tanpopo Experiment for Astrobiology Exposure and Micrometeoroid Capture Onboard the ISS-JEM Exposed Facility [#2934]*

The Tanpopo astrobiology experiment will conduct microbe and bio-orgaincs exposure and organic-bearing micrometeoroid capture on ISS for three years from 2014 to 2015.


**POSTER LOCATION #562**

*“Standoff Biofinder” for Fast, Daytime, Large Area Detection of Biological Materials Without Sample Collection [#1498]*

We have developed an instrument “Standoff Biofinder,” that can quickly (0.1 s) locate a biological material in a wide area during daytime from several meters.

Parro V. Stoker C. Davila A. F. Quinn R.  

**POSTER LOCATION #563**

*Signs Of Life Detector (SOLID): Searching for Evidence of Past Life on Mars [#2653]*

SOLID is a mature instrument with state-of-the-art liquid extraction and lab-on-a-chip immunoassay technology to detect and characterize organic C on Mars.
Yamagishi A. Demura H. Fujita K. Honda H. Imai E. et al. POSTER LOCATION #564
Life Detection Microscope for In-Situ Imaging of Living Cells on Mars [#2744]
We develop a new instrument called Life Detection Microscope (LDM) as a possible instrument onboard Mars Rover 2020, MELOS, or other future Mars missions.

Wright I. P. Andrews D. J. Barber S. J. Sheridan S. Morgan G. H. et al. POSTER LOCATION #565
Rosetta: Evaluating the Possibility of Using Ptolemy for Pre-Landing Scientific Investigations [#1901]
Sixty-seven P / Rosetta spacecraft be good / Then watch, sniff, and land.

Wyrick D. Y. Waite J. H. Jr. Brock T. McGrath M. McKinnon W. B. et al. POSTER LOCATION #566
Investigating the Formation, Evolution, and Habitability of the Galilean Satellites with High Performance Mass Spectrometry [#1615]
High-performance mass spectrometry allows for direct sampling of atomic and molecular species to determine the habitability of the Galilean moons.

Performance of the Linear Ion Trap Mass Spectrometer for the Mars Organic Molecule Analyzer (MOMA) Investigation on the 2018 ExoMars Rover [#2894]
The Mars Organic Molecule Analyzer (MOMA) investigation on the 2018 ExoMars rover mission is shown to meet performance requirements and is on track for delivery.

Schmidt F. Shatalina I. Saggin B. Gac N. Kowalski M. et al. POSTER LOCATION #568
Analytical Model and Spectral Correction of Vibration Effects on PFS Fourier Transform Spectrometer [#1752]
We proposed a new approach to correct for the microvibrations effects on Fourier Transform Spectrometer based on semi-blind deconvolution of the measurements.

Gerasimov M. V. Sapgir A. G. Zaitsev M. A. Aseev S. A. Vinogradov I. I. et al. POSTER LOCATION #569
The Martian Gas-Analytic Package for the Landing Platform Experiments of the ExoMars 2018 [#1242]
The paper describes the architecture of the Martian Gas Analytic Package, which is proposed for the Russian ExoMars Lander 2018.

Rodriguez-Manfredi J. A. de la Torre M. Conrad P. Lemmon M. Martinez G. et al. POSTER LOCATION #570
MEDA: An Environmental and Meteorological Package for Mars 2020 [#2837]
The Mars Environmental Dynamics Analyzer (MEDA) is a contributed REMS follow-on suite of sensors designed to address the Mars 2020 investigation goals.

Jones S. M. Anderson M. S. Davies A. G. Kirby J. P. Burchell M. J. et al. POSTER LOCATION #571
Aerogel Dust Capture for In Situ Mass Spectroscopic Analysis [#2104]
Aerogel was used as the capture material of fine silica particles containing PAHs. The PAHs were then desorbed, ionized, and analyzed by mass spectroscopy.

Kobayashi M. Miyachi T. Hattori M. Okudaira O. Fujii M. et al. POSTER LOCATION #572
Frequency Analysis of Dust Signal from Piezoelectric PZT Sensor [#2027]
We studied an objective method to analyze dust signal waveform for true/false identification when piezoelectric PZT is used as a dust-particle detector.

Johnson K. Fortier K. Nie C. Hurst L. Malaspina D. et al. POSTER LOCATION #573
Development of a Dust Impact Monitor for Exploration of the Inner Heliosphere [#1370]
A low-power, low-mass Dust Impact Monitor is being designed to characterize the dust environment within 0.3 AU to map out the spatial distribution of dust.
Namiki N. Mizuno T. Mita M. Kawahara K. Kunimori H. et al.  
*POSTER LOCATION #574*  
*Development of Hayabusa-2 LIDAR [#1922]*  
The Hayabusa-2 LIDAR is designed for safe navigation of the spacecraft. The altimetry data are also served for scientific studies of asteroid 1999JU3.

Poole W. D. Muller J.-P. Grindrod P. M. Gupta S.  
*POSTER LOCATION #575*  
*Footprint Scale Surface Roughness from ICESat Pulse-Widths: Lessons Learnt for Future Planetary Laser Altimeters [#1150]*  
We show that 70-m-scale surface roughness and slope can be derived from ICESat laser altimeter backscatter shot profiles over the McMurdo Dry Valleys, Antarctica.

Lucey P. G. Sun X. Abshire J. B. Neumann G. A.  
*POSTER LOCATION #576*  
*An Orbital Lidar Spectrometer for Lunar Polar Compositions [#2335]*  
An infrared reflectance lidar obtains multispectral data near 3 µm to map ice in the lunar polar regions. Visible fluorescence seeks organics.

*POSTER LOCATION #577*  
*Deuterium/Hydrogen Ratio Measurements with Laser-Induced Breakdown Spectroscopy (LIBS) [#2080]*  
We examined the D/H ratio measurement of H2O/D2O ice with laser-induced breakdown spectroscopy (LIBS), taking future in situ measurements into account.

*POSTER LOCATION #578*  
*Remote Raman and LIBS Spectroscopy for Future Mars Rover Missions [#2463]*  
Integrated Raman-LIBS spectroscopy is capable of remotely determining both the mineralogical and geochemical composition for future Mars missions.

*POSTER LOCATION #579*  
*A Compact Laser Induced Breakdown, Raman, and Fluorescence Spectroscopy Instrument for Mars Exploration [#1546]*  
A prototype compact remote LIBS, Raman, and laser-induced fluorescence spectroscopy instrument for planetary science has been produced and extensively tested.

Sobron P. Lopez-Reyes G. Sansano A. Manrique J. A. Rull F.  
*POSTER LOCATION #580*  
*Data Fusion in Planetary LIBS + Raman Spectroscopy [#2875]*  
Data fusion in LIBS and Laser Raman Spectroscopy enables more robust detection of salts in binary mixtures than would be possible using both techniques alone.

Alerstam E. Maruyama Y. Blacksberg J.  
*POSTER LOCATION #581*  
*High Speed Time-Resolved Raman Spectroscopy for Planetary Surface Exploration [#2182]*  
Luminescent rock / Please, tell us your story / Many fast bursts of light.

Sansano A. Navarro R. López-Reyes G. Rull F.  
*POSTER LOCATION #582*  
*Development of the Calibration Target for Exomars’ Raman Instrument (RLS) [#2623]*  
In this work we present the development of the calibration target for the Raman Spectrometer Instrument to be onboard the Exomars rover.

Sansano A. Navarro R. Sanz J. A. Manrique J. A. Medina J. et al.  
*POSTER LOCATION #583*  
*Development of a Spectral Data Base for Exomars’ Raman Instrument (RLS) [#2803]*  
In this work we present the actual status of development of a Raman spectra database to be applied by the science team of the Exomars Raman instrument.

Dreißigacker A. Köhler E. Fabel O. van Gasselt S.  
*POSTER LOCATION #584*  
*Development of a New Planetary X-Ray Fluorescence Spectrometer and Co-Development of Standard Samples for On-Board Calibration [#2814]*  
We are developing standard samples for onboard calibration of a new planetary X-ray fluorescence spectrometer.
Kim K. J. Choi I. Lee S. R. Yi E. S. Choi H. W. POSTER LOCATION #585
XRF Analysis of Stony Meteorites Using an Elemental Analyzer and a Portable XRS [#2700]
We investigated XRF analysis of stony meteorites for classification and quantification of stony meteorites using an elemental analyzer and a portable XRS.

Hong J. Grindlaj J. Romaine S. Ramsey B. Binzel R. P. et al. POSTER LOCATION #586
Miniature Lightweight X-Ray Optics (MiXO) for Solar System Exploration [#2203]
We introduce Miniature X-ray Optics to bring highly successful Wolter-I X-ray optics to planetary science within affordable mass, power, and cost constraints.

Li R. Ostrowski S. Li D. Paar G. Coates A. et al. POSTER LOCATION #587
ESA ExoMars Rover PanCam: Pre-Launch Localization Modeling and Accuracy Assessment [#1926]
Exomars PanCam hardware consists of two wide-angle cameras that provide multispectral stereo images and a High-Resolution Camera providing monoscopic images.

De Angelis S. De Sanctis M. C. Ammannito E. Altieri F. Carli C. et al. POSTER LOCATION #588
Analysis of Rocks Particulates by VNIR Spectroscopy with Ma_Miss Instrument Breadboard [#1713]
The ExoMars-2018/Ma_Miss miniaturized spectrometer will observe martian subsoil in VNIR spectral range 0.4–2.2 µm, with high spatial resolution, 120 µm.

MinMap: An Instrument Concept for the Mars 2020 Mission [#2037]
MinMap is a compact, mast-mounted imaging spectrometer that operates at visible/short-wave infrared (VSWIR) wavelengths from 500 to 2560 nm.

Ehlmann B. L. Mustard J. F. Murchie S. L. Green R. O. Mouroulis P. et al. POSTER LOCATION #590
Microimaging Spectroscopy on Mars with CIMMBA, Proposed for Mars-2020: The Caching-Supporting Infrared Microimager for Mineralogy and Biosignature Assessment [#2824]
Microimaging VSWIR spectroscopy coupled with microimaging would bring new petrologic capabilities to the exploration of planetary surfaces.

Altinok A. Bornstein B. Estlin T. Gaines D. Schaffer S. et al. POSTER LOCATION #591
Automatic Image Analysis for Adaptive Instrument Targeting: Applications to MSL and Mars 2020 [#2871]
We present new applications onboard image analysis relevant to future rovers, such as an MSL extended mission or Mars 2020 rover operations.

Okada T. Fukuhara T. Tanaka S. Taguchi M. Imamura T. et al. POSTER LOCATION #592
Thermal-Infrared Imaging of C-Class Asteroid 162173(1999JU3) by Hayabusa-2 [#1201]
Thermal imaging of C-class asteroid 162173 (1999JU3) is planned by Hayabusa-2. Its objectives, instrumentation, calibration, and operation are briefly described.

Iwata T. Kitzazato K. Abe M. Arai T. Nakauchi Y. et al. POSTER LOCATION #593
Results of Ground-Performance Tests for the Hayabusa-2 Near-Infrared Spectrometer (NIRS?) [#1805]
We report the performance of Near-Infrared Spectrometer (NIRS3) on Hayabusa-2, confirmed by ground tests using the flight mode.

Grott M. Knollenberg J. Hänschke F. Kessler E. Müller N. POSTER LOCATION #594
Radiometric Calibration of The MAscot RAdiometer MARA for the Hayabusa 2 Mission [#1324]
Results of the radiometric calibration and verification of the MASCOT radiometer MARA are presented.
A Novel Spectral and Radiometric Calibration Target for the TIR Imager and the MARA Instrument on the Hayabusa2 Mission [#1317]

At DLR we have developed a spectral and radiometric calibration target that will allow a cross calibration of the MARA and the TIR instruments on Hayabusa-2.

A Wide-Angle Camera for the Mobile Asteroid Surface Scout (MASCOT) on Hayabusa-2 [#1927]

MASCOT on Hayabusa-2 will carry four instruments, including a wide-angle camera. We describe science goals, instrument design, and performance of the camera.

MASCOT (‘Mobile Asteroid Surface Scout’) — Developing a Landing Platform with Four Instruments for the Hayabusa-2 Mission [#2601]

MASCOT is a mobile asteroid surface scout for the Hayabusa-2 mission. It carries four scientific P/L. General design and mission scenario is described.

A Mobile Asteroid Surface Scout (MASCOT) for the Hayabusa 2 Mission [#1817]

MASCOT will support JAXA’s Hayabusa-2 mission to the asteroid 1999 JU3, will descend and land on the asteroid, and will change its position by hopping.

SIRSE: A Spectral ImageR and Spectrometer for Europa [#1034]

SIRSE is a next generation spectral imaging instrument, based on New Horizons Ralph, with improved capability to meet Europa Clipper science objectives.

JANUS: The Visible Camera Onboard the ESA JUICE Mission to the Jovian System [#2094]

JANUS is the camera selected by ESA as the visible imager of the JUICE mission, focusing on the three icy Galilean satellites and the Jupiter atmosphere.

Laser Desorption Infrared Spectroscopy: A Proof of Concept Study for Future Icy World Exploration [#2437]

Using laser desorption, this investigation focuses on the minimum energy requirements of future exobiological missions for icy world explorers.

Near-Infrared Reflectance of Tholins in Methane Ice: Preliminary Results and Implications for Interpretation of New Horizons LEISA Data [#1264]

Pluto (Titan) tholins do not appear to be reactive in methane ice, and their NIR signature is not totally concealed by the dramatic methane absorption bands.

Utilizing the Integrated Software for Imagers and Spectrometers (ISIS) to Support Future Missions [#1686]

Including ISIS support will strengthen most instrument or mission proposals.

A Goniometric System to Measure the Incomplete Mueller Matrices of Packed Layers [#2872]

We describe a laboratory goniometric system capable of measuring the polarized reflectance of particulate layers.

Age of Martian Meteorite Zagami Obtained by Prototype In Situ Dating Spectrometer [#1665]

We obtained a Rb/Sr isochron age for the martian meteorite Zagami using a dating spectrometer that we developed as a prototype for in situ dating on Mars.
Cohen B. A.  Swindle T. D.  Roark S. E.  
**POSTER LOCATION #606**

In Situ Geochronology on the Mars 2020 Rover with KArLE (Potassium-Argon Laser Experiment) [#1140]

KArLE will provide absolute K-Ar ages by combining LIBS and mass spectrometry measurements made on a single pit in a core sample taken by the Mars 2020 rover.

French R. A.  Cohen B. A.  Miller J. S.  
**POSTER LOCATION #607**

Volume Measurements of Laser-Generated Pits for In Situ Geochronology Using KArLE (Potassium-Argon Laser Experiment) [#1936]

Determining the accuracy/precision of volume measurements of laser-generated pits to better understand the ablation process for isotope abundance calculations.

Cho Y.  Miura Y. N.  Sugita S.  
**POSTER LOCATION #608**

Development of an In-Situ K-Ar Isochron Dating Method 2: Validation Measurements with Natural Rocks [#1205]

Potassium-argon isochrons have been obtained for natural rock samples using an in situ K-Ar dating method with a LIBS-QMS system.

Currie D. G.  Delle Monache G. O.  Dell’Agnello S.  Behr B. B.  
**POSTER LOCATION #609**

A Lunar Laser Ranging Retroreflector Array for the 21st Century: History, Science Status, Apollo Simulation and Future [#1702]

Lunar Laser Ranging has addressed the crust and interior, GR tests, and gravity. However, Apollo arrays and librations the limit the range measurement accuracy.

Noda H.  Kunimori H.  Araki H.  
**POSTER LOCATION #610**

Lunar Laser Ranging Experiment at Koganei SLR Station [#1638]

We try to range the retroreflectors on the Moon by using the Satellite Laser Ranging station of NICT in Koganei, Tokyo, Japan.

Nagihara S.  Zacny K.  Hedlund M.  Taylor P. T.  
**POSTER LOCATION #611**

Development of Compact, Modular Lunar Heat Flow Probes [#1156]

We report our latest efforts in developing a compact, modular heat flow probe system that can be accommodated on a variety of robotic and human lunar missions.

Horikawa Y.  Tanaka S.  Sakatani N.  Takita J.  Ogawa K.  
**POSTER LOCATION #612**


We developed a heat flow probe prototype onboard a penetration probe (penetrator) and evaluated the uncertainty of thermal conductivity measured by the probe.

Mueller N.  Kopp E.  Walter I.  Grott M.  Knollenberg J.  et al.  
**POSTER LOCATION #613**

The HP³ Radiometer for the InSight Mission [#2375]

The HP³ radiometer will measure Mars surface brightness temperature for one year at fixed spots near the InSight lander to help constrain planetary heatflow.

**POSTER LOCATION #614**


The heat flow probe (HP³) for the 2016 InSight mission to Mars is described and the measurement and operational requirements are discussed.

**POSTER LOCATION #615**

Predicted Penetration Performance of the InSight HP³ Mole [#1325]

The penetration performance of the HP³ heat flow probe is assessed, and applications to the Moon and Mars are discussed.

**POSTER LOCATION #616**

*Mars Compass: A Magnetometer for the Mars 2020 Rover [#2696]*

We describe the Mars Compass investigation proposed for the Mars 2020 rover, the first mobile magnetometer on Mars.

Chi P. J.  Russell C. T.  Lai H. R.  

**POSTER LOCATION #617**

*Magnetospheric Response of Interplanetary Field Enhancement as Observed by Ground-Based Magnetometer Stations: A Case Study [#2077]*

Ground-based magnetometer networks have detected impulsive signals due to the impact of an Interplanetary Field Enhancement (IFE) on Earth’s magnetosphere.

Miller R. S.  Lawrence D. J.  

**POSTER LOCATION #618**

*Muon Radiography as a Probe of the Interior Structure of Small Solar System Bodies [#1134]*

We describe cosmic-ray-induced muon radiography, a new approach enabling remote determination of the density and 3D structure of small solar system bodies.

Calaway M. J.  McConnell J. T.  

**POSTER LOCATION #619**

*ECTFE (Halar) as a New Material for Primary Sample Containment of Astromaterials [#1095]*

ECTFE, Halar, is examined for potential use on future sample return missions as a primary containment material in gloveboxes and long-term storage vessels.


**POSTER LOCATION #620**

*Sample Tube Sealing and Sample Integrity Analysis for Future Sample Return Missions [#1054]*

Sealing methods for samples in 1-cm-diameter sample tubes were designed and evaluation for sample preservation for the proposed Mars Sample Return campaign.

Chu P.  Indyk S.  Zacny K.  James W.  

**POSTER LOCATION #621**

*A Comet Surface Sample Return Probe [#1536]*

A concept for a small-scale spacecraft has been designed to impact a comet surface, obtain a sample, and ascend from the surface to deliver its sample.

Zacny K.  Chu P.  Paulsen G.  Davis K.  

**POSTER LOCATION #622**

*Sample Acquisition and Caching Architectures for the Mars2020 Mission [#1168]*

The Mars2020 mission will cache cores for future return. We have been developing caching architectures, coring drills, and unique bits for this mission.

Zacny K.  Paulsen G.  Yoon S.  Wettergreen D.  Cabrol N.  

**POSTER LOCATION #623**

*Life in the Atacama — The Drill and Sample Delivery System: Results from the 2013 Field Campaign [#1174]*

Honeybee Robotics designed and built a sampling drill and a carousel for the LITA project. The system was deployed from the CMU Zoe rover in Atacama in 2013.

Glass B.  Wang A.  Huffman S.  Zacny K.  Lee P.  

**POSTER LOCATION #624**

*LITA Drill Tests at Haughton Crater [#2891]*

The latest LITA drill did not demonstrate a capability of penetrating hard rock or ice-consolidated material at the Drill Hill test site.


**POSTER LOCATION #625**

*A New Plasma Drilling Technology with Applications for Moon, Asteroid, and Mars Exploration and ISRU [#2594]*

A new plasma drilling technology is under development that will enable deep subsurface access for science and ISRU on the Moon, asteroids, Mars, and its moons.
Barmatz M. Steinfeld D. Anderson M. Winterhalter D.  
**POSTER LOCATION #626**

3D Microwave Print Head Approach for Processing Lunar and Mars Regolith [#1137]
We plan to develop a 3D microwave print head facility based on sintering and melting studies of lunar and Mars simulants using our microwave heating facility.

Orenstein N. P.  
**POSTER LOCATION #627**

ISRU Potable Water Harvester for Astronaut Missions [#1520]
Induction furnace concept to release water from martian and lunar regolith without excavation. Applications include astronaut use and cosmic origin analysis.

Izenberg N. R. Papadakis S. J. Gold R. E. Kott T. M.  
**POSTER LOCATION #628**

Archimedes’ Engine: Buoyant Unspooling Generator for Planetary Mission Power Applications [#1215]
On Venus’ surface Archimedes’ Engine gets power from balloons.

Lee Y. H. Zakrjajsek J. F. Bairstow B. K.  
**POSTER LOCATION #629**

Provides mission concept designers with the description of the Radioisotope Power Systems Reference Book.
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