FORTY-FOURTH LUNAR AND PLANETARY SCIENCE CONFERENCE

PROGRAM OF TECHNICAL SESSIONS

MARCH 18–22, 2013

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

ORGANIZERS

Lunar and Planetary Institute
Universities Space Research Association

CONFERENCE CO-CHAIRS

Stephen Mackwell, Lunar and Planetary Institute
Eileen Stansbery, NASA Johnson Space Center
David Draper, NASA Johnson Space Center

PROGRAM COMMITTEE

Neyda Abreu, Pennsylvania State University
Carl Allen, NASA Johnson Space Center
Debra Buczkowski, Johns Hopkins University, Applied Physics Laboratory
Rajdeep Dasgupta, Rice University
Dean Eppler, NASA Johnson Space Center
Juliane Gross, American Museum of Natural History
John Gruener, NASA Johnson Space Center
Justin Hagerty, U.S. Geological Survey
Rose Hayward, U.S. Geological Survey
Veronika Heber, University of California, Los Angeles
Lindsay Keller, NASA Johnson Space Center
Walter Kiefer, Lunar and Planetary Institute
Georgiana Kramer, Lunar and Planetary Institute
Melissa Lane, Planetary Science Institute
Tom Lapen, University of Houston
Francis McCubbin, University of New Mexico
Michael Mischna, Jet Propulsion Laboratory
Keiko Nakamura-Messenger, Jacobs Technology
AndrewNeedham, The Open University
Paul Niles, NASA Johnson Space Center
Sarah Noble, NASA Goddard Space Flight Center
Ross Potter, Lunar and Planetary Institute
Buck Sharpton, Lunar and Planetary Institute
Stephanie Shipp, Lunar and Planetary Institute
Paul Schenk, Lunar and Planetary Institute
Allan Treiman, Lunar and Planetary Institute
Catherine Weitz, Planetary Science Institute
Oliver White, Lunar and Planetary Institute
Ryan Zeigler, NASA Johnson Space Center

Produced by the Lunar and Planetary Institute (LPI), 3600 Bay Area Boulevard, Houston TX 77058-1113. Logistics, administrative, and publications support for the conference were provided by the Meeting and Publication Services Department of the LPI. The LPI is operated by the Universities Space Research Association. This material is based upon work supported by NASA under Award No. NNX08AC28A.
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 17, from 4:00 to 8:00 p.m., and from 8:00 a.m. to 5:00 p.m. Monday through Friday, March 18 through 22. 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. 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 http://www.lpi.usra.edu/meetings/lpsc2013/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 17. The desk is located just outside the Town Center Exhibit Area on the first floor. For more information, visit their website at http://www.txagprinting.com/.

Personal Schedule
Create your own personal meeting schedule using the Personal Schedule tool found in the USRA Meeting Portal! 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

**Bruker**
www.bruker.com  
1239 Parkway Ave.  
Ewing NJ 08628  
Contact: Don Becker  
908-256-2627  
don.becker@bruker-axs.com

Bruker offers a complete range of analytical solutions for nano/micro-analysis and nano-imaging techniques: X-ray microanalysis with the world renowned XFlash® detector (NEW 6th Generation!) and QUANTAX microanalysis system, CrystAlign EBSD, Tornado micro-XRF system, and Micro-CT for 3D imaging on SEM. Innovation with integrity — Visit Bruker for all your nanoscience needs.

**Cambridge University Press**
www.cambridge.org/us  
32 Avenue of the Americas  
New York NY 10013-2473  
Contact: James Murphy  
212-924-3900  
jmurphy@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/.

**Centre for Planetary Science and Exploration**
cpsx.uwo.ca  
Department of Earth Sciences  
Western University  
1151 Richmond Street  
London Ontario N6A5B7 Canada  
Contact: Jennifer Heidenheim  
519-661-2111  
cpsx@uwo.ca

The goal of the Centre for Planetary Science and Exploration (CPSX) is to make Western University the focus for planetary science and exploration research in Canada, and to establish Western as a leading school for space systems design. The CPSX boasts the largest planetary science research group in Canada, consisting of over 50 faculty members and researchers, 10 post-docs, and 35 graduate students from 10 academic departments across the university.

**Jacobs Technology**
www.jacobstechnology.com  
2224 Bay Area Blvd  
Houston TX 77058  
Contact: Amanda Taylor  
281-483-5160  
amanda.j.taylor@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 James Webb Space Telescope (JWST) is a 6.5-meter space telescope that will be launched later this decade. JWST will study infrared light from the universe with four imaging and spectroscopic instruments. JWST’s science goals include answering fundamental questions about the origin of the cosmos and life in the Universe. The telescope is being built by Northrop Grumman Aerospace Systems. With development led by NASA’s Goddard Space Flight Center. The Space Telescope Science Institute is the Science and Operations Center for the JWST.

JHU/Applied Physics Laboratory
civspace.jhuapl.edu
11100 Johns Hopkins Road
Laurel MD 20723

Contact: Margaret Simon
240-228-7150
Margaret.Simon@jhuapl.edu

The Johns Hopkins University’s Applied Physics Laboratory (APL) leads several NASA planetary missions and conducts significant grant-based research on planetary, space, and Earth science interests. APL has built 68 spacecraft and nearly 200 instruments, including New Horizons to Pluto, MESSENGER in orbit around Mercury, STEREO, and the Van Allen Probes to study the radiation belts.

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 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, and the Lunar Reconnaissance Orbiter.

Lockheed Martin
www.lockheedmartin.com
12257 Wadsworth Blvd.
Littleton CO 80125

Contact: Melissa Croswhite
303-971-9646
melissa.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, Helio-physics, 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.

NASA Planetary Science — NASA In-Space Propulsion Technology Program
spaceflightsystems.grc.nasa.gov/Advanced/ScienceProject/ISPT/
NASA Glenn Research Center
21000 Brookpark Rd, Mail Stop 142-5
Cleveland OH 44136

Contact: Daniel Vento
216-433-2834
Daniel.M.Vento@nasa.gov

Design Your Mission! NASA's In-Space Propulsion Technology program is sponsoring an opportunity to design your mission with the latest in NASA's Mission Design tools. Designers will be available to discuss your concept, potential methods of implementation, and design a notional trajectory to determine delivered capabilities and mission class estimate. The NASA ISPT Project provides advanced propulsion technology for planetary science missions. Technologies include advanced ion propulsion, advanced chemical propulsion, and planetary ascent vehicles, as well as aerocapture and Earth entry vehicles.

NASA Planetary Science
solarsystem.nasa.gov/eyes
NASA/JPL-NASA's Eyes on the Solar System
4800 Oak Grove Drive
Mail Stop 180-112
Pasadena CA 91109-8001

Contact: Eddie Gonzales
818-354-2326
eddie.gonzales@jpl.nasa.gov

Almost everyone with a computer can now “ride along” with our planetary missions in a video-game like fashion. Using “Eyes on the Solar System,” people everywhere can experience NASA and some ESA missions in real time or travel through time viewing missions from 1950 through 2050 using real mission data. New features and operation of NASA's “Eyes on the Solar System” and “Eyes on the Earth” online tools will be demonstrated.
The Radioisotope Power Systems Program is an ongoing partnership between NASA and the U.S. Department of Energy to develop the next generation of reliable radioisotope power systems (RPS). The program is working to develop the Advanced Stirling Radioisotope Generator (ASRG) and to maintain the capability to produce the Multi-Mission Radioisotope Thermoelectric Generator (MMRTG), which serves as the power source for the Mars rover Curiosity.

The Center for Lunar Science and Exploration is an integral member of the NASA Lunar Science Institute and is designed to address the highest science priorities identified by the National Research Council for NASA, integrate lunar science with exploration activities to enhance mission productivity, generate expertise to meet the nation’s needs, and provide a pipeline of knowledge for students and the public.

The Geosciences Node of NASA’s Planetary Data System (PDS) archives and distributes data related to the study of the surfaces and interiors of terrestrial planetary bodies. We work with NASA missions to help them generate well-documented, permanent data archives. We provide data to NASA-sponsored researchers upon request, make data available using Analyst’s Notebooks and Orbital Data Explorers, and provide expert assistance in using the data.

The 17 nodes of the worldwide RPIF Network are NASA-sponsored reference centers for lunar and planetary information, including maps, images, digital data, artifacts, support documentation, outreach materials, and much more.

Nearly a century of expertise and continuing innovation make Boeing the leader in the aerospace and defense industry. Boeing combines global resources and a spirit of innovation to provide best-of-industry, network-enabled solutions to military, government, and commercial customers around the world. From battle-proven aircraft, to unmanned vehicles, space systems, and beyond, Boeing is the world’s leading space and defense business and the world’s largest satellite manufacturer, an emerging leader in support systems and services.
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.

The United States Geological Survey Astrogeology Science Center is a community leader in planetary science research, image processing, cartography, geologic mapping, and geographic information systems (GIS). Our mission is to serve the planetary community and public with research and technical expertise, mission support, analytical software, image products, digital and print maps, technical training, and education and public outreach programs.

Welcome to the

Lunar and Planetary Science Conference
March 18–22, 2013 • The Woodlands, Texas

Like LPSC?
Imagine what we can do for your meeting!

- 45 years of experience managing scientific meetings
- Experience in NASA/government regulations
- Unique specialized systems for facilitating optimum participant experience and scientific exchange

Visit us at www.hou.usra.edu/meetingsinfo  meetings@hou.usra.edu
# LPSC Week at a Glance

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

<table>
<thead>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Monday Afternoon, 1:30 p.m.</td>
<td></td>
<td></td>
<td></td>
<td>[M151] Plenary Session: Masursky Lecture and Dwornik Award Presentations</td>
<td></td>
</tr>
<tr>
<td>Monday Evening, 5:30 p.m.</td>
<td></td>
<td></td>
<td></td>
<td>NASA Headquarters Briefing</td>
<td></td>
</tr>
<tr>
<td>Tuesday Evening, 6:00 p.m.</td>
<td></td>
<td></td>
<td></td>
<td>Town Center Exhibit Area Poster Session I</td>
<td></td>
</tr>
</tbody>
</table>
**LPSC Week at a Glance**

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

<table>
<thead>
<tr>
<th>Thursday Morning, 8:30 a.m.</th>
<th>[R401] Achondrites: Journey to the Center of an Asteroid</th>
<th>[R402] Mineralogy of Martian Aqueous Environments</th>
<th>[R403] Refractory Inclusions in Chondrites</th>
<th>[R404] Lunar Samples and Experiments: The Big Picture</th>
<th>[R405] Impact Mechanics I: An Experimental Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday Afternoon, 1:30 p.m.</td>
<td>[R451] Ice, Glaciers, and Polar Processes on Mars</td>
<td>[R452] Planetary Atmospheres: Exoplanets</td>
<td>Followed at 2:45 p.m. by [R453] Planetary Atmospheres: Polar Caps are from Mars, Superrotation is from Venus</td>
<td>[R454] Lunar Samples: View of the Lunar Crust</td>
<td>[R455] Impact Mechanics II: An Analytical and Modeling Perspective</td>
</tr>
<tr>
<td>Thursday Evening, 6:00 p.m.</td>
<td>Town Center Exhibit Area</td>
<td>Poster Session II</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GUIDE TO TECHNICAL PROGRAM

WW = Waterway Ballroom; MB = Montgomery Ballroom.

Sunday Evening, March 17, 4:00 p.m.
WW and Prefunction Area  Registration

Sunday Evening, March 17, 5:00 p.m.
WW4/5 and Prefunction Area  Welcome Event

Monday Morning, March 18, 8:30 a.m.
WW1  M101  SPECIAL SESSION:  Planetary Differentiation Across the Solar System  p. 1
WW4  M102  SPECIAL SESSION:  Mars Science Laboratory I:  Geology and Environment  p. 2
WW6  M103  Lunar Remote Sensing  p. 4
MB  M104  Early Solar System Chronology  p. 5

Monday Afternoon, March 18, 1:30 p.m.
WW4  M151  PLENARY SESSION:  Masursky Lecture and Dwornik Award Presentations  p. 7

Monday Afternoon, March 18, 2:30 p.m.
WW1  M152  Planetary Cartography:  Mapping, Databases, and Tools  p. 8
WW4  M153  SPECIAL SESSION:  Mars Science Laboratory II:  Soils and Rocks  p. 9
WW5  M154  Planetary Volcanism in the Solar System  p. 10
WW6  M155  Planetary Dynamics and Tectonics  p. 11
MB  M156  From Dust to Planets in the Protoplanetary Disk  p. 12

Monday Evening, March 18, 5:30 p.m.
WW4/5  NASA Headquarters Briefing
followed by
Town Center  Opening of Exhibits and Student/Scientists Networking Event

Tuesday Morning, March 19, 8:30 a.m.
WW1  T201  Terrestrial Planetary Differentiation:  Core to Mantle  p. 15
WW4  T202  SPECIAL SESSION:  Mars Science Laboratory III:  The Rocknest Sand Dune  p. 16
WW5  T203  Chondrites:  Formation and Alteration  p. 18
WW6  T204  Origin and Evolution of the Moon  p. 19
MB  T205  License to Chill:  Icy Satellite Interiors and Surface Processes  p. 21

Tuesday Afternoon, March 19, 1:30 p.m.
WW1  T251  Rising to the Challenge:  Improving the Public Understanding of Science in the Next Decade  p. 22
WW4  T252  Mars Exploration Rover:  Results from Endeavour Crater  p. 23
followed at 3:15 p.m. by
T253  Impact Processes on Mars  p. 24
WW5  T254  (Proto)Solar Nebula:  Composition, Exchange Reactions, and Mixing  p. 25
WW6  T255  SPECIAL SESSION:  GRAIL Explores the Moon’s Interior  p. 26
MB  T256  Moonlaker:  Titan’s Fluval Processes, Surface Geology and Atmosphere  p. 28
### Wednesday Morning, March 20, 8:30 a.m.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW1</td>
<td>W301</td>
<td>SPECIAL SESSION: Dawn: Vesta from the Inside Out</td>
</tr>
<tr>
<td>WW4</td>
<td>W302</td>
<td>Tissint and NWA 7034: The Latest in Mars Sample Return</td>
</tr>
<tr>
<td>WW5</td>
<td>W303</td>
<td>Mercury Science from MESSENGER</td>
</tr>
<tr>
<td>WW6</td>
<td>W304</td>
<td>Lunar Remote and Sample Spectroscopy, and the New Highland Rock Type</td>
</tr>
<tr>
<td>MB</td>
<td>W305</td>
<td>Fluids on Mars: Flowing, Freezing, and Settling Down</td>
</tr>
</tbody>
</table>

### Wednesday Afternoon, March 20, 1:30 p.m.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW1</td>
<td>W351</td>
<td>SPECIAL SESSION: Vesta as the HED Parent Body</td>
</tr>
<tr>
<td>WW4</td>
<td>W352</td>
<td>Piecing Together Mars Petrology with Experiments, Samples, and Remote Sensing</td>
</tr>
<tr>
<td>WW5</td>
<td>W353</td>
<td>Volatiles at Mercury</td>
</tr>
<tr>
<td><strong>followed at 3:00 p.m. by</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WW4</td>
<td>W354</td>
<td>Venus Tectonics, Volcanism, and Surface Properties</td>
</tr>
<tr>
<td>WW6</td>
<td>W355</td>
<td>Chondrites: Organic Synthesis and Secondary Processes</td>
</tr>
</tbody>
</table>

### Thursday Morning, March 21, 8:30 a.m.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW1</td>
<td>R401</td>
<td>Achondrites: Journey to the Center of an Asteroid</td>
</tr>
<tr>
<td>WW4</td>
<td>R402</td>
<td>Mineralogy of Martian Aqueous Environments</td>
</tr>
<tr>
<td>WW5</td>
<td>R403</td>
<td>Refractory Inclusions in Chondrites</td>
</tr>
<tr>
<td>WW6</td>
<td>R404</td>
<td>Lunar Samples and Experiments: The Big Picture</td>
</tr>
<tr>
<td>MB</td>
<td>R405</td>
<td>Impact Mechanics I: An Experimental Perspective</td>
</tr>
</tbody>
</table>

### Thursday Afternoon, March 21, 1:30 p.m.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW4</td>
<td>R451</td>
<td>Ice, Glaciers, and Polar Processes on Mars</td>
</tr>
<tr>
<td>WW5</td>
<td>R452</td>
<td>Planetary Atmospheres: Exoplanets</td>
</tr>
<tr>
<td><strong>followed at 2:45 p.m. by</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WW4</td>
<td>R453</td>
<td>Planetary Atmospheres: Polar Caps are from Mars, Superrotation is from Venus</td>
</tr>
<tr>
<td>WW6</td>
<td>R454</td>
<td>Lunar Samples: Our Evolving View of the Lunar Crust</td>
</tr>
<tr>
<td>MB</td>
<td>R455</td>
<td>Impact Mechanics II: An Analytical and Modeling Perspective</td>
</tr>
</tbody>
</table>

### Friday Morning, March 22, 8:30 a.m.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW1</td>
<td>F501</td>
<td>Surface Interactions on Asteroids: Regolith and Space Weathering</td>
</tr>
<tr>
<td>WW4</td>
<td>F502</td>
<td>Planetary Aeolian Processes: Erosion, Deposition and Bedforms</td>
</tr>
<tr>
<td><strong>followed at 10:15 a.m. by</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WW5</td>
<td>F503</td>
<td>Exobiology</td>
</tr>
<tr>
<td>WW6</td>
<td>F504</td>
<td>Presolar Grains</td>
</tr>
<tr>
<td>WW6</td>
<td>F505</td>
<td>Lunar Volatiles: The Moon is Wet Enough</td>
</tr>
<tr>
<td>MB</td>
<td>F506</td>
<td>Terrestrial Impact Craters: Where, When, What, How</td>
</tr>
</tbody>
</table>

### Friday Afternoon, March 22, 1:30 p.m.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW1</td>
<td>F551</td>
<td>Remote Sensing of Small Bodies</td>
</tr>
<tr>
<td>WW4</td>
<td>F552</td>
<td>Mars Volatiles from Mantle to Atmosphere: Water, Halogens, and Organics</td>
</tr>
<tr>
<td>WW5</td>
<td>F553</td>
<td>Stardust and IDPs</td>
</tr>
<tr>
<td><strong>followed at 3:00 p.m. by</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WW6</td>
<td>F554</td>
<td>Chondrules</td>
</tr>
</tbody>
</table>
**POSTER SESSIONS**

**Tuesday Evening, March 19, 6:00 p.m.**

<table>
<thead>
<tr>
<th>Town Center Exhibit Area</th>
<th>POSTER SESSION I</th>
<th>p.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T601</td>
<td>Genesis Mission: Target Handling and Solar Wind Abundances</td>
<td>73</td>
</tr>
<tr>
<td>T602</td>
<td>(Proto)Solar Nebula I: Composition, Exchange Reactions and Mixing</td>
<td>74</td>
</tr>
<tr>
<td>T603</td>
<td>(Proto)Solar Nebula II: Isotope Anomalies</td>
<td>75</td>
</tr>
<tr>
<td>T604</td>
<td>Early Solar System Chronology</td>
<td>76</td>
</tr>
<tr>
<td>T605</td>
<td>Chondrites: Organic Synthesis and Secondary Processes</td>
<td>78</td>
</tr>
<tr>
<td>T606</td>
<td>Chondrites: Low-Temperature Secondary Processes</td>
<td>80</td>
</tr>
<tr>
<td>T607</td>
<td>Chondrites: High-Temperature Secondary Processes</td>
<td>81</td>
</tr>
<tr>
<td>T608</td>
<td>Early Differentiation of Planetary Bodies Across the Solar System</td>
<td>83</td>
</tr>
<tr>
<td>T609</td>
<td>Terrestrial Planetary Differentiation: Core to Mantle</td>
<td>83</td>
</tr>
<tr>
<td>T610</td>
<td>Vesta and the HED Connection: Dawn Results</td>
<td>84</td>
</tr>
<tr>
<td>T611</td>
<td>Impact Craters on Vesta, Large and Small</td>
<td>85</td>
</tr>
<tr>
<td>T612</td>
<td>Planetary Dynamics and Tectonics</td>
<td>87</td>
</tr>
<tr>
<td>T613</td>
<td>Mercury</td>
<td>89</td>
</tr>
<tr>
<td>T614</td>
<td>Mars Science Laboratory: Geology Regional and Local</td>
<td>92</td>
</tr>
<tr>
<td>T615</td>
<td>Mars Science Laboratory: Instruments and Calibrations</td>
<td>93</td>
</tr>
<tr>
<td>T616</td>
<td>Mars Science Laboratory: The Atmosphere and Environment</td>
<td>96</td>
</tr>
<tr>
<td>T617</td>
<td>Mars Science Laboratory: Soils and Rocks</td>
<td>97</td>
</tr>
<tr>
<td>T618</td>
<td>Mars Science Laboratory: Results from Rocknest</td>
<td>100</td>
</tr>
<tr>
<td>T619</td>
<td>Mars Thermal Properties</td>
<td>102</td>
</tr>
<tr>
<td>T620</td>
<td>Mars Mapping and Structural Analyses</td>
<td>103</td>
</tr>
<tr>
<td>T621</td>
<td>Mass Movements and Erosion on Mars</td>
<td>103</td>
</tr>
<tr>
<td>T622</td>
<td>Impact Processes on Mars</td>
<td>104</td>
</tr>
<tr>
<td>T623</td>
<td>Mars Volcanism</td>
<td>105</td>
</tr>
<tr>
<td>T624</td>
<td>Volcanism on Mars: From Analogues to Flow Morphologies to Mapping</td>
<td>106</td>
</tr>
<tr>
<td>T625</td>
<td>Volcanism on Venus, Moon, and Io</td>
<td>108</td>
</tr>
<tr>
<td>T626</td>
<td>The Lunar Interior from Gravity and Tides: GRAIL, Lunar Prospector, Chang'e, and Laser Ranging</td>
<td>110</td>
</tr>
<tr>
<td>T627</td>
<td>Lunar Geophysics and Tectonics</td>
<td>111</td>
</tr>
<tr>
<td>T628</td>
<td>Lunar Samples</td>
<td>113</td>
</tr>
<tr>
<td>T629</td>
<td>Icy Satellites</td>
<td>118</td>
</tr>
<tr>
<td>T630</td>
<td>Titan</td>
<td>121</td>
</tr>
<tr>
<td>T631</td>
<td>Planetary Rings</td>
<td>122</td>
</tr>
<tr>
<td>T632</td>
<td>Education and Outreach: Higher Education</td>
<td>123</td>
</tr>
<tr>
<td>T633</td>
<td>Education and Outreach: Student Research</td>
<td>123</td>
</tr>
<tr>
<td>T634</td>
<td>Education and Outreach: Public Outreach</td>
<td>124</td>
</tr>
<tr>
<td>T635</td>
<td>Education and Outreach: Scientist Engagement</td>
<td>125</td>
</tr>
<tr>
<td>T636</td>
<td>Education and Outreach: Citizen Science</td>
<td>125</td>
</tr>
<tr>
<td>T637</td>
<td>Education and Outreach: Education Programs</td>
<td>126</td>
</tr>
<tr>
<td>T638</td>
<td>Planetary Mission Concepts</td>
<td>127</td>
</tr>
<tr>
<td>T639</td>
<td>BepiColombo Mission to Mercury</td>
<td>131</td>
</tr>
<tr>
<td>T640</td>
<td>Mars Landing Sites: Current and Future</td>
<td>131</td>
</tr>
<tr>
<td>T641</td>
<td>Instrument and Payload Concepts</td>
<td>132</td>
</tr>
<tr>
<td>T642</td>
<td>When the Planets Come to Earth: Terrestrial Analogs for Extraterrestrial Environments</td>
<td>139</td>
</tr>
<tr>
<td>T643</td>
<td>Planets in the Laboratory: Laboratory Study of Terrestrial Analogs</td>
<td>142</td>
</tr>
</tbody>
</table>
**Tuesday Evening, March 19, 6:00 p.m. (continued)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>T644</td>
<td>Material Analogs: Materials and Properties</td>
<td>143</td>
</tr>
<tr>
<td>T645</td>
<td>Tomorrow’s Missions Today: Operations Testing at Terrestrial Analog Sites</td>
<td>143</td>
</tr>
<tr>
<td>T646</td>
<td>Into the Field with the Laboratory: Analog Tests of Laboratory Techniques</td>
<td>145</td>
</tr>
</tbody>
</table>

**Thursday Evening, March 21, 6:00 p.m.**

<table>
<thead>
<tr>
<th>Town Center Exhibit Area</th>
<th>POSTER SESSION II</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>R701</td>
<td>Presolar Grains and Dust Evolution</td>
<td>147</td>
</tr>
<tr>
<td>R702</td>
<td>Comet Wild 2/Stardust</td>
<td>148</td>
</tr>
<tr>
<td>R703</td>
<td>IDPs and Micrometeorites</td>
<td>149</td>
</tr>
<tr>
<td>R704</td>
<td>Chondrules</td>
<td>150</td>
</tr>
<tr>
<td>R705</td>
<td>Refractory Inclusions in Chondrites</td>
<td>151</td>
</tr>
<tr>
<td>R706</td>
<td>Chondrites Other</td>
<td>152</td>
</tr>
<tr>
<td>R707</td>
<td>Satter’s Mill Meteorite</td>
<td>154</td>
</tr>
<tr>
<td>R708</td>
<td>Analysis of Itokowa Samples</td>
<td>156</td>
</tr>
<tr>
<td>R709</td>
<td>Regolith and Dust Processes on Airless Bodies</td>
<td>157</td>
</tr>
<tr>
<td>R710</td>
<td>Differentiated Meteorites and Bodies</td>
<td>158</td>
</tr>
<tr>
<td>R711</td>
<td>Ceres</td>
<td>160</td>
</tr>
<tr>
<td>R712</td>
<td>Small Body Physics: Keeping it Together</td>
<td>160</td>
</tr>
<tr>
<td>R713</td>
<td>Potentially Hazardous Asteroids</td>
<td>161</td>
</tr>
<tr>
<td>R714</td>
<td>Comets and Icy Small Bodies</td>
<td>162</td>
</tr>
<tr>
<td>R715</td>
<td>Phobos and Deimos</td>
<td>162</td>
</tr>
<tr>
<td>R716</td>
<td>Remote Sensing of Small Bodies</td>
<td>163</td>
</tr>
<tr>
<td>R717</td>
<td>Cratering on Small Bodies</td>
<td>164</td>
</tr>
<tr>
<td>R718</td>
<td>Impact Cratering: Experiments, Modeling, and Laboratory Studies</td>
<td>164</td>
</tr>
<tr>
<td>R719</td>
<td>Craters: Statistics, Maps, Observations, and Techniques</td>
<td>168</td>
</tr>
<tr>
<td>R720</td>
<td>Terrestrial Impacts: Features at All Scales</td>
<td>170</td>
</tr>
<tr>
<td>R722</td>
<td>Lunar Remote Sensing</td>
<td>176</td>
</tr>
<tr>
<td>R723</td>
<td>Getting Results for the Moon: Data Fusion, Model Improvements, and Emerging Technology</td>
<td>182</td>
</tr>
<tr>
<td>R724</td>
<td>Mars Petrology: Experiments, Samples, and Remote Sensing</td>
<td>186</td>
</tr>
<tr>
<td>R725</td>
<td>Fluids on Mars: Oceans, Lakes, Valleys, Gullies, RSLs, and Analogs</td>
<td>190</td>
</tr>
<tr>
<td>R726</td>
<td>Martian Water and Secondary Mineralogy</td>
<td>193</td>
</tr>
<tr>
<td>R727</td>
<td>Ice, Glaciers, and Polar Processes on Mars</td>
<td>199</td>
</tr>
<tr>
<td>R728</td>
<td>Mars Glacial and Periglacial</td>
<td>201</td>
</tr>
<tr>
<td>R729</td>
<td>Planetary Aeolian Processes: Erosion, Deposition, Bedforms, and Simulations</td>
<td>202</td>
</tr>
<tr>
<td>R730</td>
<td>Planetary Atmospheres</td>
<td>204</td>
</tr>
<tr>
<td>R731</td>
<td>Planetary Cartography: Mapping</td>
<td>207</td>
</tr>
<tr>
<td>R732</td>
<td>Planetary Cartography: Databases and Tools</td>
<td>208</td>
</tr>
<tr>
<td>R733</td>
<td>Venus Surface and Interior</td>
<td>211</td>
</tr>
<tr>
<td>R734</td>
<td>Exobiology</td>
<td>212</td>
</tr>
<tr>
<td>R735</td>
<td>Asteroid Analysis: Missions and Tools</td>
<td>214</td>
</tr>
</tbody>
</table>
SPECIAL SESSION:
PLANETARY DIFFERENTIATION ACROSS THE SOLAR SYSTEM
Monday, 8:30 a.m.  Waterway Ballroom 1

Chairs:  Lindy Elkins-Tanton
         Bruce Bills

8:30 a.m.  Bottke W. F.  *  Asphaug E.
On the Origin and Evolution of Differentiated Planetesimals [#1672]
Hit and run collisions were common among differentiated objects in the terrestrial planet region. Some surviving fragments were captured within the main belt.

8:45 a.m.  Tarduno J. A.  *  Cottrell R. D.
Paleomagnetism of the Springwater Pallasite:  Further Evidence for a Dynamo in the Main Group Pallasite Parent Body [#2801]
Paleointensity data from the Springwater pallasite support evidence for a parent-body dynamo and pallasite formation far from a core-mantle boundary.

9:00 a.m.  Gattacceca J.  *  Weiss B. P.  Gounelle M.  Lima E. A.  Rochette P.
More Evidence for a Partially Differentiated CV Parent Body from the Meteorite Kaba [#1721]
A paleomagnetic study of the CV chondrite Kaba brings more evidence for a partially differentiated CV parent body.

Resolution of Small Differences in the Time of Metal Segregation in Iron Meteorite Parent Bodies [#1920]
Using Pt-W-isotope correlations we obtained pre-exposure $^{182}\text{W}/^{184}\text{W}$ for the major iron meteorite groups (IIAB, IIIAB, IVA) that are unaffected by cosmic rays.

9:30 a.m.  McCoy T. J.  *  Gardner-Vandy K. G.
Asteroid Partial Melting at the Solar System’s Snow Line [#2481]
Parent body size and water:rock ratio are critical parameters in understanding hybrid metal-silicate-ice differentiation models.

9:45 a.m.  Rivkin A. S.  *
Spectroscopy and Asteroid Interiors:  Judging a Book when all you have is its Cover [#2737]
Beauty’s not skin deep. Asteroids’ inner natures can be seen from here.

10:00 a.m.  Burbine T. H.  *
What Do the Heliocentric and Size Distributions of V-Types tell us About Igneous Differentiation in the Asteroid Belt? [#2637]
The heliocentric and size distributions of V-types imply that Vesta-like differentiation occurred on multiple parent bodies of roughly similar sizes.

10:15 a.m.  Bland P. A.  *  Travis B. J.  Dyl K. A.  Schubert G.
Giant Convecting Mudballs of the Early Solar System [#1447]
In studying the hydrothermal evolution of primitive asteroids we have assumed that they were lithified. Disgarding this assumption solves a number of problems.
10:30 a.m. Castillo-Rogez J. C. * Frank E. A. Walsh K. J.
*Physical and Chemical Differentiation of Large Icy Asteroids as a Function of Origin: Application to Ceres [2767]*
We search for markers of icy asteroid origin to be sought for by the Dawn spacecraft.

10:45 a.m. Sarid G. * Stewart S. T.
*Hold On to Your Volatiles — Early Preservation In Evolving Icy Planetesimals [1467]*
We examine volatile species survival in ice-rock objects, in relation with its relative collisional and thermochemical evolution.

11:00 a.m. McKinnon W. B. * Bland M. T.
*Differentiation of Large Outer Solar System Satellites: Implications for Core Chemistry, Internal Structure, and Non-Hydrostatic Gravity [2983]*
The evolutionary paths to differentiation taken (or avoided) by large icy moons are quite different from those of the terrestrial planets and major asteroids.

11:15 a.m. Sotin C. * Reynard B.
*Onset of Convection and Differentiation in the Hydrated Cores of Icy Moons [1436]*
Numerical simulations suggest that the inner part of hydrated cores dehydrates. For large values of internal heating, convection can start in the outer core.

11:30 a.m. Rubin M. E. * Desch S. J. Neveu M.
*Thickness of Undifferentiated Crust on Kuiper Belt Objects Experiencing Rayleigh-Taylor Instabilities [2559]*
We investigate the role of Rayleigh-Taylor instabilities in overturning the crust of KBOs. We conclude that small KBOs can retain an undifferentiated crust.

---

**SPECIAL SESSION: MARS SCIENCE LABORATORY I: GEOLOGY AND ENVIRONMENT**

**Monday, 8:30 a.m. Waterway Ballroom 4 [M102]**

**Chairs:**
- Ashwin Vasavada
- Lauren Edgar

8:30 a.m. Grotzinger J. P. * Blake D. F. Crisp J. Edgett K. S. Gellert R. et al.
*Mars Science Laboratory: First 100 Sols of Geologic and Geochemical Exploration from Bradbury Landing to Glenelg [1259]*
The Mars Science Laboratory rover, Curiosity, touched down on the surface of Mars on August 5, 2012. Numerous geologic and geochemical studies were performed.

8:45 a.m. Palucis M. C. * Dietrich W. E. Hayes A. G. Williams R. M. E. Calef F. et al.
*Origin and Evolution of the Peace Vallis Fan System that Drains into the Curiosity Landing Area, Gale Crater [1607]*
Gale Crater contains a large alluvial fan near Curiosity’s landing site. We present an analysis of imaging and topographic data to constrain the fan’s origin.

9:00 a.m. Williams R. M. E. * Dietrich W. E. Grotzinger J. P. Gupta S. Malin M. C. et al.
*Curiosity’s Mastcam Images Reveal Conglomerate Outcrops with Water-Transported Pebbles [1617]*
Curiosity Mastcam images of outcrops with rounded pebbles provide the first evidence of sedimentary conglomerate on another planet.
9:15 a.m. Mangold N. * Forni O. Ollila A. Anderson R. Berger G. et al.
Chemcam Analysis of Conglomerates at Bradbury Site, Mars [#1267]
This paper discusses the ChemCam imaging and chemical analyses of conglomerate clasts and cement at the Bradbury site.

Sedimentary Facies and Bedform Analysis Observed from the Rocknest Outcrop (Sols 59-100), Gale Crater, Mars [#1628]
Recent results from MSL enable the recognition of distinct cross-bedded facies. Cross-bedding geometries provide insight into the depositional environment.

9:45 a.m. Stack K. M. * Grotzinger J. P. Sumner D. Y. Ehlmann B. L. Milliken R. E. et al.
Using Outcrop Exposures on the Road to Yellowknife Bay to Build a Stratigraphic Column, Gale Crater, Mars [#1431]
We use outcrop observations from the MSL Curiosity rover to construct stratigraphic models consistent with orbital data and first principles of stratigraphy.

10:00 a.m. Kah L. C. Rubin D. M. Gupta S. Lewis K. W. Kocurek G. A. et al.
Origin of the Low-Albedo Mound Skirting Unit in the Region of the MSL Landing Ellipse, and Implications for the Relative Age of Glenelg Strata [#1121]
Heavily cratered, low-albedo strata within Gale Crater are used to provide information on stratigraphic relationships between the MSL landing ellipse and Mt. Sharp.

10:15 a.m. Milliken R. E. * Ewing R. Fischer W. Hurowitz J. A.
Clay and Sulfate-Cemented Sandstones in Gale Crater: Evidence from Orbital Data [#1243]
Morphologic features in Gale Crater are consistent with preserved bedforms cemented by sulfate and clay minerals, indicating intermittent wet conditions.

Mars Science Laboratory: First 100 Sols Monitoring the Atmosphere and Environment Within Gale Crater [#1191]
The MSL mission places atmospheric and environmental sensors within an equatorial setting ~4.5 km elevation and between the crater rim and a 5-km-high mountain.

10:45 a.m. Haberle R. M. * Gómez-Elvira J. de la Torre Juárez M. Harri A.-M. Hollingsworth J. L. et al.
A Preliminary Interpretation of the First Results from the REMS Surface Pressure Measurements of the MSL Mission [#1625]
We present the MSL REMS surface pressure measurements from the first 90 sols of operations and provide a preliminary interpretation.

11:00 a.m. Moores J. E. Haberle R. Lemmon M. Bean K. M. Mischna M. et al.
Constraints on Atmospheric Water Vapor and Circulation at Gale Crater from the MSL Atmospheric Monitoring Campaign [#1548]
A synthesis of atmospheric measurements suggests that conditions at Gale may be particularly dry near the surface during the first 90 sols ($L_s = 151^\circ$ to $203^\circ$).

Mars Atmospheric Escape Recorded by H, C and O Isotope Ratios in Carbon Dioxide and Water Measured by the SAM Tunable Laser Spectrometer on the Curiosity Rover [#1365]
Mars in situ measurements of the isotopic ratios of D/H in water, and $^{13}$C/$^{12}$C, $^{18}$O/$^{16}$O, $^{17}$O/$^{16}$O, and $^{13}$C/$^{18}$O/$^{12}$C/$^{16}$O in carbon dioxide are reported.
Preliminary isotopic measurements of the martian atmosphere from SAM indicate enrichments in the heavy stable isotopes of C, O, and H.

**LUNAR REMOTE SENSING**
Monday, 8:30 a.m.  Waterway Ballroom 6  [M103]

**Chairs:**  Lisa Gaddis  
Paul Hayne

8:30 a.m.  Klima R. L.  *  Hagerty J. J.  Cahill J. T. S.  Lawrence D. J.  
*Integrating Near-Infrared Derived Mineralogy and Gamma Ray Derived Chemistry of the Moon: Probing Igueous Sources from Orbit [#2158]*  
We integrate M3 and Lunar Prospector data to compare the mineralogy and hydroxyl content of thorium anomalies for several locations on the lunar nearside.

8:45 a.m.  Crites S. T.  *  Lucey P. G.  Norman J.  
*The Mafic Component of the Lunar Crust from a Survey of Small Craters [#1810]*  
We are performing a global survey of immature small lunar craters in order to study the source of the mafic component of the lunar feldspathic highlands.

9:00 a.m.  Hayne P. O.  *  Ghent R.  Bandfield J. L.  Vasavada A. R.  Siegler M. A.  et al.  
*Formation and Evolution of the Moon’s Upper Regolith: Constraints from Diviner Thermal Measurements [#3003]*  
We use Diviner data to constrain the Moon’s upper regolith thickness and find that this correlates with ages of recent craters and mare basalts.

9:15 a.m.  Kumamoto A.  *  Ono T.  Kobayashi T.  Oshigami S.  Haruyama J.  
*Determination of the Permittivity of the Lunar Surface Based on the Radar Echo Intensity Observed by the Kaguya [#1950]*  
The permittivity of the lunar surface has been determined based on the radar echo intensity and roughness of the surface observed by the Kaguya spacecraft.

9:30 a.m.  Lehman K. M.  *  Kramer G. Y.  Mayne R. G.  Kiefer W. S.  
*Composition Analysis of the Marius Hills Volcanic Coplex Uising Diviner Lunar Radiometer Experiment and Moon Mineralogy Mapper [#1225]*  
The combined datasets allowed plagioclase-rich regions to be identified along with clarifying previous compositional assessments.

*A Highly Unusual Series of Young Impact Melts and Rocky Surfaces Antipodal to Tycho Crater [#1770]*  
A unique set of features are present in LRO LROC, Diviner, and Mini-RF data. Rocky material impacted the surface from two azimuths across a 11000 sq. km region.

10:00 a.m.  Hawke B. R.  Giguere T. A.  *  Gaddis L. R.  Gustafson J. O.  Lawrence S. J.  et al.  
*Cryptomare and Pyroclastic Deposits on the Northern East Side of the Moon [#1883]*  
We analyzed LROC images as well as other spacecraft data to identify and characterize cryptomare and pyroclastic deposits on the northern east side of the Moon.
*The Lassell Massif — Evidence for Complex Volcanism on the Moon [2504]*  
New LROC Wide Angle Camera, Narrow Angle Camera digital elevation models, and Diviner data  
support a history of complex volcanism for the Lassell Massif region.

10:30 a.m. Braden S. E. * Robinson M. S. Stopar J. D. van der Bogert C. H. Hawke B. R.  
Age and Extent of Small, Young Volcanic Activity on the Moon [2843]  
Crater counts provide upper and lower age estimates for a subset of newly mapped small volcanic  
features found throughout the lunar maria.

“New” Volcanic Features in Lunar, Floor-Fractured Oppenheimer Crater [2262]  
New high-resolution data of Oppenheimer crater reveal at least eight “new” volcanic features that were  
previously unrecognized.

11:00 a.m. Greenhagen B. T. * Neish C. D. Bandfield J. L. Ghent R. R. Hayne P. O. et al.  
Anomously Fresh Appearance of Tsiolkovskiy Crater: Constraints from Diviner,  
Mini-RF, and LROC [2987]  
Tsiolkovskiy Crater has massive impact melt and is 300 Ga younger than previously reported but  
appears anomalously fresh in Diviner thermophysical datasets.

11:15 a.m. Moriarty D. P. III * Isaacs P. J. Pieters C. M.  
NW-Central South Pole-Aitken: Compositional Diversity, Geologic Context, and Implications for  
Basin Evolution [3039]  
Compositional diversity in Finsen, Leibnitz, and Davison craters is investigated using M³ data to  
constrain the evolution of the South Pole-Aitken Basin.

11:30 a.m. Poppe A. R. * Halekas J. S. Sarantos M. Delory G. T.  
Model-Based Constraints on the Lunar Exosphere Derived from ARTEMIS Pick-Up  
Ion Observations [1678]  
We use ARTEMIS observations of pick-up ions in the terrestrial magnetotail to constrain the density  
and distribution of the lunar neutral exosphere.

---

**EARLY SOLAR SYSTEM CHRONOLOGY**  
Monday, 8:30 a.m. Montgomery Ballroom [M104]

**Chairs:** Glenn MacPherson  
Yuri Amelin

8:30 a.m. Chen J. H. * Papanastassiou D. A. Telus M. Huss G. R.  
Fe-Ni Isotopic Systematics in UOC QUE 97008 and Semarkona Chondrules [2649]  
We investigated the possible presence of short-lived ⁶⁰Fe in the early solar system, by measuring  
Ni isotopes in unequilibrated ordinary chondrite chondrules.

8:45 a.m. Tang H. * Dauphas N.  
⁶⁰Fe-⁶⁰Ni Constraints on Core Formation and Rapid Accretion of Vesta and Mars [2483]  
By a new estimate of the initial ⁶⁰Fe/⁶⁰Ni ratio, we present a chronological application to establish the  
time of core formation and accretion on Vesta and Mars.

9:00 a.m. Tenner T. J. * Ushikubo T. Nakashima D. Kita N. T. Weisberg M. K.  
²⁶Al in Chondrules from the CR3.0 Chondrite Queen Alexandra Range 99177:  
A Link with O Isotopes [2010]  
Of six QUE 99177 chondrules investigated by SIMS, two (δ¹⁷O: −5‰, Mg# 99) have excess ²⁶Mg,  
and four (δ¹⁷O: −1.7–2.8‰, Mg# 97.5–98.5) do not.

9:30 a.m. Amelin Y. * Sapah M. S. Cooke I. Stirling C. H. Kaltenbach A. * U-Th-Pb Systematics of CAIs from CV Chondrite Northwest Africa 4502 [#2690] Four CAIs from CV chondrite NWA 4502 have Pb-isotopic age of 4567.40 ± 0.27 Ma, and uniform 238U/235U of 137.808 ± 0.019.

9:45 a.m. MacPherson G. J. * Ushikubo T. Kita N. T. Ivanova M. A. Bullock E. S. et al. Petrologic and 26Al/27Al Isotopic Studies of Type A CAIs and Documentation of the Fluffy Type A – Compact Type A – Type B CAI Evolutionary Transition [#1530] Petrologic and Al-Mg-isotope studies show how fluffy type A CAIs evolve into compact type A CAIs, and how compact type A CAIs evolve into type B CAIs.

10:00 a.m. Jacobsen B. * Wasserburg G. J. McKeegan K. D. Hutcheon I. D. Krot A. N. et al. Resetting and Disturbance to the Al-Mg System in Allende Type B CAIs [#2941] To evaluate the disturbance to the Al-Mg system in CAIs we compare our new SIMS data for Allende Type B CAIs with published bulk rock Al-Mg data.

10:15 a.m. Pravdivtseva O. V. * Meshik A. P. Hohenberg C. M. The I-Xe Record: Early Onset of Aqueous Alteration in Magnetites Separated from CM and CV Carbonaceous Chondrites [#3104] New I-Xe ages of magnetites from CM and CV chondrites support early onset of aqueous alteration on chondritic parent bodies in agreement with previous I-Xe data.


10:45 a.m. Doyle P. M. * Nagashima K. Jogo K. Krot A. N. 53Mn-53Cr Chronometry Reveals Secondary Fayalite in Asuka 881317 (CV3) and MacAlpine Hills 88107 (CO/CM-like) Formed 4–5 Ma After CV CAIs [#1793] Secondary fayalite in both a CV and CO/CM meteorite formed 4–5 Ma after CV CAIs, according to 53Mn-53Cr ages calculated using a matrix-matched standard.

11:00 a.m. Righter M. * Lapen T. J. Andreasen R. Evidence for Excess Hafnium-176 in Eucrite QUE 97053 [#2745] We present the initial results of our investigation of 176Lu-177Hf systematics in eucrites. The data shows that excess 176Hf exists on the eucrite parent body.

11:15 a.m. Wimpeny J. B. * Yin Q.-Z. Cooke I. Stirling C. Amelin Y. Reassessing the Chronology of the Unique Achondrite Asuka 881394 Using Al-Mg and U-Pb Systematics [#2308] We investigate the chronology of the achondrite Asuka 881394, focusing on the discrepancy between the absolute Pb-Pb age and Al-Mg systematics.

11:30 a.m. Iizuka T. * Amelin Y. Puchtel I. S. Walker R. J. Irving A. J. et al. U-Pb age, Re-Os isotopes, and HSE Geochemistry of Northwest Africa 6704 [#1841] The unique achondrite NWA 6704 has an U-Pb age of 4563.34 ± 0.32 Ma (assuming 235U/238U = 137.88) and high HSE abundances with suprachondritic 187Os/188Os.
PLENARY SESSION:
MASURSKY LECTURE AND DWORNIK AWARD PRESENTATIONS
Monday, 1:30 p.m.  Waterway Ballroom 4  [M151]

Chair: Stephen Mackwell, Eileen Stansbery, and David Draper

Presentation of the 2012 GSA Stephen E. Dwornik Award Winners —

Best Graduate Oral Presentation:
D. Hemingway, University of California, Santa Cruz, “Insights into Lunar Swirl Morphology and Magnetic Source Geometry: Models for the Reiner Gamma and Airy Anomalies”

Honorable Mention, Graduate Oral Presentation
S. M. Tikoo, Massachusetts Institute of Technology, “Decline of the Ancient Lunar Core Dynamo”

Best Graduate Poster Presentation
I. B. Smith, University of Texas, “The Northern Spiral Troughs of Mars as Cyclic Steps: A Theoretical Framework for Calculating Average Migration and Accumulation Rates”

Best Undergraduate Poster Presentation
A. J. Ryan, Arizona State University, “Lava Coils and Drifting Patterned Ground in Cerberus Palus, Mars”

Honorable Mention, Undergraduate Poster Presentation
R. T. Daly, Brigham Young University, “Steps Toward an Innovative Electrospray-Based Particle Source for Dust Accelerators”

Honorable Mention, Undergraduate Poster Presentation
K. T. Crane, University of Tennessee, Knoxville, “Shape and Thermal Modeling of a Selection of M-Type Asteroids”

Honorable Mention, Undergraduate Poster Presentation
H. M. Meyer, College of Charleston, “Using a New Crustal Thickness Model to Test Previous Candidate Lunar Basins and to Search for New Candidates”

Presentation of the LPI Career Development Award Winners —

Winners to be announced

Masursky Lecture —
Elkins-Tanton L. T. *
On Building an Earth-Like Planet [#1408]
Magma ocean processes on planetesimals and planets control the earliest compositional differentiation and volatile content of the terrestrial planets.

Lindy Elkins-Tanton is the director of the Department of Terrestrial Magnetism at the Carnegie Institution for Science. Her research is on the evolution of terrestrial planets and the relationships between Earth and life on Earth. One of her research efforts addresses the chemistry and physics of the formation of terrestrial planets, with projects focusing on planetesimals, the Moon, Mercury, Earth, rocky exoplanets, and processes such as degassing the earliest atmospheres. A second major research effort concerns the relationships between large volcanic provinces and global extinction events, focusing on the Siberian flood basalts and the end-Permian extinction. She has lead four field seasons in Siberia, as well as participated in fieldwork in the Sierra Nevada, the Cascades, the Faroe Islands, and a fifth Siberian expedition. Elkins-Tanton received her B.S. and M.S. from MIT in 1987, and then spent eight years working in business, with five years spent writing business plans for young high-tech ventures. She then returned to MIT, where she earned her Ph.D. Elkins-Tanton spent five years as a researcher at Brown University, followed by five years on the MIT faculty, culminating as Associate Professor of Geology, before accepting her current position at Carnegie. Elkins-Tanton is a two-time National Academy of Sciences Kavli Frontiers of Science Fellow and served on the National Academy of Sciences Decadal Survey Mars panel. Other awards include a National Science Foundation CAREER award, Outstanding MIT Faculty Undergraduate Research Mentor, and the Explorers Club Lowell Thomas prize. The second edition of her six-book series, The Solar System, was published in 2010.
# PLANETARY CARTOGRAPHY: MAPPING, DATABASES, AND TOOLS

**Monday, 2:30 p.m.  Waterway Ballroom 1**

<table>
<thead>
<tr>
<th>Time</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
</table>
| 2:30  | Archinal B. A. * IAU Working Group                                                             | *Update on the IAU Working Group on Cartographic Coordinates and Rotational Elements and its Upcoming Report* [#2895]  
The work of the IAU Working Group on Cartographic Coordinates and Rotational Elements is described. Input from the planetary community is encouraged. |
Production of controlled radar mosaics of the Moon is underway. We are working outward from the north pole and will map both poles to 70° at 30 m/pix. |
| 3:00  | Hare T. M. * Akins S. W. Sucharski R. M. Bailen M. S. Anderson J. A.                            | *Map Projection Web Service for PDS Images* [#2068]  
The Astrogeology Science Center has developed an on-line tool that transforms raw PDS images to science-ready map projected images. |
“SPICE” is the international standard, comprising data and allied software, for analyzing the data returned from missions sent to any solar system body. |
| 3:30  | Gläser P. * Scholten F. Haase I. Oberst J. De Rosa D. et al.                                    | *Improvement of Local LOLA DTMs using LROC NAC DTMs — Example for an ESA Lunar Lander Candidate Landing Site* [#1967]  
A method to improve LOLA DTMs with the help of NAC DTMs is shown at Connecting Ridge, a candidate landing site for the ESA Lunar Lander at the lunar south pole. |
| 3:45  | Rosiek M. R. * Thomas O. Howington-Kraus E. Foster E.                                          | *Lunar South Pole Digital Elevation Models from Lunar Reconnaissance Orbiter Narrow Angle Camera* [#2583]  
Comparison of topographic models generated from LRO NAC images with LOLA grid and track data, covering the lunar south pole. |
An algorithm for automatic identification of lunar control points from Chandrayaan-1 TMC triplet images and Clementine ortho image is presented in this paper. |
To support reanalysis of the Apollo 17 seismic data we determined the ME-coordinates of the LSPE active sources and receivers using LROC NAC and Apollo surface images. |
4:30 p.m. Smith A. Thompson D. R. * Sayfi E. Xing Z. Castano R.

*A Web-Based Search Service to Support Imaging Spectrometer Instrument Operations* [2467]

We developed a web service for searching within imaging spectrometer data, enabling fast interpretations of these data products during instrument operations.

### SPECIAL SESSION: MARS SCIENCE LABORATORY II: SOILS AND ROCKS

**Monday, 2:30 p.m. Waterway Ballroom 4** [M153]

**Chairs:** R. A. Yingst

Juergen Schieber

2:30 p.m. Wiens R. C. * Maurice S. Sautter V. Blaney D. Bridges N. T. et al.

*Compositions Determined by ChemCam Along Curiosity’s Traverse from Bradbury Station to Glenelg in Gale Crater, Mars* [1363]

Igneous float rocks near the landing site are highly porphyritic with abundant feldspars. Conglomerates and pebbles appeared similar in composition.

2:45 p.m. Gellert R. * Berger J. A. Boyd N. Brunet C. Campbell J. L. et al.

*Initial MSL APXS Activities and Observations at Gale Crater, Mars* [1432]

We report and discuss initial MSL APXS chemical compositions measured during the first 102 sols at Gale Crater.

3:00 p.m. Meslin P.-Y. * Cousin A. Berger G. Forni O. Gasnault O. et al.

*Soil Diversity Along Bradbury-Glenelg Traverse* [2023]

Overview of ChemCam measurements of soil targets during the 100 first sols of the mission.

3:15 p.m. Mitrofanov I. G. * Litvak M. Lisov D. Behar A. Boynton W. V. et al.

*Content of Hydrogen at Testing Spots of the Gale Crater: The First Data from DAN Onboard the Curiosity Mars Rover* [1487]

The first data from active measurements by DAN instrument is presented for the content of hydrogen at testing spots along the traverse of the Curiosity Rover.


*Chlorine and Hydrogen Contents from the First 90 Sols of MSL DAN Active Measurements* [1752]

Chlorine and hydrogen abundances are derived from MSL DAN active measurements. Analysis of DAN quick-look parameters and modeling of DAN data are presented.

3:45 p.m. Yingst R. A. Goetz W. Hamilton V. E. Hipkin V. Kah L. C. et al.

*Characteristics of Pebble and Cobble-Sized Clasts Along the Curiosity Rover Traverse from Sol 0 to 90* [1232]

The characteristics of small clasts suggest a complex interplay of varying lithologies, transport mechanisms, and environmental circumstances at Gale Crater.

4:00 p.m. Minitti M. E. * Yingst R. A. Edgett K. S. Dietrich W. E. Hamilton V. E. et al.

*Mars Hand Lens Imager (MAHLI) Observations of Rocks at Curiosity’s Field Site, Sol 0–100* [2186]

We describe the properties (e.g., color, structure, texture) of five rocks at Curiosity’s Gale crater field site observed by MAHLI at various pixel scales.

4:15 p.m. Schmidt M. E. * King P. L. Gellert R. Elliott B. Thompson L. et al.

*APXS of First Rocks Encountered by Curiosity in Gale Crater: Geochemical Diversity and Volatile Element (K and Zn) Enrichment* [1278]

APXS analyses of rocks to date in Gale Crater expand the range of Mars rocks to include compositions rich in volatile and alkali elements with high Fe and Mn.
4:30 p.m. Stolper E. M. * Baker M. B. Fisk M. Gellert R. King P. L. et al.  
The Petrochemistry of Jake_M: A Martian Mugearite [#1685]  
Rock “Jake_M” analyzed by the APXS on MSL is consistent with a highly fractionated alkaline rock. Its normative mineralogy and chemistry suggest a mugearite.

---

**PLANETARY VOLCANISM IN THE SOLAR SYSTEM**

**Monday, 2:30 p.m. Waterway Ballroom 5**

**Chairs:** Lynn Carter  
Carlton Allen

2:30 p.m. Denevi B. W. * Ernst C. M. Whitten J. L. Head J. W. Murchie S. L. et al.  
The Volcanic Origin of a Region of Intercrater Plains on Mercury [#1218]  
We present evidence for the volcanic origin of a region of intercrater plains associated with an ancient impact basin approximately the same size as Caloris.

2:45 p.m. Vander Kaaden K. E. * McCubbin F. M. Agee C. B.  
Experimental Constraints on the Density and Compressibility of Lavas from the Northern Volcanic Plains of Mercury [#1565]  
The goal of our study is to determine the density and compressibility for a NVP composition in order to assess its eruptability onto the surface of Mercury.

3:00 p.m. Allen C. C. * Donaldson Hanna K. L. Pieters C. M. Moriarty D. P. Greenhagen B. T. et al.  
Pyroclastic Deposits in Floor-Fractured Craters — A Unique Style of Lunar Basaltic Volcanism? [#1220]  
Small pyroclastic deposits in the lunar floor-fractured crater Alphonsus are distinct from nearby mare basalts but similar to regional pyroclastic deposits.

3:15 p.m. Jozwiak L. M. * Head J. W. Wilson L.  
Consequences of Shallow Lunar Magmatic Intrusion: Venting, Pyroclastics, and Subsidence Associated with Floor-Fractured Craters [#2170]  
We examine the consequences of a magmatic intrusion beneath floor-fractured craters. We explore magma degassing, pyroclastic eruptions, and subsidence.

3:30 p.m. Thorey C. * Michaut C.  
Floor Fractured Craters on the Moon: An Evidence of Past Intrusive Magmatic Activity? [#1508]  
Our model for the spreading of a magmatic intrusion below a crater-like topography is able to reproduce the main features of lunar floor-fractured craters.

3:45 p.m. Edwards C. S. * Bandfield J. L. Christensen P. R. Rogers A. D.  
The Formation of Infilled Craters by Impact Induced Decompression Melting of the Martian Mantle [#2153]  
Decompression melting of the mantle via impact excavation is an important, widespread, and ancient process that has dramatically shaped the surface of Mars.

4:00 p.m. Dundas C. M. * Keszthelyi L. P.  
Modeling Steam Pressure Under Martian Lava Flows: Implications for Rootless Eruptions [#2550]  
Melting and boiling ground ice beneath martian lava flows can trigger rootless-cone-forming explosions for ice at tens of centimeters depth.
4:15 p.m.  Huang J. *  Kraft M.  Christensen P. R.  Xiao L.  
*New Evidence for Early Explosive Volcanism on Mars [#2288]*  
We identified possible eroded remnants of pyroclastic flows on Noachian volcanoes to support that 
explosive volcanism was an important process on early Mars.

4:30 p.m.  Rathbun J. A. *  Lopes R. M.  Howell R. R.  Tsang C. C.  Spencer J. R.  
*Active Ionian Volcanoes from New Horizons: Combining Data from LORRI, MVIC, and LEISA [#1418]*  
New Horizons MVIC detected on Tvashtar and E. Girru while LORRI detected 54 emission sources. 
Seven hotspots were observed at short timescales with no variation.

---

**PLANETARY DYNAMICS AND TECTONICS**  
Monday, 2:30 p.m.  Waterway Ballroom 6  

**Chairs:** Andrew Dombard  
Patrick McGovern

2:30 p.m.  Weller M. B. *  Lenardic A.  
*Sensitivity of Tectonic States to Climatic Perturbations Over Geologic Time: Implications for Terrestrial Worlds [#1253]*  
As the surface warms / Convection becomes perturbed / Plate tectonics wane.

2:45 p.m.  Leone G. *  Tackley P. J.  Gerya T.  May D. A.  Zhu G.  
*3D Numerical Model for the Formation of the Martian Dichotomy and the Tharsis and Elysium Rises [#1089]*  
We investigate impact of a 1600 km of radius impactor with 70% of iron (in radius) in the southern polar region of Mars for the origin of the dichotomy.

3:00 p.m.  Lillis R. J. *  Stewart S. T.  Manga M.  
*Demagnetization by Basin Forming Impact on Early Mars: Contributions from Shock, Heating and Excavation [#1433]*  
Simulations reveal the relative importance of thermal versus shock demagnetization, with implications for identifying the dominant magnetic mineral on Mars.

3:15 p.m.  Karimi M. *  Dombard A. J.  
*Using Large Quasi-Circular Depressions to Study the Thermal History of the Northern Lowlands of Mars [#2631]*  
We constrain heat flux by simulating lower crustal flow beneath large QCDs. Our results show higher heat flux relative to that in the southern highlands.

3:30 p.m.  Elder C. M. *  Showman A. P.  
*Melt Migration Through Io’s Conve sting Mantle [#2993]*  
We consider the effects of melt migration in a column of rock rising through Io’s mantle between downwellng plumes.

3:45 p.m.  Rhoden A. R. *  Hurford T. A.  
*Obliquity-Controlled Lineament Azimuth Distributions on Europa [#2002]*  
Fixed mentor’s mistake / Non-synchronous rotation / Cannot explain cracks.

4:00 p.m.  Bills B. G. *  Stiles B. W.  Kirk R.  Howington-Kraus E.  Redding B. et al.  
*Titan Rotation: Constraints from Cassini Radar [#1313]*  
Cassini radar data constrain the rotational dynamics of Titan. The mean pole and spin rate are well determined. Variations are present, but enigmatic.
Elastic Thickness of Titan’s Ice Shell Estimated from a Combined Study of Gravity and Topography \[#1656\]
Cassini-derived gravity and topography data suggest that Titan’s ice shell is largely rigid and that its surface has undergone extensive erosion.

Evidence for Global Contraction on Titan from Patterns of Tectonism \[#2509\]
The goal of this study is to create a global map of the orientations of mountain chains on Titan in order to identify the sources of tectonic mechanism.

### FROM DUST TO PLANETS IN THE PROTOPLANETARY DISK

**Monday, 2:30 p.m.  Montgomery Ballroom [M156]**

**Chairs:**
Edward Young
Penelope Wozniakiewicz

2:30 p.m. Johnson T. V. *   Mousis O.   Lunine J. I.   Madhusudhan N.  
*Effects of Refractory Carbon Grains on Exoplanet Planetesimal Composition* \[#1403\]
We calculate planetesimal compositions for exoplanet systems with different C/O ratios, where 0.55 of C is in the form of organic CHON grains.

2:45 p.m. Wozniakiewicz P. J. *   Bradley J. P.   Ishii H. A.   Brownlee D. E.   Price M. C.   et al.  
*Pre-Accretional Sorting of GEMS in the Outer Solar Nebula* \[#2275\]
We report on new size distribution data for CP IDP components that suggests GEMS were sorted by a different mechanism to their accompanying crystalline grains.

3:00 p.m. Nuth J. A. III *   Paquette J. A.  
*Effects of Lightning in the Solar Nebula: Particle Size Distributions as a Function of Time and Distance from the Ionization Channel* \[#1740\]
Condensation of silicates following nebular lightning as functions of time and distance from the ionization channel for several different core channel temperatures are discussed.

3:15 p.m. Weidenschilling S. J. *  
*Gravitational Diffusion and Mixing During Accretion of the Asteroids* \[#2704\]
Quantitative modeling of radial migration and compositional mixing of asteroids due to scattering by planetary embryos during accretion.

3:30 p.m. Boley A. C.   Morris M. A. *   Desch S. J.  
*High-Temperature Processing of Solids in Planetary Embryo Bow Shocks* \[#2409\]
We describe a series of 3-D radiation hydrodynamics simulations that are used to examine thermal histories of solids as they pass through nebular bow shocks.

3:45 p.m. Young E. D. *   Rubie D. C.   O’Brien D. P.  
*Oxygen Isotopic Consequences of Giant Planet Migration* \[#1794\]
Consequences of the Grand Tack giant planet migration model for the oxygen-isotopic compositions of the terrestrial planets is investigated numerically.

4:00 p.m. Fischer R. A. *   Ciesla F.  
*Dynamics and Chemical Evolution of the Terrestrial Planets from a Large Number of N-Body Simulations* \[#2448\]
We performed 100 N-body simulations and combined them with a chemical model to study statistics of dynamics and chemical evolution of terrestrial planets.
4:15 p.m. Jacobsen S. B. * Petaev M. I. Huang S. Sasselov D. D.
*An Isotopically Homogeneous Region of the Inner Terrestrial Planet Region (Mercury to Earth): Evidence from E Chondrites and Implications for Giant Moon-Forming Impact Scenarios [#2344]*
E chondrites and Earth suggests an isotopically homogeneous inner terrestrial planet region. This explains identical isotope compositions for the Moon and Earth.

4:30 p.m. Fischer-Gödde M. * Burkhardt C. Kleine T.
*Origin of the Late Veneer inferred from Ru Isotope Systematics [#2876]*
Correlated Mo-Ru-isotope anomalies in meteorites indicate that the late veneer derives from the same isotopic reservoir than the building blocks of Earth.
TERRESTRIAL PLANETARY DIFFERENTIATION: CORE TO MANTLE
Tuesday, 8:30 a.m. Waterway Ballroom 1 [T201]

Chairs: Willem van Westrenen
James Day

8:30 a.m. Reufer A. *  Asphaug E.  Scott E. R. D.
Low-Velocity Collision, Inefficient Accretion, Hit-and-Run Disruption, and the Stripping of
Protoplanetary Cores [#3094]
Similar-sized collisions lead to a great diversity of planetary composition, and can produce iron-rich
cores by mantle stripping.

8:45 a.m. Dwyer C. A. *  Nimmo F.  Chambers J. E.
Chemical and Hf/W Isotopic Consequences of Lossy Accretion [#1773]
Modeled terrestrial planet accretion using an N-body code that had multiple possible outcomes for
impacts. Tracked bulk and Hf/W chemistry. Results are interesting.

9:00 a.m. Dauphas N. *  Kobayashi H.  Fornace M.  Tang H.
Chronological and Dynamical Constraints on the Accretion of Mars [#1305]
Mars formed from small planetesimals in a massive disk. Impacts and \(^{26}\)Al-decay provided sufficient
heat to induce formation of a global magma ocean.

9:15 a.m. Day J. M. D. *
Timing of Late Accretion and the Relationship Between Planetary Mantle Oxidation and Highly
Siderophile Elements [#1835]
Timing and varying amounts of late accretion highly-siderophile-element additions to solar system
planets place fundamental constraints on planetary accretion.

9:30 a.m. Kempl J.  Frost D. J.  Vroon P. Z.  Kowalski P. M.  van Westrenen W. *
Silicon Isotope Fractionation Between Metal and Silicate at High Pressure and High Temperature —
Implications for Earth’s Core [#1891]
Experiments show that metal-silicate Si-isotope fractionation at high pressure is smaller than
previously thought, further complicating core formation models.

9:45 a.m. Shahar A. *  Hillgren V. J.  Mesa-Garcia J.  Horan M. F.  Mock T. D.  et al.
Iron Isotope Fractionation in an Fe-S Alloy: Implications for Core Formation [#2351]
We investigated the effect of S content on the Fe-isotope fractionation between metal and silicate and
apply our results to martian differentiation.

10:00 a.m. Righter K. *  Danielson L. R.  Pando K.  Shofner G.  Lee C. T.
Modelling of Equilibrium Between Mantle and Core: Refractory, Volatile, and Highly
Siderophile Elements [#2358]
Equilibrium between mantle and core-forming metal can explain Earth’s primitive mantle
concentrations of refractory, volatile, and highly siderophile elements.

10:15 a.m. Dasgupta R. *  Chi H.  Duncan M.  Shimizu N.
Experimental Constraints on Speciation and Metal-Silicate Partitioning of Carbon in a
Magma Ocean — Implications for Core-Mantle Volatile Fractionation in Terrestrial Planets [#2255]
New experiments constrain speciation and metal-silicate partitioning of carbon in a magma ocean, and
shed light on the origin of volatiles in terrestrial planets.
10:30 a.m. Chabot N. L. * Wollack E. A. Humayun M.
* The Effect of Oxygen as a Light Element in Metallic Liquids on Partitioning Behavior [1562]
New experimental results indicate how an O-bearing metallic liquid would influence partitioning behavior during differentiation and core crystallization.

10:45 a.m. Huang S. * Jacobsen S. B. Mukhopadhyay S.
* Does the Earth have a Supercrondritic Sm/Nd Ratio? [2251]
Chondritic reservoir has ~50 ppm $^{142}$Nd variation. $^{147}$Sm-$^{143}$Nd-isotopic systematics of major terrestrial reservoirs show that Earth has a near-chondritic Sm/Nd.

11:00 a.m. Zhang Y. X.
* Superchondritic Mantle is Partially Depleted Mantle; and Quantification of the Spidergram Sequence [1823]
This report shows that the superchondritic mantle inferred from Nd isotopes is partially depleted mantle in terms of Sm/Nd, Lu/Hf, and Rb/Sr ratios.

The Volatile Chemistry of Apatite in Planetary Materials: Implications for the Behavior of Volatiles During Planetary Differentiation? [2731]
Apatites in basalts from Earth, Moon, Mars, 4 Vesta, and chondrites are used to understand the behavior of magmatic volatiles during planetary differentiation.

11:30 a.m. Hyung E. * Petaev M. I. Huang S. Jacobsen S. B.
* Is the Mantle Chemically Stratified? Insights from Isotopes and Modeling the Shear Wave Velocity of the Lower Mantle [2960]
Until Fe-Mg partition coefficients and elastic properties of mantle minerals are better constrained, there is no need for a chemically stratified mantle.

---

**SPECIAL SESSION: MARS SCIENCE LABORATORY III: THE ROCKNEST SAND DUNE**
Tuesday, 8:30 a.m. Waterway Ballroom 4 [T202]

**Chairs:**
Kenneth Edgett
Laurie Leshin

8:30 a.m. Kocurek G. Bridges N. T. Edgett K. S. Goetz W. Lewis K. W. et al.
Rocknest Sand Shadow at the Curiosity Field Site: Morphology, Origin and Stabilization [1375]
The morphology and wind regime of the Rocknest sand shadow are interpreted. This feature was the site of the first scooping activities by the MSL rover.

8:45 a.m. Edgett K. S. * Yingst R. A. Minitti M. E. Goetz W. Kah L. C. et al.
Mars Hand Lens Imager (MAHLI) Efforts and Observations at the “Rocknest” Eolian Sand Shadow in Curiosity’s Gale Crater Field Site [1201]
Here’s the scoop on MAHLI science observations and engineering support at the Rocknest sand shadow at Curiosity’s Gale Crater, Mars, field site.

Morphological and Chemical Characteristics of Sediment in the Rocknest Eolian Sand Shadow, Gale Crater, Mars [1222]
The Rocknest deposit shows (1) layering and (2) crust formation/cementation. LIBS data are consistent with late-stage mobilization of some cations (Li, Na, K).
*Mineralogy and Elemental Composition of Wind Drift Soil at Rocknest, Gale Crater [#1289]*  
Mineralogical/elemental analyses of soil from an aeolian bedform are reported. Results are compared to soil measurements by MER-A, and martian basalts.

*First X-Ray Diffraction Results from Mars Science Laboratory: Mineralogy of Rocknest Aeolian Bedform at Gale Crater [#1111]*  
CheMin XRD data revealed plagioclase, forsteritic olivine, augite, and another pyroxene, with minor oxide, silicate, and sulfate phases in a Gale Crater dune.

**9:45 a.m.** Morrison S. M. * Downs R. T. Blake D. F. Bish D. L. Ming D. W. et al.  
*Crystal-Chemical Analysis of Soil at Rocknest, Gale Crater [#1831]*  
This is a crystal-chemical analysis of data collected by the Mars Science Laboratory instrument, CheMin, on soil at Rocknest in Gale Crater.

**10:00 a.m.** Morris R. V. * Ming D. W. Blake D. F. Vaniman D. T. Bish D. L. et al.  
*The Amorphous Component in Martian Basaltic Soil in Global Perspective from MSL and MER Missions [#1653]*  
CheMin, APXS and Mössbauer data from MSL and MER show the XRD amorphous component of global basaltic soil is ~36 wt% with high SiO2/Al2O3 and Fe2O3/SiO2 ratios.

**10:15 a.m.** Mahaffy P. R. * Cabane M. Webster C. R. Archer P. D. Atreya S. K. et al.  
*Curiosity’s Sample Analysis at Mars (SAM) Investigation: Overview of Results from the First 120 Sols on Mars [#1395]*  
Overview of results from Curiosity’s Sample Analysis at Mars (SAM) investigation during the first 120 martian sols are summarized.

**10:30 a.m.** Archer P. D. Jr * Sutter B. Ming D. W. McKay C. P. Navarro-González R. et al.  
*Possible Detection of Perchlorates by Evolved Gas Analysis of Rocknest Soils: Global Implications [#2168]*  
The SAM instrument on MSL has tentatively identified perchlorate, confirming Phoenix results. Implications of globally-distributed perchlorates are discussed.

**10:45 a.m.** Leshin L. A. Webster C. R. Mahaffy P. R. Flesch G. J. Christensen L. E. et al.  
*Hydrogen Isotopic Composition of Water in the Martian Atmosphere and Released from Rocknest Fines [#2234]*  
SAM TLS analysis of H isotopes in water from the atmosphere and Rocknest fines of Mars reveals D-enriched values comparable to telescopic and meteorite data.

**11:00 a.m.** Franz H. B. * McAdam A. C. Stern J. C. Archer P. D. Jr. Sutter B. et al.  
*Carbon and Sulfur Isotopic Composition of Rocknest Soil as Determined with the Sample Analysis at Mars (SAM) Quadrupole Mass Spectrometer [#2066]*  
We present preliminary carbon and sulfur-isotope ratios determined with SAM’s quadrupole mass spectrometer by evolved gas analysis of Rocknest soil.

**11:15 a.m.** Stern J. C. * Steele A. Brunner A. E. Coll P. Eigenbrode J. L. et al.  
*Detection of Reduced Nitrogen Compounds at Rocknest Using the Sample Analysis at Mars (SAM) Instrument on the Mars Science Laboratory (MSL) [#2790]*  
Reduced nitrogen compounds were detected in Gale Crater solid samples by Sample Analysis at Mars (SAM) on MSL. Studies to elucidate their origins are underway.
*Investigating the Origin of Chlorohydrocarbons Detected by the Sample Analysis at Mars (SAM) Instrument at Rocknest [#1080]*  
Several chlorohydrocarbons were detected by the SAM instrument after pyrolysis of the Rocknest sample. The origin of these organics will be discussed.

<table>
<thead>
<tr>
<th>Time</th>
<th>Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:30 a.m.</td>
<td>Glavin D. P. * Archer D. Brunner A. E. Buch A. Cabane M. et al.</td>
<td><em>Investigating the Origin of Chlorohydrocarbons Detected by the Sample Analysis at Mars (SAM) Instrument at Rocknest</em></td>
</tr>
</tbody>
</table>

**CHONDRITES: FORMATION AND ALTERATION**

**Tuesday, 8:30 a.m. Waterway Ballroom 5 [T203]**

Chairs: Michael Weisberg  
Kieren Howard

8:30 a.m. Weisberg M. K. * Ebel D. S. Connolly H. C. Jr.  
*EL3 Chondrites: Primitive Nebular Materials, not Products of Asteroidal Processing [#2871]*  
EL3s consist of chondrules and metal nodules enclosing mixtures of silicates, FeNiP, troilite, daubreelite, and graphite. Their origins are evaluated.

8:45 a.m. Wang K. * Moynier F. Paniello R. C.  
*Iron Isotopic Fractionation during Metal/Silicate Segregation in Enstatite Chondrite and Aubrite Parent Bodies [#2254]*  
We report the Fe isotopes of 22 aubrites and enstatite chondrites as well as separated phases (magnetic and nonmagnetic) and discuss their origins.

9:00 a.m. Gross J. * Treiman A. H. Connolly H. C. Jr.  
*A New Subgroup of Amphibole-bearing R Chondrites: Evidence from the New R-Chondrite MIL 11207 [#2212]*  
MIL 11207 is the second R chondrite that bears water-rich minerals like amphibole and biotite, suggesting a new subclass or grouplet of chondrites.

9:15 a.m. Ruzicka A. * Hutson M. Jamsja N. Stout T.  
*Anhydrous and Hydrous R Chondrites: Evidence from NWA 6491, 6492 and the Newly Discovered NWA 7514 [#1168]*  
Alteration effects in three R chondrites suggest that the dominant OH-bearing assemblages in some are produced by the alteration of sulfide.

9:30 a.m. Le Guillou C. * Dohmen R. Müller T. Vollmer C. Rogalla D. et al.  
*Serpentinization of Amorphous Silicate in the Early Solar System: A Nanoscale Experimental Study [#1969]*  
Kinetics of hydration studied to constrain the nebular and asteroidal aqueous alteration scenarios. Fast reaction rate and similarities with CR3 are observed.

9:45 a.m. Howard K. T. * Alexander C. M. O'D.  
*A New Classification Scheme for Aqueously Altered Carbonaceous Chondrites Based on Total Phyllosilicate Abundance [#2598]*  
We demonstrate a new classification scheme for aqueously altered carbonaceous chondrites that is high resolution and applicable to samples from all groups.

10:00 a.m. Sutton S. * Cloutis E. A. Alexander C. M. O'D.  
*The Valence State of Fe and the Origin of Water in Chondrites [#2357]*  
We explore the implications of bulk Fe valence state measurements of CM, CR, CI, and O chondrites for the origins of chondritic water.
10:15 a.m. Stephant A. * Rémusat L. Robert F.
*Hydrogen Isotopic Compositions and Water Contents in Type I Chondrules of Paris CM Chondrite [#1560]*
Analyses of water contents and D/H ratios performed on Paris chondrules attest to the presence of a specific process responsible for large D/H heterogeneities.

10:30 a.m. Dyl K. A. * Cleverley J. S. Bland P. A. Ryan C. G.
*Abundance, Spatial Variability, and Geochemistry of Transition Metals in Carbonaceous Chondrite Matrices [#2143]*
We show the quantified abundances of transition metals in samples of Vigarano, Murchison, Cold Bokkeveld, and Bells. Heterogeneity exists at the micrometer scale.

10:45 a.m. Leroux H. * Cuillier P. Zanda B. Hewins R. H.
*A TEM Investigation of the Fine-Grained Matrix of the Paris CM Chondrite [#1528]*
We present a TEM study on the weakly altered Paris CM chondrite to specify the first stages of evolution of the fine-grained components in a CM parent body.

11:00 a.m. Davidson J. * Nagashima K. Krot A. N. Lauretta D. S.
*Oxygen Isotopic Compositions of Magnetite and Chondrule Olivine in CK3 Carbonaceous Chondrites: Links to the CV3 Chondrites [#2522]*
We present in situ O-isotope measurements of magnetite and associated chondrule olivine in the CK3s Asuka 881595 and Watson 002 to investigate CV3/CK links.

11:15 a.m. Scott E. R. D. * Krot T. V. Goldstein J. I.
*Thermal and Impact Histories of Ordinary Chondrites and Their Parent Bodies: Constraints from Metallic Fe-Ni in Type 3 Chondrites [#1826]*
Metallographic cooling rates of H3 chondrites and cloudy taenite studies are incompatible with the onion-shell model and require impact mixing during cooling.

*PCA 02012: A Unique Thermally Metamorphosed Carbonaceous Chondrite [#2708]*
We report a unique thermally metamorphosed carbonaceous chondrite PCA 02012 suggesting a new insight into material evolution of CM chondrite group.

---

**ORIGIN AND EVOLUTION OF THE MOON**
**Tuesday, 8:30 a.m. Waterway Ballroom 6 [T204]**

**Chairs:** Bradley Jolliff
Charles Shearer

**8:30 a.m.** Taylor S. R. * Koeberl C.
*The Origin of the Moon Revisited [#1165]*
Processes that occur during large-scale impact events can provide guidance in understanding certain aspects of the composition of the Moon.

**8:45 a.m.** Pahlevan K. *
*Developing the Rare Earth Element Constraint for Scenarios of Lunar Origin [#3073]*
The absence of volatility-related rare-Earth-element anomalies (e.g., Ce) places constraints on any scenario of lunar origin. Here we develop this constraint.
9:00 a.m. Nekvasil H. * Coraor A. E. DiFrancesco N. Lindsley D. H. Ustunisik G.

*Alkali Depletion of the Bulk Moon, is it Required? [#2830]*
Considerations of plagioclase stability in highlands lithologies suggests that the lunar magma ocean need not have been as alkali depleted as currently thought.

9:15 a.m. Dhaliwal J. K. * Day J. M. D. Moynier F. Kato C. Valdes M.

*Constraints on Earth-Moon System Formation from Zinc [#2749]*
Volatile depletion on the Moon, most recently observed in zinc data, may be explained by late accretion mechanisms or oxidation states different from Earth.

9:30 a.m. Nakajima M. * Stevenson D. J.

*Thermodynamic Processes During the Moon-Forming Impact [#2680]*
We have run various giant impact simulations with SPH and investigated thermodynamic structures of the Moon-forming disks and Earth’s mantles.

9:45 a.m. Visscher C. * Fegley B. Jr.

*Chemistry of the Protolunar Disk [#1546]*
Melt-vapor chemical models of the protolunar disk show that impact-generated disk atmospheres are marked by abundant SiO, O, O₂, Na, and high oxygen fugacity.

10:00 a.m. Desch S. J. * Taylor G. J.

*Isotopic Mixing due to Interaction Between the Protolunar Disk and the Earth’s Atmosphere [#2566]*
We argue mixing between Earth and the Moon was vigorous but self-limiting and brief. All isotopes were mixed, then only some moderate volatiles fractionated.

10:15 a.m. Armytage R. M. G. * Brandon A.

*A Non-Chondritic Earth as the Result of Collisional Erosion in the Giant Impact: Constraints from Existing Lunar ⁴²Nd Data [#1708]*
Using lunar ¹⁴²Nd data, we assess the viability of collisional erosion during the giant impact generating a superchondritic Sm/Nd in bulk silicate Earth.

10:30 a.m. Sprung P. * Kleine T. Scherer E. E.

*Hafnium-Neodymium Isotopic Evidence for a Chondritic Composition of the Moon [#1594]*
The lunar Hf-Nd-isotopic record requires chondritic Lu/Hf and Sm/Nd of the bulk Moon once the significant effects of neutron capture reactions are considered.

10:45 a.m. Laneuville M. * Wieczorek M. A. Breuer D.

*Asymmetric Thermo-Chemical Evolution of the Moon [#1636]*
We study the influence of high heat sources concentration on the nearside of the Moon on its thermochemical evolution.

11:00 a.m. Davenport J. D. * Neal C. R.

*LMO Theory, Reverse Modeling, KREEP, and Ground Truth: Clues to the Bulk LMO Composition? [#2885]*
An investigation into the nature and composition of the initial bulk LMO using forward and reverse modeling from a urKREEP composition.

11:15 a.m. Jolliff B. L. * Korotev R. L. Zeigler R. A.

*Basin Excavation, Lower Crust Composition, and Bulk Moon Mass Balance in Light of a Thin Crust [#2655]*
Samples and compositional data reflect a mafic crustal component that must be accounted for in models of lunar structure based on new evidence for a thin crust.
11:30 a.m. Shearer C. K. * Burger P. V. Marks N. E. Borg L. E. Gaffney A. M.
Petrology and Chronology of Early Lunar Crustal Building I. Comprehensive Examination of a Ferroan Anorthosite Clast in 60016 [#1689]
We combine textural, microbeam, isotopic observations-measurements to decipher the petrogenesis of a FAN clast and the primordial differentiation of the Moon.

LICENSE TO CHILL: ICY SATELLITE INTERIORS AND SURFACE PROCESSES
Tuesday, 8:30 a.m. Montgomery Ballroom [T205]

Chairs: Steven Vance
Robert Pappalardo

8:30 a.m. Hammond N. P. * Barr A. C.
Determining Ice Shell Conditions Conducive to Convection-Driven Grooved Terrain Formation on Ganymede [#1771]
We determine the likely range of ice shell thicknesses necessary for grooved terrain on Ganymede to form by convective driven resurfacing.

8:45 a.m. Vance S. * Bouffard M. Choukroun M. Sotin C.
Aqueous and Solid-Phase Equations of State for the H2O-MgSO4 System: Prediction of Ocean and Ice Thicknesses for Ganymede and Other Icy Worlds [#1872]
Pressure, heat, and salt make sometimes a great ocean, new data reveal.

9:00 a.m. Singer K. N. * McKinnon W. B. Schenk P. M.
Ice Lithosphere Thickness on Europa from Impact Basin Ring-Graben [#2197]
We measure graben widths, depths, and spacing around Tyre and Callanish to produce radial strain profiles and estimate ice shell brittle-ductile transitions.

9:15 a.m. Soderlund K. M. * Schmidt B. E. Blankenship D. D. Wicht J.
Dynamics of Europa’s Ocean and Sensitivity to Water Properties [#3009]
We use numerical simulations of thermal convection to investigate Europan ocean dynamics and to constrain how the ocean may influence the overlying ice shell.

9:30 a.m. Hobley D. E. J. * Moore J. M. Howard A. D.
How Rough is the Surface of Europa at Lander Scale? [#2432]
Europa girdled / By jagged blades of ice. Are / Returns polarized?

Surface Composition near the Trailing Hemisphere Apex on Europa [#3011]
Surface deposits near Europa’s trailing hemisphere apex include several terrain types and reveal a complex interplay between endogenic and exogenic processes.

10:00 a.m. Scipioni F. * Tosi F. Ciarniello M. Capaccioni F. Filacchione G. et al.
Spectroscopic Identification and Classification of Terrain Units on Dione’s and Rhea’s Surfaces Based on Cassini/VIMS Data [#1995]
We identified nine and eight terrain units on Dione’s and Rhea’s surface respectively, correlated to specific surface morphologies, analyzing Cassini/VIMS-IR cubes.

10:15 a.m. Howett C. J. A. * Spencer J. R. Paranicas C. Schenk P. M.
Surface Alteration of Saturn’s Icy Satellite Surface by High-Energy Electron Bombardment [#2824]
A comparison and interpretation of the characteristics of thermally anomalous regions discovered on Mimas, Tethys, and most recently Dione.
10:30 a.m.  Mitchell K. L. *  Khankhoje U. K.  Castillo-Rogez J. C.  Wall S. D.  
*Enceladus’ Brilliant Surface: Cassini RADAR Observations and Interpretation [#2902]*
Cold Enceladus / Ice and weathered snow reflect / To dazzle radar.

10:45 a.m.  Yin A. *  Pappalardo R. T.  
*Left-Slip Faulting Along the Tiger Stripe Fractures: Implications for the Tectonic Evolution of the South Polar Terrain, Enceladus [#1145]*
We present a model that the development of the Tiger Stripe fractures was a result of bookshelf faulting due to clockwise rotation of the South Polar Terrain.

11:00 a.m.  Porco C. *  DiNino D.  Nimmo F.  
*How the Jets, Heat and Tidal Stresses Across the South Polar Terrain of Enceladus are Related [#1775]*
Data from Cassini and models of tidal stresses, energy transport and crack propagation yield a consistent explanation for Enceladus’ south polar activity.

11:15 a.m.  Weiss J. W. *  Porco C. P.  Mitchell C. J.  
*The Identification of Non-Axisymmetric Features in Cassini Low-Resolution, High-Phase Images of Saturn’s E Ring [#2989]*
Report on efforts to match tendril features in Saturn’s E ring with jets of Enceladus.

11:30 a.m.  Pappalardo R. T. *  Schubert G.  
*Enceladus and Miranda: Similar Histories of Low-Order Convection and Reorientation During Differentiation [#2808]*
We propose antipodal leading and trailing tectonized regions on Miranda and Enceladus were formed simultaneously by degree-2 convection during differentiation.

---

**RISING TO THE CHALLENGE:**
**IMPROVING THE PUBLIC UNDERSTANDING OF SCIENCE IN THE NEXT DECADE**
**Tuesday, 1:30 p.m.  Waterway Ballroom 1 [T251]**

**Chairs:**  Stephanie Shipp  
Stephen Mackwell

1:30 p.m.  Sykes M. V. *  
*Planetary Science: The Need and Responsibility to Engage the Public and the Challenge of Effectiveness [#2453]*
Planetary scientists have both the opportunity and responsibility to engage the public in science. Are we doing so effectively?

1:45 p.m.  Storksdieck M. *  
*What Does the Public Need to Know? The Nature of Science and Functioning Public Scientific Literacy [#2518]*
Science presented to the general public often focuses on content. However, also sharing the nature of science may create a more scientifically literate public.

2:00 p.m.  Becker S. *  Johnson L.  
*Engaging the Public in Planetary Science Through Emerging Technology and New Media [#2561]*
This presentation will explore ways to effectively increase public awareness, literacy, and engagement in science through emerging technologies and new media.

2:15 p.m.  *Panel/Audience Discussion Led by Session Chairs*
2:45 p.m. Spitz A. H. * Hergenrother C. W. Hill D. H. Lauretta D. S. 
*OSIRIS-REx Target Asteroids! Involving the Public in Asteroid Research and Scientists with the Public [#2934]
OSIRIS-REx’s “Target Asteroids!” is a citizen science program for amateur astronomers that contributes to basic scientific understanding of near-Earth objects.

3:00 p.m. Cudnik B. M. * Day B. H. 
*Ground Based Observations of Lunar Meteoroid Phenomena in Support of the LADEE Mission [#1718]
This paper introduces the LADEE mission to the Moon and describes the type of groundbased observations requested to support the science of the mission.

*The Dawn Mission’s Use of Google + Hangout for Professional Development and Product Assessment [#2899]
The Dawn mission team has successfully engaged the public in mission science through the use of numerous social media platforms.

3:30 p.m. Viotti M. A. * Edgett K. S. 
*Follow Your Curiosity: A New Era of Public Participation in Discovery [#2969]
The Mars Public Engagement program has been exploring new learning technology to effectively engage the public in Mars science.

3:45 p.m. McPhee J. C. * 
*Engaging the World in Dialogue About Space: Humans in Space Youth Art Competition [#2927]
The Humans in Space Youth Art Competition widely engages the public in dialogue about and participation in the future of space exploration.

4:00 p.m. Gay P. L. * Gugliccu N. Bracey G. Lehan C. Lewis S. 
*The CosmoQuest Virtual Research Facility for the Public [#2811]
The CosmoQuest virtual research center engages the public in geomorphology science in an educationally scaffolded environment.

4:15 p.m. Panel/Audience Discussion Led by Session Chairs

---

**MARS EXPLORATION ROVER: RESULTS FROM ENDEAVOUR CRATER**

**Tuesday, 1:30 p.m. Waterway Ballroom 4 [T252]**

**Chair:** Matthew Golombek

1:30 p.m. Noe Dobrea E. Z. * Wray J. J. Calef F. J. Parker T. J. Murchie S. L. 
New analyses of CRISM data of Endeavour Crater lead to new insights on the origin, transport, and alteration of hydrated minerals at Endeavour Crater.

1:45 p.m. Squyres S. W. * Arvidson R. E. Athena Science Team 
*Overview of Opportunity Rover Results from Clay-Bearing Materials at Endeavour Crater [#2352]
Overview of scientific results to date from Opportunity’s exploration of clay-bearing materials at Endeavour crater.
2:00 p.m. Crumpler L. S. *  Athena M. E. R.
Field Geologic Context of Opportunity Traverse from Greeley Haven to the Base of Matijevic Hill [#2292]
Field geologic mapping results at Endeavour Crater by MER Opportunity has identified evidence for a long history of nonacidic water availability on early Mars.

2:15 p.m. Herkenhoff K. E. *  Arvidson R. E.  Jolliff B. L.  Weitz C. M.  Athena Science Team
Recent Results from the Opportunity Microscopic Imager [#2462]
The Microscopic Imager on the Opportunity rover continues to return useful data, most recently showing new types of spherules and bright veins at Cape York.

2:30 p.m. Farrand W. H. *  Ruff S. W.  Rice M. S.  Arvidson R. E.  Jolliff B. L.  et al.
Veins in Matijevic Hill Lithologic Units Observed by Opportunity [#2482]
The occurrences of veins in the rock units of the Matijevic Hill portion of the rim of Endeavour crater, being explored by the Opportunity rover, are described.

2:45 p.m. Cohen B. A. *  Clark B. C.  Gellert R.  Klingelhöfer G.  Ming D. W.  et al.
Mars Exploration Rover APXS Results from Matijevic Hill [#2294]
Basaltic outcrops / Newberries, breccias, and veins / Clays still elusive.

3:00 p.m. Arvidson R. E. *  Bennett K.  Catalano J.  Fraeman A.  Gellert R.  et al.
Smectites on Cape York, Matijevic Hill, Mars, as Observed and Characterized by CRISM and Opportunity [#1286]
We describe the first ground-based observations of phyllosilicates on Mars and discuss implications based on the combined CRISM and Opportunity measurements.

### IMPACT PROCESSES ON MARS

**Chair:** Nadine Barlow

**Chair:** Nadine Barlow

3:15 p.m. Nuhn A. M. *  Tornabene L. L.  Osinski G. R.  McEwen A. S.
Decameter-Scale Morphologic and Structural Martian Mapping of Layered Bedrock in Crater Central Uplifts [#2402]
We will present comparative morphologic and structural mapping of uplifts within three 30-km complex craters on Mars.

3:30 p.m. Bamberg M. *  Jaumann R.  Asche H.  Kneissl T.  Michael G. G.
Observations and Origins of Fractured Craters on Mars [#2362]
Floor fractured craters can be used to investigate the climatic conditions and therefore the fluvial and volcanic activity at the Noachian-Hesperian boundary.

3:45 p.m. Barlow N. G. *  Boyce J. M.
Martian Low-Aspect Ratio Layered Ejecta (LARLE) Craters: Constraints on Formation Models from Analysis of LARLE Distribution and Characteristics [#1196]
We have completed a survey of all LARLE craters within the ±75 latitude zone on Mars. Lobateness and ejecta mobility values support a base surge formation.

4:00 p.m. El Maarry M. R. *  Dohm J. M.  Michael G.  Thomas N.
Morphology and Temporal Evolution of the Ejecta of Hale Crater in the Argyre Basin, Mars: Results from High Resolution Mapping [#3064]
We investigate the ejecta of Hale Crater using HiRISE images to understand their fluid nature.
4:15 p.m. Daubar I. J. * McEwen A. S. Byrne S.
How Accurately can we Date Recent Climate Change on Mars? [#2977]
We question claims of recent martian climate change based on small craters. The current impact rate is presented; uncertainties in cratering ages persist.

4:30 p.m. Frey H. V. * Mannoia L. M.
A Revised, Rated and Dated Inventory of very Large Candidate Impact Basins on Mars [#2501]
Reevaluation of evidence for very large Mars impact basins suggests 32 good candidates, rated on the strength of topographic and crustal thickness signatures.
3:15 p.m. Lyons J. R. *
*Photodissociation of CO Isotopologues: Models of Laboratory Experiments and Implications for the Solar Nebula [#2984]*
New models of the photolysis of CO isotopologues reproduce experiments, and predict three-isotope oxygen slope near unity for some stellar spectra.

*Huge Isotope Effect in VUV Photodissociation of N₂: Implications for Meteorite Data [#1043]*
Huge nitrogen-isotopic fractionation during VUV photodissociation of N₂ is reported along with a theoretical model and is useful for understanding meteorite data.

3:45 p.m. Wasserburg G. J. * Yin Q.-Z.
*The ²⁶Al-Oxygen Isotope Conundrum [#2841]*
No late injection or multi-component ²⁶Al source is required. Continuous and variable infall rates from a uniform source could explain ²⁶Al and oxygen isotopes.

4:00 p.m. Boss A. P. *
*Short-Lived Radioisotope Homogeneity and Stable Oxygen Isotope Heterogeneity: Single Shot Versus Continuous Injection at the Surface of the Outer Solar Nebula [#1082]*
Three-dimensional disk models show that single-shot injection at the outer disk surface leads to isotopic homogeneity but continuous injection leads to isotopic heterogeneity.

4:15 p.m. Desch S. J. * Pan L. Scannapieco E. Timmes F. X.
*Mixing of Clumpy Supernova Ejecta into Nearby Molecular Clouds [#2692]*
We show clumpy supernova ejecta can contaminate nearby molecular gas at levels ~10⁻⁴. All late-forming stars will have meteoritic abundances of radionuclides.

4:30 p.m. Liu M.-C. * Chaussidon M. Srinivasan G. McKeegan K. D.
*Origins of Calcium-41 in the Early Solar System: A Stellar Source or Protosolar Irradiation? [#1765]*
We report some preliminary results from a quantitative investigation of the possible astrophysical origins for ⁴¹Ca.

---

**SPECIAL SESSION: GRAIL EXPLORES THE MOON’S INTERIOR**

**Tuesday, 1:30 p.m. Waterway Ballroom 6 [T255]**

**Chairs:** Maria Zuber  
Walter Kiefer

1:30 p.m. Zuber M. T. * Smith D. E. Asmar S. W. Konopliv A. S. Lemoine F. G. et al.
*Gravity Recovery and Interior Laboratory (GRAIL): Extended Mission and Endgame Status [#1777]*
The GRAIL extended mission has provided gravity models that are being used to map the upper crust of the Moon in unprecedented detail.

1:45 p.m. Wieczorek M. A. * Nimmo F. Kiefer W. S. Neumann G. A. Miljkovic K. et al.
*High-Resolution Estimates of Lunar Crustal Density and Porosity from the GRAIL Extended Mission [#1914]*
GRAIL gravity data show that the crust of the Moon has been highly fractured by billions of years of impact cratering.

*Theoretical and Observational Constraints on Lunar Mega-Regolith Thickness [#2463]*
Thermal models predict lunar porosity extending to maximum depths of tens of kilometers. Admittance studies can detect layers of this thickness.
Revised Thickness of the Lunar Crust from GRAIL Data: Implications for Lunar Bulk Composition \[\#1783\]
Analyses of GRAIL data indicate a relatively thin lunar crust, leading to the conclusion that the Moon is not enriched in refractory elements compared to Earth.

GRAIL Gravity Observations of Lunar Volcanic Complexes \[\#2030\]
GRAIL gravity observations constrain the volume, thickness, compensation state, and magmatic plumbing of lunar volcanic fields.

GRAIL Search for Cryptomaria \[\#2755\]
Using maps of the Moon’s Bouguer gravity anomaly derived from GRAIL data, we search for lunar deposits of cryptomaria.

Impact-Generated Loading and Lithospheric Stress Gradients at Lunar Impact Basins: Implications for Maria Emplacement Scenarios \[\#3055\]
Impact-induced crustal thickening around lunar basins produces uplift that generates lithospheric stresses favorable to magma ascent and mare emplacement.

The Inventory of Lunar Impact Basins from LOLA and GRAIL \[\#2379\]
The inventory of lunar basins revealed by GRAIL does not indicate a more extensive history of lunar impacts as has been previously suggested.

The Origin of Lunar Mascon Basins, Part I. Impact and Crater Collapse \[\#2043\]
We use GRAIL data with hydrocode and finite-element modeling to explain the origin of lunar mascon basins. This is Part 1/2, covering hydrocode results.

The Origin of Lunar Mascon Basins, Part I. Cooling and Isostatic Adjustment \[\#2037\]
We use GRAIL data with hydrocode and finite-element modeling to explain the origin of lunar mascon basins. This is Part 2/2, covering FEM results.

Asymmetric Distribution of Lunar Impact Basins Caused by Variations in Target Properties \[\#1926\]
GRAIL revealed more large impact basins on the lunar nearside than farside. Impact modeling shows that variations in target properties affect the basin size.

Properties of the Lunar Interior: Preliminary Results from the GRAIL Mission \[\#3092\]
GRAIL analyses provide lunar gravity field, Love number, and moment of inertia with improved uncertainties.

GRAIL Gravity Field of the Lunar South Polar Region \[\#1749\]
Gravity over the south pole is compared with other data, including Bouguer gravity, crustal thickness and density, surface temperatures, and neutron results.
MOONLAKER: TITAN’S FLUVIAL PROCESSES, SURFACE GEOLOGY AND ATMOSPHERE
Tuesday, 1:30 p.m. Montgomery Ballroom [T256]

Chairs: Thomas McCord
Alexander Hayes

1:30 p.m. McCord T. B. * Hayne P. O. Sotin C. Constraints on Titan’s Surface Composition Using VIMS Solar Occultation Measurements [#1687]
VIMS solar occultation observations are used to estimate atmospheric effects and determine surface reflectance and composition.

We will present an examination of Titan’s polar landscapes through an examination of the relationships between lacustrine, fluvial, and hillslope morphologies.

2:00 p.m. Wood C. A. * Stefan E. R. Hayes A. G. Kirk R. K. Lunine J. I. et al. Morphological Evidence for Former Seas Near Titan’s South Pole [#1764]
Residual small lakes and extensive sea beds attest to extensive surface liquids near Titan’s south pole, perhaps 30–50 k.y. ago.

The importance of aquifer properties and climate on the size distribution and seasonality of lakes on Titan is investigated using a groundwater flow model.

2:30 p.m. Glein C. R. * Shock E. L. Introducing a New Kind of Geochemistry: The Thermodynamics of Cryogenic Fluvial Geochemistry on Titan [#1229]
We present a thermodynamic model that allows exploration of the geochemistry that is driven by cold liquid hydrocarbons on Saturn’s moon Titan.

2:45 p.m. Malaska M. * Hodyss R. Laboratory Investigation of Benzene Dissolving in a Titan Lake [#2744]
Tiny little rings / Drifting in a Titan lake / Fade away slowly.

3:00 p.m. Wagner A. * Chevrier V. F. Magar S. S. Luspay-Kuti A. Roe L. A. Evaporation of Ethane-Methane Liquid Mixtures Under Simulated Titan Conditions [#3047]
We present the results of an experimental study regarding the evaporation rates of liquid ethane-methane mixtures under simulated Titan conditions.

The thermal destabilisation of methane clathrates by cryolava flows and intrusions is sufficient to resupply Titan’s current atmospheric methane.

3:30 p.m. Moore J. M. * Howard A. D. Schenk P. M. Bedrock Denudation on Titan: Estimates of Vertical Extent and Lateral Debris Dispersion [#1763]
Analysis of Titan’s landscape that suggest that ~ 250 m of net bedrock erosion has at least locally taken place and ~1 km of maximum local erosion.
3:45 p.m. Singh S.* Chevrier V. F. Ulrich R.  
*Numerical Modeling of Titan Fluvial Features [2913]*  
Minimum constraints of the fluid flows on Titan have been calculated to determine the boulder size with viscosity and temperature-dependent fluid equation.

*Alluvial Fans on Titan Reveal Materials, Processes and Regional Conditions [2641]*  
Alluvial fans on Titan reveal vigorous fluvial processes occur or occurred, indicate a prolonged depositional history, and may illuminate climate conditions.

*The Unusual Crater Soi on Titan: Possible Formation Scenarios [2079]*  
Titan’s Soi crater / Barely makes a surface dent / Filled by sediments?

4:30 p.m. Garcia A.* Rodriguez S. Le Gall A. Courrech du Pont S. Narteau C. et al.  
*Global Mapping and Characterization of Titan’s Dune Fields with Cassini: Correlation Between RADAR and VIMS Observations [1978]*  
We analyzed dunes coverage of Titan’s surface and the correlation between the dunes imaged by the RADAR/SAR with the two “brown” and “blue” units given by VIMS.
SPECIAL SESSION: DAWN: VESTA FROM THE INSIDE OUT
Wednesday, 8:30 a.m. Waterway Ballroom 1 [W301]

Chairs: Paul Schenk
Bonnie Buratti

Vesta in the Light of Dawn [#1200]
Dawn’s observations put Vesta in a new light.

8:45 a.m. Fu R. R. * Hager B. H. Ermakov A. I. Zuber M. T.
Early Viscous Relaxation of Asteroid Vesta and Implications for Late Impact-Driven Despinning [#2115]
Finite-element simulations suggest that early Vesta achieved hydrostatic equilibrium. Possible relic hydrostatic terrains indicate 6% late despinning.

9:00 a.m. Roberts J. H. * Rivkin A. S. Chabot N. L.
Thermal Challenges for an Ancient Dynamo on Vesta [#2349]
Magnetized eucrites / Whence the remanent B-field? / Vesta’s core stable.

Vestalia Terra: An Ancient Mascon in the Southern Hemisphere of Vesta [#2882]
Vestalia Terra is an ancient terrain on Vesta that displays the highest topography on the asteroid and is associated with a significant mascon.

9:30 a.m. Mandler B. E. * Elkins-Tanton L. T.
Chemical Models for the Crystallization of a Magma Ocean on Vesta: Making HED Lithologies and the Narrow Range in Eucrite Compositions [#2350]
Our model produces all HEDs and the narrow range in eucrite compositions by magma ocean crystallization, melt extraction, and recharge of shallow magma chambers.

9:45 a.m. Wasson J. T. *
No Magma Ocean on Vesta (or Elsewhere in the Asteroid Belt; Volatile Loss from HEDs [#2836]
Magma oceans could not form in the asteroid belt. Radiogenic sources heat too slowly, and hot impact debris is lost. Impacts can produce magmas and volatile loss.

10:00 a.m. Bowling T. J. * Johnson B. C. Melosh H. J.
Formation of Equatorial Graben Following the Rheasilvia Impact on Asteroid 4 Vesta [#1673]
Modeling of the Rheasilvia impact on 4 Vesta suggests that the equatorial graben observed by Dawn opened following the passage of the impact wave.

10:15 a.m. Stickle A. M. * Schultz P. H. Crawford D. A.
Subsurface Shear Failure in Spherical Bodies: A Possible Formation Mechanism for the Surface Troughs on 4 Vesta [#2417]
Laboratory experiments combined with numerical models suggest a possible formation mechanism for the surface troughs observed on Vesta by the Dawn spacecraft.

10:30 a.m. Buczkowski D. L. * De Sanctis M. C. Raymond C. A. Wyrick D. Y. Ammannito E. et al.
Brumalia Tholus: An Indication of Magmatic Intrusion on Vesta? [#1996]
We show evidence that Brumalia Tholus represents a dike on Vesta, formed due to magmatic intrusion into subsurface fractures under the Vestalia Terra region.
10:45 a.m.  Titus T. N. *  Becker K. J.  Tosi F.  Capria M. T.  De Sanctis M. C.  et al.  
**Analysis of Temperature and Thermal Inertia of the Surface of Vesta Using Dawn VIR Survey Observations [2400]**
In this analysis, we attempted to remove many of the surface physical properties that influence variations in thermal emission and to quantify thermal inertia.

11:00 a.m.  Lunning N. G. *  McSween H. Y.  Corrigan C. M.  
**Vesicular Impact-Melt Clasts in Carbonaceous Chondrites: Evidence from the CV3 Meteorite LAR 06317 and Relevance to Surface Processes on the Asteroid 4 Vesta [1407]**
This study identifies and describes CV vesicular impact-melt clasts, and their relevance to impact features in carbonaceous-chondrite-bearing regolith on Vesta.

**Neutron Absorption Measurements Constrain Eucrite-Diogenite Mixing in Vesta’s Regolith [3023]**
Measurements of neutron absorption by Dawn’s Gamma Ray and Neutron Detector reveal global variations in the eucrite-diogenite ratio of Vesta’s regolith.

11:30 a.m.  Tosi F. *  Capria M. T.  De Sanctis M. C.  Denevi B. W.  Blewett D. T.  et al.  
**Thermal Behavior of Pitted Terrains on Vesta [1917]**
We present temperature maps and spectra of pitted terrain observed by the VIR experiment onboard Dawn, which constrain their composition and physical structure.

---

**TISSINT AND NWA 7034: THE LATEST IN MARS SAMPLE RETURN**

**Wednesday, 8:30 a.m.  Waterway Ballroom 4 [W302]**

**Chairs:**  Christopher Herd  
Carl Agee

8:30 a.m.  Herd C. D. K. *  Duke M. J. M.  Bryden C. D.  Pearson D. G.  
**Tissint Among the Shergottites: Parental Melt Composition, Redox State, La/Yb and V/Sc [2683]**
We provide an actual bulk SiO2 analysis of the Tissint meteorite, along with redox estimates, and then compare Tissint to other shergottites.

8:45 a.m.  Grosshans T. E. *  Lapen T. J.  Andreasen R.  Irving A. J.  
**Lu-Hf and Sm-Nd Ages and Source Compositions for Depleted Shergottite Tissint [2872]**
We present trace-element abundances for the major constituent phases, Lu-Hf and Sm-Nd ages, initial Hf- and Nd-isotope data, and source compositions for Tissint.

9:00 a.m.  Brennecka G. A. *  Borg L. E.  Symes S. J. K.  Wadhwa M.  
**The Age of Tissint: Sm-Nd and Rb-Sr Isotope Systematics of a Martian Meteorite Fall [1786]**
We report the Rb-Sr, $^{147}$Sm-$^{143}$Nd, and $^{146}$Sm-$^{142}$Nd systematics of Tissint. The age information and isotopic characteristics are compared to other martian meteorites.

**Multiple Shock Events and Diamond Formation on Mars [1037]**
Several shock events with distinct dense inventories encountered in Tissint and NWA 6162: diamond and olivine dissociation to MgSiO3 perovskite + mgnesiowüstite.
Two petrographic settings of organic carbon in the Tissint martian meteorite and its isotopic compositions of C, N, and H by nanoSIMS demonstrate a biogenetic origin.

We have inventoried the organic material in the Tissint meteorite. We find C and N containing organic compounds associated with hydrothermal mineral inclusions.

Substantial ferric iron components in the oxides phases of NWA 7034 show it is not only the most water-rich martian meteorite, but also the most oxidized.

In this study we classify lithologic clasts in the meteorite NWA 7034 using mineral textural relationships, major-element and REE chemistry, and O isotopes.

10:30 a.m. Ziegler K. * Sharp Z. D. Agee C. B. The Unique NWA 7034 Martian Meteorite: Evidence for Multiple Oxygen Isotope Reservoirs [#2639]
NWA 7034 contains multiple coexisting oxygen-isotope reservoirs, and attests to isotopic differences between the deep mantle and the crust/atmosphere of Mars.

10:45 a.m. Cartwright J. A. * Ott U. Hermann S. Agee C. B. NWA 7034 Contains Martian Atmospheric Noble Gases [#2314]
Black Beauty’s her name, from Mars she certainly came, as our work displays. Noble gas it’s clear, shows trapped martian atmosphere, more data to come!

NWA7034 provides the only relevant lithology to account for the large crustal magnetization of Mars. We evidence abundant magnetite, maghemite, and goethite.

11:15 a.m. Hewins R. H. * Zanda B. Humayun M. Pont S. Fieni C. et al. Northwest Africa 7533, an Impact Breccia from Mars [#2385]
NWA 7533 contains clast-laden melt rocks, orthopyroxene, norite-monzonite, and microbasalt. Inverted pigeonite and alkali feldspars indicate a deep origin.

11:30 a.m. Humayun M. * Zanda B. Hewins R. H. Göpel C. Composition of North West Africa 7533: Implications for the Origin of Martian Soils and Crust [#1429]
Implications of the matrix chemistry of the new martian impact breccia, NWA 7533, for the origin of martian soils and crustal thickness will be presented.
MERCURY SCIENCE FROM MESSENGER
Wednesday, 8:30 a.m. Waterway Ballroom 5 [W303]

Chairs: Louise Prockter
Carolyn Ernst

8:30 a.m. Weider S. Z. * Nittler L. R. Starr R. D. Solomon S. C.
The Distribution of Iron on the Surface of Mercury from MESSENGER X-Ray Spectrometer Measurements [#2189]
MESSENGER X-ray Spectrometer data reveal large spatial-scale variations in the total Fe content of Mercury’s surface that may be related to surface elevation.

8:45 a.m. Nittler L. R. * Weider S. Z. Starr R. D. Crapster-Pregont E. J. Ebel D. S. et al.
Mapping Major Element Abundances on Mercury’s Surface with MESSENGER X-Ray Spectrometer Data [#2458]
MESSENGER X-ray data are used to generate Mg/Si, Al/Si, S/Si, and Ca/Si maps of Mercury’s surface. One high-Mg,S,Ca area correlates with the presence of hollows.

9:00 a.m. Evans L. G. * Pępłowski P. N. Killen R. M. Potter A. E. Sprague A. L.
Variable Sodium on the Surface of Mercury: Implications for Surface Chemistry and the Exosphere [#2033]
We report evidence for spatial variation in the abundance of Na on Mercury’s surface and the relationship to latitudinal variations in Mercury’s Na exosphere.

9:15 a.m. Rivera-Valentin E. G. * Barr A. C.
Impact Induced Compositional Variations on Mercury: Implications for Primordial Interior Structure [#1015]
Monte Carlo modeling indicates mercurian LRM variation does not require crustal heterogeneities and its distribution is indicative of primordial composition.

9:30 a.m. Irving A. J. * Kuehner S. M. Bunch T. E. Ziegler K. Chen G. et al.
Ungrouped Mafic Achondrite Northwest Africa 7325: A Reduced, Iron-Poor Cumulate Olivine Gabbro from a Differentiated Planetary Parent Body [#2164]
Some mineralogical and bulk compositional features of this unique achondrite match known data for Mercury. Could this be a Hermean meteorite?

Radio Frequency Occultations Show that Mercury is Oblate [#2485]
RF occultations measurements of Mercury’s southern hemisphere show polar flattening, which has implications for rotational history and internal structure.

10:00 a.m. James P. B. * Zuber M. T. Solomon S. C. Phillips R. J.
Geophysical Constraints on Mercury’s Physiographic Provinces [#2042]
We localize long-wavelength gravity and topography from MESSENGER. The results shed light on the structure and formation of Mercury’s geological provinces.

New Constraints on Timing and Mechanisms of Regional Tectonism from Mercury’s Tilted Craters [#2444]
We combine MESSENGER profiles of tilted crater floors with morphology to establish age constraints for the formation of prominent regional features on Mercury.
10:30 a.m. Ernst C. M. * Denevi B. W. Murchie S. L. Barnouin O. S. Chabot N. L. et al.
Volcanic Plains in Caloris Basin: Thickness, Timing, and What Lies Beneath [2364]
We show that the Caloris interior plains are at least 2.5 km thick, were emplaced within a short interval, and predated the large-scale tectonic modification.

10:45 a.m. Selvans M. M. * Watters T. R. James P. B. Zuber M. T. Solomon S. C.
Comparison of Tectonic Feature Locations and Crustal Thickness in the Northern Hemisphere of Mercury [2773]
We compare maps of lobate scarps and high-relief ridges to crustal thickness on Mercury, and find no preferred crustal thickness values for their localization.

11:00 a.m. Byrne P. K. * Klimczak C. Blair D. M. Ferrari S. Solomon S. C. et al.
Tectonic Complexity Within Volcanically Infilled Craters and Basins on Mercury [1261]
We describe the progression in tectonic complexity from some of the smallest to the largest volcanically infilled impact features on Mercury.

Induced Magnetic Fields at Mercury from MESSENGER Observations [1311]
We investigate magnetic fields induced in Mercury’s interior using MESSENGER magnetometer data.

MESSENGER’s Second Extended Mission: Exploring Mercury’s Dynamic Magnetosphere and Complex Surface at Unprecedented Scales [2907]
MESSENGER’s second extended mission will begin in March 2013. Unprecedented observations are planned of Mercury’s surface, dynamic magnetosphere, and exosphere.

---

LUNAR REMOTE AND SAMPLE SPECTROSCOPY, AND THE NEW HIGHLAND ROCK TYPE
Wednesday, 8:30 a.m. Waterway Ballroom 6 [W304]

Chairs: Georgiana Kramer
Tomoko Arai

FTIR and Raman Spectroscopy of the Lunar Picritic Glasses [2360]
Full FTIR and Raman spectra are reported for the three lunar glass compositions. We demonstrate the 3550 cm$^{-1}$ total water peak is measurable in the samples.

8:45 a.m. Arnold J. A. * Glotch T. D. Thomas I. R. Bowles N. E.
Plagioclase-Olivine Mixtures in a Simulated Lunar Environment [2972]
We use lunar-environment mid-IR emissivity spectra to constrain changes in modeled Diviner Christiansen feature positions with mixture composition.

Effects of Varying Temperature and Pressure Conditions on Emissivity Spectra: Application to Thermal Infrared Observations of Airless Bodies [2225]
New lab measurements illustrate, for the first time, how the pressure and the way in which a sample is heated each contribute to the changes in TIR spectra.
This document contains an oral presentation schedule for the 44th Lunar and Planetary Science Conference (LPSC) Program. Each entry includes the time, presenter(s), title of the presentation, and a brief abstract. The presentations cover various topics related to lunar and planetary science, including space weathering effects, meteorite geology, mineralogy, and the distribution of specific mineral phases on the Moon. The abstracts discuss the methodologies used and the key findings or hypotheses presented by the researchers.
FLUIDS ON MARS: FLOWING, FREEZING, AND SETTLING DOWN
Wednesday, 8:30 a.m. Montgomery Ballroom  

Chair: Robert Craddock
Susan Conway

8:30 a.m. Craddock R. A. * Irwin R. P. III Howard A. D. Latham D. W.
The History of Water on Early Mars: The Sun, the Wind, and the Rain [#1984]
Here we review our current understanding of fluvial features on Mars and their implications for the history of water and climate.

8:45 a.m. Irwin R. P. III *
Testing Links Between Impacts and Fluvial Erosion on Post-Noachian Mars [#2958]
The six largest post-Noachian craters on Mars either substantially pre-date erosion or are not strongly eroded. These impacts did not create erosive climates.

9:00 a.m. Hauber E. * Platz T. Reiss D. Le Deit L. Kleinhans M. G. et al.
Old or not so Old: That is the Question for Deltas and Fans in Xanthe Terra, Mars [#2513]
The morphology of many martian deltas is indicative of short-lived aqueous activity. They formed in the Hesperian/Amazonian and do not imply a dense atmosphere.

9:15 a.m. Weitz C. M. * Grant J. A. Irwin R. P. III Wilson S. A.
Sedimentary Deposits Associated with Small Upland Basins Around Ladon Basin [#2081]
We have identified more than a dozen outcrops of light-toned layered sedimentary deposits, including clays, in the uplands to the west of Ladon basin.

9:30 a.m. McKeown N. K. * Rice M. S. Warner N. H. Gupta S.
A Detrital Source for the Phyllosilicates at Eberswalde Crater [#2302]
The material sampled by the Holden and possibly Eberswalde impacts likely contained Fe-Mg phyllosilicates that were then eroded and redeposited in the delta.

9:45 a.m. Ori G. G. * Cannarsa F. Salese F. Dell’Arciprete I. Komatsu G.
Why Braided Streams are Apparently Absent but There are Meander and Low-Sinuosity Single-Channels River Systems on Mars [#2369]
Among fluvial systems on Mars the most present patterns are low-sinuosity single-channel rivers and meander belts. Braided streams are apparently absent.

10:00 a.m. Erkeling G. * Reiss D. Hiesinger H. Ivanov M. A. Bernhardt H.
Fluvioglacial Formation Scenario for Valleys and Ridges at the Deuteronilus Contact of the Isidis Basin, Mars: Implications for Esker Formation and a Late Hesperian Isidis Sea [#1919]
We propose a fluvioglacial formation scenario for the geologic setting of small valleys and ridges (eskers) at the Deuteronilus contact of the Isidis basin.

10:15 a.m. Harrison T. N. * Osinski G. R. Tornabene L. L.
Relationship Between Host Material and Gully Morphology on Mars [#1420]
Here we present observations demonstrating that the substrate material through which gully channels incise plays a significant role in overall gully morphology.

10:30 a.m. Dickson J. L. * Head J. W. Barbieri L.
Martian Gullies as Stratigraphic Markers for Latitude-Dependent Mantle Emplacement and Removal [#1012]
HiRISE data reveal 108 examples on Mars of stratigraphic relationships of cyclical latitude-dependent mantle emplacement separated by gully activity.
10:45 a.m. Conway S. J. * Soare R. J.

*Gully Morphometrics as Indicators of Degradation Intensity Around the Argyre Basin* [#2488]

We use the slope, aspect, and topographic position of gullied slopes in western Argyre, Mars to indicate the degree of degradation (thaw) of the ice-dust mantle.

11:00 a.m. Grimm R. E. * Harrison K. P. Stillman D. E. Michaels T. I.

*Water Budgets of Martian Recurring Slope Lineae* [#1146]

Several m$^3$/m$^2$ of water are required seasonally for these flows. If the source is buried ice, sites are active for <kyr or are intermittent over hundreds of kyr.


*Formation of Recurrent Slope Lineae (RSL) by Freshwater Discharge of Melted Cold Traps* [#1737]

RSL lengthen for ~97 ± 31 sols when surface afternoon temperatures are >273 K. This suggests high concentrations of brine are not necessary to generate RSL.


*Recurring Slope Lineae (RSL) and Subsurface Chloride Hydrates on Mars* [#2606]

Preliminary results from a systematic experimental investigation on chloride hydrates support a hypothesis on the source of RSL observed on Mars.

---

**SPECIAL SESSION: VESTA AS THE HED PARENT BODY**

**Wednesday, 1:30 p.m. Waterway Ballroom 1 [W351]**

**Chairs:** Patrick Peplowski
Andrew Beck

1:30 p.m. Buratti B. J. * Dalba P. A. Hicks M. D. Reddy V. Sykes M. V. et al.

*Vesta, Vestoids, and HEDs: Dawn, Ground-based, and RELAB Observations* [#1845]

Spectral differences between the vestoids, the HED meteorites, and Vesta can be explained by a new form of space weathering.

1:45 p.m. Claydon J. L. * Crowther S. A. Gilmour J. D.

*The I-Pu-Xe System in Anomalous and Vestan Eucrites: Was Vesta Unusually Large?* [#2173]

Vestan eucrites carried on losing xenon for longer than anomalous eucrites. Was extended activity associated with a larger parent body?

2:00 p.m. Dietderich J. E. * Lapen T. J. Andreasen R. Righter M.

*Isotope Systematics of the Type 7 Eucrite Jonzac: A Look into the History of the Eucrite Parent Body Using the Lu-Hf, Pb-Pb and U-Pb Isotopic Systems* [#2879]

Multiple isotopic dating of type 7 eucrite Jonzac provided an igneous formation age via U-Pb, and metamorphic resetting ages from Lu-Hf and Pb-Pb.

2:15 p.m. Satake W. * Buchanan P. C. Takeda H. Mikouchi T. Miyamoto M.

*Redox States of Cumulate Eucrite Y-75011 and Surface Eucrite Y 980433 as Inferred from Iron Micro-XANES Analyses of Plagioclase* [#1444]

We focused on surface and cumulate eucrites that were not affected by annealing, in order to estimate whether the deep crust was a relatively more oxidized environment.

2:30 p.m. Peplowski P. N. * Lawrence D. J. Prettyman T. H. Yamashita N. Bazell D. et al.

*Compositional Variability on the Surface of 4 Vesta Revealed Through GRaND Measurements of High-Energy Gamma Rays* [#2754]

Measurements of high-energy gamma-ray emission have resulted in the identification of regions with eucritic and howarditic/diogenitic elemental compositions.
2:45 p.m. Lawrence D. J. * Peplowski P. N.  Prettyman T. H.  Feldman W. C.  Bazell D.  
*Mapping Elemental Variations at Vesta: Dawn Fast Neutron Measurements [#2303]*  
Fast neutron data from the GRaND instrument on Dawn are presented. Variations related to hydrogen and possibly average atomic mass are observed.

3:00 p.m. De Sanctis M. C. * Ammannito E.  Palomba E.  Longobardo A.  Capaccioni F.  et al.  
*Possible Detection of Olivine on Vesta [#1460]*  
Identifying olivine-rich lithologies on Vesta can constrain different petrologic scenarios. We report the possible detection of olivine based on VIR data.

3:15 p.m. Patzer A. *  
*New Data on the Compositions of Silicates in HED Meteorites: Variety is the Spice [#2468]*  
A comprehensive set of new compositional data of HED silicates reveals a variety of endmember compositions far more diverse than previously recognized.

3:30 p.m. Frigeri A. * Ammannito E.  De Sanctis M. C.  Capaccioni F.  Tosi F.  et al.  
*Vesta Fs and Wo Maps Derived by VIR on Dawn [#1946]*  
Here we report the molar Fe and Ca maps produced by processing VIR mapping spectrometer data onboard the Dawn mission to Vesta.

*Mesosiderite on Vesta: A Hyperspectral Vis-Nir Investigation [#2245]*  
We develop and test spectral indexes to detect mesosiderite materials on Vesta by means of the Dawn VIR hyperspectral data.

4:00 p.m. Zambon F. * Capaccioni F.  De Sanctis M. C.  Ammannito E.  Li J.-Y.  et al.  
*Mineralogical Composition of the Different Types of Bright Deposits on Vesta [#2510]*  
Study of the mineralogical composition of the different types of bright deposits on Vesta surface through band center and band depth analysis.

4:15 p.m. McSween H. Y. * De Sanctis M. C.  Ammannito E.  Prettyman T. H.  Dawn Science Team  
*The Geologic Context for Eucrites/Diogenites/Howardites, and Implications for Their Petrogenesis [#1529]*  
Mapped occurrences of HED lithologies on Vesta provide new insights that help constrain the asteroid’s magmatic evolution.

4:30 p.m. Warren P. H. * Isa J.  Gessler N.  
*Petrology of Secondary Mineral Development, Probably Fluid-Driven, Within the Uniquely Evolved Eucrite Northwest Africa 5738 [#2875]*  
The extremely evolved NWA 5738 eucrite has diverse late alteration products, offering unprecedented insights into fluid-driven alteration processes on Vesta.
PIECING TOGETHER MARS PETROLOGY WITH EXPERIMENTS, SAMPLES, AND REMOTE SENSING  
Wednesday, 1:30 p.m. Waterway Ballroom 4 [W352]

Chairs:  
Deanne Rogers  
Alan Brandon

1:30 p.m.  First E. *  Hammer J.  Welsch B.  
_Thermal History of Yamato 980459: Constraints from Mineralogy, Crystal Morphology, and Dynamic Cooling Experiments_ [#2943]  
We seek to constrain the thermal history of Y-98 through thin section analysis of the meteorite and 1-atm dynamic cooling experiments on a synthetic equivalent.

1:45 p.m.  Shearer C. K. *  Aaron P. M.  Burger P. V.  Guan Y.  Bell A. S. et al.  
_Petrogenetic Linkages Among fO2, Isotopic Enrichments-Depletions and Crystallization History in Martian Basalts. Evidence from the Distribution of Phosphorus and Vanadium Valance State in Olivine Megacrysts_ [#2326]  
Here we decipher the microscale crystallization history of olivine megacrysts using changes in the redox state and linking it to microscale changes in P.

2:00 p.m.  Dygert N. J. *  Liang Y.  Hess P. C.  
_An Experimental Study of REE and Other Trace Element Partitioning Between Augite and Fe-Rich Basalts_ [#1582]  
This abstract presents hedenbergite and augite-melt trace-element partition coefficients from six experiments and a partitioning model for Fe-rich systems.

2:15 p.m.  Brandon A. D. *  Day J. M. D.  Puchtel I. S.  Walker R. J.  
_Highly Siderophile Element Evidence in Shergottites for Pervasive Late Accretion in the Inner Solar System_ [#1120]  
New shergottite data show that Mars’ and Earth’s mantles have similar highly-siderophile-element abundances consistent with late accretion after core formation.

2:30 p.m.  Lapen T. J. *  Andreasen R.  Righter M.  Irving A. J.  
_Lu-Hf Age and Isotope Systematics of Intermediate Permafic Olivine-Phyric Shergottite NWA 2990: Implications for the Diversity of Shergottite Sources_ [#2686]  
New Lu-Hf age and Sm-Nd and Lu-Hf source compositions are presented for olivine-phyric permafic shergottite NWA 2990.

2:45 p.m.  Bouvier A. *  Blichert-Toft J.  Albarède F.  El Goresy A.  Agee C. B. et al.  
_U-Th-Pb Evolution Requires very old Age for Newly Found Depleted Shergottites_ [#2421]  
U-Th-Pb-isotopic systematics of freshly found martian meteorites support Noachian crystallization ages for shergottites, and Amazonian age for NWA 7034.

3:00 p.m.  Turrin B. *  Park J.  Herzog G. F.  Lindsay F. N.  Delaney J. S. et al.  
_40Ar/39Ar Ages of Maskelynite Grains from ALHA 77005_ [#2979]  
We obtained a $^{39}\text{Ar}/^{40}\text{Ar}$ age of 200 Ma for maskelynites from ALHA 77005. Trapped Ar ratios are not consistent with a martian or terrestrial atmospheric origin.

3:15 p.m.  Park J. *  Herzog G. F.  Nyquist L. E.  Lindsay F.  Turrin B. et al.  
The Ar isochron age of Zagami K-rich melt is 187 ± 12 Ma with $^{40}\text{Ar}/^{36}\text{Ar}$ trapped ~ 1900. Even so, the extra $^{40}\text{Ar}$ did not come directly from the martian atmosphere.
3:30 p.m. Huber L. * Irving A. J. Maden C. Wieler R.
*Noble Gas Cosmic Ray Exposure Ages for Five Shergottites and Evidence for Trapped Martian Atmosphere in Tissint [#1534]*
We report the noble gas cosmic ray exposure ages of five shergottites, NWA 7032, NWA 7042, NWA 7257, NWA 7937, and Tissint, and also discuss their heavy NG.

3:45 p.m. Michalski J. R. * Bleacher J. E. Wright S. P.
*Evidence for Ancient Explosive Volcanism Within Arabia Terra, Mars [#1263]*
Arabia Terra contains calderas formed through explosive volcanism. They may be the source of clastic materials within layered sulfates and fretted terrains.

4:00 p.m. Pan C. * Rogers A. D. Michalski J. R.
*Thermal and Near-Infrared Analyses of Central Uplifts of Martian Impact Craters [#2491]*
We analyze martian impact craters with central uplift globally using TIR and NIR data. Spectrally distinct units of central uplifts are identified.

*Infrared Spectral Identification of Unusually Feldspar-Rich Rocks on Mars [#3065]*
Orbital near-infrared spectroscopy reveals a new martian rock type that may be anorthosite or a felsic composition (e.g., granite or rhyolite).

4:30 p.m. Rogers A. D. * Nazarian A. H.
*Evidence for Late-Noachian Flood Volcanism in Noachis Terra, Mars and the Possible Role of Hellas Impact Basin Tectonics [#1760]*
Igneous stratigraphy observed within bedrock over huge area. Likely flood basalts. Hellas fractures enabled magma ascent through thick crust.

---

**VOLATILES AT MERCURY**

**Wednesday, 1:30 p.m. Waterway Ballroom 5 [W353]**

**Chair:** Christian Klimczak

1:30 p.m. Chabot N. L. * Ernst C. M. Denevi B. W. Nair H. Murchie S. L. et al.
*Imaging Inside Mercury’s Permanently Shadowed Craters: First Images from MESSENGER [#1693]*
We will present the first MESSENGER images that successfully resolve the surface within Mercury’s permanently shadowed, ice-bearing craters.

1:45 p.m. Helbert J. * Maturilli A. D’Amore M. Vaughan W. M. Head J. W. et al.
*High-Temperature Spectroscopy of Sulfides and Implications for Hollows on Mercury [#1498]*
We present spectral reflectance measurements at visible and near-infrared wavelengths of fresh and heated samples of calcium and magnesium sulfide.

2:00 p.m. Kargel J. S. *
*Mercury’s Hollows: Chalcogenide Pyro-Thermokarst Analog of Thermokarst on Earth, Mars, and Titan [#2840]*
MESSENGER imagery of Mercury reveals enigmatic “hollows” on crater floors, interpreted as analogs of thermokarst on Earth, Mars, and Titan.

2:15 p.m. Thomas R. J. * Rothery D. A. Conway S. J. Anand M.
*Mechanisms and Sources Involved in the Formation of Hollows on the Surface of Mercury [#1182]*
Hollows are dominantly structurally controlled, suggesting derivation of hollow-forming volatiles from depth. Insolation influences hollowing weakly.
The Role of Thrust Faults as Conduits for Volatiles on Mercury [#1390]
The frequent spatial association of volcanic pits with thrust faults on Mercury is motivation to study if faults functioned as conduits for volatile-rich magmas.

2:45 p.m. Stewart S. T. * Leinhardt Z. M. Humayun M.
Giant Impacts, Volatile Loss, and the K/Th Ratios on the Moon, Earth, and Mercury [#2306]
The different K/Th ratios of the Moon and Mercury are consistent with the different volatile loss processes during their proposed giant impact scenarios.

VENUS TECTONICS, VOLCANISM, AND SURFACE PROPERTIES
Wednesday, 3:00 p.m. Waterway Ballroom 5 [W354]

Chair: Laurent Montesi

3:00 p.m. Ivanov M. A. * Head J. W.
Evolution of Tectonics on Venus [#1126]
Evolution of tectonic styles on Venus is described.

3:15 p.m. Kiefer W. S. *
Making Ishtar Terra, Venus: Mobile Lid Tectonics, Continental Crust, and Implications for Liquid Water and Planetary Evolution [#2541]
Ishtar Terra likely formed in the mobile lid tectonics regime, implying the presence of liquid water on Venus at one time.

3:30 p.m. Montesi L. G. J. *
Morphology of Bottom-Driven Rifts: Implications for Venusian Tectonics [#2861]
What pattern of faulting is generated when rifts are driven from the bottom rather than their edge, like on Venus?

3:45 p.m. Mueller N. T. * Maturilli A. Helbert J. Elkins-Tanton L. T.
Igneous Rock Emissivity Measurements at High Temperatures in Support of Thermal Modeling and Infrared Imaging of Venus’ Canali and Lava Flows [#1932]
Emissivity spectra of a carbonatite and an ijolite at high temperatures, relevant for the modeling of canali formation and the search for canali deposits in NIR.

4:00 p.m. Bondarenko N. V. * Kreslavsky M. A.
Venus Surface Properties in Magellan Radar Altimeter Data: Results of Principal Component Analysis [#1648]
Analysis of radar backscattering function solutions from the SCVDR dataset gives additional information for detailed surface characterization and classification.

4:15 p.m. Kohler E. * Chevrier V. F. Gavin P. Johnson N.
Experimental Stability of Tellurium and its Implications for the Venusian Radar Anomalies [#2951]
We experimentally show that tellurium oxidizes at average Venus surface temperatures, but converts to coloradoite at altitudes corresponding to radar anomalies.
CHONDrites: Organic Synthesis and Secondary Processes

Wednesday, 1:30 p.m.  Waterway Ballroom 6  [W355]

Chairs: Laurence Garvie
Richard Walker

1:30 p.m.  Yabuta H. *  Noguchi T.  Itoh S.  Sakamoto N.  Hashiguchi M.  et al.
Evidence of Minimum Aqueous Alteration in Rock-Ice Body: Update of Organic Chemistry and Mineralogy of Ultracarbonaceous Antarctic Micrometeorite [#2335]
We identified Ni-bearing pyrrhotite and GEMS-like objects without metal from an ultracarbonaceous micrometeorite containing large, nitrogen-rich organics.

1:45 p.m.  Rémusat L. *  Piani L.
H and N Isotopes Distribution in Insoluble Organic Matter in Ordinary Chondrites: Constrains on Early Solar System Processes [#1401]
NanoSIMS imaging shows that δD and δ15N of IOM in ordinary chondrites is consistent with the occurrence of finely mixed minute amounts of interstellar OM.

2:00 p.m.  De Gregorio B. T. *  Peeters Z.  Stroud R. M.  Nittler L. R.  Alexander C. M. O'D.
Parent-Body Processing of Organic Nanoglobule Aggregates [#2390]
Aqueous processing of organic nanoglobules depletes nitrile chemical functionality and produces vesicular features.

2:15 p.m.  Alexander C. M. O'D. *  Bowden R.  Fogel M. L.  Howard K. T.
Carbonate Abundances and Isotopic Compositions in Chondrites [#2788]
We have determined the carbonate isotopic compositions and contents of ~80 CCs and OCs, and explore the implications for chondrite accretion and alteration.

2:30 p.m.  Barcena H. *  Connolly H. C. Jr.
Unusual Synthesis of Carbohydrates [#2720]
A hypothesis for the origin of carbohydrates in interstellar space is presented. Carbohydrate synthesis in liquid CO2 was shown feasible by NMR experiments.

2:45 p.m.  Elsila J. E. *  Charnley S. B.  Burton A. S.  Glavin D. P.  Dworkin J. P.
Compound-Specific Isotopic Ratios of Amino Acids in CM and CR Chondrites [#1281]
We compare measured compound-specific stable isotopic ratios of amino acids from carbonaceous chondrites with predictions from potential formation pathways.

3:00 p.m.  Monroe A. A. *  Pizzarello S.
Diastereomer Amino Acids in Meteorites and Their Significance for the Prebiotic Distribution of Molecular Asymmetry in the Solar System [#2735]
Large enantiomeric excesses in meteoritic isoleucine/alloisoleucine diastereomers are confirmed by calculations excluding possible terrestrial contamination.
**SUTTER’S MILL METEORITE**

**Wednesday, 3:15 p.m. Waterway Ballroom 6 [W356]**

**Chairs:** Laurence Garvie  
Richard Walker

_Light Element Geochemistry and Spectroscopy of the Sutter’s Mill Carbonaceous Chondrite [#3000]_  
We report the carbon- and nitrogen-isotopic composition and UV-Vis spectrum of the Sutter’s Mill chondrite, for comparison with other carbonaceous chondrites.

3:30 p.m. Garvie L. A. J. *  
_Mineralogy of the Sutter’s Mill Carbonaceous Chondrite [#2148]_  
Powder XRD analysis of seven Sutter’s Mill stones indicate that the parent body was a rubble pile of at least two distinct carbonaceous chondrite classes.

3:45 p.m. Nishiizumi K. * Caffee M. W. Hamajima Y. Welten K. C.  
_Exposure Age of Sutter’s Mill Carbonaceous Chondrite [#2696]_  
Exposure age and preatmospheric size of Sutter’s Mill CM meteorite are obtained from cosmogenic radionuclide measurements and compared with that of other CM2 chondrites.

4:00 p.m. Walker R. J. * Yin Q.-Z.  
_{187}Re-{187}Os Isotopic and Highly Siderophile Element Abundance Systematics of the Sutter’s Mill Meteorite: Clues to Late-Stage Secondary Processes Acting on Chondrites [#1964]_  
Sutter’s Mill provides a unique opportunity to assess the causes of very late stage alteration on highly-siderophile-element abundances in chondrites.

_Organic Analysis of Sutter’s Mill Chondrite Using C-XANES [#2118]_  
C-XANES analysis of the Sutter’s Mill meteorite reveals that primitive organic matter is present in the fine-grained matrix material surrounding a diamond grain.

_Coordinated In Situ Analyses of Organic Nanoglobules in the Sutter’s Mill Meteorite [#2759]_  
We report in situ analyses of organic nanoglobules in the Sutter’s Mill meteorite using UV fluorescence imaging, FTIR, STEM, NanoSIMS, and uL2MS.
ACHONDrites: Journey to the Center of an Asteroid
Thursday, 8:30 a.m.  Waterway Ballroom 1

Chairs: Joseph Goldstein
       Roger Hewins

8:30 a.m. Mittlefehldt D. W. * Peng Z. X.
Petrologic and In-Situ Geochemical Constraints on Diogenite Genesis [#1285]
In situ measurements of minor/trace elements in diogenite orthopyroxenes show that some record fine-
scale igneous zoning, some subsolidus equilibration effects.

8:45 a.m. Castle N. * Herd C. D. K. Bachmann O. Irving A. J.
Eucrite Pyroxene Chemistry and Petrogenesis: Testing the Models [#2508]
Eucrite pyroxenes from four meteorites with matching oxygen isotopes are inconsistent with cogenesis
by existing petrogenetic models, implying multiple sources.

9:00 a.m. Boesenberg J. S. * Weisberg M. K. Greenwood R. C. Gibson J. M. Franchi I. A.
The Anomalous Enstatite Meteorites — Part 1: Anomalous Aubrites and Oxygen Isotopes [#2320]
Petrology, chemistry, and oxygen isotopes of the anomalous E chondrites are discussed.

9:15 a.m. Hidaka Y. * Yamaguchi A. Shirai N. Ebihara M.
Partial Melting Processes on the Primitive Achondrite Parent Bodies from a Viewpoint of
Chemical Composition [#1892]
Partial melting processes on primitive achondrite parent bodies are discussed from chemical
compositions of acapulcoite-lodranites and winonaites.

9:30 a.m. Gardner-Vandy K. G. * McCoy T. J. Corrigan C. M. Lauretta D. S. Benedix G. K.
Implications of R Chondrite Melting Experiments on the Formation of GRA 06128/9 [#2595]
Partial melting experiments on R chondrites suggest that GRA 06128/9 might have formed from very-
low-degree partial melting in the Ab-SiO2-Fo system.

Large-Scale Melting and Impact Mixing on Early-Formed Asteroids: Evidence from High-Precision
Oxygen Isotope Studies [#3048]
High-precision oxygen-isotope analysis provides new evidence for the origin and evolution of
pallasites, mesosiderites, HEDs and anomalous eucrites.

10:00 a.m. Michel P. Goodrich C. A. Jutzi M. Wilson L. O’Brien D. P. * et al.
Numerical Modeling of Catastrophic Disruption of Molten and Partly Molten Asteroids, with
Implications for Breakup of the Ureilite Parent Body [#1300]
Numerical modeling of catastrophic disruption and reassembly of partly molten asteroids is used to
constrain models for ureilite petrogenesis.

Origin of Metal in Ureilites: Problems, Possibilities, and Implications for
Ureilite Petrogenesis [#1384]
The origin of Fe-metal in ureilites is directly related to the origin of their FeO-variation. Problems and
constraints are clarified.

10:30 a.m. Miyahara M. * Ohtani E. El Goresy A. Lin Y. T. Feng L. et al.
A Huge Single Diamond in Almahata Sitta Coarse-Grained Ureilite [#1425]
We found a huge single diamond from Almahata Sita ureilite. The diamond would crystallize through
CVD process or form from a fluid.
10:45 a.m. Williams J. T. * Humayun M.
*Origin of the IVB Irons in a Hit-and-Run Collision [#2784]*
We show that the IVB parental liquid must have originated in a hit-and-run collision by remelting of an early cumulate from a sulfur-bearing core.

11:00 a.m. Goldstein J. I. * Scott E. R. D. Winfield T. Yang J.
*Thermal Histories of Group IAB and Related Iron Meteorites and Comparison with Other Groups of Irons and Stony Iron Meteorites [#1394]*
Cooling rate measurements and the link with winonaites suggest that IAB complex irons cooled at depth at different locations in one or more silicate-rich bodies.

11:15 a.m. Worsham E. A. * Bermingham K. R. Walker R. J.
*New Insights into the Formation and Crystallization of IAB Complex Iron Meteorites from Highly Siderophile Elements and Mo Isotopes [#2456]*
IAB complex iron meteorite crystallization was studied using new HSE data. The genetic relationship of two groups in the complex was evaluated with Mo isotopes.

11:30 a.m. Burkhardt C. * Hin R. C. Kleine T. Bourdon B.
*Mass-Dependent Molybdenum Isotope Fractionation — A New Tracer for Core Formation [#1902]*
We define the stable Mo-isotope composition of planetary bodies and show that Mo isotopes are a powerful new tool to constrain the conditions of core formation.

---

**MINERALOGY OF MARTIAN AQUEOUS ENVIRONMENTS**

**Thursday, 8:30 a.m. Waterway Ballroom 4 [R402]**

**Chairs:** Scott McLennan
Susanne Schwenzer

8:30 a.m. Schwenzer S. P. * Reed M. H.
*Modeling Alteration Minerals on Mars — Investigating the High Temperature Component [#2301]*
High-temperature mineral formation in martian rocks — modeled with the new code CHIM-XPT — reveals the early history of (impact-generated) hydrothermal systems.

8:45 a.m. Carter J. * Loizeau D. Mangold N. Poulet F. Bibring J.-P.
*Widespread Surface Weathering on Early Mars: A Case for a Warmer and Wetter Mars [#1755]*
We report the detection of numerous specific clay stratigraphies on Mars that are consistent with weathering sequences formed under nonarid climates on Earth.

9:00 a.m. Dehouck E. * Gaudin A. Mangold N. Lajaunie L. Dauzeres A. et al.
*Weathering of Olivine Under CO2 Atmosphere: A Martian Perspective [#2071]*
We performed an experimental study of the weathering of olivine under CO2 and air. The results can help to understand the secondary mineralogy of Mars.

9:15 a.m. Horgan B. * Kahmann-Robinson J. A. Bishop J. L. Christensen P. R.
*Climate Change and a Sequence of Habitable Ancient Surface Environments Preserved in Pedogenically Altered Sediments at Mawrth Vallis, Mars [#3059]*
The clay stratigraphy at Mawrth Vallis, Mars, is interpreted as a paleosol sequence. Soil mineralogy indicates climate transitions and surface environments.

9:30 a.m. Pan L. * Ehlmann B. L.
*Phyllosilicate and Hydrated Silica Detection in the Knobby Terrains of Acidalia Planitia [#2572]*
Hydrated silica and Fe/Mg phyllosilicate with olivine-bearing units are found using CRISM data in eastern Acidalia Planitia associated with mud volcanoes.
9:45 a.m. Hallis L. J. * Ishii H. A. Bradley J. P. Taylor G. J.
Comparisons of Martian and Antarctic Alteration: A Transmission Electron Microscope Study of MIL 090032 [#1735]
We studied both the pre-terrestrial and terrestrial alteration in MIL 090032 — a martian nakhlite meteorite — using transmission electron microscopy.

10:00 a.m. Tomkinson T. * Lee M. R. Mark D. F. Stuart F. M.
The Nakhlite Meteorites Provide Evidence for Mineralization of Martian CO₂ by Carbonation of Silicates [#1208]
Evidence from the Lafayette meteorite shows that carbon dioxide could have been sequestered very effectively from the martian atmosphere by mineral carbonation.

10:15 a.m. Bishop J. L. * Wray J. J. Ehlmann B. L. Brown A. J. Parente M.
Refining Martian Carbonate Chemistries Determined Through CRISM Analyses of Several Carbonate-Bearing Outcrops [#2555]
This study refines the chemistries of carbonate outcrops on Mars through current analyses of CRISM data utilizing newly available lab spectra of carbonates.

10:30 a.m. McLennan S. M. * Zhao Y.-Y. S.
Trace Element (Cr, Ni, Zn) Geochemistry of Surficial Processes on Mars: Insights from Experiments and Implications for In Situ Measurements [#2642]
Experiments evaluating Cr, Ni, and Zn behavior during acid alteration, evaporation, and oxidative diagenesis provide constraints on interpreting Mars APXS data.

10:45 a.m. Niles P. B. * Golden D. C. Michalski J.
Experimental Evidence for Weathering and Martian Sulfate Formation Under Extremely Cold Water-Limited Environments [#2526]
We describe experiments that show weathering and sulfate formation are possible at temperatures <–40°C by acidic thin films that may be occurring on Mars.

11:00 a.m. Leftwich K. M. * Bish D. L.
Phase Stabilities in the Na₂Mg(SO₄)₂·H₂O System and Hydration/Dehydration Behavior of a New 16-Hydrate Phase Under Mars-Relevant Conditions [#2778]
This work describes the dehydration/hydration behavior of phases in the Na₂Mg(SO₄)₂·H₂O system under Mars-relevant conditions.

11:15 a.m. Elsenousy A. A.E. * Hanley J. Chevrier V. F.
Freezing and Evaporation Modeling of Phoenix WCL Solutions Using FREZCHEM and Geochemical Workbench [#2695]
The WCL solutions modeled using FREZCHEM and GWB show the absence of Ca perchlorate in the simulations, which indicates a very arid environment.

11:30 a.m. Glotch T. D. * Bandfield J. L. Wolff M. J. Arnold J. A.
Chloride Salt Deposits on Mars — No Longer “Putative” [#1549]
We have discovered a new spectral class of chloride salt deposits on Mars. Differences between spectral classes are due to grain sizes of admixed silicates.
REFRACTORY INCLUSIONS IN CHONDrites
Thursday, 8:30 a.m. Waterway Ballroom 5 [R403]

Chairs:  Steven Simon
         Justin Simon

8:30 a.m.  Matzel J. E. P. * Simon J. I. Hutcheon I. D. Jacobsen B. Simon S. B. et al.
Oxygen Isotope Measurements of a Rare Murchison Type A CAI and its Rim [#2632]
O-isotope data from melilite, spinel, hibonite, perovskite, and the W-L rim of a Murchison Type A
CAI show a uniform isotopic composition between rim and CAI.

Does Oxygen Isotopic Heterogeneity in Refractory Inclusions and Their Wark-Lovering Rims Record
Nebular Reprocessing? [#1828]
A study of CAIs with varying mineralogies to distinguish the record of secondary reprocessing in the
nebula from that which occurred on the parent body.

9:00 a.m.  Needham A. W. * Messenger S.
Corundum-Hibonite Inclusions and the Environments of High Temperature Processing in the Early
Solar System [#2929]
We report in situ O- and Mg-isotope analyses of corundum-hibonite inclusions in ALH 77307, a highly
unequilibrated CO3.0 chondrite.

9:15 a.m.  Krot A. N. * Nagashima K.
Mineralogy, Petrology, and Oxygen-Isotope Compositions of Amoeboid Olivine Aggregates from
CH Chondrites [#1750]
CH AOA formed together with CAI in a 16O-rich reservoir, avoided melting, and may provide a clue
for a bimodal distribution of ($^{26}$Al/$^{27}$Al)$_0$ among 16O-rich CH CAI.

9:30 a.m.  Crapster-Pregont E. J. * Ebel D. S.
Fractional Condensation: Evidence from Chemical Variations in Ca, Al-Rich Inclusions in
CO Chondrites [#2112]
Fractional condensation best explains preliminary results from a comprehensive study of CAIs in
CO chondrites by image and major-element chemical analysis.

9:45 a.m.  Schwander D. * Berg T. Schönhense G. Palme H. Ott U.
Clues to the Formation History of Refractory Metal Nuggets [#1959]
Refractory metal nuggets contain only low vapor pressure metals. They must have formed at high
temperatures. We discuss three different formation scenarios.

10:00 a.m.  Mendybaev R. A. * Teng F.-Z. Georg R. B. Richter F. M.
Magnesium and Silicon Isotopic Fractionations During Evaporation of Forsterite-Rich Melts:
The Temperature and Composition Effects [#3017]
Results of new evaporation experiments with Fo-rich melts are discussed in terms of temperature and
composition effects on fractionation of Si and Mg isotopes.

Oxygen Isotope Systematics of Allende FUN CAI CMS-1 [#2435]
Recently, we reported on the Ti-, Si-, and Mg-isotopic compositions of a new FUN CAI, CMS-1. Here, we
report on the O-isotopic composition of its primary phases.
10:30 a.m.  Aléon J. *  Marin-Carbonne J.  Taillifet E.  McKeegan K. D.  Charnoz S. et al.
* Igneous CAI Growth by Coagulation and Partial Melting of Smaller Proto-CAIs: Insights from a Compact Type A CAI and from Modeling [#2530]*
Mineral chemistry mapping and O-isotope study of a compact type A CAI and coagulation modeling bring new information about CAI growth in the solar nebula.

10:45 a.m.  Simon S. B. *  Grossman L.
* A Compact Type A Inclusion with Multiple Wark-Lovering Rims: A Complex History Recorded in Pyroxene [#2793]*
We report an inclusion with multiple rims and six texturally and chemically distinct occurrences of pyroxene.

11:00 a.m.  Han J. *  Brearley A. J.
* A FIB/TEM Study of Refractory Inclusions from the ALHA 77307 CO3.0 Carbonaceous Chondrite: Microstructural Observations from Melilite-Rich Inclusions [#2682]*
We present new FIB/TEM observations of melilite-rich inclusions in ALHA 77307 to characterize the micro- to nanoscale texture and chemistry of CAIs in CO3.

11:15 a.m.  Sapah M. S. *  Krot A. N.  Amelin Y.
* Mineralogy and Petrography of Refractory Inclusions in North West Africa 4502, Oxidized CV3 Chondrite [#1036]*
This study describes the mineralogy and petrology of five large CAIs from the new oxidized CV chondrite NWA 4502.

11:30 a.m.  Ivanova M. A. *  Krot A. N.  Kononkova N. N.  MacPherson G. J.
* Heterogeneity in Bulk Compositions of Compound CAIs from NWA 3118 and Efremovka CV3 Chondrites [#1661]*
We reported about heterogeneity in bulk compositions of compound CAIs containing ultrarefractory CAIs from NWA 3118 and Efremovka CV3 chondrites and discuss their origin.

---

**LUNAR SAMPLES AND EXPERIMENTS: THE BIG PICTURE**

**Thursday, 8:30 a.m.  Waterway Ballroom 6 [R404]**

**Chairs:**  Jennifer Rapp
  Clive Neal

8:30 a.m.  Rapp J. F. *  Draper D. S.
* Can Fractional Crystallization of a Lunar Magma Ocean Produce the Lunar Crust? [#2732]*
Experimental fractional crystallization of the lunar magma ocean produces cumulates similar to the observed anorthosite crust and predicted early cumulates.

8:45 a.m.  Grove T. L. *  Charlier B.  Brown S. M.
* Experimental Study of Lunar Magma Ocean Crystallization, I: Plagioclase Saturation and Major Element Constraints on Cumulate Remelting Processes [#2391]*
Crystallization experiments quantify mineralogical and chemical variations in cumulates formed during late-stage lunar magma ocean crystallization.

9:00 a.m.  Carlson R. W. *  Borg L.  Gaffney A. M.  Boyet M.
* Rb-Sr, Sm-Nd and Lu-Hf Isotope Systematics of Norite 77215: Refining the Age and Duration of Lunar Crust Formation [#1621]*
Concordant $^{142}$Sm, $^{143}$Nd, and Lu-Hf internal isochron ages (4296 ± 20 Ma) for norite 77215 add support for a late (<4.5 Ga) formation of the Moon.
Evidence for Widespread Magmatic Activity at 4.36 Ga in the Lunar Highlands from Young Ages Determined on Troctolite 76535

Young Sm-Nd and Rb-Sr ages of 4.30 Ga determined on lunar troctolite 76535 are consistent with a widespread magmatic event late in the Moon’s history.

Lutetium-Hafnium and Samarium-Neodymium Systematics of Apollo 17 Sample 78236: Age and the Importance of Thermal Neutron Fluence on the Lutetium-Hafnium System

Sm-Nd and Lu-Hf ages of Apollo 17 sample 78236 are 4448 ± 32 and 4446 ± 23 Ma, respectively. Lu-Hf neutron fluence corrections are larger than predicted by Sm and Gd.

Crystal Stratigraphy of Lunar Troctolite 76535: Implications for Mg-Suite Origins and Evolution

Analysis of lunar troctolite 76535 via crystal stratigraphy allows much more detailed petrogenetic information to be obtained.

A Young Age for KREEP Formation Determined from Lu-Hf Isotope Systematics of KREEP Basalts and Mg-Suite Samples

Initial Hf-isotopic compositions of KREEP basalts and Mg-suite samples indicate that KREEP formed at 4.36 Ga.

15434.8,181 Orthopyroxene Xenocrysts; Implications for the Petrogenesis of Apollo-15 KREEP Basalts

New chemical data for 15343.8,181. Trace-element data suggests that the large Opx crystals might be xenocrysts.

Silica Polymorphs in Lunar Granite

Apollo 12 granites? Silica polymorphs! Raman spectra! Quartz! Cristobalite! Hackle fracture pattern! Cristobalite or tridymite inversion! Rhyolitic volcanism?

Lunar Mare Basalt Volcanism: New Constraints on Magma Ascent and Eruption

GRAIL data on lunar crust density imply that all lunar basalts were negatively buoyant in the crust, placing constraints on source depths and eruption rates.

The Viscosity of Lunar Magmas at High Pressure and Temperature

We measure lunar magma viscosity at high P-T as a function of composition, using in situ falling sphere viscometry and X-ray absorption techniques.

The Origin of Young Mare Basalts Inferred from Lunar Meteorites NWA 4734, NWA 032, and LAP 02205

Geochemical and isotopic analyses of NWA 4734, NWA 032, and LAP 02205 show that melting of the mantle sources of the youngest mare basalts does not require KREEP.

The Origin of the Apollo 14, 15 and 17 Yellow Glasses

The compositional variability of the intermediate-Ti yellow glasses suggests magma mixing from at least two lunar cumulate source regions from 200 to 300 km deep.
**IMPACT MECHANICS I: AN EXPERIMENTAL PERSPECTIVE**  
**Thursday, 8:30 a.m. Montgomery Ballroom**

**Chairs:**  
Peter Schultz  
Michael Poelchau

8:30 a.m.  
Ebert M. *  Hecht L.  Deutsch A.  Kenkmann T.  
*Geochemical Exchange Processes Between Projectile and Target in Hypervelocity Cratering Experiments* [#1489]  
This work addresses essential topics in impact cratering: (1) projectile partitioning into ejecta, (2) element-fractionation during projectile-target interaction.

8:45 a.m.  
*Entropy Gain for Shock-Heated Forsterite: Implications for Atmospheric Blow off on the Early Earth and Venus* [#2537]  
The peak shock pressures and temperatures for forsterite were obtained up to 0.8 TPa. Then, we discuss atmospheric blow off on the early Earth and Venus.

9:00 a.m.  
*Diaplectic Quartz Glass and SiO2 Melt Experimentally Generated at only 5 GPa Shock Pressure: Laboratory Observations Versus Mesoscale Modeling* [#1461]  
Impact experiments (2.5–17.5 GPa) with porous sandstone were compared to mesoscale numerical models quantifying the processes during single pore collapse.

9:15 a.m.  
Poelchau M. H. *  Hoerth T.  Rudolf M.  Deutsch A.  Thoma K. et al.  
*Experimental Cratering in Quartzite, Tuff and Sandstone: Effects of Target Properties and Projectile Size on Crater Dimensions* [#2339]  
MEMIN cratering results show the effect of target properties (porosity, saturation, strength) and projectile diameter on crater scaling.

9:30 a.m.  
Wozniakiewicz P. J. *  Price M. C.  Burchell M. J.  Cole M. J.  Kearsley A. T.  
*Oblique Impact Craters: Morphology Dependence on Impactor Size* [#2121]  
We present new data that shows the morphology of oblique impact craters changes as a function of impactor size.

9:45 a.m.  
Güldemeister N. *  Moser D.  Wünnemann K.  Grosse C.  
*Recording the Seismic Signal Generated by Hypervelocity Impact in Experiments and Numerical Models* [#1474]  
We record the seismic signal generated by hypervelocity meteorite impact in laboratory experiments and compare the data with numerical models.

10:00 a.m.  
Housen K. R. *  Sweet W. J.  
*Experimental Simulation of Large-Scale Impacts on Porous Asteroids* [#1993]  
Recent centrifuge impact experiments simulate large-scale cratering on porous asteroids and provide the first evidence of compaction-dominated cratering.

10:15 a.m.  
Yasui M. *  Arakawa M.  Hasegawa S.  Fujita Y.  Kadono T.  
*In Situ Flash X-Ray Observation of Crater Formation in Porous Gypsum Analogous to Low-Density Asteroids* [#1032]  
We conducted laboratory impact experiments for a porous gypsum target and observed the target interior during crater formation by using a flash X-ray.
10:30 a.m.  Schultz P. H. *  Hermalyn B.
*Non-Proportional Crater Growth in Experimental Impact Craters [#2589]*
Evolution of crater profiles and truncated crater growth using layered targets demonstrate that crater diameter and depth exhibit different dependencies.

10:45 a.m.  Runyon K. D. *  Barnouin O. S.
*Ejecta Emplacement and Regolith Gardening: An Experimental Investigation [#2163]*
Preliminary ejecta emplacement experiments show that mobile ejecta significantly erodes the preexisting surface and creates analogous morphologies to nature.

11:00 a.m.  Hermalyn B. *  Schultz P. H.  Meech K. J.  Kleyna J.
*New Insights into the Ejecta Mass-Velocity Distribution: Experimental Time-Resolved Measurements and Applications to Cratering [#1102]*
This work presents novel measurements of the time-resolved cumulative and incremental ejecta mass distribution from impact experiments at the NASA AVGR.

*Impact Experiments Simulating Rock Sampling from C-Type Asteroid [#2981]*
We conducted impact experiments with an analog material of C-type asteroids using the impact sampling system of the Hayabusa-2 spacecraft.

11:30 a.m.  Price M. C. *  Wozniakiewicz P. J.  Cole M. J.  Burchell M. J.
*Secondary Ejecta Clouds from Hypervelocity Impacts on Al and Glass Targets: Comparison Between Experiments and Hydrocode Modelling [#2154]*
Secondary ejecta patterns formed on witness plates are described from hypervelocity impacts onto Al and glass targets. Implications for Stardust are discussed.

---

ICE, GLACIERS, AND POLAR PROCESSES ON MARS
Thursday, 1:30 p.m.  Waterway Ballroom 4

**Chairs:** Jean-Pierre Bibring  
Reid Parsons

1:30 p.m.  Bibring J. -P. *  Forget F.
*Why has Mars Uniquely Preserved the Record of its Early (Possibly Habitable) Times? [#2161]*
New simulations show that Mars dichotomy was partially ice covered and thus protected against the effects of the LHB, preserving the record of Mars habitable(?) times.

1:45 p.m.  Clifford S. M. *  Costard F.  PetitJean M.  Mouginot J.  Parker T.
*Evidence for the Widespread Occurrence of Massive Ground Ice in the Northern Plains of Mars: A Potential Relic of a Former Ocean? [#2889]*
Radar and geomorphic evidence is presented for the survival of massive ground ice, possibly a frozen relic of an ancient ocean, beneath the northern plains.

2:00 p.m.  Fastook J. L. *  Head J. W.
*Amazonian Non-Polar Glaciation: Supply-Limited Glacial History and the Role of Ice Sequestration [#1256]*
Pd elevations provide estimates of potential ice volume stored in the transient layer, as well as maximum layer thicknesses resulting from complete cap removal.
2:15 p.m.  Le Deit L. *  Hauber E.  Fueten F.  Pondrelli M.  Rossi A. P.  et al.
Investigation of Possible Coastal and Periglacial Landforms in Gale Crater, Mars [#2187]
Using orbital data, we analyzed several landforms in the crater suggesting the past presence of a lake connected to ice-rich permafrost in Aeolis Mons.

2:30 p.m.  Hallet B. *  Sletten R. S.  Stewart W.  Williams R.  Mangold N.  et al.
Fracture Networks, Gale Crater, Mars [#3108]
Direct observations by Curiosity promise to help eliminate certain hypotheses about the genesis of fractures and support others.

2:45 p.m.  Oehler D. Z. *
A Periglacial Analog for Landforms in Gale Crater, Mars [#1322]
The high thermal inertia unit within the MSL landing ellipse at Gale Crater contains a suite of features that can be interpreted within a periglacial framework.

3:00 p.m.  Parsons R. A. *  Holt J. W.
Glaciation at Euripus Mons, Mars: Insights from Combining Numerical Ice Flow Modeling, SHARAD Observations and High-Resolution Topography [#1840]
Informed by SHARAD and HRSC data, simulations suggest ice flow over a sloping surface with ice grain sizes in excess of 1 mm, assuming an ice temperature of 205 K.

3:15 p.m.  Pedersen G. B. M. *  Head J. W.
The morphology of Utopia-Elysium flows suggests that marginal lahar deposits emplaced in the martian environment are ice-rich due to freezing of pore-water.

3:30 p.m.  Scanlon K. E. *  Head J. W.
Volcano-Ice Interactions at Arsia Mons, Mars [#2091]
We survey new evidence for glaciovolcanic landforms, polythermal glaciation, and more extant ice than previously thought in the Arsia Mons fan-shaped deposit.

3:45 p.m.  Soare R. J. *  Conway S. J.  Dohm J. M.
Low-Centred Polygons and Recent Landscape Modification by “Wet” Periglacial Processes In and Around the Argyre Impact Basin, Mars [#1025]
Very late Amazonian landforms, whose morphology and key characteristics point to an origin by “wet” periglacialism in the Argyre region of Mars, are discussed.

4:00 p.m.  Sizemore H. G. *  Zent A. P.  Rempel A. W.
Initiation and Growth of Martian Ice Lenses [#1368]
We employ numerical simulations of soil-ice interactions to place quantitative constraints on the growth of segregated ice lenses in the northern latitudes.

4:15 p.m.  Guallini L. *  Brozzetti F.  Marinangeli L.
We report first structural analysis of complex deformational systems affecting SPLD (Promethei Lingula, Mars) consistent with soft-sediment and DSGSD mechanisms.

4:30 p.m.  Brothers T. C. *  Holt J. W.
Korolev Crater, Mars: Growth of a 2-km Thick Ice-Rich Dome Independent of, but Possibly Linked to, the North Polar Layered Deposits [#3022]
3-D SHARAD stratigraphy over the icy mound in Korolev, Mars, is consistent with an atmospheric origin and hints at deposition coeval with the NPLD.
** PLANETARY ATMOSPHERES: EXOPLANETS  
Thursday, 1:30 p.m.  Waterway Ballroom 5  

Chair: Feng Tian

1:30 p.m. Hu R. * Seager S.  
*Photochemistry in Thick Atmospheres on Super Earths [#1428]*  
Present the first photochemistry-thermochemistry model for super Earth atmospheres not necessarily hydrogen dominated. Will discuss applications on super Earths GJ 1214b.

1:45 p.m. Robinson T. D. * Catling D. C.  
*Explanation of a “0.1 bar Tropopause Rule” in Thick Atmospheres of Planets and Large Moons [#3083]*  
We explain a common “0.1 bar tropopause rule” for the thick atmospheres of planets and large moons using physically-based arguments and simple models.

*A Numerical Study on Atmospheric General Circulations of Synchronously Rotating Aqua-Planets — Dependence on Planetary Rotation Rate and Solar Constant [#2562]*  
Numerical experiments on climate states of synchronously rotating terrestrial planets are performed for various planetary rotation rate and solar constant.

2:15 p.m. Catling D. C. * Zahnle K. J.  
*An Impact Stability Limit Controlling the Existence of Atmospheres on Exoplanets and Solar System Bodies [#2665]*  
We propose an impact erosion stability limit that determines the presence or absence of atmospheres on exoplanets and solar system bodies.

2:30 p.m. Zahnle K. J. * Catling D. C.  
*The Cosmic Shoreline [#2787]*  
The division between planets with and without atmospheres appears to be universal. Here we consider atmospheres to be survivors of thermal escape.

** PLANETARY ATMOSPHERES:  
POLAR CAPS ARE FROM MARS, SUPERROTATION IS FROM VENUS  
Thursday, 2:45 p.m.  Waterway Ballroom 5  

Chairs: Jonathan Bapst  
Sanjay Limaye

2:45 p.m. Sornig M. * Sonnabend G. Blank S. Herrmann M. Krause P. et al.  
*Temperature and Wind in the Venusian Upper Atmosphere Measured by Ground Based Infrared Spectroscopy [#1515]*  
We shall present groundbased dayside temperatures and Doppler wind measurements from 2010 to 2013 in the venusian upper atmosphere at an altitude of ~110 km.

3:00 p.m. Machado P. * Widemann T. Luz D. Peralta J.  
*Venus Winds with Ground-Based Doppler Velocimetry and Comparison with Coordinated Cloud Tracking Method Winds [#1975]*  
We present CFHT’s wind results based on Doppler shifted solar lines and compare with our previous measurements VLT/UVES and with Venus Express, and Galileo.
3:15 p.m. Hart R. A. * Russell C. T. Leinweber H. Strangeway R. J. Zhang T. L.
.Mapping Venus Lightning Using ULF Waves in the Lower Ionosphere of Venus [#1088]
ULF waves below 10 Hz in Venus’ ionosphere allow the rate of lightning to be measured.

3:30 p.m. Goswami J. N. * Radhakrishnan K.
.Indian Mission to Mars [#2760]
An Indian Mars mission scheduled for launch in 2013 will focus on Mars atmosphere composition, escape and detection of methane; mission details will be presented.

3:45 p.m. Villanueva G. L. * Mumma M. J. Novak R. E.
Hydrogen, Oxygen and Carbon Isotopic Ratios in the Martian Atmosphere [#2551]
We present atmospheric isotopic ratios of martian water and carbon dioxide obtained using groundbased high-resolution spectroscopy.

4:00 p.m. Martinez G. M. * Rennó N. O. Hoffman J. H. Elliott H. M. Fischer E.
.Near Surface Water Vapor Pressure and Relative Humidity on Mars: New Values Obtained from the Phoenix Mass Spectrometer [#2994]
Here, we show new values for the near surface relative humidity and water vapor pressure from the analysis of the Phoenix Mass Spectrometer measurements.

4:15 p.m. Madeleine J.-B. * Head J. W. III Forget F. Navarro T. Millour E. et al.
What Defines a Martian Glacial State? Analysis of the Mars Climate System Under Past Conditions Using the new LMD Global Climate Model [#1895]
The recent ice ages of Mars are revisited using an updated version of the LMD Global Climate Model, whose results are compared to the observed geology.

4:30 p.m. Head J. W. III
.The Early Climate History of Mars: “Warm and Wet” or “Cold and Dry”? [#1523]
Recent climate models predict a “cold and icy” Noachian Mars instead of “warm and wet.” Noachian geology is examined to assess these end-member interpretations.

**LUNAR SAMPLES: OUR EVOLVING VIEW OF THE LUNAR CRUST**
Thursday, 1:30 p.m. Waterway Ballroom 6 [R454]

**Chairs:**
Amy Fagan
Ryan Zeigler

1:30 p.m. Zeigler R. A. * Jolliff B. L. Korotev R. L.
We assess the likelihood that the provenance of the Dhofar 961 meteorite clan is the SPA basin based on their bulk compositions and lithologic components.

1:45 p.m. Wittmann A. * Korotev R. L. Jolliff B. L.
.Feldspathic Granulite Clasts in Lunar Meteorite Shisr 161 — Cumulates from a Differentiated Basin Melt Sheet? [#2061]
Poikilitic granulites could be cumulate rocks that formed from fractional crystallization in lunar basin impact melt sheets.
2:00 p.m. McLeod C. L. * Brandon A. D. Lapen T. J. Shafer J. T. Peslier A. H. et al. 
The Petrology and Geochemistry of Feldspathic Granulitic Breccia NWA 3163: 
Implications for the Lunar Crust [2003]
New geochemical and geochronological data from lunar granulite NWA 3163 aims to provide new 
insights into the evolution of the lunar crust.

2:15 p.m. Shaulis B. J. * Righter M. Lapen T. J. Irving A. J. 
3.1 Ga Crystallization Age of Magnesian and Ferroan Gabbro Lithologies in Lunar Meteorites 
Northwest Africa 773, 3170, 6950 and 7007 and Evidence for 3.95 Ga Components in NWA 773 
Polymict Breccia [1781]
Baddeleyite crystallization ages of lunar meteorites Northwest Africa 773, 3170, 6950 and 7007.

2:30 p.m. Fagan A. L. * Joy K. H. Kring D. A. 
Trapped 40Ar/36Ar Closure Ages of Apollo 15 Regolith Samples Lithified over the past 
3 Billion Years [2392]
We recalculate the closure ages of selected Apollo 15 regolith breccias, which potentially provide an 
archive of regolith processes in the last 3 billion years.

2:45 p.m. Niihara T. * Beard S. P. Swindle T. D. Kring D. A. 
Evidence for Multiple Impact Events from Centimeter-Sized Impact Melt Clasts in Apollo 16 Ancient 
Regolith Breccias: Support for Late Stage Heavy Bombardment of the Moon [2083]
We have been probing that issue with a series of studies of Apollo 16 impact melts to determine if they 
were produced by a single event or multiple events.

3:00 p.m. Warren P. H. * Harrison T. M. Isa J. Boehnke P. Heizler M. 
Petrology and Geochemistry of Apollo 16 North Ray Crater Rocks: Precursor to an 
Argon-Thermochronologic Investigation [3107]
We report the petrology and geochemistry of a suite of 30 Apollo 16 North Ray Crater rocklets, some 
of which will be used for thermochronology.

3:15 p.m. Park J. * Nyquist L. E. Shih C.-Y. Herzog G. F. Yamaguchi A. et al. 
Late Bombardment of the Lunar Highlands Recorded in MIL 090034, MIL 090036 and MIL 090070 
Lunar Meteorites [2576]
Anorthosite Ar ages are 3.0–3.6 Ga — the same range seen for impact melt clasts from other lunar 
feldspathic breccias. M(IL 0900)34 and M70 differ from M36.

3:30 p.m. Nishiizumi K. * Caffee M. W. 
Relationships Among Six Lunar Meteorites From Miller Range, Antarctica Based on 
Cosmogenic Radionuclides [2715]
Exposure histories, ejection depth, and pairing of six Miller Range lunar meteorites are presented using 
cosmogenic radionuclide measurements.

3:45 p.m. Merle R. E. * Nemchin A. A. Grange M. L. Whitehouse M. J. 
Stratigraphy of the Fra Mauro Formation Defined by U-Pb Zircon Ages of Breccia Samples from 
Apollo 14 Landing Site [1833]
We compared U-Pb age distribution patterns of zircon grains extracted from different breccia types 
from the Fra Mauro Formation (Apollo 14 landing site).

4:00 p.m. Grange M. L. * Nemchin A. A. Pidgeon R. T. Merle R. E. Timms N. E. 
What Lunar Zircon Ages Can Tell? [1884]
Distribution of published lunar zircon ages is shown and possible origin of age groups is discussed in 
terms of magmatic and impact activity on the Moon.
Most brecciated lunar meteorites have an asteroidal meteorite component that is chondritic. Some do not.

Complex textures and siderophile-element abundances of metal in Apollo 17 melt breccias illustrate the difficulties associated with impactor fingerprinting.

**IMPACT MECHANICS II: AN ANALYTICAL AND MODELING PERSPECTIVE**

**Thursday, 1:30 p.m.  Montgomery Ballroom [R455]**

**Chairs:** Ross Potter
Kai Wünnemann

**1:30 p.m.**
Timms N. E. *   Healy D.
*The Effects of Anisotropic Elastic Properties on Shock Deformation Microstructures in Zircon and Quartz [1862]*
We investigate the relationships between intrinsic anisotropic elastic properties and the formation of shock-related microstructures of zircon and quartz.

**1:45 p.m.**
Wada K. *   Nakamura A. M.
*Penetration Process in Granular Media Revealed by Numerical Simulation [1466]*
We perform numerical simulations of impact into granular media toward understanding the penetration process in regolith layers on small bodies.

**2:00 p.m.**
Tonge A. L.   Ramesh K. T. *   Barnouin O. S.
*A New Pressure Dependent Damage and Flow Model Applied to Numerical Simulations of Psyche Formation on Eros (433) [2799]*
We present results from simulations of impacts on Eros using a material model that includes subscale flaw evolution and pressure-dependent flow after failure.

**2:15 p.m.**
Abramov O. *   Kring D. A.   Mojzsis S. J.
*Assessing Impact Melt Volumes Calculated with Diverse Analytical and Numerical Methods [2231]*
Three analytical and numerical methods for calculating impact melt volumes are compared and contrasted. Results agree within ~20% for most of the parameter space.

**2:30 p.m.**
Quintana S. N. *   Crawford D. A.   Schultz P. H.
*Verification of Impact Melt and Vapor Determination Methods in CTH [1733]*
This study addresses two methods for determining melting and vaporization in CTH through a sequence of hydrodynamic and strength studies.

**2:45 p.m.**
Elder C. M. *   Bray V. J.   Melosh H. J.
*The Theoretical Plausibility of Central Pit Crater Formation via Melt Drainage [2796]*
Central pits could form in impact craters via the drainage of impact melt into impact-generated fractures if enough melt can drain before fractures freeze shut.

**3:00 p.m.**
Sharpton V. L. *
*Ejecta Thickness and Target Uplift Measurements from Lunar Crater [2789]*
Layered outcrops in the walls of lunar craters show that target uplift accounts for 70–90% of rim elevation. Implications for excavation flow are discussed.
3:15 p.m. Collins G. S. *  
*Numerical Simulations of Complex Crater Formation with Dilatancy: Implications for Gravity Anomalies of Lunar and Terrestrial Craters [#2917]*  
Simulations of crater formation that account for porosity generation provide insight into density and gravity anomalies beneath lunar and terrestrial craters.

3:30 p.m. Potter R. W. K. * Kring D. A. Collins G. S.  
*The Attenuation of Structural Uplift, with Depth, Beneath Impact Structures [#2802]*  
By numerically modeling basin-forming impacts, we quantify the amount of structural uplift and its attenuation with depth beneath lunar impact basins.

3:45 p.m. Bruck Syal M. * Schultz P. H. Crawford D. A.  
*Cometary Coma Collisions on the Moon [#2569]*  
This work numerically investigates how an active comet’s tenuous atmosphere (coma) affects cometary impact processes at the Moon.

4:00 p.m. Johnson B. C. * Bowling T. J. Melosh H. J.  
*Formation of Valhalla-Like Multi-Ring Basins [#1302]*  
Using the iSALE hydrocode, we resolve the formation of the concentric faults associated with Valhalla-like multiring structures.

4:15 p.m. Bierhaus M. * Noack L. Wünnemann K. Breuer D.  
*Basin-Forming Impacts on Mars: Consequences on Mantle Dynamics [#2420]*  
We combined numerical impact (iSALE) and mantle convection (GAIA) models to investigate the long time consequences of basin-forming impacts.

4:30 p.m. Stewart S. T. * Mukhopadhyay S.  
*Late Impacts and the Origins of the Atmospheres on Venus, Earth, and Mars [#2419]*  
Major differences in the noble gas signatures of terrestrial planetary atmospheres are a result of the different outcomes of late impact events on each planet.
SURFACE INTERACTIONS ON ASTEROIDS: 
REGOLITH AND SPACE WEATHERING 
Friday, 8:30 a.m.  Waterway Ballroom 1

**Chairs:**  
Roy Christoffersen  
David Blewett

8:30 a.m.  Campo Bagatlin A.  *  
Small Asteroids with “Dusty” Atmospheres? [#3010]  
Due to their high spin rate acceleration near the equators of some asteroids may be directed outward.  
What are the effects of that on surface material?

8:45 a.m.  Sanchez P.  *  Scheeres D. J.  Bierhaus E. B.  Clark B.  
**Simulations of Regolith Interactions in Microgravity** [#2271]  
Interactions between a rigid sampling device and regolith settled in a microgravity environment are shown.  The results are relevant for the OSIRIS-REx mission.

The Nature of C Asteroid Regolith from Meteorite Observations [#2179]  
We examine what we have learned about the mineralogy of fine-grained asteroid regolith from meteorites and the examination of the samples from asteroid Itokawa.

9:15 a.m.  Yada T.  *  Abe M.  Okada T.  Uesugi M.  Karouji Y.  et al.  
**Mineral Ratios of Itokawa Samples — Difference Between Two Rooms of a Hayabusa Sample Catcher** [#1948]  
Mineral ratios of Itokawa particles recovered from a Hayabusa sample catcher are calculated based on analytical data obtained during their initial descriptions.

9:30 a.m.  Busemann H.  *  Alwmark C.  Böttger U.  Gilmour J. D.  Heitmann U.  et al.  
We present our study, aimed finally at the detection of He-Xe in Itokawa, by analysing Hayabusa grains with X-ray tomography, Raman, and FTIR spectroscopy.

**Surface Nano-Morphologies of Itokawa Regolith Particles Formed by Space Weathering Processes: Comparison with Ion Irradiation Experiments** [#1441]  
Space weathering structures on Itokawa regolith surfaces were investigated by FE-SEM and compared with morphologies of ion-irradiated olivine fragments.

10:00 a.m.  Tsuchiyama A.  *  Matsumoto T.  Noguchi T.  
**“Space Erosion”: A New Type of Space Weathering Process on the Surface of Asteroid Itokawa** [#2169]  
A new type of space weathering process “space erosion” was recognized by comparing micro-CT, FE-SEM, and TEM/STEM observations on common Itokawa particles.

**Radiative Transfer Modeling of Space Weathering on Vesta** [#1632]  
Model spectra for assemblages of howardite composition that have undergone lunar-style space weathering give insight into soil maturation processes on Vesta.
10:30 a.m. Hiroi T. * Sasaki S. Misu T. Nakamura T. 
Keys to Detect Space Weathering on Vesta: Changes of Visible and Near-Infrared Reflectance Spectra of HEDs and Carbonaceous Chondrites [1276]
Investigated are key features for detecting space weathering in visible, near-infrared, and 3-µm reflectance spectra of HEDs and carbonaceous chondrites.

Asteroidal Space Weathering: The Major Role of FeS [2404]
We report the results of experiments that explore the efficiency of npFeS production via the main space weathering processes operating in the asteroid belt.

11:00 a.m. Christoffersen R. * Cintala M. J. Keller L. P. See T. H. Horz F.
Nanoscale Mineralogy and Composition of Experimental Regolith Agglutinates Produced Under Asteroidal Impact Conditions [2605]
Agglutinate-like particles produced at experimental impact velocities applicable to asteroids have been characterized by analytical TEM techniques.

Laser Space Weathering of Allende Meteorite [2494]
Laser irradiation experiments are done on a sample of the Allende meteorite to answer basic questions regarding how carbonaceous materials react to space weathering.

11:30 a.m. Rivkin A. S. * Howell E. S. Emery J. P. Sunshine J. M.
Does the Solar Wind Create OH on NEO Surfaces?: Observations of 433 Eros and 1036 Ganymed [2070]
NEO OH? Solar wind or impactors? Patience, grasshopper.

---

PLANTARY AEOLIAN PROCESSES: 
EROSION, DEPOSITION AND BEDFORMS
Friday, 8:30 a.m. Waterway Ballroom 4 [F502]

Chair: Ryan Ewing

8:30 a.m. Ewing R. C. * Hayes A. G. Lucas A.
Reorientation Time-Scales of Titan’s Equatorial Dunes [1187]
Titan’s equatorial dune fields show evidence of changing winds and include barchans and star dune morphologies forming on damp or lag deflationary surfaces.

8:45 a.m. Kite E. S. * Lewis K. W. Lamb M. P. Newman C. E. Richardson M. I.
Possible Role for Slope Winds in Forming Gale Crater’s Mound (and Other Sediment Mounds on Mars): The Slope Wind Enhanced Erosion and Transport Hypothesis [1166]
The structure, stratigraphy, and shape of Gale Crater’s mound may be explained by growth in place near the crater’s center mediated by wind-topography feedback.

9:00 a.m. Geissler P. E. * Fenton L. K. Bridges N. T.
Dust “Drifts” on Mars [2573]
Bright deposits on the flanks of volcanoes and elsewhere on Mars are interpreted as dust “drifts,” a new class of eolian deposit distinct from dunes and TARs.
9:15 a.m.  Reiss D. *  Zimmerman M. I.  Lewellen D. C.  
*Formation of Cycloidal Dust Devil Tracks by Redeposition of Coarse Sands in Southern Peru: Implications for Mars [#2446]*  
Based on field work and numerical simulations we show that cycloidal dust devil tracks on Earth are formed by redeposition of coarse sands.

9:30 a.m.  Schultz P. H. *  Quintana S.  
*Impact Blast Wind Scouring on Mars [#2697]*  
Certain permanent streaks on Mars are linked to intense blast winds created by impacts. Their survival has important implications for surface erosion rates.

9:45 a.m.  Chojnacki M. *  Burr D. M.  Moersch J. E.  
*Local Sourcing and Aeolian Fractionation as Factors for Compositional Heterogeneity of Martian Aeolian Bedform Sand [#3031]*  
Mapping of martian dune compositions reveals regional- and local-scale compositional heterogeneity likely caused by aeolian fractionation and local sourcing.

10:00 a.m.  Bourke M. C. *  
*The Formation of Sand Furrows by Cryo-Venting on Martian Dunes [#2919]*  
Sand furrows are eroded on polar dunes seasonally by cryoventing.

---

EXO BIOLOGY
Friday, 10:15 a.m.  Waterway Ballroom 4  [F503]

Chairs:  George Cooper  
Jochen Jänchen

10:15 a.m.  Conrad P. G. *  Archer D.  Coll P.  de la Torre M.  Edgett K.  et al.  
*Habitability Assessment at Gale Crater: Implications from Initial Results [#2185]*  
We address early MSL results from the framework of chemical, physical, geological, and geographic habitability metrics.

10:30 a.m.  Gómez F. *  Gómez-Elvira J.  Rodríguez-Manfredi J. A.  Wiens R. C.  Meslin P.-Y.  et al.  
*Habitability Approach for MSL [#2050]*  
During the first 100 sols MSL has measured relevant ambient parameters and carried out mineralogical analysis that have implications for habitability quantification.

10:45 a.m.  Pasini D. L. S. *  Price M. C.  Burchell M. J.  Cole M. J.  
*Survival of Nannochloropsis Phytoplankton in Hypervelocity Impact Events up to Velocities of 4 Km/s [#1497]*  
Nannochloropsis Phytoplankton has been shown to survive shock pressures up to 17 GPa via impact events of 4 km/s. Thus it is a viable candidate for Panspermia.

11:00 a.m.  Cooper G. *  Horz F.  O’leary A.  Chang S.  
*The Impact and Oxidation Survival of Selected Meteoritic Compounds: Signatures of Asteroid Organic Material on Planetary Surfaces [#1868]*  
Sulfonic and phosphonic acids were the most impact and oxidation resistant of all tested meteorite compounds. They are potential markers of asteroidal delivery.

11:15 a.m.  Lin T. J. *  Breves E. A.  Dyar M. D.  Holden J. F.  
*Hyperthermophile-Mineral Interactions and Correlating Mineral Transformations [#2560]*  
Interactions and correlations between two novel, hyperthermophilic iron reducers and the different minerals that are utilized and produced.
The Lost City Hydrothermal Field: A Spectroscopic and Astrobiological Martian Analog [#2742]
Samples obtained from an active zone of serpentinization on Earth show a spectrally similar suite of minerals to surfaces in Nili Fossae, Mars.

PRESOLAR GRAINS
Friday, 8:30 a.m. Waterway Ballroom 5 [F504]

Chairs: Bradley Meyer
Thomas Zega

8:30 a.m.
Meyer B. S. * Bojazi M. J.
Sensitivity of Nitrogen-15 Production in Explosive Helium Burning to Supernova Energies and Reaction Rates and Importance for Low-Density Supernova Graphite Grains [#3006]
We explore the sensitivity of helium burning production nitrogen-15 to supernova energies and reaction rates and the importance for low-density graphite grains.

8:45 a.m.
Groopman E. E. * Zinner E. K. Bernatowicz T. J.
C, Ca, and Ti Isotopes: On the Origins of High- and Low-Density Presolar Graphite Grains [#1757]
We report on isotopic measurements of C, Ca, and Ti in high- and low-density presolar graphite grains. Their origins are often difficult to pinpoint.

9:00 a.m.
Croat T. K. * Amari S. Bernatowicz T. J.
Isotopic and Microstructural Studies of Low-Density Graphites with Extreme C Anomalies [#2415]
18O enrichments from an internal TiC indicate a SN origin for its 13C-rich graphite host and tungsten grains were found in an extremely 13C-rich graphite.

9:15 a.m.
Jadhav M. * Pignatari M. Herwig F. Zinner E. Gallino R. et al.
Presolar Graphite Grains from Post-AGB Stars [#1963]
We compare presolar graphite grain isotopic data to very late thermal pulse nucleosynthesis predictions in post-AGB stars. Measurements agree with VLTP models.

9:30 a.m.
Fujiya W. * Hoppe P. Zinner E.
A Possible Supernova Origin of Type AB Presolar Silicon Carbide Grains [#1535]
N-, S-, Mg-Al- and Ca-Ti-isotopic measurements were performed on 34 presolar SiC grains of type AB, which suggest that several grains possibly have a SN origin.

9:45 a.m.
Liu N. * Savina M. R. Davis A. M. Gallino R. Straniero O. et al.
New Lessons Learned About Stellar Nucleosynthesis from Barium Isotopic Composition of Presolar SiCs from the Murchison Meteorite [#2507]
We demonstrated that Ba isotopes of mainstream SiCs provide the most restrictive constraints on the 13C pocket internal structure in AGB model calculations.

10:00 a.m.
Hoppe P. * Leitner J. Groener E.
Search for Small Supernova Silicates in the Acfer 094 Meteorite by High-Resolution NanoSIMS Ion Imaging [#1038]
We report here results from a high-resolution (50 nm) imaging survey of matrix material in Acfer 094, aimed at finding small supernova silicates (<100 nm).
10:15 a.m. Haenecour P. * Floss C.  
Presolar Silica Grains in Meteorites: Identification of a Supernova Silica Grain in the CO3.0 Chondrite LaPaz 031117 [#1024]  
We report the identification of a supernova silica grain in LAP 031117 (CO3.0) and discuss models of silica dust formation in circumstellar environments.

10:30 a.m. Zega T. J. * Floss C.  
Extraction and Analysis of a Presolar Oxide Grain from the Adelaide Ungrouped C2 Chondrite [#1287]  
We present results on the microstructural analysis of an in situ oxide grain from the Adelaide ungrouped C2 chondrite.

10:45 a.m. Leitner J. * Metzler K. Vollmer C. Hoppe P.  
Search for Presolar Grains in Fine-Grained Chondrule Rims: First Results from CM Chondrites and Acfer 094 [#2273]  
Presolar dust found in chondrule rims suggests a nebular accretion. Abundance variations may have recorded the alteration histories of the precursor materials.

11:00 a.m. Nittler L. R. * Alexander C. M. O'D. Stroud R. M.  
High Abundance of Presolar Materials in CO3 Chondrite Dominion Range 08006 [#2367]  
The highest presolar silicate grain abundance of any meteorite and D- and 15N-rich organic matter indicate CO3 DOM 08006 is one of the most primitive meteorites.

11:15 a.m. Bose M. * Zega T. J. Williams P.  
Effects of Secondary Processes on the Circumstellar and Interstellar Grains in QUE 97416 [#2718]  
The CO3 chondrite QUE 97416 contains low abundance of presolar grains and numerous 15N-rich “hotspots” in its coarse matrix.

11:30 a.m. Crowther S. A. * Gilmour J. D.  
Solar System Xenon Signatures: Solar, Fractionated Solar and an S-Process Deficit [#2126]  
In light of Genesis Xe data we reexamine relationships between solar wind Xe, Xe-Q, and Xe-P3, and identify an s-process deficit in Xe-P3 compared to solar wind.

---

**LUNAR VOLATILES: THE MOON IS WET ENOUGH**  
Friday, 8:30 a.m. Waterway Ballroom 6 [F505]

**Chairs:** Francis McCubbin  
Noah Petro

Complex Indigenous Organic matter Embedded in Apollo 17 Volcanic Black Glass Surface Deposits [#2103]  
We report the identification of arguably indigenous organic matter present within surface deposits of Apollo 17 black glass grains.

8:45 a.m. Anand M. * Tartèse R. Barnes J. J. Starkey N. A. Franchi I. A. et al.  
Abundance, Distribution, and Isotopic Composition of Water in the Moon as Revealed by Basaltic Lunar Meteorites [#1957]  
We report the OH contents and the H-isotopic composition of apatites from three basaltic lunar meteorites to constrain the volatile inventory of the lunar interior.
9:00 a.m. Füri E. * Deloule E. Gurenko A. A. Marty B. 
Constraints on the Origin of Lunar ‘Water’ from D/H and Noble Gas Analyses of Single Apollo 17 Volcanic Glasses [#2108]
We present coupled noble gas and hydrogen-isotope data for single lunar volcanic glasses to constrain the abundance and origin of indigenous lunar water.

9:15 a.m. Sarbadhikari A. B. * Marhas K. K. Sameer S. Goswami J. N. 
Water Content in Melt Inclusions and Apatites in low Titanium lunar Mare Basalt 15555 [#2813]
Water content in melt inclusions and apatites in low-Ti lunar mare basalt provide clues for lunar magma processes.

Apatite in Granulite 79215: Geochemistry of a Lunar Metasomatic Fluid [#1567]
Apatite is abundant in the lunar granulite 79215; the bulk rock composition suggests metasomatic alteration by a halogen-rich fluid derived from KREEP rock.

Volatile Components in the Moon: Abundances and Isotope Ratios of Cl and H in Lunar Apatites [#2851]
Measurements of concentrations and isotope ratios of both hydrogen and chlorine in lunar samples reveal complex reservoirs of volatiles in the Moon.

10:00 a.m. Robinson K. L. * Nagashima K. Taylor G. J. 
D/H of Intrusive Moon Rocks: Implications for Lunar Origin [#1327]
The enrichment of deuterium in intrusive lunar rocks argues for the fractionation of D from H by vaporization during lunar formation.

10:15 a.m. Hui H. * Peslier A. H. Zhang Y. Neal C. R. 
Evidence for a “Wet” Early Moon [#1830]
Using FTIR we detected ~6 ppm and up to ~2.7 ppm H2O in plagioclase of FAN and troctolite respectively, indicating that the initial LMO could have ~320 ppm H2O.

Presence of OH/H2O Associated with the Lunar Compton-Belkovich Volcanic Complex Identified by the Moon Mineralogy Mapper (M3) [#2688]
OH/H2O associated with Compton-Belkovich is shown using data from the Moon Mineralogy Mapper. Mini-RF data shows CB to be mantled in a block-poor deposit as well.

10:45 a.m. Bhattacharya S. * Chauhan P. Ajai 
Study of 2800-nm OH/H2O Feature at Compton-Belkovich Thorium Anomaly (CBTA) in the Far Side of the Moon Using Chandrayaan-1 Moon Mineralogy Mapper (M3) data [#1382]
Study of OH/H2O features from the CBTA region on the farside of the Moon based on Chandrayaan-1 Moon Mineralogy Mapper (M3) Data. OH/H2O doublets are observed.

11:00 a.m. Li S. * Milliken R. E. 
Quantitative Mapping of Lunar Surface Hydration with Moon Mineralogy Mapper (M3) Data [#1337]
Lunar surface hydration is quantitatively mapped and analyzed with new thermally-corrected M3 data.

Bulk Insolation Models as Predictors for Locations of High Lunar Hydrogen Concentration [#2374]
Study finds a positive correlation between surface insolation at the lunar poles and Lunar Exploration Neutron Detector (LEND) epithermal maps.
11:30 a.m. Haruyama J. * Yamamoto S.  Yokota Y.  Ohtake M.  Matsunaga T.
*An Explanation of Bright Areas Inside Shackleton Crater at Lunar South Pole other than Water-Ice Deposits [#1731]*
Bright inside of lunar south pole Shackleton Crater could be explained by distribution of fresh plagioclase, probably PAN, other than by 20% water-ice deposits.

TERRESTRIAL IMPACT CRATERS: WHERE, WHEN, WHAT, HOW
Friday, 8:30 a.m.  Montgomery Ballroom  [F506]

Chairs: Michail Petaev
Cassandra Marion

8:30 a.m. Mader M. M. * Osinski G. R.  Tornabene L. L.
*Structural Geology of the Mistastin Lake Impact Structure, Labrador, Canada [#2517]*
The study summarizes the use of a high-quality digital terrain model to assess the structure and diameter of the ~28-km Mistastin Impact Structure in Labrador.

8:45 a.m. Young K. E. * Hodges K. V.  van Soest M. C.  Osinski G. R.
*Dating the Mistastin Lake Impact Structure, Labrador, Canada, Using Zircon (U-Th)/He Thermochronology [#2426]*
We report a new and slightly younger age for the Mistastin Lake impact structure using the (U-Th)/He system.

9:00 a.m. Pickersgill A. E. * Osinski G. R.  Flemming R. L.
*Shock Metamorphism in Plagioclase from the Mistastin Lake Impact Structure, Canada [#2471]*
Anorthosites exhibiting PDFs in quartz, ubiquitous undulatory extinction, and a mosaic-patchy extinction pattern in plagioclase suggest low peak pressures.

*The Prince Albert Impact Structure, Northwest Territories, Canada: A New 28-km Diameter Complex Impact Structure [#2099]*
We confirm a new 28-km-diameter impact structure in Arctic Canada. It offers important insights into crater collapse and shatter cone formation.

9:30 a.m. Marion C. L. * Osinski G. R.  Linnen R. L.
*Characterization of Hydrothermal Mineralization at the Prince Albert Impact Structure, Victoria Island, Canada [#1635]*
Mineralogical and fluid inclusion results from the Prince Albert impact structure are presented as evidence for a post-impact hydrothermal system.

9:45 a.m. Schmieder M. * Tolher E.  Denyszyn S.  Jourdan F.  Haines P. W.
*Shock-Metamorphosed Zircons from the Acraman Impact Structure (South Australia) — Tracers of Multi-Stage Impact Crater Evolution [#1991]*
Complex crater evolution is recorded in melt rock-hosted zircons from the Acraman impact structure, South Australia. New SEM and U/Pb data are presented.

10:00 a.m. Anders D. * Osinski G. R.  Grieve R. A. F.
*The Onaping Intrusion, Sudbury, Canada — An Impact Melt Origin and Relationship to the Sudbury Igneous Complex [#1637]*
The results of this study provide evidence that the Onaping Intrusion from the Sudbury impact structure is an impact melt and might be the roof rock of the SIC.
*Petrography of the Impact Breccias from the ICDP-El’gygytgyn Drill Core, NE-Russia — A Focus on Melt Particles [#1340]*
Volcanic and impact-generated melt particles in impact breccias from the D1c ICDP drill core from the El’gygytgyn impact structure are discriminated.

10:30 a.m.  Sturm S. *  Wulf G.  Jung D.  Kenkmann T.
The Ries Impact Crater: An Analogue to Double-Layer Rampart Craters on Mars [#1876]
We concerned the question if the Ries Crater is comparable to martian double-layer ejecta craters by comparing the ejecta distribution outside the crater.

10:45 a.m.  Goderis S. *  Tagle R.  Belza J.  Smit J.  Montanari A.  et al.
*Can Siderophile Element Abundances and Ratios Across the K-Pg Boundary be Used to Discriminate Between Possible Types of Chondrites? [#2167]*
A revisit to platinum-group-element abundances across the Cretaceous-Paleogene boundary and implications for the nature of the projectile.

11:00 a.m.  Moore J. R. *  Hallock H. R.  Chipman J. W.  Sharma M.
Iridium and Osmium Fluences Across the K-Pg Boundary Indicate a Small Impactor [#2405]
Reconciling global iridium and osmium fluences associated with the K-Pg impact indicates that the Chicxulub impactor was relatively small (~320 Gt or less).

11:15 a.m.  Hamann C. *  Hecht L.  Ebert M.  Wirth R.
*Chemical Projectile-Target Interaction and Liquid Immiscibility in Impact Glass from the Wabar Craters, Saudi Arabia [#1522]*
This work investigates partitioning of iron meteorite matter in Wabar impact glass and shows that Wabar black melt/glass was formed by liquid immiscibility.

11:30 a.m.  Petaev M. I. *  Huang S.  Jacobsen S. B.  Zindler A.
Large Platinum Anomaly in the GISP2 Ice Core: Evidence for a Cataclysm at the Bølling-Allerød/Younger Dryas Boundary? [#1046]
A large Pt anomaly in the Greenland GISP2 ice core rules out a chondritic impact at ~12,900 years but does not rule out the Younger Dryas impact hypothesis.

---

**REMOTE SENSING OF SMALL BODIES**
Friday, 1:30 p.m.  Waterway Ballroom 1  [F551]

**Chairs:**
Faith Vilas  
Tasha Dunn

1:30 p.m.  Dunn T. L. *  Burbine T. H.  Bottke W. F.  Clark J. P.
*Mineralogies and Source Regions of Near Earth Asteroids [#1197]*
We determine the mineralogies and source regions of 72 near-Earth asteroids, most of which are S-types or Q-types.

1:45 p.m.  Murchie S. L. *  Fraeman A. A.  Arvidson R. E.  Rivkin A. S.  Morris R. V.
*Internal Characteristics of Phobos and Deimos from Spectral Properties and Density: Relationship to Land-Forms and Comparison with Asteroids [#1604]*
Phobos, Deimos, and other small bodies show a relationship between estimated macroporosity in the interior and the types of landforms present on the surface.
2:00 p.m. Fraeman A. A. * Murchie S. L. Arvidson R. E. Rivkin A. S. Morris R. V.

*Constraints on the Compositions of Phobos and Deimos from Mineral Mapping [#1572]*

Results from mapping mineral absorptions on Phobos and Deimos using visible/near infrared CRISM observations. Discovery and implications of feature at 0.65 µm.

2:15 p.m. Capaccioni F. * Filacchione G. De Sanctis M. C. Capria M. T. Tosi F. et al.

Photometric Properties of the Asteroid 21 Lutetia from VIRTIS-Rosetta Observations [#2229]

This work describes photometric corrections applied to the VIRTIS-Rosetta spectra of the asteroid Lutetia and the resulting surface color variation identified.

2:30 p.m. Conrad A. R. * Merline W. J. La Camera A. Boccacci P. Bertero M. et al.

Detecting Asteroid Satellites with LINC-NIRVANA at the Large Binocular Telescope [#2032]

Asteroid satellites help determine mass, density, and composition. LINC-NIRVANA will yield a factor of 3 improvement in the limiting separation for detections.

2:45 p.m. Sugita S. * Kuroda D. Kameda S. Hasegawa S. Kamata S. et al.

Visible Spectroscopic Observations of Asteroid 162173 (1999 JU3) with the Gemini-S Telescope [#2591]

Our results suggest that the surface of 1999JU3 may be covered with partially devolatilized CM-like materials and that its parent body could be 163 Erigone.

3:00 p.m. Shepard M. K. Nolan M. C. Springmann A. Howell E. S. Taylor P. A. et al.

Radar Observations of Three X/M-Class Main-Belt Asteroids [#2408]

We present observations of 3 M-class asteroids: 110 Lydia, 359 Georgia, and 779 Nina. All show evidence of high metal content. Two have bifurcated radar echoes.

3:15 p.m. Wlodarczyk I. Leliwa-Kopystynski J. *

Cumulative Distributions of Asteroids in the Families [#1879]

Families are extracted from 292003 asteroids. Size distributions in the different ranges of sizes and catastrophic vs. cratering forming-event are considered.

3:30 p.m. Walsh K. J. * Delbo M. Bottke W. F. Vokrouhlicky D. Lauretta D. S.

Introducing the Eulalia and New Polana Families: Re-Assesing Primitive Asteroid Families in the Inner Main-Belt [#2835]

Two primitive asteroid families dominate the inner main asteroid belt and are therefore a dominate source of primitive NEOs.

3:45 p.m. Cikota S. * Ortiz J. L. Morales N. Moreno F. Tancredi G.

A Photometric Search for Main Belt Comets [#1520]

A photometric search for main belt comets just by using the MPCAT-OBS Observation Archive.

4:00 p.m. Waszczak A. * Ofek E. O. Aharonson O. Kulkarni S. R. Bauer J. et al.

A Search for Main-Belt Comets as Extended Objects in the Palomar Transient Factory Survey [#2008]

We search the Palomar Transient Factory (PTF) wide-field survey to refine the statistical upper limits on the population size of main-belt comets.

4:15 p.m. Vincent J.-B. * Sierks H. Rose M.

Jet Activity on the Cliffs of Comet 9P/Temple 1 [#2401]

Cliff of Tempel 1 / Source of gas and dust jets / Modeled with COSSIM.

4:30 p.m. Vilas F. *

Reflectance Spectrophotometry of the Irregular Outer Jovian Satellites as Insight to Solar System History [#2900]

Reflectance spectra of JVI Himalia, JVII Elara, JVIII Pasiphae, JIX Sinope, JX Lysithea, JXI Carme, and JXII Ananke address solar system formation conditions.
MARS VOLATILES FROM MANTLE TO ATMOSPHERE:
WATER, HALOGENS, AND ORGANICS
Friday, 1:30 p.m. Waterway Ballroom 4 [F552]

1:30 p.m. Balta J. B. * McSween H. Y. Jr.
The Second Shergottite Age Paradox [#1510]
We present a second shergottite age paradox, the inability to find young shergottites on Mars, and argue that magmatic water can explain this stratigraphy.

1:45 p.m. Gross J. * Bell A. S. Filiberto J.
Water in the Martian Interior: Evidence from Hydroxyl-Rich Apatite in Olivine-Phyric Shergottite NWA 6234 [#2208]
NWA 6234, a mantle-derived melt unaffected by volatile loss, contains hydroxyl-rich apatite representing snapshots of the volatile ratios of the parental magma.

2:00 p.m. Peslier A. H. *
Water in Nominally Anhydrous Minerals from Nakhlites and Shergottites [#1130]
Water contents measured by FTIR in pyroxene, olivine and maskelynite from nakhlites and shergottites could be controlled by shock, degassing, and magmatic history.

2:15 p.m. Mane P. * Hervig R. Wadhwa M. Balta J. B. McSween H. Y. Jr.
Hydrogen Isotopic Composition of Tissint, the Newest Martian Meteorite Fall [#2220]
This abstract reports hydrogen-isotopic analysis of mineral phosphates and maskelynites in the newest martian meteorite fall, Tissint.

2:30 p.m. Usui T. * Alexander C. M. O’D. Wang J. Simon J. I. Jones J. H.
A Moderate D/H Ratio for a Surficial Water Reservoir on Mars [#1454]
Ion microprobe analyses of glassy phases in shergottites from geochemically distinct magmatic sources indicate the presence of a common surface water reservoir.

2:45 p.m. Kurokawa H. * Sato M. Ushioda M. Matsuyama T. Moriwaki R. et al.
Significant Water Loss During Noachian Era: Constraints from Hydrogen Isotopes in Martian Meteorites [#1853]
Based on the D/H data from the meteorites, we determine the amount of water loss during Noachian and post-Noachian periods.

3:00 p.m. Nunn M. H. * Agee C. B. Thiemens M. H.
Oxygen Isotopic Composition of Water in Martian Meteorite Northwest Africa 7034 [#2768]
Water extracted from martian meteorite Northwest Africa 7034 possesses oxygen-isotopic compositions distinct from the bulk rock but similar to bulk SNCs.

A Reduced Organic Carbon Component to Martian Basalts [#2659]
We describe reduced organic carbon in 12 martian basalts. It is either associated with magmatic and/or hydrothermal activity and spans 4.2 Ga of Mars history.

3:30 p.m. Burton A. S. * Callahan M. P. Elsila J. E. Baker E. M. Smith K. E. et al.
Amino Acids from Mars? Clues from the Martian Shergottite Roberts Massif (RBT) 04262 [#2613]
The martian meteorite RBT 04262 was found to contain primarily nonproteinogenic amino acids that may be extraterrestrial in origin.
3:45 p.m. Giesting P. A. * Filiberto J.
*Halogen Systematics During Crystallization of the Chassignites [#3087]*
Variations in F and Cl of kaersutite, apatite, and biotite in the chassignites reveal their crystallization sequence and final melt/fluid halogen content.

4:00 p.m. Sharp Z. D. * Shearer C. K. Jr. McCubbin F. M. Agee C. B. McKeegan K. D.
The Effect of Vapor Pressure on Cl Isotope Fractionation: Application to $\delta^{37}\text{Cl}$ Value(s) of Mars [#2611]
The Cl-isotope fractionation of NaCl in vacuum and air is the same. Cl isotopes of martian meteorites indicate crustal contamination for nonshergottites.

4:15 p.m. Karunatillake S. * Zhao Y. Y. S. McLennan S. M. Skok J. R.
Dos Martian Soil Release Reactive Halogens to the Atmosphere? [#2428]
Loss to low-T UV photolysis may drive Br variability in the martian soil profile. In contrast, aqueous processes likely influence bimodality of the S/Cl ratio.

4:30 p.m. Zhao Y. Y. S. * McLennan S. M. Jackson A. W. Karunatillake S.
Photochemical Effects on Bromine and Chlorine Distributions During Brine Evaporation on the Martian Surface [#3002]
Our UV experiments showed that fractionalations of Br/Cl and production of perchlorate can be observed under both Earth and simulated Mars atmospheric conditions.

---

**STARDUST AND IDPS**
Friday, 1:30 p.m. Waterway Ballroom 5 [F553]

**Chairs:** Don Brownlee
Natalie Starkey

1:30 p.m. Brownlee D. E. * Joswiak D. Matrajt G.
The Nature and Relationship of Coarse and the Mysterious Fine Materials Collected from Comet Wild 2 [#2564]
The fine component of materials collected from Comet Wild 2 appears differs from the coarse component and appears to have a different solar nebula origin.

Preservation and Modification of Fine-Grained Cometary Dust Captured by Stardust: The Fate of Aggregate Components in Hypervelocity Impacts on Aluminium Foil [#1910]
Diverse mixtures of melts and mineral fragments are found by using a new X-ray detector to map craters made by impact of aggregates on Stardust aluminium foil.

2:00 p.m. Floss C. * Stadermann F. J. Kearsley A. T. Burchell M. J. Ong W. J.
Determination of Presolar Grain Abundances in Samples from Comet 81P/Wild 2 [#1133]
We report the results of presolar grain searches in laboratory test shots of Acfer 094 and use them to calibrate absolute presolar grain abundances in Wild 2.

Caligula, a Stardust Sulfide-Silicate Assemblage Viewed Through SEM, NanoFTIR, and STXM [#2332]
NanoFTIR is a new technique to probe infrared modes below the diffraction limit of FTIR. We apply it here to examine an amorphous Stardust silicate.
*Q-Gases in an Unusual IDP: A Noble Gas Link to Carriers in Stardust Track 41 [#1694]*
Helium- and neon-isotope ratios in a large amorphous particle extracted from a cluster IDP closely match compositions measured in the meteoritic Q-phase.

2:45 p.m. Starkey N. A. *  Franchi I. A.
*Piecing Together the History of the Earliest Silicate and Organic Reservoirs in the Solar System [#1925]*
Early solar system silicate and organic reservoirs are investigated with O, C, N, and H isotopes in a large set of IDPs to reveal intricately linked histories.

---

**CHONDRULES**
Friday, 3:00 p.m.  Waterway Ballroom 5  [F554]

**Chairs:**
**Melissa Morris**  
**Devin Schrader**

3:00 p.m. McNally C. P.  Hubbard A.  Mac Low M. M.  Ebel D. S. *  D’Alessio P.
*Mineral Processing by Short Circuits in Protoplanetary Disks [#2844]*
The short-circuit instability in protosolar nebulae concentrates magnetic energy dissipation from MRI, heating very localized regions enough to melt chondrules.

3:15 p.m. Harju E. R. *  Young E. D.
*Silicon Isotopes in Type 1AB Chondrules and Implications for the Conditions Attending Gas-Liquid Reactions in Chondrules [#2908]*
Results of silicon isotopes measured in situ by LA-MC-ICPMS in type 1AB chondrules interpreted with condensation models for silicon.

3:30 p.m. Schrader D. L. *  Nagashima K.  Krot A. N.
*Variations in Oxygen-Isotope Compositions of the Gaseous Reservoir During Formation of Type-I and Type-II Chondrules in CR Carbonaceous Chondrites [#2616]*
Here we estimate the O-isotope composition of ambient gas that exchanged with type-I and type-II chondrules from the CR chondrites.

3:45 p.m. Nagashima K. *  Krot A. N.  Libourel G.  Huss G. R.
*Magnesian Porphyritic Chondrules Surrounded by Ferroan Igneous Rims from CR Chondrite GRA 95229 [#1780]*
Some type I chondrules were recycled in a type II chondrule-forming region to form ferroan igneous rims from precursors with diverse O-isotope compositions.

4:00 p.m. Morris M. A. *  Garvie L. A. J.
*New Constraints on the Formation of Igneous Rims Around Chondrules [#2852]*
We present new constraints on the formation of igneous rims around chondrules, and show that a minimum particle size (core plus dust rim) is required.

*Microchondrules in Unequilibrated Ordinary Chondrites: Insights into Chondrule Formation Environments [#2239]*
Fine-grained rims and their constituent microchondrules provide records of initial chondrite accretion and chondrule-forming environments.
4:30 p.m.  Dobrica E. *  Brearley A. J.  
*Ubiquitous Microchondrules in the Matrix of Unequilibrated Ordinary Chondrites [2701]*
We report the identification of a large number of microchondrules within the matrices of two UOCs and we discuss their connection to chondrules.

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:30 p.m.</td>
<td>Dobrica E. *  Brearley A. J.</td>
<td><em>Ubiquitous Microchondrules in the Matrix of Unequilibrated Ordinary Chondrites [2701]</em></td>
<td></td>
</tr>
</tbody>
</table>

**LUNAR IMPACT CRATERING: WHERE, WHEN, WHAT, AND HOW?**

Friday, 1:30 p.m.  Waterway Ballroom 6  | F555 |

**Chairs:** Harald Hiesinger  
Caleb Fassett

1:30 p.m.  Kickapoo Lunar Research Team *  Kramer G. Y.  
*Stratified Ejecta Boulders as Indicators of Layered Plutons on the Lunar Nearside [1246]*  
We test hypotheses for the formation of boulders found on the Moon with multiple layers of alternating albedos to determine their most plausible origin.

1:45 p.m.  Spudis P. D. *  Smith M. C.  
*Stratigraphy and Composition of Nectaris Basin Deposits [1483]*  
New geological mapping of the ejecta deposits of the Nectaris basin has been used to estimate the composition of its ejecta.

2:00 p.m.  Meyer H. M. *  Denevi B. W.  Boyd A. K.  Robinson M. S.  
*The Distribution and Origin of Lunar Light Plains Around Orientale Basin [1539]*  
The distribution, variability, and origin of the lunar light plains associated with the Orientale basin are examined using data from LROC.

2:15 p.m.  Hurwitz D. M. *  Kring D. A.  
*Composition and Structure of the South Pole-Aitken Basin Impact Melt Sheet [2224]*  
The differentiation of the lunar SPA basin impact melt sheet is modeled to determine if it is consistent with noritic and gabbroic lithologies observed within SPA.

2:30 p.m.  Kalynn J. D.  Johnson C. L. *  Barnouin O. S.  Osinski G. R.  
*Lunar Complex Craters: Revisiting Depth-Diameter and Central Peak Height-Diameter Relationships [1309]*  
We establish depth-diameter and central peak height-diameter relationships for young, fresh complex lunar craters using Lunar Orbiter Laser Altimeter data.

2:45 p.m.  Mahanti P. *  Robinson M. S.  Stelling R.  Lawrence S. J.  Stopper J.  
*A Probabilistic Model to Explore Depth-Diameter Dependencies for Lunar Craters [1215]*  
Probabilistic modeling of depth-diameter dependencies of lunar craters is proposed for understanding crater formation and associated morphological processes.

3:00 p.m.  Stopar J. D. *  Hawke B. R.  Robinson M. S.  Giguere T. A.  
*Impact Melt Burial and Degradation Through Crater Modification in Simple Lunar Craters [1772]*  
A thin layer of debris destroys/obscures many impact melt ponds in simple lunar craters, even at \( D < 1 \text{ km} \), during crater modification and post-impact degradation.

3:15 p.m.  Fassett C. I. *  
*Crater Degradation of Kilometer-Sized Craters on the Lunar Maria: Initial Observations and Modeling [2026]*  
New measurements of the topography of \( D = 1–3 \text{ km} \) craters on the lunar maria provide insight into crater degradation processes and erosion rates.
3:30 p.m. Zanetti M. * Jolliff B. L. van der Bogert C. H. Hiesinger H.  
*New Determination of Crater Size-Frequency Distribution Variation on Continuous Ejecta Deposits: Results from Aristarchus Crater [#1842]  
A comprehensive crater count of the Aristarchus Crater ejecta blanket provides evidence for self-secondary craters and their influence on absolute model ages.

3:45 p.m. Hiesinger H. * van der Bogert C. H. Thiessen F. Robinson M. S. 
*Absolute Model Ages of Light Plains in the Southern Lunar Hemisphere [#2827]  
We present new absolute model ages of 16 lunar light plains of the southern lunar hemisphere. The absolute model ages vary from 3.71 to 4.02 Ga.

4:00 p.m. Nemchin A. A. * Norman M. L. Zeigler R. A. Grange M. L. 
*Constraining the Flux of Impactors Postdating Heavy Bombardment Using U-Pb Ages of Impact Glasses [#1834]  
U-Pb dating of glass beads from Apollo 14 soil sample 14163 suggests complex formation and reworking history of these impact glasses.

4:15 p.m. Kirchoff M. R. * Chapman C. R. Marchi S. Bottke W. F. Enke B. 
*Hints that the Lunar Impact Flux has not been Constant for Large Impacts During the Last 3 Gyr [#2689]  
We compute model ages from superposed crater densities for D = 50–300-km Eratosthenian and younger craters, which hint the impact flux may not be constant.

4:30 p.m. Frey H. V. * Burgess E. E. 
*Improved N(50) Crater Retention Ages for 80 Large Lunar Basins: Evidence for an Early as well as a Late Heavy Bombardment? [#1606]  
We improve the determination of N(50) crater retention ages for 80 large lunar basins by accounting for overlap between basins. The age distribution shows two distinct peaks.
POSTER SESSION I: GENESIS MISSION:
TARGET HANDLING AND SOLAR WIND ABUNDANCES
Tuesday, 6:00 p.m. Town Center Exhibit Area [T601]

POSTER LOCATION #1
Recent Optical and SEM Characterization of Genesis Solar Wind Concentrator Diamond-on-Silicon Collector [#2466]
Observations of contaminants and irradiation damage on diamond-on-silicon surface and postsubdivision imaging.

POSTER LOCATION #2
Burkett P. J. Allton J. A. Clemett S. J. Gonzales C. P. Lauer H. V. Jr et al.
Plan for Subdividing Genesis Mission Diamond-on-Silicon 60000 Solar Wind Collector [#2837]
Using innovative laser scribing and cleaving techniques, Genesis sample 60000 was subdivided resulting subsamples for allocation and analysis.

POSTER LOCATION #3
Lauer H. V. Burkett P. J. Rodriguez M. C.
Nakamura-Messenger K. Clemett S. J. et al.
Laser Subdivision of the Genesis Concentrator Target Sample 60000 [#2691]
The Genesis Allocation Committee received a request for ~ 1 cm² of the target sample 60000. We describe the cutting plan used to provide the allocation.

POSTER LOCATION #4
Rodriguez M. R. Allton J. H. Burkett P. J. Gonzalez C. P.
Examples of Optical Assessment of Surface Cleanliness of Genesis Samples [#2515]
We present recent examples of optically surveyed Genesis samples as part of a cleaning plan intended to create a set of “assessed clean” samples for allocation.

POSTER LOCATION #5
Kuhlman K. R. Rodriguez M. C. Gonzalez C. P. Allton J. H. Burnett D. S.
Cleaning Study of Genesis Sample 60487 [#2930]
This examination of the efficacy of various cleaning methods was conducted using correlative microscopy of Genesis sample 60487.

POSTER LOCATION #6
Application of CO₂ Snow Jet Cleaning in Conjunction with Laboratory Based Total Reflection X-Ray Fluorescence Spectrometry for Genesis Solar Wind Samples [#2465]
Genesis solar wind samples were analyzed using TXRF spectrometry before and after CO₂ jet cleaning to investigate the efficiency of this cleaning method.

POSTER LOCATION #7
Goreva Y. S. Burnett D. S.
TOF-SIMS Ion Imaging for Evaluation of Effectiveness of Genesis Sample Cleaning [#2109]
TOF-SIMS techniques is used to image surfaces of Genesis samples before and after cleaning.

POSTER LOCATION #8
Veryovkin I. V. Schmeling M. Toyoda N. Mashita T. Yamada I. et al.
Gas Cluster Ion Beam Cleaning of Genesis Solar Wind Samples: Further Steps in the Method Evaluation [#2970]
We present new results of cleaning Genesis samples by Gas Cluster Ion Beam irradiation. This cleaning study includes sample characterization by TXRF and RIMS.

POSTER LOCATION #9
Veryovkin I. V. Zinovev A. V. Tripa C. E. Baryshev S. V. Pellin M. J. et al.
Backside Sputter Depth Profiling of Genesis Samples: An Application to Diamond-on-Silicon Collectors [#2247]
We present a new approach to quantitative elemental and isotopic analysis of Genesis Diamond-on-Silicon solar wind collectors by RIMS and SIMS.

POSTER LOCATION #10
Genesis Sodium and Potassium Bulk Solar Wind Fluences [#3030]
We present preliminary measurements of bulk solar wind 23Na and 39K abundances in the Genesis Si and diamond-on-Si wafers using backside depth profiling by SIMS.
POSTER LOCATION #11

**Carbon, Nitrogen, and Oxygen Abundances in the Bulk Solar Wind and Calibration of Absolute Abundances [2540]**

Updated C, N, and O solar wind abundances measured by backside depth-profiling using SIMS and strategies for their absolute calibration are presented.

POSTER LOCATION #12

**Solar Abundances of Volatile Elements Revisited After Genesis [1277]**

Significant differences among elemental abundances from different solar sources can be reduced or eliminated when results from the Genesis mission are used.

POSTER LOCATION #386

**Isotopic CO in the Solar Photosphere, Viewed Through the Lens of 3D Spectrum Synthesis [3038]**

New analyses of CO isotopologue abundances in the solar photosphere are now consistent with Genesis solar wind results, although $^{17}$O error bars are still large.

POSTER LOCATION #13

**Evolution of Circumplanetary Particle Disks and Formation of Multiple-Satellite Systems [1856]**

We perform N-body simulations in order to see the evolution of less massive circumplanetary particle disks and see the evolution of multiple-satellite systems.

POSTER LOCATION #14

**Coupling Protoplanetary Disk Thermodynamics and Geometry: Toward a more Self-Consistent Structure [2274]**

Building a new complete model of protoplanetary disks that would be dynamically, thermodynamically, and geometrically intercorrelated and self-consistent.

POSTER LOCATION #15

**Dust Accretion onto Planetesimals in the Solar Nebula [1361]**

The extent to which newly formed planetesimals accrete solids remains uncertain. We created a model to determine under what conditions particles are accreted.

POSTER LOCATION #16

**Insights on CAIs Thermal History from Turbulent Transport Simulations of Micron-Sized Precursors in the Early Solar Nebula [2007]**

Using numerical simulations we showed that turbulent transport in a thermally zoned protoplanetary disk might be at the origin of CAIs complexity and diversity.

POSTER LOCATION #17

**The Distribution of Isotopically Heavy Water in an Evolving Solar Nebula [1806]**

We study how oxygen-isotopic anomalies inherited from the parent cloud vary as oxygen-bearing species experience isotopic exchange in an evolving solar nebula.

POSTER LOCATION #18

**Gas-Silicate Interactions: The “PRONEXT” Experiment [1990]**

PRONEXT, a new experimental set-up we developed, is dedicated to the investigation of the possibility (or not) of producing molecules on the surface of silicates.
Roskosz M. Leroux H. Depecker C. Rémusat L. Laurent B. POSTER LOCATION #19
Water Uptake, Diffusion and Isotopic Signature in Amorphous Silicates in Contact with Dry Vapor at Low Partial Pressure [#1968]
Partial hydration of amorphous silicates is reported. A quick captation and a slow volume diffusion coupled to a large redistribution of H isotopes is observed.

Matsuno J. Tsuchiyama A. Koike C. Chiha H. Imai Y. et al. POSTER LOCATION #20
Structural Modification in Amorphous MgSiO₃ with Heat Treatment [#2199]
A hydrous phyllosilicate crystallized in annealing experiments of amorphous MgSiO₃ using condensate at high-temperature plasma furnace.

Sun T. Niles P. B. Socki R. A. Bao H. Liu Y. POSTER LOCATION #21
An Update on the Non-Mass-Dependent Isotope Fractionation Under Thermal Gradient [#1700]
Non-mass-dependent isotope fractionation of gases is found in laboratory convective condition, making such effect be considerable in natural environments.

Peto M. K. Jacobsen S. B. POSTER LOCATION #22
Understanding the Initial Xe Isotope Composition of the Terrestrial Atmosphere and the Compositional Variation of Meteorites [#3067]
The Xe composition of the initial Earth atmosphere is depleted in the heaviest nuclides. We rederive this composition in light of nucleosynthetic components.

Yu T. Meyer B. S. POSTER LOCATION #23
Yields in Simple Models of Dense Thermonuclear Supernovae [#1998]
Our calculation of simple models of dense thermonuclear supernovae shows that in such low entropy condition there could be a lot of n-rich isotopes produced.

Steele R. C. J. McKeegan K. D. Liu M. C. POSTER LOCATION #24
Titanium Isotope Anomalies in CM Hibonites: Nucleosynthetic Sources and Mixing in the Early Solar System [#2967]
Titanium-isotope anomalies in hibonite grains have been used to investigate nucleosynthetic sources and mixing processes in the early solar system.

Akram W. M. Schönbachler M. POSTER LOCATION #25
Zirconium Isotope Evidence for Dust Processing in the Early Solar Nebula [#2138]
Bulk rock solar system material has Zr-isotope anomalies, characteristic of a heterogeneous distribution of s-process material, from different sources.

Fukami Y. Yokoyama T. Okui W. POSTER LOCATION #26
Tellurium Isotope Compositions in Sequential Acid Leaching Samples of Carbonaceous Chondrites [#2038]
We present data of Te-isotopic compositions in acid leachates of Murchison (CM2), Allende (CV3), and Tagish Lake (C2-ung) measured by N-TIMS.

Nagai Y. Yokoyama T. POSTER LOCATION #27
Molybdenum Isotope Anomalies in Allende and Murchison Meteorites [#2373]
We report Mo-isotopic compositions for Allende (CV3.6) and Murchison (CM2) by N-TIMS. They have Mo-isotope anomalies characterized by s-process deficit.
Burkhardt C. Schönächler M.  
**POSTER LOCATION #28**

*Nucleosynthetic Tungsten Isotope Anomalies in Acid Leachates of the Orgueil, Murchison and Allende Carbonaceous Chondrites* [#1912]

Our W leachate data provide new insights into W nucleosynthesis and nebular and parent body processing of presolar materials.

Cook D. L. Kruijer T. S. Kleine T.  
**POSTER LOCATION #29**

*180W Anomalies in Iron Meteorites: Implications for p-Process Heterogeneity* [#1097]

Measurements of 180W in iron meteorites and metal from the CB chondrite Gujba do not indicate a heterogeneous distribution of p-process isotopes in the nebula.

Peters S. T. M. Münker C. Becker H. Schulz T.  
**POSTER LOCATION #30**

*Tungsten-180 Anomalies in Iron Meteorites Reflect Alpha Decay of Osmium-184* [#2073]

Combined 180W isotope and Os-W concentration data indicate that α-decay of 184Os, previously considered stable, explains 180W anomalies in iron meteorites.

Wittig N. Humayun M. Leya I.  
**POSTER LOCATION #31**

*Nucleosynthetic and Cosmogenic Palladium Isotope Anomalies Resolved in IVB Irons* [#2355]

We present new and highly precise Pd-isotope data for IVB irons, which coupled to W-Os-Pt-isotope data, reveal cosmogenic and nucleosynthetic isotope anomalies.

Hidaka H. Yoneda S.  
**POSTER LOCATION #32**

*Systematic p-Process Isotopic Excesses of Sr, Ba, Ce and Sm Observed in the Chemical Separates of the Kapoeta Meteorite* [#1867]

Sr-, Ba-, Ce-, Nd-, Sm-, and Gd-isotopic compositions of the chemical separates of Kapoeta were determined to find systematic p-process isotopic anomalies.

**POSTER LOCATION #33**

*Barium Isotope Abundances in Meteorites: Implications for Early Solar System Evolution* [#1734]

New Ba-isotope data from thermally unequilibrated chondrites indicate that Ba isotopes were homogeneously distributed throughout the solar system.

Bermingham K. R. Mezger K. Horstmann M. Scherer E. E.  
**POSTER LOCATION #34**

*Evidence for Extinct 135-Cs from Ba Isotopes in Allende Inclusions?* [#1732]

New Ba-isotope data from Allende CAIs may provide direct evidence for live 135Cs in the early solar system.

Antonelli M. A. Peters M. Farquhar J.  
**POSTER LOCATION #35**

*Multiple Sulfur Isotope Analyses of Iron Meteorites: Implications for Nebular Evolution* [#1279]

This abstract presents the multiple sulfur-isotopic compositions of 61 different iron meteorites from 8 different chemical groups, and their implications.

Bowers M. Kashiv Y. Collon P. Lu W.  
**POSTER LOCATION #36**

*Experimental 32S(a,p)36Cl Reaction Cross-Section and 36Cl Production in the Early Solar System* [#2543]

Results of the 32S(a,p)36Cl cross section measurement will be discussed and other possible important reactions for 36Cl production in the early solar system.

Myojo K. Yokoyama T. Sano Y. Takahata N. Sugiuira N.  
**POSTER LOCATION #37**

*Strontium Isotope Anomalies and 26Al-26Mg Chronology in CAIs from CV Chondrites* [#2626]

We present Sr-isotopic data and Al-Mg ages for CAIs from CV chondrites. The result suggests 84Sr/86Sr heterogeneity due to location in the early solar system.
Bell E. A.  Gilmour J. D.  Harrison T. M.  Turner G.  Crowther S. A.  
**POSTER LOCATION #38**
*Origins of Pu/U Variations in >4 Ga Terrestrial Zircons* [#2313]
Xenon in >4 Ga zircons yields estimates of original Pu/U that deviate from chondritic estimates. Xenon loss is resolved for some; other causes are less certain.

Cooke I.  Sapah M. S.  Kaltenbach A.  Stirling C. H.  Amelin Y.  
**POSTER LOCATION #39**
*Uranium Isotopic Composition and Trace Element Abundances of CAIs from CV Chondrite Northwest Africa 4502* [#1709]
We have initiated a study of the new oxidised CV chondrite NWA-4502 to help reconcile inconsistencies between recently reported ages of CAIs.

Andreasen R.  Lapen T. J.  
**POSTER LOCATION #40**
*The Absolute Neodymium Isotopic Composition of Standard Materials — Implications for Accurate and Precise 142-Neodymium Measurements and Chronology* [#2918]
The stable Nd-isotopic compositions of standard materials vary by 1.5 ε per amu. Variations are observed for both synthetic and natural standards.

Parai R.  Jacobsen S. B.  Huang S.  
**POSTER LOCATION #41**
*Strontium Isotopic Constraints on Early Solar System Chronology* [#2544]
Precise determination of instrumental mass fractionation laws are necessary to constrain the age of formation of planetary objects, such as the Moon.

Theis K. J.  Schönbächler M.  
**POSTER LOCATION #42**
*Palladium-Silver Ages of the Ordinary Chondrite Allegan (H5) and Acapulcoite Dhofar 125 and Related Stable Isotope Fractionation* [#2051]
Using the short-lived Pd-Ag chronometer to infer a resetting event for Allegan and early Pd-Ag closure for Dhofar 125 followed by stable isotope fractionation.

Matthes M.  Fischer-Gödde M.  Kleine T.  
**POSTER LOCATION #43**
*Palladium-Silver Isotope Systematics of IIIAB Iron Meteorites* [#2780]
We analyzed the Ag-isotopic composition of the IIIAB irons Grant and Cape York to improve the resolution of their cooling history in the early solar system.

Telus M.  Huss G. R.  Nagashima K.  Ogliore R. C.  
**POSTER LOCATION #44**
*Initial Abundance of 60Fe in Unequilibrated Ordinary Chondrites* [#2964]
New results for SIMS measurements of 60Fe-60Ni systematics of chondrules from UOCs are reported. Implications for the (60Fe/56Fe)_0 ratio of UOCs are discussed.

Chen H.  Bishop M. C.  Humayun M.  Williams J. T.  Mynier F.  
**POSTER LOCATION #45**
*Cosmogenic Effects on Cu Isotopes in IVB Irons: Implications for the 182Hf-182W Chronometry* [#1909]
Cu isotopes in IVB irons are affected by cosmic ray exposure. Cu isotopes can be used for correcting neutron capture induced shifts in W isotopes.

**POSTER LOCATION #46**
*First I-Xe Ages of Rumuruti Chondrites and the Thermal History of Their Parent Body* [#2211]
Xe closure occurred 4556–4548 Myr ago, ~5 Myr after the Mn-Cr system. The R5 sample is young compared to the R3 samples, consistent with the onion shell model.

Iizuka T.  Kaltenbach A.  Amelin Y.  Stirling C. H.  Yamaguchi A.  
**POSTER LOCATION #47**
*U-Pb Isotope Systematics of Eucrites in Relation to Their Thermal History* [#1907]
We present the first combined high-precision 238U/235U- and Pb-isotopic data for eucrites, including Camel Donga, Agoult, DAG 380, NWA 049, and Ibitira.
Incorporation of the Short-Lived Radionuclide $^{36}\text{Cl}$ Into Calcium Aluminum Inclusions in the Solar Wind Implantation Model [#1722]

We consider $^{36}\text{Cl}$ in CAIs in primitive carbonaceous meteorites in accordance with a solar wind implantation model.

Ar-Ar analyses of two ordinary chondrite fragments from the Almahata Sitta breccia reveal no evidence for any thermal events more recent than 4150 Ma.

Matrix-matched standards are required for accurate $^{53}\text{Mn}-^{53}\text{Cr}$ chronometry. We have prepared synthetic fayalite in order to date secondary fayalite in chondrites.

We assess the accuracy and precision of the Savitzky-Golay Second Derivative fitting method to Raman spectra of IOM in comparison to previous fitting techniques.

Correlations between concentrations of organic species and mineral species in meteorites have been assessed by infrared and Raman microspectroscopy.

A quantum-chemical calculation is carried out on the adsorption of organics on mineral surfaces to investigate the delivery of organics into Earth.

Raman data for three CR chondrites demonstrate that initial heterogeneity disappears with degree of aqueous alteration. A new model explains the processes involved.

We see two distinct and successive processes in the evolution of organic matter in metamorphosed carbonaceous chondrites: carbonization then graphitization.
TEM Study of Insoluble Organic Matter in Primitive Chondrites: Unusual Textures Associated with Organic Nanoglobules [#3101]
We report some unusual nanoglobule morphologies found in the insoluble organic matter from primitive chondrites.

Zaytsev M. A.  Gerasimov M. V.  Safonova E. N.  Ivanova M. A.  Lorenz C. A.  et al.  POSTER LOCATION #58
Comparative Investigation of Organic Components in the Murchison (CM2) and Kainsaz (CO3) Carbonaceous Chondrites [#1905]
Organics in meteorites could be synthesized in nebula and by processing on protoplanetary bodies. Synthesis in a high-temperature vapor cloud is also possible.

Hashiguchi M.  Kobayashi S.  Yurimoto H.  POSTER LOCATION #59
Isotopically Anomalous Organic Matters in Murchison and Northwest Africa 801 [#1758]
We report isotopic compositions and morphology of D- and/or 15N-rich organic matters from Murchison (CM2) and NWA 801 (CR2) identified by isotope imaging.

Laurent B.  Roskosz M.  Rémusat L.  Depecker C.  Vezin H.  et al.  POSTER LOCATION #60
Molecular and Isotopic Study of Irradiated Organic Matter Analogue [#1536]
To better understand the H-isotope signature in IOM, polymer films were irradiated with electrons producing quinones groups, organic radicals, and D-H fractionation.

Le Guillou C.  Bernard S.  Rémusat L.  Brearley A. J.  Leroux H.  POSTER LOCATION #61
Amorphization and D/H Fractionation of Kerogens during Experimental Electron Irradiation: Comparison with Chondritic Organic Matter [#1960]
Kerogens irradiation in the TEM studied by STXM/NanoSIMS. Kinetics of electron driven D/H fractionation may be inhibited in the ISM and the protosolar nebula.

Orthous-Daunay F.-R.  Gyngard F.  POSTER LOCATION #62
Sulfur Isotopic Composition of HF/HCl Residues in Type 1 and 2 Carbonaceous Chondrites [#2604]
We measured isotopic composition of organic relative to inorganic sulfur in several HF/HCl residues in order to investigate for aqueous alteration signatures.

Riebe M.  Busemann H.  Huber L.  Wieler R.  POSTER LOCATION #63
Primordial Noble Gases in the Unequilibrated LL3.2 Chondrite Krymka Analyzed by Closed System Step Etching [#2133]
CSSE analysis of phase Q gives elemental ratios consistent with Q. Neon-isotopic ratios differ significantly from ratios for Q, indicating the presence of Ne-E or HL.

McLeod A. S.  Dominguez G.  Gainsforth Z.  Westphal A.  Keilmann F.  et al.  POSTER LOCATION #65
NanoFTIR for the Analysis of Planetary Materials [#2643]
We present the application of scanning near-field microscopy and nanoscale broadband infrared spectroscopy to the study of chondrites and presolar grains.

Henkel T.  Lyon I. C.  POSTER LOCATION #66
Further Analysis of the Molecular Structure of Cometary Organic Material [#2554]
Using time-of-flight secondary ion mass spectrometry to record complete mass spectra enables determination of whole molecules rather than functional groups only.
Construction of Hydrous Meteorites from Ordinary Chondrite Fragments [*2730*]
Small fragments of anhydrous rock are hydrated and adhered to create an analogue for a hydrous meteorite.

Evidence for Extended Aqueous Alteration in CR Carbonaceous Chondrites [*1929*]
Three CR chondrites (EET 92159, GRA 95229, and LAP02342) were studied together with the Kaidun microbreccia to get insight into the parent body aqueous alteration.

Detailed Statistical Analysis of Fe-Mg Systematics of Amoeboid Olivine Inclusions [*2991*]
Fe-Mg distributions of olivine grains in AOIs can be used to refine the petrologic subtypes to the second digit, similar to the use of Cr2O3 distribution in chondrules.

Secondary Fayalite, Hedenbergite, and Magnetite in the CO3.0-3.1 Carbonaceous Chondrites Y-81020, ET 90043, and MAC 88107 [*1754*]
Fayalite, hedenbergite, and magnetite in Y-81020, EET 90043 and MAC 88107 resulted from aqueous alteration of the CO chondrite parent asteroid at low water/rock ratio.

Non-Progressive Aqueous Alteration of CM Carbonaceous Chondrites: The Perspective of Modal Mineralogy and Bulk O-Isotopes [*2520*]
Mineral abundances and O isotopes in CMs are inconsistent with progressive aqueous alteration models: Hydration was without flow and supply of H2O was limited.

Halogens in CM Chondrites [*2375*]
Setup of an extraction line of halogens by pyrohydrolysis using restricted sample masses, and its application to chondrites to determine the asteroidal history.

Fe and Mg Compositional Variations of CM/CI Meteorites and Dark Asteroids [*1048*]
CM/CI meteorites show a trend between 12-µm band position and modal abundance of Mg-rich phyllosilicates that is now observed in the spectra of dark asteroids.

Aqueous Alteration Experiments of Chondrule Analogue and Iron Sulfide Mixture with H2O-CO2 Fluid [*1878*]
We carried out aqueous alteration experiments of mixture of olivine, mesostasis glass, and pyrrhotite with H2O-CO2 fluid.

Hydration Kinetics of Pericalse: Quantum Chemical Calculations and Implications for the Timescale of Formation of Hydrous Minerals in the Solar Nebula [*2396*]
The kinetics for the formation of hydrous phyllosilicates, which has important implications for water incorporation into Earth, is studied theoretically.
POSTER SESSION I: CHONDRITES: HIGH-TEMPERATURE SECONDARY PROCESSES
Tuesday, 6:00 p.m.  Town Center Exhibit Area  [T607]

Hutson M.  Ruzicka A.  Brown R.  POSTER LOCATION #76
A Pyroxene-Enriched Shock Melt Dike in the Buck Mountains 005 (L6) Chondrite [#1186]
A complex pyroxenitic igneous dike in the Buck Mountains 005 (L6) chondrite was produced by a variety of shock-related processes.

Meszaros M.  Ditrói-Puskás Z.  Váčzi T.  Keresztfuri Á.  POSTER LOCATION #77
A New Petrological Study of Nyirábrány, an Ordinary Chondrite from Hungary [#1477]
Analyzing the Hungarian Nyirábrány meteorite, based on chemical, mineralogical, and textural features it can be classified as an L/LL4-5S2W2 ordinary chondrite.

Khan R.  Shirai N.  Ebihara M.  POSTER LOCATION #78
Bulk Chemical Composition of R Chondrites: New Data [#2059]
We have analyzed 15 R chondrites of different petrologic types by neutron activation analysis and discuss the metamorphism in the R-chondrite parent body.

Tupelo, a New EL6 Enstatite Chondrite [#2088]
The Tupelo meteorite was found, classified, and named in 2012. Based on mineral compositions and modal abundances, it was determined to be an EL6 chondrite.

Berger E. L.  Lauretta D. S.  Zega T. J.  Keller L. P.  POSTER LOCATION #80
FIB-TEM Investigations of Fe-Ni-Sulfides in the CI Chondrites Alais and Orgueil [#1615]
We discuss the microstructures and textures of sulfide grains from Alais and Orgueil and the implications that these data have on grain formation conditions.

Lehner S. W.  Nemeth P.  Petaev M. I.  Buseck P. R.  POSTER LOCATION #81
Origin of Fine-Grained Albite in an EH3 Sulfidized Chondrule [#2500]
We report evidence that nanocrystalline albite in an Al-rich, Cl-bearing mesostasis from EH3 chondrite SAH 97072 formed as a byproduct of augite sulfidation.

Lehner S. W.  Nemeth P.  Petaev M. I.  Buseck P. R.  POSTER LOCATION #82
Pyrite in an EH3 Metal-Sulfide Nodule [#2237]
We report the occurrence of pyrite and pyrrhotite interspersed among porous silica in the core of a metal-sulfide nodule from the EH3 chondrite ALH 84170.

Lewis J. A.  Jones R. H.  POSTER LOCATION #83
Phosphate Mineralogy of Petrologic Type 4-6 L Ordinary Chondrites [#2722]
We compare phosphates in L chondrites with previous work on H and LL chondrites, and examine differences in metamorphic conditions between OC parent bodies.

Cuvillier P.  Leroux H.  Jacob D.  POSTER LOCATION #84
Fe-Mg Interdiffusion Profiles in Forsterite within the Allende Matrix. Time-Temperature Constraints Deduced from a TEM Study [#1873]
To infer the origin (nebular or asteroidal) of the ferroan olivine in the Allende matrix, an analytical TEM study of forsterite with Fe-rich rim was performed.

Posner E. S.  Ganguly J.  Hervig R.  POSTER LOCATION #85
Cr Diffusion in Spinel: Experimental Studies and Applications to Cooling Rate Recorded by Chevron Zoned Cr-Spinel in Allende and Mn-Cr Cosmochronology [#1419]
We determined Cr diffusion in spinel and applied the data to retrieve cooling rate of spinel likely to have formed by nebular condensation, and Mn-Cr chronology.
From 2D to 3D Chemical Analysis: A µ-XRF, EDS and EBSD Study of the Gujba CB Chondrite [#2439]
3-D chemical data of Gujba are presented, which help visualizing the magnitude of interactions between different preexisting metal particles and impact melt.

CB Chondrites Could have Formed in an Impact Plume [#2309]
Metal with similar siderophile contents to bulk compositions of zoned and unzoned CB grains condenses from a plume formed by CR metal-H chondrite impact.

Magnetic Fabric Formation by Oblique Impact in Pultusk H Chondrite [#2089]
Oblique collision on the parent body of Pultusk allowed for non-coaxial deformation, shearing, brecciation, and formation of magnetic foliation and lineation.

Thermal Demagnetization of Shock Remanent Magnetization in Extraterrestrial Materials [#2354]
We study how the magnetic records of meteorites are affected by shock.

Unique Polymict Breccia Northwest Africa 7531 Composed of Recrystallized LL Clasts Associated with CR Metachondrite Material: Evidence for Highly Equilibrated Ordinary Chondritic Impactors onto the CR Chondrite Parent Body [#2214]
This remarkable specimen records impact mixing of two very different highly equilibrated chondritic lithologies (presumably on the CR chondrite parent body).

The Metamorphic History of Two Major New Finds of Antarctic CO Chondrites (DOM 08004) and MIL 07531) Determined from Thermoluminescence data [#2333]
TL data for two major CO chondrites were determined. Both are homogeneous low-grade CO chondrites (DOM 3.2, MIL 3.3). NTL data indicate very different orbits.

Petrogenesis of Microporphyritic Impact Melt Clasts in Ordinary Chondrites [#2615]
In an effort to understand early solar system bombardment in the asteroid belt, we examine microporphyritic impact melt clasts in ordinary chondrites.

Mineralogical and Chemical Relationships Among Anomalous CV and CR Chondrites MET 01017, RBT 04133, and MIL 07513 [#2346]
We use the mineralogy of matrices to discriminate between CV and CR group classification and discuss the relationship of anomalous CV/CRs with CVred chondrites.

Allende 10 B 41: Megachondrule, or Impact Melt Clast? [#1646]
Oh, “megachondrule” / We were sadly mistaken / You are impact melt.

**POSTER LOCATION #96**

*Differentiation in Planetesimals with Applications to Asteroid (16) Psyche [#1351]*

We explore the likely compositional ranges of silicate planetesimal interiors and consider the ramifications for the asteroid Psyche and in the IVA iron meteorites.

---

Fu R. R.  Elkins-Tanton L. T.  

**POSTER LOCATION #97**

*Partially Differentiated Planetesimals may Retain Primitive Crusts [#1173]*

Melts of carbonaceous chondrites are dry and denser than the chondritic crust itself. A primitive surface is therefore expected to survive differentiation.

---

Komacek T. D.  Ciesla F. J.  Davison T. M.  

**POSTER LOCATION #98**

*A Model for the Three-Dimensional Heating of a Planetesimal [#1359]*

We present a 3-D model exploring the effects of radiogenic and impact heating in a planetesimal, displaying model test results and describing future work.

---

Righter K.  

**POSTER LOCATION #99**

*Late Chondritic Additions and Planet and Planetesimal Growth: Evaluation of Physical and Chemical Mechanisms [#2196]*

The hypothesis of late chondritic addition to planets and differentiated bodies will be evaluated using both chemical and physical constraints.

---

Hirschmann M. M.  

**POSTER LOCATION #100**

*Atmosphere/Magma Ocean Interactions: Consequences for Planetary Differentiation and Volatile Evolution [#2049]*

Magma ocean-atmosphere interactions play a key role in the differentiation of terrestrial planets and formation of geochemical reservoirs.

---

Zhang H.  Withers A. C.  Hirschmann M. M.  

**POSTER LOCATION #101**

*Experimental Investigation of the Role of Oxygen Fugacity on Degassing of Planetary Magma Oceans [#2657]*

We present experiments on $f_O^2$ variation with pressure in silicate melts to address redox gradients in magma oceans and their influence on planetary evolution.

---

Mills R. D.  

**POSTER LOCATION #102**

*The Effect of Thermal Cycling on Crystal-Liquid Separation During Lunar Magma Ocean Differentiation [#2317]*

Thermal cycling during crystallization of a magma ocean could lead to coarsening of crystals and more efficient fractional crystallization.

---

Shibazaki Y.  Fei Y.  

**POSTER LOCATION #103**

*Experimental Comparison of Densities Between Liquid and Solid Phases in the Fe-FeS System at High Pressure: Implications for the Evolution of Planetary Cores [#1623]*

Based on our high-pressure experiments, Fe-S liquid is denser than coexisting solid FeS. S-rich core would consist of outer solid core and inner liquid core.
Hillgren V. J. Fei Y.  
**POSTER LOCATION #104**

*Metal-Silicate Partitioning of Si and S in Highly Reducing Conditions: Implications for the Evolution of Mercury [#3078]*

The strange composition of Mercury’s surface may be the result of core formation under reducing conditions and high temperatures.

Marin N. Righter K. Danielson L. Pando K. Lee C.  
**POSTER LOCATION #105**

*Metal-Silicate Partitioning of Bi, In, and Cd as a Function of Temperature and Melt Composition [#1848]*

New data for the systematic metal-silicate partitioning behavior of Bi, In, and Cd as a function of temperature, pressure, and melt composition was obtained.

**POSTER LOCATION #106**

*Measuring the Solubility of Neutral Nickel in Silicate Melts: Another Experimental Problem [#1559]*

New experiments indicate that exsolution of gas from the metal phase during quench can spew metal particles into the silicate melt.

Monteux J. Arkani-Hamed J.  
**POSTER LOCATION #107**

*Thermal Consequences of Giant Impacts and Core Merging in Early Mars [#1456]*

We investigate the dynamics of core merging after a giant impact and explore the consequences of this process on the early martian thermal state.

Grocholski B. Cottrell E.  
**POSTER LOCATION #108**

*Water Storage Capacity of Dense, Lower Mantle Minerals [#1303]*

We have found evidence of structurally bound water with IR absorption in the dense, high-pressure minerals that make up the lower mantle of terrestrial planets.

---

**POSTER SESSION I: VESTA AND THE HED CONNECTION: DAWN RESULTS**

Tuesday, 6:00 p.m. Town Center Exhibit Area [T610]

Haba M. K. Yamaguchi A. Horie K. Hidaka H.  
**POSTER LOCATION #109**

*Formation Processes of Zircons in Basaltic Eucrites: Evidence from Zr/Hf Ratios and REE Abundances [#1989]*

Zr/Hf ratios and REE abundances of some zircons from basaltic eucrites indicate that the zircons could have formed or recrystallized during metamorphic events.

**POSTER LOCATION #110**

*Petrology of the Unbrecciated Eucrite, Cumulus Hills 04049 [#2434]*

CMS 04049, 27 is an equilibrated slowly-cooled eucrite with an unusual sulfide-rich mesostasis area.

Beck A. W. Viviano C. E. McCoy T. J.  
**POSTER LOCATION #111**

*Limitations of Sample Size in Meteorite Thin Section and Spectroscopic Studies: Implications for the HEDs and Vesta [#3069]*

Sampling error calculations for harzburgite diogenites indicate olivine abundance is best estimated with available fine-grained samples, even at low abundance.

De Sanctis M. C. Ammannito E. Frigeri A. Capaccioni F. Tosi F. et al.  
**POSTER LOCATION #112**

*Mineralogical Diversity Across Vesta: Identification of Different Lithologies [#1881]*

Global mapping of the distributions of HED lithologies on Vesta by Dawn’s VIR imaging spectrometer provides the missing geologic context for these meteorites.

**POSTER LOCATION #113**

*Preliminary Iron Distribution on Vesta [#3015]*

A preliminary map of Fe on Vesta derived from Dawn’s Gamma Ray and Neutron Detector indicates a variation in the distribution of elemental Fe.
Palomba E. Longobardo A. De Sanctis M. C. Ammannito E. Capaccioni F. et al. POSTER LOCATION #114
Calibration of Spectral Indexes Suitable for Olivine Detection on Vesta [#1922]
In order to detect olivine-rich regions on the vestan surface, spectral indexes are reviewed, calibrated and applied to the hyperspectral Dawn-VIR data.

Hoffmann M. Nathues A. POSTER LOCATION #115
Mixing and Formation of Pure Layers of Specific Minerals on Vesta [#1554]
Images by the Dawn Framing Camera have been used to identify mixing and exposure processes on Vesta. Granular flows and secondary cratering are discussed.

Vesta-HED Connection: Comparison of Dawn FC, Hubble Space Telescope, and Ground-Based Observations of Vesta [#1040]
We compared data from Dawn, HST, and groundbased telescopes of Vesta. Dawn data confirms a significant number of earlier interpretations from the ground.

Reedy R. C. Prettyman T. H. Yamashita N. POSTER LOCATION #117
Solar-Proton Fluxes During the Current Solar Cycle and Their Space Effects [#2855]
Solar-proton fluxes since 2009 at Earth and STEREO spacecraft were compiled and usually compare well with count rates in GRaND on Dawn near Vesta.

Mizzon H. Toplis M. J. Yamashita N. Prettyman T. H. Forni O. POSTER LOCATION #118
Application of Blind Source Separation to Planetary Nuclear Spectroscopy [#2975]
This study presents the application of the independent component analysis to separate chemical-element contributions to planetary gamma ray spectra.

Li J.-Y. Combe J.-P. Longobardo A. Capaccioni F. De Sanctis M. C. et al. POSTER LOCATION #119
The Photometric Properties of Vesta in Visible and Near-Infrared from Dawn VIR Instrument [#2343]
We report the photometric properties of Vesta derived from Dawn VIR instrument at 0.4–3.5 μm with the Hapke model and Minnaert model.

Pulmer E. M. Heggy E. Capria M. T. Tosi F. Russell C. T. POSTER LOCATION #120
Dielectric Properties of the Surface of Asteroid Vesta from Dawn VIR Thermal Observations [#2476]
We utilize thermal inertia calculations from the Dawn mission to develop a dielectric model of the surface of asteroid Vesta.

Ruesch O. Hiesinger H. Metzler K. Kallisch J. Cloutis E. A. et al. POSTER LOCATION #121
Assessment of HED Spectral Variability: Observation Geometry and Accuracy in Retrieving Composition [#2236]
We measured vis-NIR spectra and composition of 11 HED samples. We investigated observation geometry effects and accuracy in retrieving composition from spectra.
Bimodal Craters on Vesta: Impacts on slopes studied by numerical simulations #1903
A number of unusual craters have been observed on Vesta. By numerical simulations, we studied the formation of these craters in topographically rough terrain.

The “Swarm” — A Peculiar Crater Chain on Vesta #1492
The Swarm is a unique crater chain on Vesta. It is an elongated concentration of small craters and is located in the Pinaria quadrangle.

Gullies on Vesta, Related Geologic Features and Possible Formation Mechanisms #1578
Gullies in craters are classified as type L (linear) and type C (curvilinear). Possible formation mechanisms, including dry and fluid flow, are investigated.

Impact-Related Flow Features on Asteroid Vesta #1611
This presentation discusses lobate, flow-like features on Vesta, which we suggest were produced by impact and gradational processes, not volcanism.

We derived a lunar-like chronology for Vesta. Application to measured crater frequencies result in agreement with three peaks of HED Ar-Ar ages within the error.

Vesta Impact Craters: Rheasilvia over Veneneia #1924
Two-dimensional numerical modeling is aimed to analyze consequences of Rheasilvia crater formation over the older Veneneia crater and connection Vesta family mineralogy.

Is the Coriolis Force Responsible for Curved Features on Vesta? #1955
We investigated the curved features associated with Vesta’s south polar basin Rheasilvia to analyze the contribution of the Coriolis force.

Geologic Map of the Northern Hemisphere of Vesta Based on Dawn FC Images #2582
We present a new geologic map of the northern hemisphere (>21°) of Vesta based on images of the Dawn mission.
POSTER SESSION I: PLANETARY DYNAMICS AND TECTONICS
Tuesday, 6:00 p.m. Town Center Exhibit Area

Walsh L. S.   Watters T. R.   Banks M. E.   Solomon S. C.  POSTER LOCATION #135
Wrinkle Ridges on Mercury and the Moon: A Morphometric Comparison of Length-Relief Relationships with Implications for Tectonic Evolution [#2937]
Morphometric comparison of 300 mercurian and lunar wrinkle ridges indicate greater amounts of global contraction on Mercury than the Moon.

Williams N. R.   Bell J. F. III   Watters T. R.   Banks M. E.   Robinson M. S.  POSTER LOCATION #136
Recent Tectonic Deformation in Mare Frigoris [#2949]
Tectonic deformation within Mare Frigoris has continued to within the last tens of millions of years.

Weller M. B.   Lenardic A.  POSTER LOCATION #137
Hysteresis of Tectonics Regimes on Terrestrial Worlds, One is Not Enough: Plate Tectonics and Internal Heating Through Time [#1822]
Time passes, worlds age / Where once only stagnant reigns / Active may remain.

Matsuyama T.  POSTER LOCATION #138
Large Effect of Small Planet on Plate Tectonics and Thermal Evolution: Application to Mars [#2783]
This study applies a recently developed thermal evolution model of Earth to other planets, especially Mars, which supports the early martian plate tectonics.

Sekhar P.   King S. D.  POSTER LOCATION #139
Analysis of Martian Geoid and Topography based on Temperature Dependent Layered Viscosity Mantle Convection Models [#2719]
Correlate spherical harmonic degree structure of martian mantle with geoid and topography for varying viscosity-layered models and compare it with observed data.

Arkani-Hamed J.   Roberts J. H.  POSTER LOCATION #140
Impact Heating and Coupled Core Cooling and Mantle Dynamics on Mars [#2395]
Impact shock heats Mars / Core can’t convect, dynamo dies / Back in a billion?

Lillis R. J.   Robbins S. J.   Manga M.   Halekas J. S.   Frey H. V.  POSTER LOCATION #141
A New, Statistically Robust Timeline for the Martian Dynamo [#1435]
Using a probabilistic technique for estimating crater magnetization from magnetic fields, we determined that the martian dynamo very likely ceased 4.1 Gyr ago.

Espley J. R.   Connerney J. E. P.  POSTER LOCATION #142
Crustal Magnetic Fields at Mars: Improved Interpretation Through Higher Resolution [#2891]
Downward continuation of martian magnetic crustal fields creates higher-spatial-resolution maps that allow for improved interpretations of geophysical features.

Amara S.   Cole T. E.   Morales N.   Schuman S.  POSTER LOCATION #143
Comparing and Contrasting Magnetic Properties of Terra Cimmeria and Tharsis Montes [#1308]
Our team studied this question: What mineralogical and thermal characteristics make the magnetism of Terra Cimmeria different from that of Tharsis Montes?

Banerdt W. B.   Smrekar S.   Lognonné P.   Spohn T.   Asmar S. W.   et al.  POSTER LOCATION #144
InSight: A Discovery Mission to Explore the Interior of Mars [#1915]
The InSight mission will illuminate the processes of terrestrial planet formation and evolution through a surface-based geophysical investigation of Mars.
Seismic Activity Estimates for the Cerberus Fossae Region of Mars and Implications for the 2016 InSight Mission

Using of crater density and measured fault motion in the Cerberus Fossae region of Mars to determine the annual rate of seismicity and number of detectable events.

Seismic Wind Noise Coupling Through Mars’ Regolith: Implications for the InSight NASA Discovery Mission

We present seismic attenuation properties of martian regolith analogues and discuss implications for a surface-deployed planetary seismometer.

Viking Seismometer Record: Data Restoration and Dust Devil Search

Whispers from the past / Viking mostly felt the wind / Let’s all look closer.

Impact of Anelasticity on Mars’ Dissipative Properties — Application to the InSight Mission

Attenuation models accounting for material anelasticity suggest that Mars’ average mantle viscosity is orders of magnitude greater than previously inferred.

Water Incorporation Mechanisms and Mechanical Properties of Hydrous Olivine Single Crystals: Insight into the Rheological Properties of Mantle Rocks of Terrestrial Planets

We investigated the influence of silica activity on water incorporation and evaluated the climb-controlled dislocation creep model in olivine.

Fully-3D Models for Lithospheric Deformation: A Comparison with the Thinsheet and Flexure Approximations

Compared to 3-D Mars models, thin sheet models match only the style but not magnitude of horizontal displacement while flexure fits only the radial displacement.

Constraining the Long Term Poisson’s Ratio of the Martian Lithosphere From 2D and 3D Dynamic Modeling of Lithospheric Stress and the Surface Faulting Record

We constrain the long term Poisson’s ratio of the martian crust from dynamic models and surface faults, and discuss implications on elastic thickness estimates.

Geometry and Evolution of Segmented Normal Fault Systems on Mars

Relay zones between segmented normal faults on Mars were analyzed to determine how relay zone geometry relates to segment linkage and evolution.

Progressive Evolution of Valles Marineris Fault Zone and its Role in Controlling Interior Layered Deposits and Outflow Channels

The role of the progressive opening of Valles Marineris in the evolution of ILDs and the outflow channels is investigated through systematic geologic mapping.
Oosthoek J. H. P.  Rossi A. P.  Carranza E. J.  Unnithan V.   POSTER LOCATION #155
Developing Strategies for Predicting Locations of Past Hydrothermal Activity on Mars [#2565]
We investigate the spatial pattern of known past martian hydrothermal activity signals and their possible association with geology to predict unknown locations.

Dehant V.  Van Hoolst T.  Breuer D.  Claeys P.  Debaille V.  et al.   POSTER LOCATION #156
Planet TOPERS: Planets, Tracing the Transfer, Origin, Preservation, and Evolution of Their Reservoirs [#2052]
An overview is given of the Planet TOPERS project addressing habitability in our solar system.

Liu Z. Y. C.  Radebaugh J.  Harris R.  Christiansen E. H.   POSTER LOCATION #157
Liquid Hydrocarbons and Fluid Overpressures Explain Contractional Structures on Titan [#1851]
Liquid hydrocarbons and fluid overpressures reduce shear strength of Titan’s icy crust and enable contractional structures to form without the large stresses.

Martin E. S.  Kattenhorn S. A.   POSTER LOCATION #158
Probing Regolith Depths on Enceladus by Exploring a Pit Chain Proxy [#2047]
We explore results from two independent proxies for regolith depth using pit chains to further our understanding of Enceladus’ surface modification processes.

Beddingfield C. B.  Burr D. M.  Dunne W. M.   POSTER LOCATION #159
Evidence for Contraction Within the Leading Hemisphere Section of the South Polar Terrain Boundary, Enceladus [#1254]
We test for both extensional and contractional origins of Enceladus’ south polar terrain boundary. Our results support the hypothesis of contraction.

Beddingfield C. B.  Emery J. P.  Burr D. M.   POSTER LOCATION #160
Testing for a Contractional Origin of Janiculum Dorsa on the Northern, Leading Hemisphere of Saturn’s Moon Dione [#1301]
We test for both extensional and contractional origins of Janiculum Dorsa on Dione. Our results better support the hypothesis of contraction over extension.

Czechowski L.  Lelwa-Kopystynski J.   POSTER LOCATION #161
Isoastasy and the Shape of Iapetus [#1766]
Investigation of shape of Iapetus indicates that its equatorial bulge could be an isostatic structure instead of fossil bulge resulting from fast rotation.

Matsuyama I.  Nimmo F.   POSTER LOCATION #162
Pluto's Tectonic Pattern Predictions [#1399]
We make predictions for Pluto’s global tectonic pattern due to despinning, orbital migration, contraction, and expansion.

<table>
<thead>
<tr>
<th>POSTER SESSION I: MERCURY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday, 6:00 p.m.  Town Center Exhibit Area</td>
</tr>
</tbody>
</table>

Mazarico E. M.  Goossens S. J.  Lemoine F. G.  Smith D. E.  Zuber M. T.  et al.   POSTER LOCATION #163
The Gravity Field of Mercury Derived from Two Years of MESSENGER Data [#2429]
We present an updated gravity field of Mercury based on nearly two years of MESSENGER tracking data.

Neumann G. A.  Cavanaugh J. F.  Sun X.  Mazarico E.  Smith D. E.  et al.   POSTER LOCATION #164
The Topography of Mercury Derived from two Years of MESSENGER Data [#2842]
The Mercury Laser Altimeter has confirmed that near-polar impact craters contain both water ice and unusually dark material postulated to include organic compounds.
Phase-Ratio Images of Mercury Surface Features: Assessing Effects of Sub-Resolution Texture

Ratios of MESSENGER images at different phase angles may reveal textural differences among Mercury surfaces including hollows, pyroclastics, and impact melt.

The Rembrandt Trough: Evidence of Lithospheric Folding on Mercury?

A broad valley flanked by lobate scars associated with the Rembrandt basin may be evidence of long-wavelength deformation of Mercury’s lithosphere.

Distribution of Prominent Lobate Scars on Mercury: Contribution to Global Radial Contraction

MESSENGER orbital images and topographic data are used to map prominent lobate scars and characterize the globally contractional strain on Mercury.

We dated an Hermean smooth plain deformed by a thrust system. The age obtained through the crater count allowed us to fix an upper limit to the fault activity.

Many >200-km basins show basin-fill lavas overthrusting the basin edge. Low-latitude examples are dominated by E-W thrusting, implicating late tidal despinning.

We combine altimetry and images from MESSENGER to measure crater shape, to further the understanding of crater formation and modification on Mercury.

This paper is about the use of Mathematical Morphology and template matching to detect impact craters on Mercury surface from digital images.

Crater count-derived ages of the Rembrandt basin area have been determined by means of the Model Production Function (MPF) chronology of Mercury.

We propose that the enhanced cometary flux at Mercury delivers substantial amounts of excess carbon, which functions as a global darkening agent.

Spatial and topographic distribution of Mercury’s pit craters reveals that structure plays an important role while elevation appears to have little/no influence.

Dark spots on Mercury are small young surficial low-reflectance deposits. They form from volatile activity during the initial stages of formation of hollows.
Keller M. R.  Ernst C. M.  Denevi B. W.  Murchie S. L.  Chabot N. L.  et al.  **POSTER LOCATION #176**
*Time-Dependent Calibration of Messenger’s Wide-Angle Camera Following a Contamination Event [#2489]*
A time-dependent correction function was developed to handle contamination of WAC imagery acquired during the first year of MESSENGER’s orbital phase.

Domingue D. L.  Murchie S. L.  Denevi B. W.  Chabot N. L.  **POSTER LOCATION #177**
*MESSENGER’s Mercury Global Color Mosaic: Photometric Update [#1324]*
Based on orbital observations by the MESSENGER camera, updated photometric corrections are derived and applied to create an improved global color mosaic.

D’Amore M.  Helbert J.  Holsclaw G. M.  Izenberg N. R.  McClintock W. E.  et al.  **POSTER LOCATION #178**
*Exploiting the Mercury Surface Reflectance Spectroscopy Dataset from MESSENGER: Making Sense of Three Million Spectra [#1900]*
The MASCS Spectrometer has mapped the surface of Mercury producing more than three million spectra. We make use of our recently developed advanced DB system.

Izenberg N. R.  Weider S. Z.  Nittler L. R.  Solomon S. C.  **POSTER LOCATION #179**
*Correlating Reflectance and X-Ray Spectroscopic Data from MESSENGER [#3018]*
A comparison of UV through near-IR reflectance spectra with X-ray fluorescence observations from MESSENGER instruments reveals possible Fe correlation.

D’Amore M.  Helbert J.  Holsclaw G. M.  Izenberg N. R.  McClintock W. E.  et al.  **POSTER LOCATION #180**
*Unsupervised Clustering Analysis of Spectral Data for the Rudaki Area on Mercury [#1896]*
Study of Mercury MASCS spectral reflectance on area including craters Kuiper, Rudaki, and Waters. We analyze possible connections among different terrain types.

Helbert J.  D’Amore M.  Head J. W.  Byrne P. K.  Holsclaw G. M.  et al.  **POSTER LOCATION #181**
*A Comparison of the Spectral Properties of the Caloris and Rembrandt Impact Basins [#1496]*
Recent results from MASCS instrument on MESSENGER indicate spectral difference between Caloris and Rembrandt basin and between Caloris and the northern plains.

D’Incecco P.  Helbert J.  D’Amore M.  Maturilli A.  Head J. W.  et al.  **POSTER LOCATION #182**
*Spectral Properties and Geology of Two Impact Craters on Mercury [#1499]*
We combine spectral analysis and geologic interpretation of two study areas on Mercury in order to assess the presence of compositional heterogeneities.

Vaughan W. M.  Head J. W.  Parman S. W.  Helbert J.  **POSTER LOCATION #183**
*What Sulfides Exist on Mercury? [#2013]*
Mainly CaS and FeS, according to thermochemical theory and experimental evidence.

*Constraining the Ferrous Iron Content of Silicate Minerals in Mercury’s Crust [#1602]*
In a survey of fresh craters on Mercury, no evidence for ferrous iron in silicates has been found. Modeling suggests that silicates contain <1 wt % ferrous iron.

Maturilli A.  Helbert J.  Head J. W.  Vaughan W. M.  D’Amore M.  et al.  **POSTER LOCATION #185**
*Komatiites as Mercury Surface Analogues: Spectral Measurements at PEL [#1887]*
VIS (0.45–1.1 μm) and IR (1.5–16 μm) reflectance of three natural + one synthetic komatiite measured at PEL, on fresh and T processed (at 700 K in vacuum) samples.
POSTER SESSION I: MARS SCIENCE LABORATORY:
GEOLOGY REGIONAL AND LOCAL
Tuesday, 6:00 p.m. Town Center Exhibit Area

OMEGA/MARS Express Observation of Gale Crater [#2175]
OMEGA/MEx has covered Gale Crater, and monitored the thermal evolution over seasons and local times.

Garvin J. B., Malin M. C., Ravine M. A. POSTER LOCATION #187
Granulometry of the Surface of Mars from the Mars Descent Imager (MARDI) on Curiosity: Preliminary Comparisons with Earth [#2493]
Analysis of clast size distributions from MARDI images (Curiosity) during and after descent suggests that gravel-cobble-sized particles are similar to Viking 1.

Arvidson R. E., Fuller D., Heverly M., Iagnemma K., Lin J., et al. POSTER LOCATION #188
Mars Science Laboratory Curiosity Rover Terramechanics Initial Results [#1193]
Initial results are presented using the MSL Curiosity rover as a virtual terramechanics instrument to sense terrain properties during drives at Gale Crater.

Rice M. S., Ayoub F., Ehlmann B. L., Leprince S., Grotzinger J. P., et al. POSTER LOCATION #189
Co-Registration of CRISM and HiRISE Observations for Interpreting Mineral Stratigraphy at Gale Crater, Mars [#2323]
We present a new methodology for co-registering CRISM and HiRISE observations for better interpreting the complex mineral stratigraphy at Gale Crater, Mars.

Parker T. J., Malin M. C., Calef F. J., Deen R. G., Gengl H. E., et al. POSTER LOCATION #190
Localization and ‘Contextualization’ of Curiosity in Gale Crater, and Other Landed Mars Missions [#2534]
Site locations are used for drive and science planning and map compilation. “Contextualization” is placement of location data into regional (orbiter) context.

Preliminary Geological Map of the Peace Vallis Fan Integrated with In Situ Mosaics from the Curiosity Rover, Gale Crater, Mars [#1699]
Map relationships suggest that bedded rocks east of the MSL landing site, which are being investigated by Curiosity, are likely associated with an alluvial fan.

Geologic Mapping of the Mars Science Laboratory Landing Ellipse [#2511]
We present the geologic map of the MSL landing ellipse constructed from HiRISE imagery, identifying six major geologic units to guide science investigations.

Curiosity’s Traverse to Mount Sharp: Enhancing Scientific Investigation with Hyperspectral Orbital Data [#1221]
We interpret CRISM observations over Curiosity’s likely traverse to the base of Mount Sharp and describe how they can enhance Curiosity’s science campaign.

Rice M. S., Williams J. M., Calef F., Anderson R. B., Edgar L., et al. POSTER LOCATION #194
Detailed Geologic Mapping Along the Mars Science Laboratory (MSL) Curiosity Traverse Path from Glenelg to Mount Sharp [#2892]
We have identified geologic unit boundaries along the MSL traverse path to Mt. Sharp to better understand the stratigraphy and identify potential waypoints.
Boxwork cement structures on Mount Sharp in Gale Crater are mapped and described in detail, and the volume of water required to form the boxwork is estimated.

A 1000-km area encircling Gale Crater was mapped using ArcGIS and remote sensing datasets to determine if areas analogous to the central mound exist.

Topographic data for the MSL mission to Gale Crater reveal benches and deltas supporting prior hypotheses for multiple lake levels in the Crater.

New CRISM hyperspectral targeted mosaics of Gale Crater, Mars, reveal both local mineralogic detail and regional context for MSL science.

The mound of material in Gale Crater formed by tectonic uplift rather than sedimentary deposition and erosion.

We analyzed CRISM images along the Gale Crater rim in an effort to determine the bedrock composition of Gale and the surrounding region.

THEMIS is used to attempt to quantify mineral abundances in the central mound of Gale Crater where weathering products have been detected by CRISM.

We describe the impact conditions for the MSL CBMD, and an initial analysis of the craters formed by the CBMD and cruise stage.
Initial Performances/Observations/Results of the SAM Gas Chromatograph (SAM-GC) at Rocknest Site [#2334]
How the French contribution (a gas chromatograph) to the SAM suite of instruments is working at Mars, and how it is addressing the quest for organic matter.

SAGE and GATES: How SAM Scientists Analyze GCMS Data [#2053]
An overview of two data analysis software tools in use by the SAM team.

MSL/REMS Measurements of Conditions During MSL/SAM Atmospheric Ingestion Events [#1697]
Pressure/temperature measurements from REMS, at the times when SAM ingested samples of the Mars atmosphere in the first 100 sols of the MSL mission.

Detecting Nanophase Weathering Products with CheMin: Reference Intensity Ratios of Allophane, Aluminosilicate Gel, and Ferrihydrite [#1188]
We measured XRD patterns and RIRs of nanophase weathering products using the CheMinIV lab instrument to help constrain their abundances in Rocknest samples.

CheMin Instrument Performance and Calibration on Mars [#1369]
The CheMin X-ray diffraction and X-ray fluorescence instrument on Mars Science Laboratory has been performing within mission design requirements.

X-Ray Diffraction Reference Intensity Ratios of Amorphous and Poorly Crystalline Phases: Implications for CheMin and the Mars Science Laboratory [#3072]
Amorphous phases, likely to be analyzed by the MSL CheMin XRD instrument, are characterized using the Reference Intensity Ratio (RIR) method.

Dust on the Curiosity Mast Camera Calibration Target [#1061]
Deposition of aeolian dust is monitored on Curiosity’s Mast Camera calibration target. Magnets help to keep parts of the target dust-free.

Mars Science Laboratory Navcam/Hazcam Operations and Results [#1236]
This paper describes the early results from the Mars Science Laboratory (MSL) Hazcam and Navcam instruments.

Curiosity’s Mars Hand Lens Imager (MAHLI): Initial Observations and Activities [#1199]
Viewing targets near and far, Curiosity’s MAHLI was used for science and engineering support during the first 100 sols at the Gale Crater, Mars, field site.

Results to Date for the Mars Science Laboratory Sample Acquisition, Sample Processing and Handling System (SA/SPaH) [#1728]
The MSL SA/SPaH subsystem is designed to acquire interior rock and soil samples and then process and distributed to the onboard analytical science payload.
Fluorocarbon Contamination from the Drill on the Mars Science Laboratory: Potential Science Impact on Detecting Martian Organics by Sample Analysis at Mars (SAM) [#1652]
Teflon has been detected in rocks drilled during terrestrial testing of the MSL hardware. Complications to SAM experiments were studied.

From Univariate Analyses of the Onboard ChemCam Calibration Targets to Estimates of Martian Rock and Soil Compositions [#1170]
This paper presents the potential of using the onboard ChemCam calibration targets to assess martian rock and soil compositions using univariate analysis.

From Background to Signal: Challenges of a Solid Sample Analysis Using SAM GC-MS [#1249]
The identification of the compounds present in SAM background is necessary to perform qualitative and quantitative analysis of Mars solid samples.

Partial Least Squares Sensitivity Analysis and Improvements for ChemCam LIBS Data Analysis on Mars [#2230]
In this work, we report on the current status of the PLS technique used to quantify the elemental composition of ChemCam’s targets.

An Expanded Training Set for Processing of MSL ChemCam and LIBS Data: Spectral Library Samples Added and Effects on Elemental Composition Results from Mars [#2600]
Alkali volcanics, clay-bearing volcanics, and salt-bearing mixtures were measured to determine detectability thresholds and improve ChemCam geochemical results.

Processing Approaches for Optimal Science Exploitation of the Chemcam Remote Microscopic Imager (RMI) During the First 90 Days of Curiosity Operations [#1227]
The RMI camera of ChemCam uses a camera head inherited from the Rosetta mission. Specific processing approaches will be presented for optimal interpretation of the data.

BT-2 Calibration Target for Mars Science Laboratory Alpha Particle X-Ray Spectrometer: Characterization and Alkali Basalt Martian Analogue [#2190]
We describe the selection, context, and characterization of the APXS MSL calibration target and compare with initial MSL APXS rock analyses at Gale Crater.

The MSL rover, Curiosity, has a titanium tray for APXS analyses of samples delivered to SAM and CheMin. We evaluate APXS spectra of samples on the Ti tray.

First Measurements of the MSL APXS Calibration Target on Mars [#1506]
Post-landing spectra of the APXS calibration target reveal contamination. Modeling of this material suggests that the lab calibration is largely unchanged.

PDS Analyst’s Notebook for MSL [#1570]
The Analyst’s Notebook enriches MSL data archives to facilitate “mission replay.”
Tao Y. Muller J.-P.  

POSTER LOCATION #224

*A Machine Vision Toolkit for MSL Imagery: Demonstration Using PIO Pictures* [1573]

We demonstrate here a layer and rock detection toolkit and how it may be used to collect and analyze key marker information about a particular scene from MSL imagery.

---

McCullough E. M. Moores J. E. Francis R. MSL Science Team  

POSTER LOCATION #225

*Inferences of Martian Atmospheric Dust and Water Ice Content Derived from Radiative Transfer Models of Passive MSL Observations by MastCam* [1288]

Bispectral MSL MastCam images of the martian sky are used with a radiative transfer model to infer the dust and ice water content of the martian atmosphere.

---


POSTER LOCATION #226

*Mars Science Laboratory (MSL) — First Results of Pressure and Humidity Observations* [1482]

The first results from the MSL REMS pressure and humidity observations and comparison of the measurements with modeling results.

---

Francis R. Moores J. Maki J. Choi D. McCullough E. et al.  

POSTER LOCATION #227

*Observations of Clouds and Winds Aloft at Gale Crater* [1717]

MSL’s campaign of regular imaging of the atmosphere to study clouds, winds aloft, and atmospheric dynamics is described, along with some initial results.

---

Kahanpää H. de la Torre Juárez M. Moores J. Rennó N. Navarro S et al.  

POSTER LOCATION #228

*Rover Environmental Monitoring Station. Overview of First 100 Sols on Mars* [1532]

Presentation of REMS instrument performance, and science findings during the first 100 sols of operations.

---


POSTER LOCATION #229

*MSL/SAM Measurements of Non-Condensable Volatiles in the Atmosphere of Mars -Possibility of Seasonal Variations* [2130]

MSL/SAM finds 30% lower N₂, 21% greater ⁴⁰Ar, and 40% lower N₂/Ar compared to Viking, which seem to be related to observing conditions, seasons, or both.

---

Webster C. R. Mahaffy P. R. Atreya S. K. Flesch G. J. Christensen L. E. et al.  

POSTER LOCATION #230

*Measurements of Mars Methane at Gale Crater by the SAM Tunable Laser Spectrometer on the Curiosity Rover* [1366]

We report on the non-detection of methane in the martian atmosphere using SAM’s Tunable Laser Spectrometer (TLS) on the Curiosity Rover.

---

Franz H. B. Stern J. C. Raaen E. Trainer M. G. Wong M. H. et al.  

POSTER LOCATION #231

*Preliminary Results for the Isotopic Composition of Martian Atmospheric CO₂ as Determined with the Sample Analysis at Mars (SAM) Quadrupole Mass Spectrometer* [2057]

We present measurements of the martian atmospheric CO₂ composition obtained with SAM’s quadrupole mass spectrometer during Curiosity’s first 100 sols on Mars.

*POSTER LOCATION #233*

**Heavy Noble Gas Measurements on Mars with SAM [#2149]**

Here we discuss the Sample Analysis at Mars experimental approach to the measurement of heavy noble gases Xe and Kr.

Ehresmann B. Hassler D. M. Wimmer-Schweingruber R. F.  
Zeitlin C. Boettcher S. et al.  

*POSTER LOCATION #234*

**Analyzing the Present-Day Martian Radiation Environment with MSL/RAD — Implications for Differences in the Early-Mars Period [#2324]**

A radiation environment has a significant influence on chances for an emergence of life. What indications can be gained from present-day measurements on Mars?


*POSTER LOCATION #235*

**Onset Times of Solar Particle Events Observed by MSL/RAD — Constraints on Particle Transport [#1450]**

En route to Mars, MSL’s RAD was already operational and observed a number of solar particle events. We report on a preliminary analysis of their onset times.

Jun I. Mischna M. Tate C. Behar A. Boynton W. V. et al.  

*POSTER LOCATION #236*

**Neutron Background Environment Measured by the Mars Science Laboratory’s (MSL) Dynamic Albedo of Neutrons (DAN) Instrument During the First 100 Sols [#1608]**

Neutron background measurement from MSL’s DAN instrument during the first 100 sols is described.

Tate C. G. Moersch J. Jun I. Hardgrove C. J. Michna M. et al.  

*POSTER LOCATION #237*

**Diurnal Variations in MSL DAN Passive Measurements with Atmospheric Pressure and Soil Temperature [#1601]**

Modelling and investigation of the effects of atmospheric pressure and soil temperature changes on MSL DAN passive measurements.

**POSTER SESSION I: MARS SCIENCE LABORATORY: SOILS AND ROCKS**

*POSTER LOCATION #238*

Thursday, 6:00 p.m.  Town Center Exhibit Area [T617]

Lewin E. Olilila Toplitz Meslin P.-Y. Maurice S. et al.  

**Modal Mineralogy of Igneous Rocks with ChemCam at Gale Crater [#3102]**

ChemCam spectra shot sequences give clues upon rock mineralogy.


*POSTER LOCATION #239*

**ChemCam Target Classification: Who’s Who from Curiosity’s First Ninety Sols [#1994]**

Compositions measured by ChemCam reveal multimodal distributions, suggesting the existence of several uniform groups. We confirm it with a clustering analysis.

Clegg S. M. Mangold N. Le Mouélic S. Olilila A. Anderson R. et al.  

*POSTER LOCATION #240*

**High Calcium Phase Observations at Rocknest with ChemCam [#2087]**

ChemCam observed several Ca-rich phases at Rocknest that suggest the presence of anhydrite, phosphates such as apatite, and Ca-perchlorate.

Sautter V. Cousin A. Dromard G. Fabre C. Forni O. et al.  

*POSTER LOCATION #241*

**Is Bathurst Inlet Rock an Evidence of Explosive Volcanism in the Rocknest Area of Gale Crater? [#1985]**

Bathurst Inlet, a fine-grained sandstone-like rock with K-rich basaltic composition, could be volcanoclastic, which may indicate explosive volcanism at Gale.
Gale Crater's Bathurst Inlet and Rocknest  Compositions  

Bathurst and Rocknest, in Gale Crater are low SiO$_2$, high Ni, derived from an olivine-rich, mildly alkaline basalt sediment source with little chemical weathering.

Searching for Chemical Variation Across the Surface of RockNest, Using MSL ChemCam Spectra  

MSL ChemCam LIBS spectra for the rock “RockNest,” indicate either a fine-grained sediment or a homogenous tuff deposit, both with Ca-sulfate enrichment.

Assessment of Potential Rock Coatings at Rocknest, Gale Crater with ChemCam  

ChemCam was used to investigate possible rock coatings at Gale Crater. Observed variations in CaO, Fe$_2$O$_3$, and SiO$_2$ may be associated with rock coatings.

Possible Alteration of Rocks Observed by Chemcam Along the Traverse to Glenelg in Gale Crater on Mars  

The possibility that rocks and soils (90 first sols) have been altered is evaluated through the ChemCam observations and theoretical chemical considerations.

Evidence for Rock Surface Alteration with ChemCam from Curiosity’s First 90 Sols  

Here we present examples of chemical depth profiles obtained on rocks by ChemCam, some of which suggest the presence of surface alteration.

ChemCam Analysis on Jake Matijevic, Gale Crater  

Jake Matijevic is the first target analyzed by ChemCam and APXS, on sol 45/48. This study focuses on the ChemCam results, using several kinds of approaches.

MSL/SAM Measurements of Nitrogen and Argon Isotopes in the Mars Atmosphere  

Direct measurements of the martian atmosphere by the SAM mass spectrometer give a preliminary upper limit of 277 for the $^{14}\text{N}/^{15}\text{N}$-isotopic ratio.

Mars Imaging by the ChemCam Remote Microscopic Imager (RMI) Onboard Curiosity: The First Three Months  

This work presents the imaging capabilities of the ChemCam instrument onboard Curiosity, with examples of images, mosaics, colorized products, and 3-D reconstruction.

Rock Abrasion Textures Seen by the ChemCam Remote Micro-Imager on MSL  

We summarize observations of ventifacts and abrasion textures seen by RMI through sol 100 of MSL’s mission.

Chemcam Passive Reflectance Spectroscopy at Bradbury Landing, Mars  

The MSL ChemCam instrument has been successfully used to acquire high-spectral-resolution passive VIS/NIR reflectance spectra of surface dust, soils, and rocks.

Overview of 100 Sols of ChemCam Operations at Gale Crater  

The ChemCam instrument on MSL is performing very well at the surface of Mars. The first 100-sol dataset is rich of thousands of spectra and hundreds of images.
Early Results from Gale Crater on ChemCam Detections of Carbon, Lithium, and Rubidium [2188]
Univariate calibration models were built from ChemCam calibration sets for C, Li, and Rb. Preliminary results from Gale Crater are presented.

Chemical Variability and Trends in ChemCam Mars Observations in the First 90 Sols Using Independent Component Analysis [1262]
We apply a MVA technique, called independent component analysis, to analyse and decipher the chemical trends and variability of the 90 first sols ChemCam data.

Spectral Classification and Variability in ChemCam Data from Bradbury Landing to Rocknest [2750]
Principal components analysis and k-means clustering are used to identify compositional trends in ChemCam data collected during the first 100 sols.

The first geochemical data from Curiosity reveals two different compositions, which may reflect the dichotomy between the SNC type and Adirondack type magmas.

Preliminary Interpretation of the REMS Ground Temperature Sensor in Gale: Exploring the Thermodynamic Processes Behind the Thermal Wave [2553]
We explore the ground-temperature data from REMS on MSL to characterize their diurnal cycle and possible balances with solar radiation and air temperature.

Detection of Subsurface Vertical Geochemical Inhomogeneity with the MSL DAN Experiment: Modeling and Results from Bradbury Landing to Rocknest [1852]
Early results from MSL DAN show evidence for buried enhancements in hydrogen. Closely spaced traverse measurements can reveal subsurface contact geometries.

Estimation of Natural Neutron Emission from the Surface of the Gale Crater from the Ground Data from DAN and the Orbital Data from HEND [1864]
Latest DAN/MSL estimations of water abundance at Gale Crater are compared with predictions obtained from orbital observations performed by HEND/Odyssey.

Searching for Correlation of the MSL DAN Active Measurement Results with Local Diversity of the Surface Micro-Morphology and Regolith Texture Along the Rover Curiosity Traverse [1484]
Presented initial results of searching for correlation of MSL DAN active measurement with micromorphology and regolith texture along the Curiosity traverse.

Preliminary Mastcam Visible/Near-Infrared Spectrophotometric Observations at the Curiosity Landing Site, Mars [1374]
The MSL Mastcam acquired multiple time-of-day images to investigate light scattering properties at multiple wavelengths within and outside the landing zone.
Bell J. F. III  Godber A.  Rice M. S.  Fraeman A. A.  Ehlmann B. L.  et al.  **POSTER LOCATION #262**

*Initial Multispectral Imaging Results from the Mars Science Laboratory Mastcam Investigation at the Gale Crater Field Site [#1417]*

We report initial results of MSL/Mastcam 445-nm to 1013-nm multispectral imaging observations along the early Gale Crater traverse from Bradbury to Glenelg.

Lane M. D.  **POSTER LOCATION #263**

*Testing a Technique for Identifying Olivine Composition from Remote Sensing Data: Awaiting Ground Truth from Gale Crater, Mars [#2596]*

Gale’s dark basalt dunes / Olivine index tested / Fo no. predicted.

Schieber J.  Malin M. C.  Olson T. S.  Calef F.  Comeaux K.  et al.  **POSTER LOCATION #264**

*The Final 2½ Minutes of Terror — What we Learned About the MSL Landing from the Images Taken by the MARDI Descent Imager [#1260]*

MARDI imaging documents MSL interaction with atmosphere/winds and rocket exhaust modification of surface sediments and rocks at the landing site.

---

### POSTER SESSION I: MARS SCIENCE LABORATORY: RESULTS FROM ROCKNEST

**Tuesday, 6:00 p.m.  Town Center Exhibit Area [T618]**

Hamilton V. E.  Vasavada A. R.  Haberle R. M.  de la Torre Juárez M.  Zorzano-Mier M.-P.  et al.  **POSTER LOCATION #265**

*Preliminary Results from the Mars Science Laboratory REMS Ground Temperature Sensor at Rocknest [#1364]*

The MSL REMS ground temperature sensor (GTS) provides insight into the thermophysical properties of the surface materials observed along the rover’s traverse.

Treiman A. H.  Bish D. L.  Ming D. W.  Morris R. V.  Schmidt M. E.  et al.  **POSTER LOCATION #266**

*Basaltic Soil of Gale Crater: Crystalline Component Compared to Martian Basalts and Meteorites [#1113]*

Crystalline material in Gale Crater eolian fines is similar to that in martian basalts and meteorites, especially the Adirondack-type basalts of Gusev Crater.

Yen A. S.  Gellert R.  Clark B. C.  Ming D. W.  King P. L.  et al.  **POSTER LOCATION #267**

*Evidence for a Global Martian Soil Composition Extends to Gale Crater [#2495]*

Martian basaltic fines appear to be a distinct global unit. MSL results from soil analyses within Gale Crater can be applied at the planetary scale.


*A Preliminary Assessment of Sub-mm Spherules at Rocknest, Gale Crater, Mars [#1257]*

Round, glassy spherules / Impact melt? Volcanic glass? / Or just some marbles?

Fisk M.  Popa R.  Meslin P.-Y.  Lasue J.  Mangold N.  et al.  **POSTER LOCATION #269**

*Missing Components in Chemical Profiles of a Sand Drift in Gale Crater [#2156]*

Chemical analysis of sand at Rocknest suggests that CaO is associated with a component, possibly sulfate, that is not quantified by ChemCam.

Sullivan R.  Goetz W.  Hallet B.  Madsen M. B.  Roland S.  et al.  **POSTER LOCATION #270**

*Wind-Driven Evolution of Martian Near-Subsurface Regolith [#2198]*

MSL observations of “Rocknest” regolith similar to MER sites suggest grain size-frequency has evolved via wind to an end state that might be common across Mars.

POSTER LOCATION #271

Integrated Results from Analysis of the Rocknest Aeolian Deposit by the Curiosity Rover [#1774]

An integrated view of the results of the comprehensive analysis of the fines from the Rocknest aeolian deposit, including results from many MSL instruments.

Archer P. D. Jr  Franz H. B.  Sutter B.  McAdam A.  Ming D. W.  et al.  

POSTER LOCATION #272

Abundances of Volatile-Bearing Species from Evolved Gas Analysis of Samples from the Rocknest Aeolian Bedform in Gale Crater [#1720]

Molar abundances of volatile species outgassed during pyrolysis of Rocknest aeolian bedform material by the Sample Analysis at Mars instrument suite on MSL.

Sutter B.  Archer D.  McAdam A.  Franz H.  Ming D. W.  et al.  

POSTER LOCATION #273

Detection of Evolved Carbon Dioxide in the Rocknest Eolian Bedform by the Sample Analysis at Mars (SAM) Instrument at the Mars Curiosity Landing Site [#2095]

The (SAM) instrument detected four releases of carbon dioxide from the Rocknest eolian bedform material. Possible sources will be discussed.


POSTER LOCATION #274

The Search for Ammonia in Martian Soils with Curiosity’s SAM Instrument [#2942]

Curiosity’s first evolved gas analysis of martian soil showed a release of particles with mass 15, to which NH⁺ fragments from ammonia may contribute.


POSTER LOCATION #275

Possible Detection of Nitrates on Mars by the Sample Analysis at Mars (SAM) Instrument [#2648]

The SAM Instrument data is analyzed to search for the possible presence of nitrates in the global dust collected from the Rocknest location at Gale Crater.


POSTER LOCATION #276

Carbon Isotopic Composition of CO₂ Evolved During Perchlorate-Induced Reactions in Mars Analog Materials: Interpreting SAM/MSL Rocknest Data [#2654]

CO₂ from pyrolysis of Rocknest samples at Gale Crater represent a mixture of sources, including carbon from perchlorate-induced combustion of organics.


POSTER LOCATION #277

The Detection of Evolved Oxygen from the Rocknest Eolian Bedform Material by the Sample Analysis at Mars (SAM) Instrument at the Mars Curiosity Landing Site [#2046]

The SAM instrument onboard the Curiosity rover detected an O₂ gas release from the Rocknest eolian bedform. Possible O₂ producing phases will be discussed.

Eigenbrode J. L.  Glavin D.  Coll P.  Summons R. E.  Mahaffy P.  et al.  

POSTER LOCATION #278

Detection of Organic Constituents Including Chloromethylpropene in the Analyses of the Rocknest Drift by Sample Analysis at Mars (SAM) [#1666]

SAM detected hydrocarbons in gases thermally evolved from the Rocknest drift sample. The nature and possible sources are discussed.

Steininger H.  Goesmann F.  Goetz W.  

POSTER LOCATION #279

Pyrolysis of Organic Material and Perchlorate [#2004]

The discovery of chloromethanes with SAM makes it necessary to find a chemical pathway to create this compound during pyrolysis of organics and perchlorates.

**POSTER LOCATION #280**

*Insights into the Sulfur Mineralogy of Martian Soil at Rocknest, Gale Crater, Enabled by Evolved Gas Analyses* [#1751]

MSL SAM analyses of Rocknest soil fines have enabled the first detection of SO₂ and H₂S evolved from in situ thermal analysis of martian surface materials.

---

Fergason R. L.  Lee E. M.  Weller L.  

**POSTER LOCATION #281**

*THEMIS Geodetically Controlled Mosaics of Mars* [#1642]

This work describes the accuracy and availability of geodetically controlled THEMIS daytime and nighttime IR images and resulting mosaics.

---

Christensen P. R.  Fergason R. L.  Edwards C. S.  Hill J.  

**POSTER LOCATION #282**

*THEMIS-Derived Thermal Inertia Mosaic of Mars: Product Description and Science Results* [#2822]

This work studies the variability of martian surface properties through the creation of a global thermal inertia map from THEMIS infrared images.

---

Heath S. H.  Bell J.  Christensen P. R.  

**POSTER LOCATION #283**

*High-Resolution Martian Soil Thickness Derived from THEMIS Thermal Measurements* [#2797]

A two-layer thermal model combined with THEMIS thermal measurements to produce high-resolution maps of soil thickness on Mars’ surface.

---


**POSTER LOCATION #284**

*Thermal Inertia and Surface Heterogeneities of Mars Inferred from OMEGA/MEX* [#1525]

We derive apparent thermal inertia from OMEGA surface temperature data. OMEGA provides a new diurnal sampling to assess the heterogeneity of the martian surface.

---


**POSTER LOCATION #285**

*Thermal Modeling of Gravel and Sand at Different Saturation Levels* [#2411]

This abstract discusses the measuring and modeling of thermal inertia of typical martian sediments at various levels of saturation.

---


**POSTER LOCATION #286**

*Thermal Inertia of Sand at Different Levels of Water Saturation* [#2016]

The effect of water saturation on the thermal inertia of sand and gravel is studied and compared.

---


**POSTER LOCATION #287**

*Thermal Inertia of Martian Sediments at Various Levels of Saturation* [#1575]

The effect of water saturation on the thermal inertia of a gravel sample is investigated.

---

Peterson C. M.  Zebely Z. T.  Vinegar Z. Z.  Garcia V.  

**POSTER LOCATION #288**

*Autonomous Thermal Data Collection* [#1537]

This is about autonomous data collection using thermal probes made with thermistors and an Arduino.
POSTER SESSION I: MARS MAPPING AND STRUCTURAL ANALYSES
Tuesday, 6:00 p.m.  Town Center Exhibit Area

Pozzobon R. Mazzarini F. Massironi M. Pondrelli M. Rossi A. P. et al.  
**POSTER LOCATION #289**
Fractal Analysis and Possible Fluid Source Depth in Crater Mounds, Arabia Terra (Mars) [#2113]
The fractal analysis of the size frequency distribution of mounds on spring deposits into Arabia Terra craters gives a clue about the depth of the fluid source.

Öhman T. McGovern P. J.  
**POSTER LOCATION #290**
Strain Calculations for Circumferential Graben on Alba Mons, Mars [#2966]
Extensional strain is focused on the uppermost asymmetric graben of Alba Mons, with Alba Fossae (NW) accommodating more strain than Tantalus Fossae (E and SE).

Raaitala J. Kostama V.-P. Kukkonen S. Esestime P. Korteniemi J.  
**POSTER LOCATION #291**
Structures that Add to our Understanding of the Development of Claritas Fossae, Mars [#2017]
Regional tectonic time span extends from 4-Ga-old highland to <3-Ga-old hanging wall faults and to Claritas Rupes activity 2.5 Ga ago.

Okubo C. H.  
**POSTER LOCATION #292**
Large-Scale Geologic Mapping Through the Central Candor Colles, West Candor Chasma, Mars [#1299]
Results of the first 1:20,000-scale geologic map through the central part of the Candor Colles, in west Candor Chasma, are presented here.

**POSTER LOCATION #293**
Structural Analysis, Layer Thickness Measurements and Mineralogical Investigation of the Largest Interior Layered Deposit within Ganges Chasma, Valles Marineris, Mars [#1070]
Layering within HiRISE images covers 2.5 km of stratigraphy with average layer thicknesses of <1.5 m. Soft sedimentary deformation is visible near the base.

**POSTER LOCATION #294**
Layer Attitude and Thickness Measurements of the Three Interior Layered Deposits Mounds within Juventae Chasma, Mars [#1068]
Basal layers of mound C drape over basement topography. Average layer thicknesses for mounds A and C are <5 m while mound B averages 83.5 m.

**POSTER LOCATION #295**
Layer Attitude and Thickness Measurements of Three Interior Layered Deposits Within Capri Chasma, Mars [#1069]
Dip directions vary between outcrops; several units compose a single massive outcrop. Layer thickness is on average less than 10 m but varies considerably.

POSTER SESSION I: MASS MOVEMENTS AND EROSION ON MARS
Tuesday, 6:00 p.m.  Town Center Exhibit Area

Hooper D. M. Smart K. J.  
**POSTER LOCATION #296**
Characterization of Landslides on Mars and Implications for Possible Failure Mechanisms [#1795]
We examine geologic, geomorphic, structural, and hydrologic contextual relations of landslides on Mars to understand conditions likely to initiate failure.
Lucchitta B. K.  
*Floor Deposits and Landslides in West Candor Chasma, Mars* [#1684]
Most landslides in the Valles Marineris are younger than ILD. In west Candor Chasma, layered floor deposits overlap landslides. Implications are discussed.

*Mapping Lobate Debris Aprons and Related Ice-Rich Flow Features in the Southern Hemisphere of Mars* [#2512]
In an effort to produce a global inventory of lobate debris aprons, over 1000 aprons have been mapped thus far in the southern hemisphere of Mars using ArcGIS.

*Formation and Modification of Martian Debris Aprons: Insights from Surface Textures and Categorized Crater Counts* [#2774]
This investigation examines the formation and modification of martian debris aprons using analyses of surface textures and categorized crater counts.

Sylvest M. E.  Dixon J. C.  Barnes A.  Ito G.  
*Experimental Study of CO₂ Sublimation as a Trigger for Mass Wasting* [#1626]
We examine the influence of CO₂ frost sublimation on martian gully initiation. Process controls and their relationships to triggering events are examined.

Smart K. J.  Hooper D. M.  
*Discrete Element Modeling of Martian Landslides* [#1609]
High-resolution image data and geomorphology from MOLA-derived topography are used for discrete-element models of landslides in Valles Marineris.

Brunetti M. T.  Cardinali M.  Fiorucci F.  Santangelo M.  Guzzetti F. et al.  
*Statistics of Mass Movements in Valles Marineris, Mars* [#1898]
We mapped and characterized 219 mass movements in Valles Marineris. The statistics of landslide area and volume is compared to terrestrial distributions.

Howard A. D.  
*Quantifying Denudation on Planetary Surfaces* [#1618]
Planetary landscapes evolve, but denudation is difficult to quantify. Erosion may or may not cause net elevation change. Denudation measurements are proposed.

*Updated Resurfacing History of Mars Based on the New Global Geologic Map* [#1588]
The new global geologic map of Mars reveals how and where the planet has been resurfaced through time.

Michael G. G.  
*Planetary Surface Dating from Crater Size-Frequency Distribution Measurements: Differential Presentation of Data for Resurfaced Units* [#2181]
The recent proliferation of interest in identifying resurfacing ages makes it worth emphasising the utility of the differential presentation of crater data.
El Maarry M. R.   Dohm J. M.  
Regional Morphologies of the Smooth Deposits in the Mountainous Regions of Argyre, Mars: Results from High Resolution Mapping [#2806]
We study the smooth deposits in Argyre Basin with CTX and HiRISE images to investigate their origin and possible compositional variability.

Bennett K. A.   Bell J. F. III 
Large Martian Craters with Central Mounds: Global Distribution and Occurrence of Layers [#2652]
We conduct a survey of craters containing central mounds including their location, the mound’s offset from the crater center, and the occurrence of layers.

Hsu H. -J.   Barlow N. G.  
Investigation of the Relationship of Crater Depths and Diameters in Selected Regions of Mars [#1304]
We have investigated the role of terrain on depth-diameter and simple-complex transition diameter of martian impact craters in four regions of the planet.

Tewelde Y.   Zuber M. T.  
Determining the Fill Thickness and Densities of Mars’ Northern Lowlands [#2151]
We use MOLA topography, MRO gravity model, and crater depth to diameter relationships to estimate the fill thickness and densities of Mars’ northern lowlands.

Boyce J. M.   Barlow N. G.   Wilson L. 
Martian LARLE Ejecta: Emplacement Mechanism [#1004]
We propose that the extensive ejecta layer of LARLE craters is a base surge deposit that incorporates secondary ejecta from fine-grained mantles.

Sánchez-Bayton M.   Herraiz M.   Kereszturi Á.   Fodor E.  
Comparison of Terrestrial Cinder Cones and Candidate Volcanic Cones in the Northern Circumpolar Region of Mars [#1977]
Comparing terrestrial cinder cones to martian candidate volcanic cones in the northern circumpolar region suggests martian ones are higher and more diverse.

Wilkes C. A.   King D. T. Jr.   Wright S. P.  
Investigation of Siloe Patera and the Surrounding Area: Possible Evidence of an Ancient Volcanic Caldera on Mars [#3034]
Siloe Patera is a newly identified volcanic feature that resembles a caldera with multiple collapse features, possible subsidence, and lava flows.

McCarthy M. L.   Zimbelman J. R. 
Inflated Lava Flows East of Mars’ Tharsis Montes [#1153]
673 THEMIS images of the volcanic plains east of the Tharsis Montes volcanoes were searched for inflated lava flows; >41% showed either good or possible inflated flows.

Wishard C. A.   Zimbelman J. R.   Hennig L. A.  
Inflated Lava Flows West of Mars’ Tharsis Montes [#1631]
A study of inflated lava flows on the western side of Mars’ Tharsis Montes region. This study expands on previous studies conducted in other regions of Mars.
POSTER SESSION I: VOLCANISM ON MARS: FROM ANALOGUES TO FLOW MORPHOLOGIES TO MAPPING
Tuesday, 6:00 p.m.  Town Center Exhibit Area  [T624]

Wall K. T.   Rowe M. C.   Ellis B. S.  POSTER LOCATION #319
Differentiating Basaltic Eruption Style with X-Ray Diffraction Analysis  [#2547]
A new method of quantifying crystallinity through X-ray diffraction may provide a useful technique for determining sources of volatiles in eruptions on Mars.

Fawdon P.   Balme M. R.   Vye-Brown C. L.   Rothery D. A.   Jordan C. J.  POSTER LOCATION #320
The Evolution of Volcanism in Syrtis Major Planum (Mars): Drawing Insight from Terrestrial Analogues  [#2232]
Using two rheological models we calculate eruption parameters and rheological properties for lava flows on Syrtis Major Planum.

Harvey R. P.   Karner J. M.  POSTER LOCATION #321
“Blueberries”, “Newberries” and Accretionary Lapilli; Lessons from the Antarctic Prebble Formation on Diagnosing the Origins of Dark Lustrous Spherical Thingies  [#2064]
The spheres that we call “lapilli,” pretend like they’re Milli Vanilli. They are not “blueberries,” or even “new berries,” but comparing them isn’t too silly.

Bleacher J. E.   Orr T.   Garry W. B.   Hamilton C. W.   Zimbelman J. R.   et al.  POSTER LOCATION #322
Sinuous Ridges and Plateaus as Evidence for Lava Flow Inflation in the Tharsis Plains of Mars: Insights from Analogous Features on the Coastal Plain of Kilauea Volcano, HI  [#2090]
A volcanic origin for sinuous ridges and plateaus in the plains east of the Tharsis Montes is discussed and compared with Hawaiian volcanic features.

Zimbelman J. R.   Garry W. B.   Bleacher J. E.   Crumpler L. S.   Self S.   et al.  POSTER LOCATION #323
Inflation Processes at the McCartys Lava Flow Field, New Mexico, with Application to Identifying Inflated Lava Flows on Planetary Surfaces  [#2120]
The McCartys lava flow has abundant inflation plateaus, lava-rise pits, flow textures, and terraced margins, all helpful for identifying inflated flows on planetary surfaces.
Simulation of Inflated Pahoehoe Lava Flows [1230]
A completely new modeling approach is developed that provides a framework for exploring effects of random and ambient influences on pahoehoe lava emplacement.

Topographic and Thermal Investigations of Active Pahoehoe Lava Flows: Implications for Planetary Volcanic Processes from Terrestrial Analogue Studies [2184]
This study uses LiDAR and FLIR data to document the topographic and thermal characteristics of active pahoehoe lava flows.

Simulation of Inflated Pahoehoe Lava Flows [1230]
A completely new modeling approach is developed that provides a framework for exploring effects of random and ambient influences on pahoehoe lava emplacement.

Topographic and Thermal Investigations of Active Pahoehoe Lava Flows: Implications for Planetary Volcanic Processes from Terrestrial Analogue Studies [2184]
This study uses LiDAR and FLIR data to document the topographic and thermal characteristics of active pahoehoe lava flows.
**POSTER LOCATION #334**
**Re-Assessing the Volume and Stratigraphy of the Eastern Medusae Fossae Formation [#2386]**
Sounding radar data reveal new details of the interfaces beneath the eastern Medusae Fossae Formation hills and lead to revised estimates of volume.

Jodlowski P.  Platz T.  Michael G. G.  
**POSTER LOCATION #335**
**Eruption History of the Syrtis Major Volcanic Province, Mars [#2322]**
We present an eruption frequency record based on crater populations on exposed lava flows.

Joziwak L. M.  Head J. W.  
**POSTER LOCATION #336**
**Glacial Loading and Unloading at Arsia Mons, Mars: Potential Influence on Intrusions, Eruptions, Locations and Orientations [#2207]**
We use terrestrial analogs of modeled growth and decline of regional ice sheets to predict orientation of candidate dikes on Arsia Mons.

Leverington D. W.  
**POSTER LOCATION #337**
**Development of Kasei Valles Through Mechanical and Thermal Erosion by Voluminous Low-Viscosity Lava Flows [#1355]**
The basic properties of the Kasei Valles outflow channel are consistent with volcanic origins.

Plescia J. B.  
**POSTER LOCATION #338**
**Olympica Fossae Valles — Newly Recognized Fluvial-Volcanic System [#2478]**
Olympica Fossae and areas southwest (near Jovis Tholus) are formed by a combination of tectonic, fluvial, and volcanic processes in the latest Amazonian.

Kerber L.  Michalski J. R.  Bleacher J. E.  Forget F.  
**POSTER LOCATION #339**
**Ash Sources in Arabia Terra? Implications for the Arabia Deposits [#2290]**
A model is presented of the potential ash distribution from a newly proposed volcanic source region in Arabia Terra.

Mustard J. F.  Herd C. D. K.  Skok J. R.  Cannon K. M.  
**POSTER LOCATION #340**
**Visible-Infrared Reflectance of the Tissint Meteorite: Impact Melt, Maskelynite and Implications for Mars Remote Sensing [#2771]**
Abundant impact melt in the Tissint meteorite make it important for understanding remotely sensed data of Mars. We compare lab data and remote observations.

---

**POSTER SESSION I: VOLCANISM ON VENUS, MOON, AND IO**
**Tuesday, 6:00 p.m.  Town Center Exhibit Area [T625]**

Airey M. W.  Mather T. A.  Pyle D. M.  Glaze L. S.  Ghail R. C.  
**POSTER LOCATION #341**
**Modelling Styles of Volcanism on Venus [#1282]**
Conduit flow and subaerial plume buoyancy models are combined to model venusian volcanism under a range of conditions. Results are described using case studies.

Plescia J. B.  
**POSTER LOCATION #342**
**Plains Volcanism on the Lunar Mare [#2487]**
Areas of the mare are characterized by small-volume, low-relief shield volcanoes that represent the terminal stages of mare volcanism.

Lu Y.  Ping J. S.  Shevchenko V. V.  
**POSTER LOCATION #343**
**Volcanic Activity of the Mare Moscovienne and Schrödinger Basin [#1452]**
We used data from the Chang’e-1 and LRO for researching volcanic activity of the Mare Moscovienne and Schrödinger basins.
Enns A. C.  Robinson M. S.  
*Basaltic Layers Exposed in Lunar Mare Craters [2751]*
We searched for layered basaltic deposits in lunar craters and found they are thin (6–25 m) relative to previous measurements of lunar basaltic flows.

*Characterization of Localized and Regional Lunar Pyroclastic Deposits for Compositional and Block Population [2694]*
We are developing a rock abundance model based upon Mini-RF and Diviner as well as a compositional map to identify volcanic vents in lunar pyroclastic deposits.

Gaither T.  Gaddis L. R.  Hare T. M.  Garlant A.  
*Geologic Analysis of the Orientale Annular Pyroclastic Deposit [2125]*
A geologic analysis of the Orientale annular pyroclastic deposit using new, high-spatial resolution imaging data and derived topographic products.

Shank E. M.  Klima R. L.  Dyar M. D.  
*Characterizing Pyroxene Cooling Rate Using Reflectance Spectra [2371]*
We perform heating experiments on orthopyroxenes of different composition to calibrate the determination of site occupancy using infrared reflectance spectra.

Whitten J. L.  Head J. W.  
*Ancient Lunar Mare Volcanism: Identification, Distribution, and Composition of Cryptomare Deposits [1247]*
Lunar cryptomaria are mapped using mainly Moon Mineralogy Mapper data to understand the total area and distribution of mare basalts.

*A Thorough Search for Elusive Lunar Granophyres [1796]*
Imaging of large sections of multiple lunar meteorites reveals that granophyres are quite rare. However, granophytre clasts make up ~1% of Dhofar 1442.

Decker M. C.  Smith J. H.  Radebaugh J.  Christiansen E. H.  Williams D. A.  
*Formation of Paterae on Io: Geologic Mapping and Experimental Models [2699]*
We explore constraints on the formation of volcanic features on Io called paterae by comparing experimental models with our geologic map of Tupan Patera.

Bunte M. K.  Lin Y.  Saripalli S.  Bell J. F. III  Greeley R.  
*Intelligent Detection of Large Scale Volcanism During a Spacecraft Flyby: Examples from Flybys of Io [2519]*
We demonstrate autonomous detection of Io’s volcanic plumes and explore constraints on detecting similar features in future outer solar system missions.

Veeder G. J.  Davies A. G.  Matson D. L.  Johnson T. V.  
*New Faint Thermal Sources on Io [1320]*
We identify four new hot spots on Io. An infrared ratio technique applied to Galileo NIMS data is shown to be sensitive to faint thermal sources.

Tovar D.  Sanchez J. J.  
*Super-Eruptions on Io. A Classification Based in Earth’s Analogues [2599]*
We suggest a classification of super-eruptions on Io based in the same methodology used for these events on Earth.
POSTER SESSION I: THE LUNAR INTERIOR FROM GRAVITY AND TIDES:
GRAIL, LUNAR PROSPECTOR, CHANG’E AND LASER RANGING
Tuesday, 6:00 p.m.  Town Center Exhibit Area [T626]

Goossens S. J.  Lemoine F. G.  Sabaka T. J.  Nicholas J. B.  Mazarico E. et al.  POSTER LOCATION #354
High Degree and Order Gravity Field Models of the Moon Derived From GRAIL Primary and Extended Mission Data [#2382]
We present high-resolution lunar gravity field models derived from GRAIL primary and extended mission data.

Mazarico E.  Goossens S. J.  Lemoine F. G.  Neumann G. A.  Torrence M. H. et al.  POSTER LOCATION #355
Improved Orbit Determination of Lunar Orbiters with Lunar Gravity Fields Obtained by the GRAIL Mission [#2414]
The lunar gravity field solutions obtained with the GRAIL data alone provide significant improvements to the orbit reconstruction quality of the LRO spacecraft.

The Compensation State and Ring Structures of Lunar Basins as Revealed by GRAIL Gravity [#2823]
We use GRAIL gravity to quantify the departures from isostasy of lunar basins, and investigate the subsurface nature of the basin rings.

Blair D. M.  Johnson B. C.  Freed A. M.  Melosh H. J.  Neumann G. A. et al. POSTER LOCATION #357
Modeling the Origin of the Orientale Basin Mascon [#2821]
We model the formation of the Orientale basin mascon via a combination of hydrocode and finite-element methods, using GRAIL data as a constraint.

Baker D. M. H.  Head J. W.  Neumann G. A.  Smith D. E.  Zuber M. T. et al. POSTER LOCATION #358
GRAIL Gravity Analysis of Peak-Ring Basins on the Moon: Implications for the Crater to Basin Transition [#2662]
We measure GRAIL gravity anomaly profiles of peak-ring basins on the Moon and compare these with their morphometries to better understand peak-ring formation.

Chappaz L.  Melosh H. J.  Howell K. C. POSTER LOCATION #359
Strategies for Lava Tube Detection with GRAIL Data [#2019]
The high accuracy and resolution of the data collected by GRAIL potentially allows the detection of small-scale lunar features, specifically empty lava tubes.

Huang Q.  Xiao L. POSTER LOCATION #360
Density and Elastic Thickness Constraints at Lunar Volcanic Provinces: Implication for GRAIL [#2645]
Primary localized admittance spectrum analyses show that Marius Hills and Rümker Hills with high loading densities may be as original shield volcanic centers.

Ping J.  Su X.  Yan J. POSTER LOCATION #361
Eight mid-sized lunar impact mascon basins were identified by using Chang’e-1 LAM and gravity data, four of the hidden topographic depressions were newly found.

Williams J. G.  Boggs D. H.  Ratcliff J. T. POSTER LOCATION #362
Lunar Science from Lunar Laser Ranging [#2377]
Lunar Laser Ranging analysis compatible with GRAIL yields lunar GM, moment, CMB flattening, two dissipation sources, orientation, evidence of activity, and orbit.
Searching for Lunar Tidal Deformations with LOLA [2394]
We present preliminary results of efforts to use LOLA crossovers to detect the signature of tidal deformations on the Moon.

Qin C. Zhong S. Wahr J. M. **POSTER LOCATION #364**
*Tidal Response of a Laterally Varying Moon: An Application of Perturbation Theory* [2459]
We use analytic and numerical method together to explore the possibility of using GRAIL gravity field data to constrain the Moon’s interior structure.

Currie D. G. Delle Monache G. O. Behr B. Dell’Agnello S. **POSTER LOCATION #365**
*Thermal Analysis of Lunar Corner Cube Retro-Reflectors* [3111]
Lunar laser retro-reflectors on the Moon must undergo extreme temperatures. Our thermal analysis program will be described.

---

**POSTER SESSION I: LUNAR GEOPHYSICS AND TECTONICS**
Tuesday, 6:00 p.m. Town Center Exhibit Area [T627]

Banks M. E. Watters T. R. Robinson M. S. Williams N. R. Walsh L. S. et al. **POSTER LOCATION #366**
*Displacement-Length Relationship of Thrust Faults Associated with Lobate Scarps on the Moon* [3042]
Revised displacement-length relationship of thrust faults associated with lobate scarps on the Moon using data from the Lunar Reconnaissance Orbiter.

Molaro J. L. Byrne S. **POSTER LOCATION #367**
*Microphysical Modeling of Thermoelastic Stresses on Airless Surfaces* [1790]
We model grain-scale stresses caused by thermal fatigue/shock on airless surfaces (Moon, Mercury, and NEAs) and explore implications for regolith production.

Schmerr N. C. Thorne M. S. Yao Y. **POSTER LOCATION #368**
*Seismic Properties of the Lunar Megaregolith* [2438]
We study the seismic properties of lunar megaregolith by adapting a 3-D wave propagation code for lunar conditions and compare results to Apollo seismograms.

Blanchette-Guertin J.-F. Johnson C. L. Lawrence J. F. **POSTER LOCATION #369**
*Effect of Variable Scatterer Length-Scales and Frequency Dependent Attenuation on the Decay of Lunar Seismic Coda* [1234]
The effects of various lunar scattering structures are investigated by studying the decay characteristics of synthetic signals generated with the phonon method.

Siegler M. A. Smrekar S. E. Paige D. A. Williams J-P. **POSTER LOCATION #370**
*Crustal Effects on Lunar Heat Flow* [2516]
We use new crustal thickness and radiogenic compositions models, combined with a 3-D thermal conduction model, to constrain heat flow from the lunar interior.

Wood S. E. **POSTER LOCATION #371**
*An Analytic Model for the Thermal Conductivity of Planetary Regolith: Uncemented, Non-Spherical Particulates* [3077]
A new analytic model is presented for estimating the effective thermal conductivity of planetary regolith composed of angular particles in gas or vacuum.
A Preliminary Estimation of Lunar Heat Flow From Chang’e-2 Microwave Radiometer Observations
This study focuses on inverting lunar heat flow based on microwave radiometer of Chang’e-2 spacecraft, which is an important issue in today’s lunar exploration.

Lunar Regolith Dielectric Constant Inversion of Chang’e-1 Microwave Radiometer Results at Apollo 15
The observed CE-1 microwave data are fitted at the Apollo 15 site using a thermal model based on independently-derived surface and subsurface temperatures.

Analysis of Lunar Seismic and Temperature Profiles by Thermodynamic Modeling
The main problem in this work is estimation of seismic model confidence and determination of lunar model constraints by methods of physic-chemical modeling.

Weakness of Ilmenite Revealed by New Rheological Measurements with Implications for Lunar Cumulate Mantle Overturn
We experimentally deformed ilmenite in dislocation creep and found it is much weaker than olivine. Implications for cumulate mantle overturn are significant.

The Present-Day Thermal and Chemical Structure with Vs Profiles Predicted from the Lunar Overturn Model
Overturn model predicts a 3-D asymmetric thermochemical structure and the 1-D Vs profiles for the present-day Moon. Predicted Vs is compared to the observation.

We find strong evidence for a deep lunar melt-layer enriched in titanium from the inversion of a set of diverse geophysical data and thermochemical modeling.

The Possible Role of Water in Sustaining a Lunar Core Dynamo
We investigate the influence of water in the deep lunar interior and the possible impact on the thermal and early core dynamo evolution.

Evidence for the Presence of Water in the Lunar Interior from Electrical Conductivity
The lunar conductivity is interpreted using mineral physics observations. The Al effect is small while hydrogen is needed to explain observed conductivity.

Electric Potentials in Magnetic Dipole Fields Normal and Oblique to a Surface in Plasma: Understanding the Solar Wind Interaction with Lunar Magnetic Anomalies
We performed laboratory experiments to investigate the solar wind plasma interaction with moderate strength magnetic anomalies on the lunar surface.

Modeling Solar Wind Interaction with Surface Dipole Magnetic Fields
This research focuses on modeling the interaction of the solar wind with crustal magnetic fields on airless bodies.
Joyce C. J.  Blake J. B.  Case A. W.  Golightly M.  Kasper J. C.  et al.  \textit{POSTER LOCATION #382}

\textit{Validation of PREDICCS Using LRO/CRA TER Observations During Three Major Solar Events in 2012} [\#2707]

We present a comparison between dose rates measured by the CRaTER instrument on the LRO spacecraft and predicted by the PREDICCS radiation system.

Cox R. G.  Dunlop D.  Clark P. E.  \textit{POSTER LOCATION #383}

\textit{An International Lunar Geophysical Year} [\#1564]

We discuss a proposed International Lunar Geophysical Year (ILGY) to both harness and promote a new phase of lunar surface scientific exploration.

Riofrio L. M.  \textit{POSTER LOCATION #384}

\textit{Calculating the Lunar Orbit Anomaly} [\#2436]

A large anomaly in lunar orbital evolution found by laser light ranging may be calculated using the speed of light.

\begin{tabular}{ll}
\textbf{POSTER SESSION I: LUNAR SAMPLES} & \textbf{POSTER LOCATION #387} \\
Tuesday, 6:00 p.m. & Town Center Exhibit Area [T628] \\
Two different lunar breccia meteorites recovered in Northwest Africa in 2011 and 2012 add considerably to our knowledge of the Moon.

Korotev R. L.  Irving A. J.  \textit{POSTER LOCATION #388}

\textit{Keeping Up with the Lunar Meteorites – 2013} [\#1216]

Twelve new lunar meteorites are described. Four are paired with known meteorites, two are pairs or launch pairs, and six appear to represent new meteorites.

North S. N.  Jolliff B. L.  Korotev R. L.  \textit{POSTER LOCATION #389}

\textit{Pyroxene Composition in Lunar Meteorite NWA 2727 and Comparison to NWA 7007} [\#3013]

Our objective is to present the composition of a pyroxene-rich ferroan gabbro clast in lunar meteorite NWA 2727 and provide a comparison to NWA 7007.

Fagan T. J.  Wakabayashi Y.  Sugino hara A.  Kashima D.  \textit{POSTER LOCATION #390}

\textit{Controls and Constraints on Tholeiite-Like and Calc-Alkaline-Like Igneous Trends on the Moon from Northwest Africa 773 and Apollo 15405} [\#1812]

A tholeiitic magmatic suite is preserved in lunar breccia NWA 773. Apollo 15 QMD is more calc-alkaline. Trends formed by fractionation and immiscibility.

Elardo S. M.  Shearer C. K.  \textit{POSTER LOCATION #391}

\textit{The Origin of Oscillatory Zoning of Major and Minor Elements in Pyroxene Phenocrysts in Lunar Basaltic Meteorite NWA 032/479} [\#1701]

Oscillatory zoning of pyroxene in NWA 032/479 provides a record of magma chamber processes and the cooling history of the youngest igneous lunar sample.

Zeigler R. A.  Korotev R. L.  \textit{POSTER LOCATION #392}

\textit{Petrography and Geochemistry of Feldspathic Lunar Meteorite Larkman Nunatak 06638} [\#1767]

We report a detailed description of the petrography and geochemistry of LAR 06638, and discuss potential pairing relationships with other lunar meteorites.
Liu J. G.  Walker R. J.  
**POSTER LOCATION #393**

*Multiple Impactors Evidenced in Apollo 16 Lunar Impact-Melt Breccias [#1837]*

The HSE characteristics show that Apollo 16 lunar impact-melt breccias smaple ejecta of multiple, major impactors that created the surrounding basins.

Fagan A. L.  Neal C. R.  Beard S. P.  Swindle T. D.  
**POSTER LOCATION #394**

*Bulk Composition and \(^{40}\)Ar\(^{39}\)Ar Age Dating Suggests Impact Melt Sample 67095 may be Exotic to the Apollo 16 Site [#3075]*

Impact melt 67095 is chemically distinct from average Apollo 16 soil. Ar data suggest a thermal event ~700 Ma or less. It is likely exotic to the site.

Lawrence S. J.  Taylor G. J.  Norman M. D.  
**POSTER LOCATION #395**

*Trace Element Geochemistry of Mineral Clasts in Apollo 16 Impact Melt Breccias [#2848]*

We present new trace-element geochemistry data for mineral clasts in Apollo 16 impact melt breccias.

Roberts S. E.  Neal C. R.  
**POSTER LOCATION #396**

*Petrography is Still Relevant! Examination of Lunar Melt Rocks to Determine Formation and Evolution [#2570]*

Crystal size distributions of plagioclase and olivine can be used to distinguish pristine melts of the lunar interior from impact melts.

**POSTER LOCATION #397**

*Characterizing the Dominant Impactor Signature of Apollo 17 Impact Melt Rocks and Metals [#1280]*

We report highly-siderophile-element concentrations and \(^{187}\)Os/\(^{188}\)Os ratios for seven additional Apollo 17 melt rocks and four metal separates from one sample.

Sridhar J.  Cooper B. L.  Mckay D. S.  
**POSTER LOCATION #398**

*Extraction of Meteoritic Metals from Lunar Regolith [#2276]*

This research aims to develop and test ways to magnetically separate meteoritic metals from the lunar soil with different magnetic configurations.

Wittmann A.  Korotev R. L.  
**POSTER LOCATION #399**

*Iron-Nickel(-Cobalt) Metal in Lunar Rocks Revisited [#3035]*

Occurrences of metal particles with high Ni and Co concentrations in lunar rocks are compared with those in lunar meteorite Shişır 161.

Carpenter P. K.  North S. N.  Jolliff B. L.  Donovan J. J.  
**POSTER LOCATION #400**

*EPMA Quantitative Compositional Mapping and Analysis of Lunar Samples [#1827]*

We present the first fully quantitative EPMA WDS stage maps of lunar samples with methods for compositional mapping and processing of analytical data.

Guiza B. G.  Day J. M. D.  
**POSTER LOCATION #401**

*Insights into Volcanism on the Moon from Quantitative Textural Analysis of Mare Basalts [#1825]*

Quantitative textural analysis informs on crystallization processes during lava flow emplacement on the Moon.

**POSTER LOCATION #402**

*Applications of Electron Backscatter Diffraction to Lunar and Other Extraterrestrial Samples [#1942]*

We discuss the benefits and limitations of electron backscatter diffraction analysis in the resolution of microstructures in lunar and meteorite samples.

Barmatz M.  Steinfeld D.  Winterhalter D.  Rickman D.  Weinstein M.  
**POSTER LOCATION #403**

*Microwave Heating Studies and Instrumentation for Processing Lunar Regolith and Simulants [#1223]*

We show that in most cases sharper particle lunar simulants microwave heat more efficiently than rounder particle simulants. Enhanced heating was also observed.
Quantitative Petrography of Ilmenite in Lunar Mare Basalts [447]  
Crystal size distributions of groundmass ilmenite quantifies relationships to cooling rates, position within a flow, and residence time.

Testing the Origins of Basalt Fragments from Apollo 16 [2897]  
Quantitative textural analysis of olivine and plagioclase in basalt fragments 60603,10-16 and 65703,9-13 suggest affinities with an impact origin.

Basaltic Regolith Sample 12003,314: A New Member of the Apollo 12 Feldspathic Basalt Suite? [1044]  
We present results of a petrologic analysis of an Apollo 12 basaltic chip (12003,314) that has been proposed as a new member of the feldspathic basalt suite.

The Moon: Getting Wetter all the Time (A Survey of Apatite in Apollo 12 Basalts) [2647]  
The evidence for a wet Moon continues with water- and hydrogen-isotope data from apatite in all four suites of Apollo 12 basalts.

The Mare Basalt Fe-Isotope Dichotomy: A Preliminary Exploration into the role of Ilmenite Fractionation [2620]  
We present a preliminary evaluation on the feasibility of ilmenite crystallization causing the bulk Fe-isotope dichotomy between high- and low-Ti mare basalts.

A REE-in-Plagioclase-Clinopyroxene Thermometer for Mafic and Ultramafic Rocks from the Earth, Moon, and Other Planetary Bodies [1627]  
We present a REE-in-plagioclase-clinopyroxene thermometer that can record thermal events close to magmatic temperatures for FANs, Mg-suite rocks, CAIs, and POIs.
Raman Imaging of a Granitic Lunar Breccia

Laser Raman images! X-ray maps! High-resolution! Apollo 12 granitic breccia! Silica polymorphs! Zoned clinopyroxene! Granophyre! Mg-Fe equilibration! Quartz!

Alternative Interpretations for the Reversed Zoning in Plagioclase of Alkali Anorthosite 14305,303

We proposed alternative interpretations for the reversed zoning in plagioclase of alkali anorthosite 14305,303 that involves water in the KREEPy parent magma.

Combination of CSDs and in situ chemical analysis of mineral phases allows for a minimally destructive approach to study a dwindling supply of KREEP basalts.

Geophysical models governing the ascent and emplacement of low-density primitive liquids (Mg-suite parental liquid) suggest shallow mantle source regions.

We model a magma ocean with a flotation lid and find that escape of melt may occur for reasonable parameters, creating more nearly pure lunar anorthosites.

We present an ilmenite solubility model and reexamine LMO crystallization. The new model has great implications for thermal and chemical evolution of the Moon.

Our results show that the chemical reactivity of Apollo 14 lunar dust influences its biological effect in the lungs of rats.

We report new tranquillityite Pb/Pb ages from three high-Ti basalts from Apollo collections, providing new constraints on the ages of high-Ti volcanism on the Moon.

A complex ~ 4345 Ma zircon from an Apollo 15 breccia has undergone disturbance of its U-Pb system and annealing of its radiation damage at ~1950 Ma.

A complex ~ 4345 Ma zircon from an Apollo 15 breccia has undergone disturbance of its U-Pb system and annealing of its radiation damage at ~1950 Ma.

Earth, Moon, and Mars have chondritic Sm/Nd and a $^{142}\text{Nd}/^{144}\text{Nd}$ slightly below that of the accessible silicate Earth. $^{142}\text{Nd}$ variations have nucleosynthetic origin.
Welten K. C.  Owens T. L.  DePaolo D. J.  Nishiizumi K.  
**POSTER LOCATION #424**
*Regolith Exposure of Lunar Meteorites Based on Neutron Capture Induced Shifts in Samarium Isotopic Composition [#2933]*
The isotopic composition of Sm in five lunar meteorites shows large shifts due to neutron capture, indicating CRE ages of 700–1200 Myr in the lunar regolith.

Albalat E.  Albarède F.  
**POSTER LOCATION #425**
*Epithermal Neutron Capture by 167Er in Lunar Samples [#2330]*
Erbium neutron capture anomalies provide a robust dosimeter of epithermal neutron capture in lunar samples due to interaction of cosmic rays with the lunar regolith.

**POSTER LOCATION #426**
*Diffusion Kinetic and Retentivity of Implanted Helium in Minerals [#1389]*
This abstract introduced ion implantation and helium extraction experiments, aimed to better characterize helium diffusion in different minerals.

**POSTER LOCATION #427**
We examine the Cl distribution and isotopic composition in 66095 to gain insights into the petrogenesis of the “rusty rock” and origin of “rusty” alteration.

Provencio P. P.  Shearer C. K.  Brearley A. J.  
**POSTER LOCATION #428**
*Driving Fumarole Activity on the Moon 2. Nano-Scale Textural and Chemical Analysis of Alteration in “Rusty Rock” 66095 [#1664]*
We examine the nanoscale mineralogy and geochemistry of the alteration in 66095 to gain additional insights into the petrogenesis of the “rusty rock.”

Tartèse R.  Anand M.  Barnes J. J.  Starkey N. A.  Franchi I. A.  
**POSTER LOCATION #429**
*Distinct Petrogenesis of Low- and High-Ti Mare Basalts Revealed by OH Content and H Isotope Composition of Apatite [#2222]*
Our new data on the OH content and D/H ratio in apatites from low- and high-Ti Apollo mare basalts indicate involvement of distinct petrogenetic processes.

McCanta M. C.  Krawczynski M. J.  Grove T. L.  Seaman S. J.  
**POSTER LOCATION #430**
*Hydrogen Speciation in Low fO2 Lunar Melts [#2348]*
Experiments were run to determine hydrogen speciation in low fO2 lunar melts. OH is dominant though molecular H2O does appear higher than in terrestrial melts.

Togashi S.  Kita N. T.  Tomiya A.  Morishita Y.  
**POSTER LOCATION #431**
*Estimation of the Composition of Host Magmas from Plagioclase in Lunar Highland Rocks in Analogy with the Terrestrial Adcumulates [#2280]*
The high Sc lunar plagioclases from FAN are less affected by post-cumulus processes and preserve the low Ti/Ba ratio of the host magma and their source mantle.

Barry P. H.  Hilton D. R.  Marti K.  Taylor L. A.  
**POSTER LOCATION #432**
*Indigenous Lunar Nitrogen [#2160]*
We present new N-isotope data for lunar basalts (n = 3) from the Apollo 12 and 17 missions in an order to better quantify the indigenous lunar nitrogen component.

Carmody L.  Liu Y.  Taylor L. A.  
**POSTER LOCATION #433**
*The Water Budget of the Moon: Essential Considerations [#2159]*
We report in situ measurements of endogenous water and how overall abundances differ with the heterogeneous nature of mesostasis within lunar basalts.
Crites S. T.  Lucey P. G.  POSTER LOCATION #434
Characterization of Lunar Soils Using Microscopic Hyperspectral Imaging [#2473]
We are using microscopic hyperspectral imaging to characterize the spectral and mineralogical properties of lunar soil samples at the individual grain level.

Byrne C. J.  POSTER LOCATION #435
Evidence for Earth-Accreting Planetesimals Intercepted by the Moon [#1344]
The Moon intercepted some of the last of the planetesimals attracted by Earth’s gravity. Five such events are identified from topographic and mineral evidence.

---

POSTER SESSION I: Icy Satellites
Tuesday, 6:00 p.m.  Town Center Exhibit Area [T629]

Carter J.  Gourgeot F.  Dumas C.  Poulet F.  POSTER LOCATION #436
Reconnaissance Compositional Mapping of the Icy Satellites of Jupiter Europa and Ganymede: Early Results [#1748]
We conducted a groundbased compositional mapping campaign of the icy moons of Jupiter to identify possible endogenous processes imprinting on their surfaces.

Cameron M. E.  Smith-Konter B. R.  Pappalardo R. T.  Collins G.  Nimmo F.  POSTER LOCATION #437
Tidally-Driven Strike-Slip Failure Mechanics on Ganymede [#2711]
Strike-slip tectonism may be important to the development of Ganymede’s surface. Diurnal stress alone cannot drive motion; NSR shear stress may induce creep.

Bland M. T.  McKinnon W. B.  POSTER LOCATION #438
Reevaluating Groove Formation on Ganymede: Forming Larger-Amplitude Grooves at Smaller Extensional Strains [#2176]
New models of groove formation yield large-amplitude, graben-like structures at smaller strains. Non-associated plasticity and strain weakening are the key.

Nahm A. L.  Cameron M. E.  Smith-Konter B. R.  Pappalardo R. T.  POSTER LOCATION #439
Stress-Triggered Faulting Along Agenor Linea, Europa [#2968]
Fault segments making / Up Agenor cause triggered / Faulting on others.

Kattenhorn S. A.  Hoyer L.  Watkeys M. K.  POSTER LOCATION #440
Multi-Stage Dilational and Shearing History of Agenor Linea, Europa [#1801]
Agenor Linea formed in at least three stages under different stress conditions. The first two stages were dilational; the third stage dextral transtension.

Culha C.  Hayes A. G.  Manga M.  Thomas A.  POSTER LOCATION #441
Identifying Contraction and Expansion Along Double Ridges and Bands on Europa with Strike-Slip Displacements [#2085]
Our research dissects the kinematics of each lineament on Europa’s surface and defines the leading mechanisms of double ridges and bands.

Johnston S. J.  Montési L. G.  POSTER LOCATION #442
The Role of Plastic Deformation and Crystallizing Water Intrusions in Europan Ridges [#2932]
Determining the potential role of crystallizing water intrusions in an elastic-plastic ice shell on ridge formation on Europa using finite-element modeling.
POSTER LOCATION #443
Sill Emplacement in Europa’s Ice Shell as a Driving Mechanism for Double Ridge Formation [#3033]
We explore the viability of a sill emplacement mechanism involving fracturing and pressure-driven ascent of ocean water in a thickening ice shell on Europa.

POSTER LOCATION #444
The Structure and Evolution of Europa’s Ocean and Ice Shell in the Presence of Aqueous MgSO4 [#1877]
Finite difference applied to ocean mixing stores heat at seafloor.

POSTER LOCATION #445
Radar Detection of the Brittle-Ductile Transition on Icy Satellites Based on Ice’s Mechanical and Electrical Properties [#2300]
Detection of the brittle-ductile transition is challenging. We are proposing a detection method based on correlating mechanical and electrical properties of ice.

POSTER LOCATION #446
Modeling of Galileo/NIMS Europa Spectra of the Anti-Jovian and Trailing Sides Using Two Endmembers and Water Ice [#2998]
We have successfully modeled Europa spectra from Galileo/NIMS with two endmembers, including an average hydrate and sulfuric acid hydrate, and water ice.

POSTER LOCATION #447
Far Ultraviolet Spectroscopy and Photochemistry of Sulfur Dioxide/Water Ice Mixtures [#2328]
Photolysis of sulfur dioxide/water ices at 280 nm results in significant photochemistry. This may be the dominant mechanism for SO2 photochemistry on Europa.

POSTER LOCATION #448
The Contribution of Ancient Tiger Stripes to Plume Activity and Energy Flux on Enceladus [#1675]
New model suggests ancient tigers erupt plumes, contribute to heat.

POSTER LOCATION #449
Enceladus’s Brilliant Surface: Radar Modeling [#2531]
Cassini RADAR reveals Enceladus to exhibit very high RADAR returns. Plausible scattering geometries are investigated by an electromagnetic computational tool.

POSTER LOCATION #450
Forming CO2 Ice On Enceladus ’Surface [#1373]
“We found traces of free CO2 ice…” [Brown et al., 1976]. How did pure CO2 ice come to be on the surface? We offer an explanation.

POSTER LOCATION #451
Tidal Dissipation in a Frozen Enceladus [#1317]
Weak rubble-pile core / Tides may heat Enceladus / Ocean optional.

POSTER LOCATION #452
Differentiation, Mineralogy and Melting of Rhea [#2558]
Thermal history of Rhea is investigated including possible chemical reactions. The heat of these reactions could be a substantial factor determining evolution.

POSTER LOCATION #453
Stereo Topography and Subsurface Thermal Profiles on Icy Satellites of Saturn [#2766]
Stereo topography, combined with numerical modeling, provides evidence for subsurface water on Saturn’s satellites early in their history.
Johnston R.  White O.  
**POSTER LOCATION #454**

*Crater Chain Classification and Origins on Rhea* [#2581]

After observations of crater chains possibly formed by tidally disrupted comet impacts on jovian satellites, Rhea is searched for similar morphological features.

Herrick R. R.  
**POSTER LOCATION #455**

*The Shapes of Simple Craters in the Outer Solar System Determined with an Enhanced Shadow Measurement Technique* [#2825]

I use an enhanced shadow measurement method to examine simple craters on outer planet moons. The method does not require the shadow to cross the crater center.

Singer K. N.  McKinnon W. B.  Schenk P. M.  
**POSTER LOCATION #456**

*Large Landslides on Icy Satellites: New Examples from Rhea and Tethys* [#2955]

We present an extended dataset of long-runout landslides on icy satellites (now including Tethys!), which exhibit reduced effective coefficients of friction.

Royer E. M.  Hendrix A. R.  
**POSTER LOCATION #457**

*Far-Ultraviolet Photometric Characteristics of Tethys, Dione and Mimas* [#2338]

We investigate here the exogenic processes occurring on the surface of the larger icy satellites of Saturn located in the E ring, from the Cassini-UVIS dataset.

Galuba G. G.  Denk T.  
**POSTER LOCATION #458**

*On the Thermal Feedback Process Leading to the Global Brightness Dichotomy of Iapetus Including the Effect of Orbital Precession* [#2195]

Calculation of the global migration of water ice on Iapetus taking into account exogenic infall on the leading side and precession of the orbit.

Cartwright R.  Emery J. P.  Rivkin A.  Trilling D.  
**POSTER LOCATION #459**

*Near-Infrared Spectroscopy of Uranian Satellites: Searching for Carbon Dioxide Ice on Umbriel, Titania, and Oberon* [#1195]

We explore the distribution of CO2 on uranian moons in order to investigate whether CO2 is produced by charged particle bombardment of H2O and C-rich material.

Dones L.  Levison H. F.  
**POSTER LOCATION #460**

*The Impact Rate on Giant Planet Satellites During the Late Heavy Bombardment* [#2772]

Comets fly through space / Icy moons live through troubled times / Whew, we see them still.

Mookherjee M.  Castilo-Rogez J.  Bassett W.  Wang Z.  
**POSTER LOCATION #461**

*High Pressure Behavior of Hydrous Silicates: Insights into the Cores of Icy Planetary Bodies* [#1817]

We will present results on static and thermal equation of state of serpentine. We will be using these results to develop new core models for Titan and Europa.

Walker M. E.  Mitchell J. L.  
**POSTER LOCATION #462**

*Using Elastic Torque to Predict Libration on Icy Satellites* [#2763]

An elastic restoring torque can predict a set of elastic libration amplitudes that are dependent on the layering and rheology of the ice shells on icy moons.

Van Hoolst T.  Baland R.-M.  
**POSTER LOCATION #463**

*The Effect of Tides on the Forced Libration of Large Icy Satellites* [#2036]

We study the effect of elastic tidal deformation on the libration of icy satellites. Deformation strongly reduces libration if a subsurface ocean exists.
Using interior structure modeling to determine the planetary dynamo source region geometries for “ice” giants of various masses and compositions.

**POSTER SESSION 1: TITAN**

*TUESDAY, 6:00 P.M.*  
Town Center Exhibit Area  
[T630]

**POSTER LOCATION #464**

**Interior Structure of Water Planets: Implications for Their Dynamo Source Regions**  
(#)1638

Tian B. Y.  Stanley S.  

**POSTER LOCATION #465**

**Evolution of Titan’s and Earth’s Rivers**  
(#)2218

Misiura K. M.  Czechowski L.  

**POSTER LOCATION #466**

**Formation and Evolution of River Deltas on Titan and Earth**  
(#)2866

Witek P. P.  Czechowski L. L.  

**POSTER LOCATION #467**

**Wind Driven Capillary-Gravity Waves on Titan: Hard to Detect or Non-Existent?**  
(#)2009


**POSTER LOCATION #468**

**Composition of Titan’s Dry Lakebeds: What can be Inferred from the Solubility Theory**  
(#)1468


**POSTER LOCATION #469**

**Experimental Constraints on Methane Evaporation at the Low Latitudes of Titan**  
(#)2256

Singh S.  Cornet T.  Wagner A.  Luspay-Kuti A.  Chevrier V. F.  et al.  

**POSTER LOCATION #470**

**Infrared Study of Hydrocarbons Mixtures Under Titan Simulated Conditions**  
(#)2944

Cornet T.  Le Mouélic S.  Rodriguez S.  Sotin C.  Bourgeois O.  et al.  

**POSTER LOCATION #471**

**Estimates of Titan’s Surface Photometry in the 5 Microns Atmospheric Window Using the Cassini Visual and Infrared Mapping Spectrometer (VIMS)**  
(#)2048

Titan’s surface seems to behave as a Lambertian body at first order. We now try to refine its photometric function by testing several empirical photometry laws.

**POSTER LOCATION #472**

**Acetylene on Titan: Laboratory Experiments for Remote Sensing Detection Using Cassini/VIMS Data**  
(#)2056


**POSTER LOCATION #473**

**The Effect of Photoabsorption Cross Section and Solar Flux on Ethane Production in Titan’s Ionosphere**  
(#)2312

Effects of varying solar flux and N2 cross section resolutions on the global average C2H6 production in the upper atmosphere of Titan are presented.
Kuga M. Carrasco N. Marty B. Rigaudier T.  
**POSTER LOCATION #474**

*Nitrogen Isotopic Fractionation During RF-Plasma Gas Discharge Synthesis of Tholins: Implications for the Origin of Titan’s Aerosols [#2233]*

We have measured a $^{15}$N-depletion in analogues of Titan’s aerosols. This isotopic fractionation has strong implications for the chemistry of Titan’s atmosphere.

Sciama-O’Brien E. M. Salama F.  
**POSTER LOCATION #475**

*Investigating the Different Steps of Titan’s Atmospheric Chemistry at Low Temperature: Gas Phase Analysis [#1836]*

A mass spectrometry study of the gas phase in a lab experiment simulating the first and intermediate steps of Titan’s atmospheric chemistry at low temperature.

Sciama-O’Brien E. M. Nuevo M. Salama F.  
**POSTER LOCATION #476**

*Investigating the Different Steps of Titan’s Atmospheric Chemistry at Low Temperature: Solid Phase Analysis [#1839]*

Ex situ study of Titan tholins generated in a lab experiment simulating the first and intermediary steps of Titan’s atmospheric chemistry at low temperature.

**POSTER LOCATION #477**

*Titan’s Middle-Atmosphere Dynamical and Chemical Seasonal Changes at Northern Spring Equinox [#1034]*

Seasonal variations of Titan’s atmospheric temperature/composition from nine years of Cassini-CIRS infrared spectra indicate a general circulation reversal.

Marounina N. Tobie G. Monteux J. Carpy S. Grasset O.  
**POSTER LOCATION #478**

*Evolution of Titan’s Atmosphere During a Late Heavy Bombardment [#2242]*

We present a numerical model of the evolution of the atmosphere of Titan by impacts during an episode of intense cratering, the late heavy bombardment.

Lefèvre A. Tobie G. Choblet G. Cadek O. Le Mouélic S. et al.  
**POSTER LOCATION #479**

*Titan’s Outer Ice Shell Structure and Dynamics Constrained from Cassini Data [#2194]*

Using Cassini data, we developed an interior structure model for Titan and computed the stability of the outer ice shell considering different scenarios.

Hodyss R. P. Choukroun M. Beauchamp P. M. Sotin C. Cable M.  
**POSTER LOCATION #638**

*Titan’s Beaches: An Examination of What is Possible and What is Chemically Feasible [#1164]*

This presentation provides some of our initial thoughts on how to interpret the notion of “beaches” around the Titan mares.

---

**POSTER SESSION I: PLANETARY RINGS**

Tuesday, 6:00 p.m.  Town Center Exhibit Area  [T631]

Esposito L. W. Bradley E. T. Colwell J. E. Madhusudhanan P. Sremcovic M.  
**POSTER LOCATION #480**

*Predator-Prey Model for Haloes in Saturn’s Rings [#1362]*

Bright “haloes” form around the locations of some of the strongest resonances in Saturn’s A ring, from cyclic resonance forcing, diffusion spreads these.

Yasui Y. Ohtsuki K. Daisaka H.  
**POSTER LOCATION #481**

*Accretion of Particles onto Moonlets in Saturn’s Rings [#1791]*

Using local N-body simulations, we investigate the process of accretion of small ring particles onto a larger moonlet in Saturn’s rings.
Hirata N. Miyamoto H. Showman A. P.  POSTER LOCATION #482
Particles from Ephemeral Plume Activities of Enceladus Deposit on Saturnian Satellites [#1518]
Deposits of the E-ring materials on saturnian satellites constrain cryovolcanic activities of Enceladus.

POSTER SESSION I: EDUCATION AND OUTREACH: HIGHER EDUCATION
Tuesday, 6:00 p.m. Town Center Exhibit Area [T632]

Chan M. A. Robinson J. K.  POSTER LOCATION #483
Multi-Media Resources and 5E Pedagogy for a Coupled Earth and Mars Science Higher
Education Curriculum [#1800]
A 5E pedagogical approach (engage, explore, explain, enhance, evaluate) and multimedia resources involve
undergraduates in integrated Earth and Mars science.

Dalton H. A. CoBabe-Ammann E. A. Shipp S. S.  POSTER LOCATION #484
EarthSpace: A National Clearinghouse for Higher Education Materials and Information in
Earth and Space Sciences [#2579]
EarthSpace is a higher-education clearinghouse for Earth and space sciences containing classroom assets, news,
and the latest higher-education research.

Croft S. K.  POSTER LOCATION #485
Hands-On Activities for Introductory College Level Astronomy Classes [#2065]
Brief descriptions of a number of new hands-on activities in introductory astronomy classes available for use and
testing in YOUR classes.

Saavedra F. Lozano L.  POSTER LOCATION #486
Planetary Science Multimedia: Animated Infographics for Scientific Education and Public Outreach [#2961]
The Planetary Science Multimedia is an interactive infographic tool designed to be used in E/PO for undergraduates
and the general public.

POSTER SESSION I: EDUCATION AND OUTREACH: STUDENT RESEARCH
Tuesday, 6:00 p.m. Town Center Exhibit Area [T633]

Saad M. E. Jackson K. Fevig R. Seelan S. Bieri S.  POSTER LOCATION #487
Near-Space Balloon Competition: Providing Hands-On STEM Education to Middle and
High School Students [#2922]
Near-Space Balloon Competition: Providing hands-on STEM education to middle and high school students.

Klug Boonstra S. L. Christensen P. R. Swann J. L. Manfredi L. Zippay J. A.  POSTER LOCATION #488
Lessons Learned from the Mars Student Imaging Project: Elements for Success in Creating an Authentic Research
Experience for K-12 Students [#2725]
The Mars Student Imaging Project (MSIP) is an inquiry-based activity allowing students to create and investigate
their own research question.

Grigsby B. Turney D. Murchie S. L. McGovern A. Buczkowski D. L. et al.  POSTER LOCATION #489
Students Researching the Red Planet: Results and Ongoing Analysis with the Mars Exploration
Student Data Teams [#1207]
The Mars Exploration Student Data Teams (MESDT) program trains teams of students to conduct data analysis and
research using MRO’s CRISM instrument.
MONS (Mars Outreach for North Carolina Students) is a scientific research/engineering team composed of high school students from the Triangle area of NC.

Evaluating the High School Lunar Research Projects Program  [#2464]
This paper discusses the evaluation results of the Center for Lunar Science and Exploration’s High School Lunar Research projects program.

The CPSX IMAPS outreach initiative is funded by NSERC PromoScience and consists of inquiry activities, summer camps, rock kits, and a web-based activity.

**POSTER SESSION I: EDUCATION AND OUTREACH: PUBLIC OUTREACH**
**Tuesday, 6:00 p.m.  Town Center Exhibit Area  [T634]**

The Challenge of Evaluating Large Outreach Events: Results and Recommendations from Evaluation Efforts of International Observe the Moon Night (InOMN)  [#2479]
We report challenges and recommendations of evaluating large public events using lessons learned from this year’s International Observe the Moon Night (InOMN).

Ten Years of Exhibits, Education and Public Outreach Presenting the Mars Exploration Rover Mission at the New Mexico Museum of Natural History and Science  [#2926]
Two million visitors, over the past ten years, have seen the MER exhibit and learned about Mars at the New Mexico Museum of Natural History and Science.

In the second year of this ongoing project we aim to grow the previous event via community participation and create a platform for local area researchers to engage the public.

Death Valley National Park martian analog festivals celebrate the rich heritage of martian analog research in Death Valley National Park.

Fernbank Science Center’s planetarium is featuring live weekly updates about Mars, featuring Curiosity Rover images with a new fulldome/immersive projection system.

Storytelling in a planetarium is a fun way for planetary scientists to connect with the public; we discuss guidelines for telling engaging (science) stories.
Williams S. H. Conway E. M. Edberg S. J. Lavery D.  
"Mars is Hard": The NASA Scorecard for Mars Exploration [2792]
The public is fascinated by Mars and its exploration. In sharing that excitement, a consistent use of terminology and performance statistics is required.

Williams S. H.  
SPACE 365: An App Connecting You - and your Audience - to Space [2425]
The “SPACE 365” app has been created to help learners/educators of all types use space-related historical events to enhance education/public outreach efforts.

POSTER SESSION I: EDUCATION AND OUTREACH: SCIENTIST ENGAGEMENT
Tuesday, 6:00 p.m. Town Center Exhibit Area [T635]

POSTER LOCATION #501
NASA Planetary Science Summer School: 25 Years of Preparing the Next Generation of Planetary Mission Leaders [2938]
In celebration of our 25th anniversary, we summarize the experience at NASA’s Planetary Science Summer School, and highlight its impact on alumni’s careers.

POSTER LOCATION #502
Get Involved in Planetary Science Education and Public Outreach! Here’s How! [2753]
The Planetary Science Education and Public Outreach Forum is here to help scientists get involved in E/PO through opportunities and resources. Join us!

POSTER LOCATION #503
NASA SMD Scientist Speakers Bureau [1211]
Planetary scientists are invited to join the Speaker’s Bureau, to connect them to specific speaker requests. Visit www.lpi.usra.edu/education/speaker/.

Fuqua H. A. Szalay J. Donaldson Hanna K. L. Donohue P. H.  
POSTER LOCATION #504
LunGradCon: Lunar and Small Bodies Graduate Student Conference 2013, Call For Participation [1725]
LunGradCon provides an opportunity for grad students and postdocs to present in a low-stress, friendly environment, being critiqued only by their peers.

Brock L. S. Melosh H. J. Stewart N.  
POSTER LOCATION #505
The Implementation of Planetary Science at Purdue University [1747]
Purdue University has recently developed and expanded the Department of Earth and Atmospheric Sciences to include Planetary Sciences.

Smith H. D. Bernstein M. P. Rall J. A.  
POSTER LOCATION #385
A Summary of NASA Planetary Science R and A Program Statistics [3089]
In this poster we present data on the Planetary Science Division Research and Analysis (R&A) Program Portfolio from 2005 up to current selections in ROSES 2012.

POSTER SESSION I: EDUCATION AND OUTREACH: CITIZEN SCIENCE
Tuesday, 6:00 p.m. Town Center Exhibit Area [T636]

Mutchler M. J. Conti A. Deustua S. Viana A. Wong M. H. et al.  
POSTER LOCATION #506
Planet Investigators: Citizen Scientists as key Collaborators in Processing and Mining Hubble Images of the Solar System [2633]
Our “planet pipeline” reprocesses Hubble solar system images to make them more science-ready. Our steps engage citizen scientists to perform visual inspections.
**POSTER LOCATION #507**
*The Dawn Mission and Asteroid Mappers: Vesta Edition: The Impact of Crowd-Sourced Crater Counting* [#2860]
The progress of the Asteroid Mappers: Vesta Edition citizen science website is reported, including public participation and scientific potential.

Jones J. H. Dyches P.  
**POSTER LOCATION #508**
*Jupiter Observation Campaign — Citizen Science at the Outer Planets: A Progress Report* [#1711]
This program will connect more planetary scientists with imagers, use E/PO to connect amateur/professionals, and share amateur images of Jupiter with the public.

---

**POSTER SESSION I: EDUCATION AND OUTREACH: EDUCATION PROGRAMS**

[T637]

**POSTER LOCATION #509**
*Computer Visualizations for K–8 Science Teachers in Professional Development Workshops at the Planetary Science Institute* [#2575]
We highlight the development of enhanced computer visualizations for professional development workshops for elementary and middle-school science teachers.

Jones A. J. P. Hsu B. C. Hessen K. Buxner S. R. Canipe M.  
**POSTER LOCATION #510**
*Lunar Workshops for Educators: Evaluation Results from Year Three* [#2532]
The Lunar Workshops for Educators (LWE) are designed to educate and inspire grade 6–12 science teachers about lunar science and exploration, sponsored by LRO.

Bleacher L. V. Farrell W. M. Gross N. Weir H.  
**POSTER LOCATION #511**
*DREAM Lunar Extreme Program and Workshop: An Effective Afterschool Program for High School Students* [#2342]
Students in the DREAM Lunar Extreme Program and Workshop placed a high value on the interaction with scientists, demonstrating the importance of scientist involvement in E/PO.

Graff P. V. Achilles C. N.  
**POSTER LOCATION #512**
*Engaging Students Through Classroom Connection Webinars to Improve Their Understanding of the Mars Science Laboratory Mission* [#2097]
MSL-focused webinars increase awareness and understanding of the mission by engaging students with scientists who share the story and science of the mission.

Bryan W. T.  
**POSTER LOCATION #513**
*A Journey Through the Solar System: Outreach at the Arkansas Center for Space and Planetary Sciences* [#2248]
A new outreach activity developed by the Arkansas Center for Space and Planetary Sciences enables students to experience a scaled solar system and mission.

Vizi P. G. Sipos A.  
**POSTER LOCATION #514**
*Simulated Mars Rover Model Competition 2012-2013* [#2850]

Lang Á. Szalay K. Horváth T. Prájczer P. Láng M. et al.  
**POSTER LOCATION #515**
*Planetary Rover Robotics Experiment in Education: Carbonate Rock Collecting Experiment of the Husar-5 Rover of the Szechenyi István High School, Sopron, Hungary* [#2353]
Experiment for Husar-5 educational space probe rover consists of (1) carbonate by acid test, (2) measuring gases liberated by acid, and (3) magnetic test.
Hegyi S.  Imrek Gy.  Gocze Z.  Markovics Z.  Kereszturi Á.

POSTER LOCATION #516

Husar eRover — Web Accessible Planetary Probe in the Laboratory [#2445]
The autonomous Husar eRover is described that is used at the university education. It is controlled from the web to test remote work on planetary surfaces.

Resnick I.  Davatzes A.  Shipley T. F.

POSTER LOCATION #517

Teaching Large-Scale Temporal and Spatial Magnitudes Required in Planetary Science Classes Using Cognitive Principles [#2450]
The aim of this abstract is to outline cognitive science research on magnitude representation and analogical reasoning as it relates to planetary sciences.

POSTER SESSION I: PLANETARY MISSION CONCEPTS
Tuesday, 6:00 p.m.  Town Center Exhibit Area [T638]

Sharma P.  Nuding D.  Ozhogin P.  Bell I.  Bennett K.  et al.

POSTER LOCATION #518

VADER: Venus Atmosphere, Descent and Environmental Researcher, a NASA Planetary Science Summer School Mission Concept [#1674]
We propose a mission concept, Venus Atmosphere, Descent and Environmental Researcher (VADER), to explore the lower atmosphere and surface of Venus.

Heather D. J.  Barthelemy M.  Manaud N.  Martinez S.  Szumlas M.  et al.

POSTER LOCATION #519

ESA’s Planetary Science Archive: Status, Activities and Plans [#1930]
The PSA is a repository of all planetary data from ESA missions. The abstract presents our status and plans for 2013, including international activities.

Calaway M. J.  Burkett P. J.  Allton J. H.  Allen C. C.

POSTER LOCATION #520

Ultra Pure Water Cleaning Baseline Study on NASA JSC Astromaterial Curation Gloveboxes [#1241]
Two cleaned astromaterial curation gloveboxes were examined to better understand organic cleanliness in preparation for future sample return missions.

Calaway M. J.  Allton J. H.  Allen C. C.  Burkett P. J.

POSTER LOCATION #521

Organic Contamination Baseline Study on NASA JSC Astromaterial Curation Gloveboxes [#1242]
Two astromaterial curation gloveboxes were examined to better understand organic contamination in preparation for future sample return missions.

Bell M. S.  Calaway M. J.  Evans C. A.  Li Z.  Tong S.  et al.

POSTER LOCATION #522

Robotic Sample Manipulator for Handling Astromaterials Inside the GeoLab Microgravity Glovebox [#2134]
Innovative robotic sample handling concepts designed to meet rigorous curation requirements for preliminary examination in low-gravity space environments are presented.

Klaus K.  Post K. E.

POSTER LOCATION #523

Science and Exploration Missions Enabled by the Space Launch System [#1231]
A number of concepts for science missions were explored during Constellation. We have selected a diverse set of missions that span the SLS design space.

Klaus K.  Elsperman M. S.  Rogers F.

POSTER LOCATION #524

Mission Concepts Enabled by Solar Electric Propulsion and Advanced Modular Power Systems [#1486]
Using a common spacecraft for multiple missions reduces costs. Solar electric propulsion provides the flexibility required for multiple mission objectives.
NASA completed a study to assess the potential for stratospheric balloons to address planetary science goals and objectives; findings and results are presented.

We propose in this work to use a CubeSat in planetary sciences, specifically to observe meteoritic entry into Earth’s atmosphere.

We are evaluating application of the CubeSat paradigm to high-priority space or surface payloads for planetary, heliophysics, and astrophysics disciplines.

A tele-robotic GPR study of farside pit features is a feed-forward investment in future long-duration human stays on the Moon.

Probability associated with mutual visibility found using lunar DEMs is analysed to study the effects of elevation errors and topography on viewshed estimation.

The rocket exhaust of spacecraft landing on the Moon causes a number of observable effects. Research results on this topic are summarized and reviewed.

We report updated status of the SELENE-2 project and some progress of development of technological aspect of the system and instruments on board.

We explore how the A33 moonquake nest can be used as an anchor for a geophysical network that can be used to explore the interior structure of the Moon.
Landing Sites Optimized for Geophysical Studies of the Structure and Thermal State of the Lunar Interior [#1629]
Survey of possible landing sites/geophysical array configurations for addressing Concept 2 of the NRC report “The Scientific Context for Exploration of the Moon.”

Sample Return Landing Sites that can Provide Information on the Composition, Structure, and Evolution of the Lunar Interior [#2914]
Sample return landing sites that provide information regarding the composition, structure, and evolution of the lunar interior are identified.

Jones H. L, Peterson K. M, Whittaker W. L, Wong U. Y. POSTER LOCATION #538
Skylight: Mission to Investigate and Model a Lunar Pit [#3080]
Caves on planetary bodies beyond Earth have always been of great interest for science and exploration, but for many years there was no known way to enter.

Varga T. P, Kabai S, Berczi Sz, Szilagyi I, Varga T. N. POSTER LOCATION #539
ISRU Based Lunar Surface Habitat Module [#2862]
We create a quasi-icosahedron lunar surface habitat module that is built from the same building elements and complementary elements for the vertices.

Science and Exploration Enabled by Private Entity Mars Fly-by Mission Opportunities [#1657]
We identify specific science and exploration investigations that can be enabled through a Mars flyby mission on a private spacecraft.

Vizi P. G, Dulai S, Marschall M, Berczi Sz, Horvath A, et al. POSTER LOCATION #541
Possible Identification Method for Martian Surface Organism by Using a New Strategy of Nano-Robots [#2281]
New nanotechnology ideas to detect and measure characteristics on planetary surfaces. We show a probe to measure the dark dune spots during seasonal changes.

Orenstein N. P. POSTER LOCATION #542
Autonomous Mars In-Situ Resource Utilization Robot for Water Recovery Using Centrifugal Processing [#1843]
Multipurpose Mars resource identification, acquisition, and utilization robot with centrifugal refining process for in situ water reclamation and storage.

The 2003 NASA Planetary Science Summer School student team created a “Mars Geophysical Lander” mission concept to explore the martian interior and atmosphere.

Chicarro A. F. POSTER LOCATION #544
INSPIRE — A Future European Mars Network Science Mission [#1081]
INSPIRE is a concept for a potential future European Mars Network science mission to be launched in the early 2020s, following the footsteps of NASA’s INSIGHT mission in 2016.

Deep Drilling on Mars: Two Concepts and Prospects [#2817]
Deep drilling will be an important activity in future Mars exploration. Our study identifies two promising concepts: (1) coiled tubing drilling, and (2) mole drilling.
DeSouza C. A. G.  
**POSTER LOCATION #546**

*Conceptual Design of an Unmanned Aerial Vehicle for Mars Exploration (M.I.S.C.A.V.) [#1291]*

This abstract focuses on the use of aerial vehicles for Mars exploration, with a focus on large-scale water and mineral detection for pre-landing purposes.

Shirbhate A. A.  
**POSTER LOCATION #547**

*Celestial Army — Telecommunication Over Mars [#1008]*

This paper presents an idea about setting up a communication portal on the martian surface that will enable telecommunication on Mars and on Earth.

Cheng A. F.  
**POSTER LOCATION #548**

*AIDA: Test of Asteroid Deflection by Spacecraft Impact [#2985]*

AIDA will demonstrate asteroid deflection and characterize kinetic impact β and crater size to yield new constraints on asteroid physical properties.

**POSTER LOCATION #549**

*Explorations of Psyche and Callisto Enabled by Ion Propulsion [#1553]*

Ion propulsion enables planetary missions that would otherwise be unaffordable in a cost-capped program. Two such missions are described here.

Grima C.  Schroeder D. M.  Blankenship D. D.  
**POSTER LOCATION #550**

*Identifying Surface Characteristics with an Ice Penetrating Radar Sounder at Europa: Potential for Landing Site Selection [#2980]*

Information on surface roughness from the radar sounder in the Europa Clipper mission concept can identify and characterize potential landing sites.

Senske D.  Prockter L.  Pappalardo R.  Mellon M.  Patterson W.  et al.  
**POSTER LOCATION #551**

*Science that can be Achieved from The Europa Clipper Mission Concept: A Means to Explore Europa and Investigate its Habitability [#1600]*

The Europa Clipper, a Jupiter-orbiting spacecraft that makes many flybys of Europa, provides an excellent platform to investigate Europa’s potential habitability.

**POSTER LOCATION #552**

*Flyby of Io with Repeat Encounters (FIRE): A New Frontiers Mission Designed to Study the Most Volcanic Body in the Solar System [#2874]*

We outline a New Frontiers mission concept to study Io, the most volcanically active body in the solar system.

Laneuville M.  Bocanegra T.  Bracken C.  Costa M.  Dirkx D.  et al.  
**POSTER LOCATION #553**

*Unveiling the Evolution and Formation of Icy Giants [#1644]*

Mission concept for Uranus’ exploration prepared by members of the 2012 edition of Alpbach’s Summer School on mission design.

**POSTER LOCATION #554**

*Small Spacecraft Exploration of Uranian Moons [#1860]*

A mission to uranian moons to conduct observations and allow determination of their origin, constraining the possible evolution and history of the solar system.

**POSTER LOCATION #555**

*Deep Space Planetary Exploration Using Commercially Available Solar Electric Propulsion [#1858]*

A bold and reach-extending mission to Uranus using solar electric propulsion that will enthrall a new generation of technologists, scientists, and enthusiasts.
Ptolemy: Preparations for Scientific Investigations at the Surface of a Comet [#2129]

Ptolemy is a GC-MS system included on the Philae lander (Rosetta) and will make chemical/isotopic measurements of surface materials on Comet 67P/C-G in 2014.

Benkhoff J.
The BepiColombo Mission to Explore Mercury — Overview and Mission Status [#2834]
BepiColombo is an interdisciplinary mission to explore Mercury. In this paper a mission status update will be given.

Radiometric Performances Measured at Orsay Facilities for the On-Ground Calibration of the SIMBIO-SYS Instrument of ESA/BepiColombo [#2137]
Calibration goals, setup, and preliminary results obtained during the radiometric validation and characterization of the calibration facilities at Orsay, France.

Morlok A. Ahmedi M. Hiesinger H.
IR/IS: An Infrared Laboratory for the Study of Planetary Materials [#2157]
We introduce IR/IS, a new facility for the study of planetary materials in the near- and mid-infrared, focusing on the BepiColombo/MERTIS mission to Mercury.

Kobayashi M. Shibata H. Nogami K. Fujii M. Miyachi T. et al.
Dust Observation in Mercurial Orbit by Mercury Dust Monitor of BepiColombo [#2172]
Mercury Dust Monitor will be on board the Mercury Magnetosphere Orbiter of BepiColombo and will perform the first in situ dust detection in Mercury’s orbit.

Stooke P. J.
MER Early Traverse Mapping: MOC vs HiRISE Localization [#1396]
Spirit and Opportunity were located using MOC images before HiRISE became available. The accuracy of MOC localization is tested, errors up to 50 m are found.

Selection of the InSight Landing Site: Constraints, Plans, and Progress [#1691]
Sixteen prospective ellipses in western Elysium Planitia have been identified for landing InSight in 2016 that appear to meet the engineering constraints.

Golombek M. Warner N. Schwartz C. Green J.
Surface Characteristics of Prospective InSight Landing Sites in Elysium Planitia [#1696]
InSight landing sites in Elysium Planitia are similar to the Gusev cratered plains with a regolith >5 m thick for penetration of the heat flow probe.

Two New Candidate Landing Sites for the European 2018 ExoMars Mission Near Libya Montes Alluvial Fans, Layered Delta Deposits and Possible Coastal Cliffs [#2378]
We propose two new candidate landing sites in the Libya Montes for potential future missions to Mars, including the European ExoMars mission in 2018.
POSTER SESSION I: INSTRUMENT AND PAYLOAD CONCEPTS
Tuesday, 6:00 p.m. Town Center Exhibit Area

**POSTER LOCATION #565**


*Open Orbiter: A Platform for Enabling Planetary Science [#1424]*

A framework for developing the tools and staff required to support planetary science missions is presented which the Open Orbiter Spacecraft will space-qualify.

**POSTER LOCATION #566**

Saleh R. A. Kirk R. L.

*Proposed Documentation Standards for Describing Specifications of Imaging Systems for Planetary Mapping [#2857]*

A multiphase approach to develop standards for space imaging systems, involve documenting technical specs, geometric properties, and calibration procedures.

**POSTER LOCATION #567**

Saleh R. A. Kirk R. L.

*Automated Image Matching Techniques for Planetary Photogrammetric Mapping [#3008]*

Developing new and improving existing matching techniques for tiepoint and groundpoint measurement functions in support of planetary photogrammetric mapping.

**POSTER LOCATION #568**


*Verification and Analysis to the Simulation Platform for Optimum Frame Synchronization in Deep Space Data Receiving Missions [#1803]*

Frame synchronization simulation software was completed and verified, which is used to find optimal parameter setting strategy in deep space missions.

**POSTER LOCATION #569**

Feldkhun D. Braker B. Wagner K. H. Hynek B. M. Nesnas I. A.

*Robust High-Speed 3D Imaging for Robotic Planetary Exploration [#2594]*

The Structured Light Imaging Module uses a compact optical pattern generator for both 3-D imaging and remote microscopy for robotic planetary exploration.

**POSTER LOCATION #570**

Feldkhun D. Nowicki K. Wagner K. H. Hynek B. M.

*Remote Microscopy for Robotic Planetary Exploration [#2953]*

The structured-light remote microscope allows unprecedented 5-m-long working distance microscopy and enhances the resolution of existing rover cameras.

**POSTER LOCATION #571**

Thompson D. R. Abbey W. Allwood A. Bekker D. Bornstein B. et al.

*TextureCam: A Smart Camera for Microscale, Mesoscale, and Deep Space Applications [#2209]*

The TextureCam project is developing a “smart camera” to improve spacecraft autonomy by classifying geologic surfaces in planetary images.

**POSTER LOCATION #572**


*Demonstrating the Geological Applications of a Three Dimensional Exploration Multispectral Microscope Imager (TEMMI) [#2398]*

The following summarizes the capabilities of a prototype instrument for future missions, TEMMI (Three Dimensional Exploration Multispectral Microscope Imager).

**POSTER LOCATION #573**

Poole W. D. Muller J.-P. Gupta S.

*How Reliable are Surface Roughness Estimates from Planetary Laser Altimeter Pulse-Widths? An Assessment Using MOLA and LOLA Pulse-Width Data [#1511]*

Here, we explore the reliability of surface roughness estimates derived from planetary laser altimeter pulse-width data from Mars and the Moon.
Maturilli A. Donaldson Hanna K. L. Helbert J. Pieters C. P. POSTER LOCATION #574
A New Standard for Calibration of High Temperature Emissivity: Laboratory Intercalibration at PEL of DLR and ALEC of Brown University [#1880]
Two slag samples as references for emissivity measurements at high temperatures have been characterized at PEL of DLR and ALEC of Brown University laboratories.

Macke R. J. SJ Britt D. T. Consolmagno G. J. SJ POSTER LOCATION #575
New Pycnometer Design for Thin-Sliced Meteorites [#1398]
We present a new pycnometer designed for meteorite grain density measurements, with an adaptor ideally suited for thin-sliced meteorites.

Ishibashi K. Wada K. Namiki N. Kameda S. Arai T. et al. POSTER LOCATION #576
Elemental Analysis of Rocks with Short Range Fixed Focus Laser-Induced Breakdown Spectrometer (LIBS) [#2117]
We tested elemental composition prediction of igneous rocks with short range fixed focus LIBS with LIBS-to-sample distance changed around the focus position.

Blacksberg J. Maruyama Y. Alerstam E. Choukroun M. Charbon E. et al. POSTER LOCATION #577
Combined Microscopic Raman and LIBS for Planetary Surface Exploration Using a Fast Time-Gated Detector [#2393]
We present a mineralogy instrument that could potentially perform phase and elemental analysis on planetary surfaces in conjunction with microscopic imaging.

Ishikawa S. T. Gulick V. C. POSTER LOCATION #578
An Automated Classification of Mineral Spectra [#3085]
We present a robust, autonomous algorithm to classify Raman spectra of minerals. Our classifier performed with an accuracy of between 83 and 100%.

Arzoumanian Z. Bleacher J. E. Gendreau K. McAdam A. Shearer C. et al. POSTER LOCATION #579
Chromatic Mineral Identification and Surface Texture (CMIST) Instrument: A Next Generation Contact XRD/XRF Tool [#2116]
We discuss the unique analysis capabilities enabled by contact XRD/XRF including science, safety, and crew health for future human spaceflight missions.

Scheld D. L. Ladner D. R. Martin J. P. POSTER LOCATION #580
In-Situ Resource Analyzer (ISRA) [#2272]
An instrument is presented with a triple measurement system to work as a robotic field geologist on remote planetary surfaces such as the Moon or Mars.

Cohen B. A. Li Z.-H. Miller J. S. Brinckerhoff W. B. Clegg S. M. et al. POSTER LOCATION #581
Update on Development of the Potassium-Argon Laser Experiment (KArLE) Instrument for In Situ Geochronology [#2363]
Peering back in time / Flight parts unite to measure / The age of planets.

Cho Y. Miura Y. Sugita S. POSTER LOCATION #582
Development of an In-Situ K-Ar Isochron Dating Method Using LIBS-QMS Configuration [#1505]
An in situ K-Ar isochron dating method has been developed. We constructed a simulated isochron using LIBS and QMS techniques simultaneously.

Okabayashi S. Sakata S. Hirata T. POSTER LOCATION #583
Isotopic Analysis of Nano-gram Amounts of Tungsten Using Electrothermal Vaporization (ETV)-MC-ICPMS Technique [#1911]
The ETV-MC-ICPMS technique has been developed for the W-isotope analysis of ng sample. The reliability of this technique was evaluated using iron meteorites.
Socki R. A. Niles P. B. Cabiran M. Rossi C. Sun T.  
**POSTER LOCATION #584**

*In-Situ Water Vapor Probe for a Robot Arm-Mounted, Compact Water Vapor Analyzer: Preliminary Results [#2769]*

We are working to develop an instrument package for the in situ detection and isotope analysis of water ice on future solar system exploration missions.

Getty S. A. Brinckerhoff W. B. Cornish T. Li X. Floyd M. et al.  
**POSTER LOCATION #585**


We have demonstrated two-step laser mass spectrometry (L2MS) as a means of in situ detection and identification of key classes of organics in a complex sample.

Mora M. F. Stockton A. M. Willis P. A.  
**POSTER LOCATION #586**

*Handling of Solid Samples with Microfluidic Technology for End-to-End Analysis in a Single Device [#3091]*

Integrating solids in microchip would allow end-to-end analysis in a simpler and smaller instrument. Here, an approach for this and results will be discussed.

Tissot F. L. H. Ireland T. J. Yokochi R. Dauphas N.  
**POSTER LOCATION #587**

*Introducing Teflon-HPLC [#2867]*

We are developing the first Teflon-HPLC (High-Performance Liquid Chromatography) system for isotope geo/cosmochemistry, and application to return samples.

Ladner D. R. Scheld D. L. Agerton T.  
**POSTER LOCATION #588**

*Low-Gravity Mass GAuging System (MAGA) [#2084]*

The MAGA fluid mass gauging system is a non-invasive method based on excitation and measurement of acoustical resonant frequency modes.

**POSTER LOCATION #589**

*Dust OrbiTrap Sensor (DOTS) for In-Situ Analysis of Airless Planetary Bodies [#2888]*

We are developing a high-resolution Fourier Transform–Orbitrap-based mass spectrometer for in situ analysis of dust from airless solar system bodies.

**POSTER LOCATION #590**

*The James Webb Space Telescope: Solar System Science [#1019]*

We discuss the capabilities of the James Webb Space Telescope for accomplishing solar system science.

Sonneborn G. Milam S. N. Hines D. C. Hammel H. B. Lunine J. I.  
**POSTER LOCATION #591**

*Operations Concept for Solar System Observations with the James Webb Space Telescope [#1356]*

JWST is designed to obtain IR images and spectra (1–29 µm) of moving targets with rates of 0.030 arcsec/sec or less (Mars and beyond). Examples are given.

Longobardo A. Palomba E. Bearzotti A. Zampetti E. Pantalei S. et al.  
**POSTER LOCATION #593**

*The MOVIDA Instrument: Measurement of Volatiles Content and Charging Processes of the Lunar Dust [#2204]*

MOVIDA is a miniaturised, light, and low-power-consuming thermogravimeter under development that can have several applications in a lunar lander mission.

**POSTER LOCATION #594**

*LDEX Sensitivity Studies: Material and Impact Velocity Dependence of the Total Charge Yield Generated in Hypervelocity Impacts of Micron and Sub-Micron Sized Dust Particles [#2663]*

The operational principal of LDEX is investigated with a lab model to gain a deeper understanding of the impact process and to compare with theoretical models.
Clark P. E. Whitaker S. Brown K. Cox R. Vasant A. POSTER LOCATION #595
Compact Ultra Low Temperature Instrumentation for the Lunar Surface [#1235]
We discuss technologies essential for exploration of lunar polar regions, and ongoing development activities in crucial cold temperature electronics.

Warren T. J. Bowles N. E. Thomas I. R. POSTER LOCATION #596
The Space Environment Goniometer [#1958]
The “Space Environment Goniometer” has been constructed to support thermal infrared remote sensing measurements of the lunar surface.

Nagihara S. Zacny K. Hedlund M. Taylor P. T. POSTER LOCATION #597
A Compact, Deep-Penetrating Heat Flow Probe for Small Lunar Landers [#1252]
We report the progress and lab tests we made in developing a compact heat flow probe for future robotic lunar missions.

Glass B. J. McKay C. P. Dave A. Lee P. Mellerowicz B. POSTER LOCATION #598
Planetary-Prototype Drilling and Sample Acquisition Tests at Analog Sites [#1334]
Automated 1-m rotary-percussive drills and sample transfer could fly on a planetary mission soon. These have been tested in the lab and at analog field sites.

Cloutis E. A. Whyte L. Qadi A. Anderson-Trocme L. Bell J. F. III et al. POSTER LOCATION #599
The Mars Methane Analogue Mission (M³): Results of the 2012 Field Deployment [#1579]
A simulated rover mission to detect Mars methane suggests that search for enhanced methane is less effective than searching for suitable geological structures.

Ralchenko M. Perrot M. Samson C. Tremblay A. Holladay S. et al. POSTER LOCATION #600
The Electromagnetic Induction Sounder (EMIS) was used alongside a microrover to detect structural variations in an analogue terrain.

Cabrol N. A. Wettergreen D. S. LITA Project Science Team POSTER LOCATION #601
Life in the Atacama: Science and Technology Pathways to the Robotic Search for Life on Mars [#1190]
Multiplying the number of sites visited per mission through mobility and subsurface access may give us a greater chance of success of finding life on Mars.

Wang Alian. Lambert J. L. Sobron P. S. POSTER LOCATION #602
An Instrument Suite for Mineral ID and Biomarker Seeking in Atacama [#2586]
Three active sensors, MMRs, WIR, and BUF, were used in an Atacama field test. They provided complimentary science and suitable for next planetary surface exploration.

Zacny K. Paulsen G. Mellerowicz B. Craft J. Wettergreen D. et al. POSTER LOCATION #603
Life in the Atacama: The Drill and Sample Delivery System [#1332]
We describe development of a 1-m-class rotary percussive drill and sample delivery system for Life in the Atacama, the ASTEP-funded project.

Li R. Li D. Di K. Paar G. Coates A. et al. POSTER LOCATION #604
Experimental Results of Geometric Modeling and Accuracy Assessment of an ExoMars Rover PanCam Prototype [#2779]
Uncertainty levels for the European Space Agency (ESA) ExoMars 2018 mission panoramic camera vision system (PanCam) for mapping and localization are quantified.
Motamedi K.  Colin A.  Hutchinson I.  Ingle R.  Davies G.  
**POSTER LOCATION #605**
The Effect of Martian Condition on the Stoichiometry Calculation of Olivine (Fo-Fa) Composition Using a Combined Raman-Laser Induced Breakdown Spectroscopy Instrument [#2264]
We study olivine structure by using RLS inside a Mars atmosphere simulation chamber, to assess the effect of temperature and pressure on olivine Raman spectra.

Lopez-Reyes G.  Sobron P.  Lefevbre C.  Rull F.  
**POSTER LOCATION #606**
Application of Multivariate Analysis Techniques for the Identification of Sulfates from Raman Spectra — Implications for Exomars [#2135]
Evaluation of multivariate techniques (PCA, PLS, ANN) for the ID/quantification of minerals from Raman spectra. Implications for the Exomars Raman instrument (RLS).

Rull F.  Maurice S.  Diaz E.  Lopez G.  Catala A.  
**POSTER LOCATION #607**
Raman Laser Spectrometer (RLS) for ExoMars 2018 Rover Mission: Current Status and Science Operation Mode on Powdered Samples [#3110]
The Raman instrument is part of the analytical suite in the Exomars mission. It is able to address the mineralogical and exobiological goals of the mission.

Ciarletti V.  Clifford S. M.  Plettemeier D.  Dorizon S.  Statz C. et al.  
**POSTER LOCATION #608**
WISDOM GPR Investigations of Ice Thickness, Stratigraphy, Structure and Basal Topography in an Alpine Ice Cave in Dachstein, Austria [#2365]
Prototypes of the WISDOM GPR designed for the ExoMars rover mission have been tested in an ice cave. The experimental results show the instrument performance.

Brinckerhoff W. B.  Pinnick V. T.  van Amerom F. H. W.  
**POSTER LOCATION #609**
Mars Organic Molecule Analyzer (MOMA) Mass Spectrometer for ExoMars 2018 and Beyond [#2912]
We describe the Mars Organic Molecule Analyzer (MOMA) mass spectrometer on the 2018 ExoMars rover mission to seek the signs of past or present life on Mars.

Smith H. D.  
**POSTER LOCATION #610**
Detection of Biomolecules, Organics, and Minerals on Mars Using Fluorescence [#3061]
We propose a fluorescence instrument, adapted from ChemCam, as a non-contact detection method for organics and an excellent triage instrument for sample return.

**POSTER LOCATION #611**
Remote Detection of Minerals and Biomarkers Using RALLF: A Compact Raman, Atmospheric Lidar, LIBS and Fluorescence Sensor [#1328]
Integrated Raman, atmospheric lidar, LIBS, and fluorescence (RALLF) sensor suitable for Mars rover is described for remote detection of minerals and biomarkers.

Becker K. J.  Anderson J. A.  
**POSTER LOCATION #612**
ISIS Support for the MRO/CRISM Instrument [#2366]
The USGS ISIS team is working on data ingestion software and a camera model for the MRO/CRISM instrument that complements HiRISE, CTX, and MARCI now in ISIS.

Lawrence D. J.  Peplowski P. N.  
**POSTER LOCATION #613**
Measurements of Elemental Stratigraphy on Mars with a Rover-Mounted Gamma-Ray Spectrometer [#2282]
Laboratory data is presented to illustrate how surface gamma-ray spectroscopy can obtain measurements of compositional stratigraphy to depths of tens of centimeters.

Anderson F. S.  Whitaker T.  Hamilton V.  Nowicki K.  
**POSTER LOCATION #614**
Rb-Sr Dating with Accuracy of Better than ±150 Ma Using a Portable LDRIMS for the Mars-2020 Rover [#1762]
We demonstrate repeatable dates using portable LDRIMS hardware that could be carried on MER- or MSL-sized rovers.
Dating Planetary Surfaces Including Mars Using a New K-Ar Technique — ID KArD [#1744]
With ID KArD, K-Ar dating planetary surfaces is readily achievable, as shown by low age uncertainty, and without requiring high temperature or mass measurement.

ODIN — A Prototype Mars In-Situ Luminescence Reader for Geochronology and Radiation Measurements [#1665]
ODIN is a prototype Mars in situ luminescence instrument for geochronology and radiation measurements, intended to be mounted on a lander.

Core Acquisition and Caching for the 2020 Mars Mission [#1331]
We present a core acquisition and architecture for the planned Mars 2020 mission.

Sample Tube Sealing for Future Proposed Mars Sample Return Missions [#1198]
Sample tube sealing methods for sample collection tubes were developed and tested to preserve the scientific value for future sample return missions.

The SEIS InSight VBB Experiment [#2006]
Description of the primary payload of the next NASA martian mission: SEIS InSight. Description, heritage, performance.

Interrogating the Martian Subsurface Using Muon Radiography [#1605]
Muon Radiography is a novel, passive and deeply penetrating imaging technique, which will allow direct exploration of subsurface habitats and ice reservoirs.

The Mars Atmospheric Trace Molecule Occultation Spectrometer (MATMOS): An Overview [#2227]
We present an overview of the design and projected capabilities of the MATMOS instrument and discuss the instrument’s present status and some test results.

Atmospheric Retrievals in Preparation for a Solar-Occultation High-Resolution Fourier Transform Spectrometer at Mars [#2244]
The CSA and JPL’s MATMOS is a high-resolution Fourier transform spectrometer intended to orbit Mars. We present work on temperature retrievals and dust effects.

OSIRIS-REx OVIRS: A Scalable Visible to Near-IR Spectrometer for Planetary Study [#1100]
Details of the OSIRIS-REx visible and near IR spectrometer are presented. This instrument can be easily adapted for other planetary missions.

The OSIRIS-REx Camera Suite (OCAMS) [#1690]
OCAMS, the primary instrument on the NF OSIRIS-REx mission to NEO 1999RQ36, has three cameras designed to map surface characteristics to find a safe sampling site.

Small Carry-On Impactor (SCI): Its Scientific Purpose, Operation, and Observation Plan in Hayabusa-2 Mission [#1904]
SCI and DCAM3 are prepared in Hayabusa-2 mission to elucidate the subsurface feature of the asteroid 1999JU3 and the scaling rule of the impact crater.
Sugita S. Morota T. Kameda S. Honda R. Honda C. et al. POSTER LOCATION #626
Science Observation Strategy for Hayabusa-2 Optical Navigation Cameras (ONC) [#3026]
The flight units of ONC are currently developed for the Hayabusa-2 mission. The outline of the instrument and science observation plans will be discussed.

Namiki N. Mizuno T. Hirata N. Noda H. Senshu H. et al. POSTER LOCATION #627
Scientific use of LIDAR Data of Hayabusa-2 Mission [#1945]
Range data taken by Hayabusa-2 LIDAR are scientifically important for analysis of the shape, mass, and surface properties of the asteroid.

Tachibana S. Sawada H. Okazaki R. Takano Y. Okamoto C. et al. POSTER LOCATION #628
The Sampling System of Hayabusa-2: Improvements from the Hayabusa Sampler [#1880]
We will report the current status of development of the Hayabusa-2 sampler.

Okada T. Fukuhara T. Tanaka S. Taguchi M. Imamura T. et al. POSTER LOCATION #629
Thermal-Infrared Imager TIR on Hayabusa2: Science and Instrumentation [#1954]
Purpose of the TIR on Hayabusa 2 are to investigate the nature, origin, and evolution processes of C-class NEA 1999JU3 through thermophysical properties.

Grott M. Knollenberg J. Hänschke F. Kessler E. Müller N. et al. POSTER LOCATION #630
The MASCOT Radiometer MARA for the Hayabusa 2 Mission [#1586]
The instrument concept for the MASCOT radiometer MARA, one of the payloads of the Hayabusa II mission, is presented.

Grott M. Knollenberg J. Maturilli A. Helbert J. Müller N. et al. POSTER LOCATION #631
Mineralogical Surface Characterization Using the MASCOT Radiometer MARA on the Hayabusa 2 Mission [#1597]
The expected performance of the MASCOT Radiometer MARA, one of the payloads of the Hayabusa 2 mission, is presented.

Parsons A. M. Evans L. Lim L. Starr R. POSTER LOCATION #632
Capabilities of Gamma Ray and Neutron Spectrometers for Studying Trojan Asteroid Composition [#2082]
We will discuss the capabilities of high heritage gamma ray and neutron spectrometers for determining the surface and subsurface composition of Trojan asteroids.

Sava P. Grimm R. E. Ittharat D. Stillman D. E. POSTER LOCATION #633
Radar Imaging the Interiors of Small Bodies: Initial Migration Studies [#1350]
Transmission between an orbiter and a subsatellite and processing by full migration tomography will optimize internal imaging of asteroids and comets.

Bajo K. Itose S. Matsuya M. Ishihara M. Uchino K. et al. POSTER LOCATION #634
Development of Novel Sputtered Neutral Mass Spectrometer to Analyze Solar Wind Noble Gas [#2285]
Solar-gas-rich meteorites that were irradiated by solar wind have been studied. We have developed a novel SNMS to analyze solar noble gases in the meteorites.

Sobron P. Bamsey M. Thompson C. Berinstein A. Caron S. et al. POSTER LOCATION #635
Ion-Selective Optical Sensors for the Characterization of Europa’s Oceans [#2740]
We describe a method for characterizing the chemistry of water bodies in the solar system using optical sensors equipped with ion-selective membranes.

Sobron P. Lefebvre C. Koujelev A. Wang A. POSTER LOCATION #636
Why Raman and LIBS for Exploring Icy Moons? [#2381]
The elemental and molecular features of icy moons mixed with salts and organics relevant to Europa have been analyzed using laser Raman and LIBS instruments.
*POSTER LOCATION #637*

Wireline Deep Drill for the Exploration of Icy Bodies [#1333]

We describe development and testing of a wireline core drill system capable of penetration hundreds of meters in icy bodies such as Mars, Europa, and Enceladus.

---

**POSTER SESSION I: WHEN THE PLANETS COME TO EARTH: TERRESTRIAL ANALOGS FOR EXTRATERRESTRIAL ENVIRONMENTS**

*TUES POSTERS*

Carli C. Serrano L. M. Maturilli A. Massironi M. Capaccioni F. et al.  
*POSTER LOCATION #639*

*VNIR AND TIR Spectra of Terrestrial Komatiites Possibly Analogues of some Hermean Terrain Compositions [#1923]*

Spectra of terrestrial komatiite and komatiitic basalt are measured in the VNIR and TIR and their signatures will be discussed as comparison to Hermean terrains.

Cabrol N. A. Fountain A. G. Kargel J. S. Deglaciation Study Steering Group  
*POSTER LOCATION #640*

*Impact and Signatures of Deglaciation on the Cryosphere, Landscape, and Habitability of Earth and Mars [#1295]*

The very active effect of climate change on Earth’s cryosphere may provide a proxy for what has cyclically happened on Mars.

Szyrkiewicz A. Borrok D. M. Vaniman D. T. Goff F.  
*POSTER LOCATION #641*

*Hydrological Sulfur Cycling in the Volcanic Complex of Valles Caldera, New Mexico — Geochemical Implications for Mars [#1144]*

We have studied hydrological S cycle related to volcanic S emission and chemical weathering of terrestrial volcanic system to understand sulfate origin on Mars.

Farrand W. H. Wright S. P. Glotch T. D. Schroder C.  
*POSTER LOCATION #642*

*Spectral, Chemical, and Petrographic Comparisons of Hydrovolcanic Tephra with Basaltic Impact Ejecta: Relevance for Mars [#2249]*

Basaltic hydrovolcanic tephras and impact melt samples from Lonar Crater have been examined using instrumentation comparable to that on Mars rovers.

Bost N. Ramboz C. Foucher F. Westall F.  
*POSTER LOCATION #643*

*The Skouriotissa Mine: A New Terrestrial Analogue for Hydrated Mineral Formation on Early Mars [#1400]*

In this investigation, we present a mineralogical study of altered crustal basalts exposed at the Skouriotissa mine on Cyprus analog to martian surface.

Sansano A. Medina J. Rull F.  
*POSTER LOCATION #644*

*Raman Profiling of Carbonates Layers from Hydrothermal Analogs of Mars [#2336]*

Raman study of selected carbonated samples from Svalbard, a well known Mars analog. This study shows the differences in the cations precipitation.

*POSTER LOCATION #645*

*Alluvial Fans of Northern Chile as an Analog to Mars [#2833]*

Alluvial fans in the Atacama may constitute a strong analog to those on Mars, with fans in both environments forming from hundreds of individual runoff events.

Head J. W. III Marchant D. R.  
*POSTER LOCATION #646*

*Antarctic Dry Valley Streams and Lakes: Analogs for Noachian Mars? [#1583]*

Mars fluvial/lacustrine processes suggest a “warm and wet” Noachian: Antarctic streams and lakes show how they might also form in “cold and icy” climates.
Reflectance Spectra of Great Salt Lake Desert Sediments as Analogue Materials for Martian Paleolake Basins [#2973]
VNIR mineralogical identification of lacustrine sediments from the Pilot Valley, Utah, Mars analog environment are compared to in situ methods: XRD and QEMSCAN.

Permafrost Enabling Microclimates in Craters on Mauna Kea, Hawaii [#1695]
We study the microclimate of a crater on Mauna Kea, Hawaii that harbors patches of permafrost and may serve as an analogue to tropical craters on Mars.

Assessing Environmental Controls on Acid-Sulfate Alteration at Active Volcanoes in Nicaragua: Applications to Relic Hydrothermal Systems on Mars [#1633]
We studied active acidic volcanoes in Nicaragua to assess controls on secondary mineralogy and elucidate the paleoenvironments of martian hydrothermal systems.

Subsurface Salts in Antarctic Dry Valley Soils [#1804]
Sets of Antarctic Dry Valley sediment samples were analyzed by geochemical analysis methods. Similarities in chemical properties to Mars soils were found.

Meterological Data, Surface Temperature and Moisture Conditions at the Dalantan Mars Analogous Site, in Qinghai-Tibet Plateau, China [#1743]
The meteorological data of Dalangtan Playa for the past 30 years has been presented to serve environmental background for further Mars analogue studies.

Sedimentary Salts at Dalangtan Playa and its Implication for the Formation and Preservation of Martian Salts [#1336]
The occurrence of Mg-sulfates (e.g., kieserite) at DLT Playa, China, has been described and its implication for the martian Mg-sulfates was discussed.

Visible to Near-Infrared Spectroscopy of Acid-Sulfate Weathering Sites in Nicaraguan Volcanic Systems: An Early Mars Analog [#1677]
We compared the VIS-NIR spectroscopy of four Nicaraguan fieldsites to understand the controls of acid-sulfate weathering processes as related to early Mars.

Weathering Rinds on Basalts and Basaltic Sandstones in the Antarctic Climate: Spectroscopic Implications for Mars [#1358]
Weathering in the Amazonian-like climate of Antarctica can produce surficial rinds on both igneous and sedimentary rocks that alter their VNIR and MIR spectra.

Clastic Pipes and Deformation Features: Terrestrial Analogs to Candor Chasma [#1561]
Comparisons of terrestrial pipes with massive circular features in west Candor Chasma suggest synsedimentary deformation prior to lithification.

Topographic Fingerprint of Eruption Environment: Evidence from Reykjanes Peninsula, Iceland [#2238]
Geomorphic classification based on slope values proves successful in discriminating subaerial edifices from subglacial edifices based on DEMs.
White J. R.  Webster K. D.  Pratt L. M.  
**POSTER LOCATION #657**

*Methane Concentration Gradients Associated with Small, Thermokarst Lake on the Ice-Free Margin of Western Greenland [#3105]*

Methane concentrations from water column of shallow thermokarst lake, air, soils are used to interpret local affects on atmospheric methane concentrations.

Cadieux S. B.  Pratt L. M.  White J. R.  
**POSTER LOCATION #658**

*Methane Cycling in Small, Thermokarst Lakes in Southwestern Greenland as an Analog for Early, Wet Mars [#2166]*

Methane cycling in small, bedrock controlled, thermokarst lakes in SW Greenland as an analog for putative martian ecologies in seasonally ice-covered paleolakes.

Nikitczuk M. P. C.  Schmidt M. E.  Flemming R. L.  
**POSTER LOCATION #659**

*Altered Vesicular Basaltic Tuffs as Potential Habitable Environments: Implications for Mars [#1680]*

Textural features within coarse-grained basaltic pyroclasts suggest that vesicle micro-environments may be conducive to habitable conditions on Mars.

Greenberger R. N.  Mustard J. F.  Cloutis E. A.  Mann P.  Turner K.  
**POSTER LOCATION #660**

*Iron Oxidation State in Serpentines from Visible Imaging Spectroscopy: Implications for Planetary Exploration and Assessment of Astrobiological Potential [#1296]*

Determination of iron oxidation state, hydrogen production, and astrobiological potential of serpentines may be possible with hyperspectral visible imaging.

Schumann D.  Andersen D. T.  Kunzmann M.  Sears S. K.  Vali H.  
**POSTER LOCATION #661**

*Calcite Crystals and Concretions in Modern Conical Stromatolites from Lake Untersee, East Antarctica [#2075]*

This study investigated the mineralogy and formation of calcite crystals and concretions from modern conical stromatolites from Lake Untersee, East Antarctica.

Williams A. J.  Sumner D. Y.  
**POSTER LOCATION #662**

*Development and Preservation of Filamentous Mineral Biosignatures: Implications for Detection with the Mars Science Laboratory [#1741]*

Surface gossan microbial community characterization and mineral filament preservation provides insight into biosignatures detectable by Mars Science Laboratory.

Sharma P.  Heggy E.  Farr T. G.  Radebaugh J.  
**POSTER LOCATION #663**

*Exploring the Inner Structure of Titan’s Dunes: Implications for Understanding Paleo-Wind Regimes [#1821]*

We analyze radar backscatter and elevation variation over linear dunes observed on Titan and Earth, to examine the inner structure of these features.

**POSTER LOCATION #664**

*Living on the Edge: Understanding the Habitability of Europa’s Ice-Ocean Interface with Help from Earth [#3054]*

We present the first results from NASA’s SIMPLE project exploring beneath McMurdo Ice Shelf.

Walker C. C.  Bassis J. N.  
**POSTER LOCATION #665**

*Fractures in Structurally-Compromised Ice: Observations of Rift Behavior at the Highly Fractured Amery Ice Shelf, East Antarctica and Implications for the Icy Shells of Enceladus and Europa [#2139]*

We study fracture arrays, and demonstrate that single rift models at the icy moons may significantly underestimate stresses required for propagation of rifts.

Williamson M. C.  Garry W. B.  Carey R. J.  Shepherd J.  Germain M.  
**POSTER LOCATION #666**

*Geologic Mapping of Askja Volcano, Iceland, Using WorldView-2 High Resolution Satellite Imagery [#1779]*

Geologic mapping of Askja Volcano using WorldView-2 images reveals that the area is an excellent environmental analog for volcanic regions of the Moon and Mars.
TUES POSTERS


**POSTER LOCATION #667**

*A Laboratory Simulation Experiment of Hydrothermal Processes on Mars* [#2638]

An experiment simulates volcanic basalt reacting with acid in CO₂ atmosphere. Hydrous Ca-, Mg-, and Fe-sulfates were found as secondary mineral products.


**POSTER LOCATION #668**

*A Comparison of the Dehydration Processes of Al-, Fe²⁺, and Mg-Sulfates Under Mars Relevant Pressures and Three Temperatures* [#1797]

A comparison of the dehydration processes of alunogen, melanterite, and epsomite reveals the large differences in pathways and the induced structural changes.

Léveillé R. J. Cloutis E. A. Mann P. Sobron P. Lefebvre C. et al.

**POSTER LOCATION #669**

*Spectral Reflectance and Chemical Properties of Magnesium-Rich Phyllosilicates* [#2939]

Mg-rich phyllosilicates may be important indicators of past habitable conditions on Mars. Spectral reflectance and LIBS characteristics of Mg-clays are described.

De Angelis S. De Sanctis M. C. Ammannito E. Di Iorio T. Carli C. et al.

**POSTER LOCATION #670**

*A VIS-NIR Laboratory Spectral Library of Terrestrial Mars Analogs: Support for the ExoMars – MaMiss Instrument* [#1544]

The MaMiss (Mars Multispectral Imager for Subsurface Studies) instrument onboard the ExoMars 2018 mission will investigate the martian subsoil in the VNIR range.


**POSTER LOCATION #671**

*Stability and Phase Transition Pathways of OH-Bearing Ferric Sulfates Under the Conditions Relevant to Diurnal, Seasonal, and Obliquity Cycles on Mars* [#2634]

Results from three systematic experimental investigations on OH-bearing ferric sulfates are consistent with their occurrence at the surface of Mars.

Westall F. Bost N. Loiselle L. Ramboz C. Foucher F.

**POSTER LOCATION #672**

*The International Space Analogue Rock Collection (ISAR) for In Situ Instrument Testing: Relevance for Martian Missions* [#1397]

ISAR (www.isar.cns-orleans.fr) contains relevant lab characterised igneous and sedimentary rocks and minerals for testing instruments for in situ Mars missions.


**POSTER LOCATION #673**

*Effects of Variable Duration Annealing on the Rock Magnetic and Remanence Properties of Synthetic Basalts: Implications for the Intensity and Stability of Crustal Magnetism* [#1814]

We use synthetic basalts to investigate the magnetic properties and remanence-carrying abilities of materials likely to be present in the martian crust.

Basavaiah N. Chavan R. S.

**POSTER LOCATION #674**

*Spectral Results From Mid-IR DRIFT Analysis of Lonar Impact Crater, India* [#2636]

Spectral variations with direction of impact at Lonar Impact crater, India, are documented using mid-IR diffuse reflectance spectroscopy.

Borchardt J. D. Rygalov V. Y. Bebout B. M.

**POSTER LOCATION #675**

*A Comparative Rhizosphere and Morphological Study of a Brassica rapa on JSC-1A Lunar Regolith Simulant* [#2610]

Determine how plant morphology and rhizosphere geochemistry may be indicators of soil-forming processes using in situ resources from an early lunar base model.

\textit{Lunar Environment Simulation Capabilities at CASPER} \#2552

An inductively heated plasma source in combination with additional hardware as part of a hybrid plasma simulation facility for lunar environment simulation.

\begin{center}
\textbf{Poster Session I: Material Analogs: Materials and Properties} \\
Tuesday, 6:00 p.m. Town Center Exhibit Area [T644]
\end{center}

Butterworth A. L. Becker N. Gainsforth Z. Lanzirotti A. Newville M. et al. \textit{Poster Location} #677

\textit{Update to New Homogeneous Standards by Atomic Layer Deposition for Synchrotron X-Ray Fluorescence and Absorption Spectroscopies} \#3007

New homogeneous multi-layer film standards are available for the quantitative analysis community, compatible with synchrotron XRF, STXM, and TEM.

Carli C. Roush T. Capaccioni F. \textit{Poster Location} #678

\textit{Retrieving Optical Constants of Glasses with Variable Iron Abundance} \#1918

We calculated optical constants of volcanic glasses from VNIR spectra using a radiative transfer model. We’ll investigate how the grain size affect the model.


\textit{Widespread Contamination of Carbonate-Associated Sulfate by Present-day Secondary Atmospheric Sulfate: Evidence from Triple Oxygen Isotopes} \#2427

Our studies show that carbonate-associated sulfate signal can be severely contaminated by recent atmospheric sulfate by triple oxygen-isotope measurement.

\begin{center}
\textbf{Poster Session I: Tomorrow’s Missions Today: Operations Testing at Terrestrial Analog Sites} \\
Tuesday, 6:00 p.m. Town Center Exhibit Area [T645]
\end{center}

Skinner J. A. Jr. Koenders R. Hare T. M. \textit{Poster Location} #681

\textit{Assessing the Value of Analog “Mission” Data Sets Beyond the Testing Timeline} \#2791

We promote a discussion focused on how analog mission datasets can be a resource for cross-discipline investigation after actual tests have been completed.

Deans M. C. Smith T. Lees D. S. Scharff E. B. Cohen T. E. \textit{Poster Location} #682

\textit{Real Time Science Decision Support Tools: Development and Field Testing} \#2847

We tested our xGDS science tools in an analog lunar rover test, demonstrating that real time lunar surface science is possible with xGDS capabilities.

Hipkin V. Dubreuil-Laniel G. Gonthier Y. Haltigin T. Léveillé R. et al. \textit{Poster Location} #683

\textit{Canadian Space Agency Analogue Missions — Approach to Evaluation and Lessons Learned} \#2952

Four analogue missions supported by the Canadian Space Agency in 2011 and 2012 are presented, with focus on the approach to evaluation and lessons learned.


\textit{Astrobiology, Geology and Habitability Field Studies Supporting Mars Research} \#3057

We conducted field campaigns (EuroGeoMars and ILEWG EuroMoonMars) in the Utah desert to study geology, habitability, and samples in support of Mars-X, MRO, MER, and MSL.
2012 marked the 15th year of Research and Technology Studies (RATS) testing and the first to evaluate near-Earth asteroid operations from Johnson Space Center.

Operations concepts for human exploration of a near-Earth asteroid were tested using human subjects, prototype hardware, and a software simulation of Itokawa.

Summary of results from three years of analog tests of NASA’s GeoLab workstation, including operational lessons, science benefits, and human-robotic interfaces.

The NEEMO 16 mission was performed at the Aquarius undersea research habitat and focused on near-Earth asteroid (NEA) human exploration techniques and systems.

We report the integration and operation of the rover-mounted instruments and scientific investigations conducted during the 2012 MMAMA analog field test.

We studied how the Mars Rover Opportunity responded on tilted surfaces to understand soil properties and plan more difficult drives on steeper slopes.

Summarizing simulations of Opportunity’s drives using Artemis, including the ripple crossing on sol 2143, and driving on a tilted bedrock surface on sol 2808.

Mars Science Lab rover simulation study. Objectives: test MSL mission scientists, understand the local geology, and evaluate simulations in planetary exploration.

The Human Spaceflight Laboratory at the University of North Dakota is developing a Portable Life Support System for analog testing of the NDX-2 Lunar Spacesuit.
Ono A.  Schlacht I. L.  Hendriks J.  Battler M.  

Habitability in Mars Mission Simulation: Sounds as Stress Countermeasures [#1807]

I present the habitability research performed at the Mars Desert Research Station to increase crew performance, safety, and well-being, in human Mars missions.

Willson D.  Stocker C. R.

Space Suit Impact on Efficiency and Performance of Field Science Tasks [#3088]

We conducted pressurized space suit field trials to quantify scientist astronaut performance doing off-world field science.

---

POSTER SESSION I: INTO THE FIELD WITH THE LABORATORY: ANALOG TESTS OF LABORATORY TECHNIQUES 
Tuesday, 6:00 p.m.  Town Center Exhibit Area [T646]

Bramble M. S.  Flemming R. L.  Hutter J. L.  

A Temperature-Controlled Sample Stage for Micro-X-Ray Diffraction of Mirabilite-Containing Samples from Wolf Spring, Axel Heiberg Island, Nunavut, Canada [#1729]

A temperature-controlled sample stage was created for a micro-X-ray diffractometer to analyse samples from an Arctic saline spring at an in situ temperature.


Raman Analysis of Basaltic Samples from Tenerife Island (Cañadas, Azulejos, and Historical Eruptions) with the Exomars RLS Instrument [#2403]

Analysis of selected samples from Tenerife, where it has been compared with result obtained by the ExomarsRLS Simulator and conventional laboratory MicroRaman-XRD.

Catalá-Espi A.  Lefebvre C.  Sobrón P.  Léveillé R.  Koujelev A.  et al.

3D Chemical Mapping Using LIBS: Implications for Geochemical Investigations on Mars [#2726]

In this paper, we show a geochemical investigation of a natural coated basalt that demonstrates the capability of LIBS to produce 3-D chemical maps of targets.

Winebrenner D. P.  Elam W. T.  Miller V.  Carpenter M.  

A Thermal Ice-Melt Probe for Exploration of Earth-Analogs to Mars, Europa and Enceladus [#2986]

We describe a thermal melt-probe for inexpensive access to terrestrial subglacial analogs for Mars, Europa, Enceladus, and prospectively other locations.
Lewis J. B. Podosek F. Bernatowicz T. Floss C. Gyngard F. et al. **POSTER LOCATION #1**

**Statistical Constraints on $^{13}$C/$^{12}$C Anomalies in Allende Nanodiamonds by NanoSIMS Analysis [#2506]**

We constrained the isotopic composition of nanodiamonds by applying statistics to large numbers of measurements of smaller aggregates than heretofore analysed.

Nguyen A. N. Keller L. P. Rahman Z. Messenger S. **POSTER LOCATION #2**

**Crystal Structure and Chemical Composition of a Presolar Silicate from the Queen Elizabeth Range 99177 Meteorite [#2853]**

TEM analysis of a presolar AGB silicate from QUE 99177 reveals a small nanocrystalline enstatite core surrounded by an amorphous Fe-bearing pyroxene-like shell.

Stroud R. M. Nittler L. R. Alexander C. M. O'D. **POSTER LOCATION #3**

**Analytical Electron Microscopy of a CAI-Like Presolar Grain and Associated Fine-Grained Matrix Materials in the Dominion Range 08006 CO3 Meteorite [#2315]**

We report the discovery of a CAI-like presolar silicate and provide TEM data to support classification of DOM 08006 in the CO3.00 to CO3.05 range.

Bose M. Zega T. J. Andronokov A. Williams P. **POSTER LOCATION #4**

**A Large Presolar Oxide Grain Identified in Allende CV3 Chondrite [#3024]**

We have found a large 10 × 6-µm-sized presolar oxide grain in acid residues of CV3 carbonaceous chondrite Allende.

Haenecour P. Floss C. Jolliff B. L. Carpenter P. **POSTER LOCATION #5**

**Presolar Grains in Fine-Grained Chondrule Rims: Re-Equilibration of Oxygen Isotopic Compositions in some Presolar Silicates by Heating [#1150]**

The abundance of presolar silicates is lower in the chondrule rims than in the matrix of LAP 031117, likely reflecting their isotopic homogenization by heating.

Jadhav M. Schmitz S. Croat T. K. Brenker F. E. Schmitt M. et al. **POSTER LOCATION #6**

**Nano-Synchrotron XRF and XRD: A Powerful Non-Destructive Technique for In Situ Chemical and Structural Analyses of Presolar Grains [#2928]**

Some preliminary results of nano-SXRF and SXRD measurements of presolar graphite grains are presented to demonstrate the advantages of this method.

Ong W. J. Floss C. **POSTER LOCATION #7**

**Fe Isotope Nucleosynthesis: Constraints from Fe Isotopic Analyses of Presolar Silicate Grains from Acfer 094 [#1163]**

We report Fe-isotopic compositions for presolar silicates from Acfer 094. Some grains show depletions in $^{57}$Fe that are inconsistent with AGB model predictions.

Trappitsch R. Davis A. M. **POSTER LOCATION #8**

**Retention Model for Radiogenic Lead Isotopes in Presolar Grains [#2666]**

We present Monte Carlo model results for the retention of radiogenic lead isotopes from the decay of uranium and thorium in presolar SiC grains.

Matthews L. S. Shotorban B. Hyde T. W. **POSTER LOCATION #9**

**Effect of Stochastic Charging on Cosmic Dust Aggregation [#1519]**

This study examines how stochastic charge fluctuations alter the coagulation process of cosmic dust and the physical characteristics of the aggregates formed.
Barnes W. T.  Matthews L. S.  Hyde T. W.  
POSTER LOCATION #10

_Dust Grain Growth in a Protoplanetary Disk: Effects of Location on Charge and Size_ [#1897]

The formation and charging of dust aggregates at several different locations within the protoplanetary disk are examined using a numerical model.

Frazier S. A.  Matthews L. S.  Hyde T. W.  
POSTER LOCATION #11

_Charging Behavior of Dust Aggregates in a Cosmic Plasma Environment_ [#2480]

When exposed to UV radiation, dust aggregates in a complex plasma may exhibit a mixed charging history.

Takigawa A.  Matsumoto T.  Miyake A.  Tsuchiyama A.  Nakata Y.  et al.  
POSTER LOCATION #12

_Surface Structure Formation of Presolar Alumina (Al₂O₃): Hydrogen and Helium Ion Irradiation Experiments_ [#2080]

We performed irradiation experiments of Al₂O₃ wafers and particles with H⁺ and He⁺ ions and discussed the origin of surface structures of presolar alumina.

Stephan T.  Pellin M. J.  Rost D.  Davis A. M.  Savina M. R.  et al.  
POSTER LOCATION #13

_CHILI — The Chicago Instrument for Laser Ionization_ [#2536]

CHILI, a new RIMS instrument for isotopic analysis at ~10-nm lateral resolution and high sensitivity, is nearing completion at the University of Chicago.

**POSTER SESSION II: COMET WILD 2/STARDUST**

**Thursday, 6:00 p.m.  Town Center Exhibit Area [R702]**

White A. J.  Ebel D. S.  Greenberg M.  
POSTER LOCATION #14

_An Improved Experimental Deconvolution Technique for 3-Dimensional Laser Confocal Microscopy of Particles in Aerogel_ [#1630]

We present a method for imaging particles in aerogel. This work is adapted for samples returned by Stardust but can be applied to any future return samples.

Mohapatra R. K.  Herrmann S.  Westphal A.  Ott U.  Clark I. D.  
POSTER LOCATION #15

_Stardust Aerogel — A Noble Gas Experiment_ [#2201]

Noble gas measurements have been performed on silica aerogel from the Stardust mission to explore possible cometary atmosphere sampled via low energy implantation.

Pulma R. L.  Pepin R. O.  Westphal A.  Schlutter D.  Gainsforth Z.  
POSTER LOCATION #16

_A Light Noble Gas Inventory of Stardust Cell C2044_ [#1084]

Helium and neon concentrations and isotopic compositions from Stardust cell C2044 track 41 and aerogel samples.

Ogliore R. C.  Huss G. R.  Nagashima K.  Westphal A. J.  
POSTER LOCATION #17

_Oxygen Isotope Analysis of Fine-grained Cometary Material from the Bulb of a Stardust Track_ [#2950]

We describe a SIMS technique to measure grains embedded in aerogel and report O-isotope measurements of 65 small grains from the bulb of a Stardust track.

Frank D. R.  Zolensky M. E.  Le L.  Weisberg M. K.  Kimura M.  
POSTER LOCATION #18

_Highly Reduced Forsterite and Enstatite from Stardust Track 61: Implications for Radial Transport of E Asteroid Material_ [#3082]

We discuss the affinity of the track 61 TP to aubrites and the implications for radial transport mechanisms.

POSTER LOCATION #19

_FIB-TEM Investigations into the Condition of Refractory Presolar Phases Under Stardust-like Conditions_ [#2625]

FIB-TEM studies of Si-Ti carbide craters in Al show much surviving crystalline material, demonstrating that presolar SiCs should survive a Stardust-like impact.
We present compendia for the Stardust cometary and interstellar dust collections. The compendia are readable globally and editable by Stardust investigators.

Merouane S. Djouadi Z. D’Hendecourt L.

Posters Session II: IDPS and Micrometeorites

Thursday, 6:00 p.m. Town Center Exhibit Area

We present a close relationship between the length of the aliphatic chains and the silicate composition in 10 IDPs through infrared spectroscopy.

Wirick S. Flynn G. J. Sutton S. Zolensky M. E.

Chemical Heterogeneity of a Large Cluster CP IDP: Clues to its Formation History Using X-Ray Fluorescence Mapping and Cr and Fe XANES Spectroscopy[#2327]

A large chondritic, porous IDP was analyzed using X-ray fluorescence mapping and XANES spectroscopy to determine chemical heterogeneity and oxidation states.

Joswiak D. J. Brownlee D. E. Matrajt G.

First Occurrence of a Probable Amoeboid Olivine Aggregate in a “Cometary” Interplanetary Dust Particle[#2410]

A 10-µm grain composed of olivine + Al-Ti diopside + anorthite is the first probable amoeboid olivine aggregate (AOA) from a likely cometary IDP.

Olinger C. T. Maurette M. Das J. P. Meshik A.

Noble Gas Contents of Unmelted Cap-Prudhomme “Giant Micrometeorites”[#2278]

All noble gases are measured in 100–400 and >400-µm unmelted Antarctic micrometeorites. Significant isotopic and elemental gas variability is observed.

Ebihara M. Sekimoto S. Shirai N. Tsujimoto S. Noguchi T. et al.

Chemical Composition of Dust Samples (Micrometeorites) Recovered from Antarctic Snow[#2086]

Bulk mineralogy and chemistry of four MMs from Antarctic surface snow were investigated. Their element compositions are different from MMs from Antarctic ice.

Noguchi T. Ohashi N. Tsujimoto S. Bradley J. P. Nakamura T. et al.

Delivery of Typical Cometary Dust to the Surface of the Earth[#1380]

We identified chondritic porous micrometeorites (CP MMs) from Antarctic ice and snow. Both their texture and their mineralogy are indistinguishable from CP IDPs.

Taylor S. Lindsay F. N. Delaney J. S. Herzog G. F.

Micrometeorite SP-F88: Lunar or Angrite? [#1517]

SP-F88 is a compositionally unique micrometeorite. It is not chondritic, nor like HED or martian meteorites, but resembles angrite and lunar highland samples.

Kohout T. Kallonen A. Suuronen J.-P. Rochette P. Hutzler A. et al.

Changes to Meteoroid Shape, Porosity and Internal Structure During High Velocity Atmospheric Entry[#2486]

Porosity of pristine cosmic dust is variable. Increasing entry velocity causes partial melting and porosity increase followed by complete melting and compaction.

Hu Z. W. Winarski R.

Three-Dimensional Visualization of Porous Structure of a Cluster Interplanetary Dust Particle[#2521]

X-ray 3-D nano-imaging of a whole IDP reveals a small porous world that appears to be structurally more complex and texturally richer than previously thought.
Rudraswami N. G. Shyam Prasad M. 
*Fremdlinge Type Object in a Cosmic Spherule from the Indian Ocean* [#1192]
The cosmic spherule AAS26-D-P15 found in the collection from deep sea sediments of Indian Ocean has the presence of nugget showing resemblance to Fremdlinge found in CAIs.

Gondo T. Isobe H. 
*Artificial Cosmic Spherules Produced by Melting Experiments of the Powdered Allende Meteorite* [#1882]
We successfully reproduced artificial cosmic spherules with remarkably analogous textures to natural ones by rapid heating and cooling experiments.

Duprat J. Dachwald B. Hilchenbach M. Engrand C. Espe C. et al. 
*The MARVIN Project: A Micrometeorite Harvester in Antarctic Snow* [#2031]
MARVIN is an automated drilling and melting probe dedicated to collect pristine interplanetary dust particles (micrometeorites) from central Antarctica snow.

*The 2012 Draconid Storm as Observed by the Canadian Meteor Orbit Radar and Potentially Sampled by ER-2 Aircraft* [#1622]
We have made an effort to capture dust from Comet Giacobini-Zinner in the stratosphere.

Thomas E. Horányi M. Munsat T. 
*Meteorite Ablation Studies at the CCLDAS Dust Accelerator* [#2971]
We report on a proposed set of experiments to measure meteorite ionization coefficient and luminous efficiency at the CCLDAS dust accelerator.

Poppe A. R. 
*Modeling Interplanetary Dust Fluxes to the Outer Planets* [#2384]
We report on an effort to calculate the influx of interplanetary dust grains to the outer planets using modeling and in situ dust density observations.

*Heliocentric Variation of Cosmic Dust Flux Measured by the IKAROS-ALADDIN Between the Earth and Venus* [#2743]
IKAROS solar sail measured heliocentric variation of dust flux between Earth and Venus with 0.54 m$^2$ ALADDIN sensor and detected local concentrations.

Zhang A. C. Itoh S. Sakamoto N. Wang R. C. Yurimoto H. 
*Heterogeneous Oxygen Isotopic Compositions in a Sapphirine-Bearing Al-Rich Chondrule from the DaG 978 Carbonaceous Chondrite* [#1449]
We report O-isotopic compositions of minerals, REE compositions of mesostasis in an Al-rich chondrule, and discuss them with O and Fe-Mg diffusion calculations.

Ustunisik G. Ebel D. S. Nekvasil H. 
*Exploring The Role of Chlorine on the Degassing of Alkalis (Na and K): Implications for Chondrule Formation* [#2145]
Cl-free and Cl-bearing heating/degassing experiments were conducted at <1 bar on a synthetic AI3509 chondrule melt for time intervals of 10 min, 4 hr, and 6 hr.
Evaporation Experiments of Alkali Elements from Silicate Melts: Clues for Early Solar System Processes [1987]
Evaporation of Na and K from silicate melts causes gas phase mediated alkali-element transfer between isolated samples: application to chondrule formation.

Archer G. J. Walker R. J. Bullock E. S.
Highly Siderophile Element Abundances and Rhenium-Osmium Isotope Systematics of Chondritic Components [2635]
Highly-siderophile-element abundances and Re-Os-isotope systematics were determined for Allende CAIs, chondrules, and matrix.

Relationship Between CAIs and Chondrules: What we can Learn from a Chondrule-CAI Hybrid from the Allende CV3 Meteorite [2062]
Mineralogy, petrology, O and Si isotopes are reported from a compound chondrule-CAI from the Allende CV3 meteorite.

Kita N. T. Tenner T. J. Ushikubo T. Nakashima D. Bischoff A.
Primitive Chondrules in a Highly Unequilibrated Clast in NWA 753 R Chondrite [1784]
A highly unequilibrated R3 clast from NWA 753 (R3-6) chondrite contains a variety of chondrules with Mg# of 100–67. It may correspond to subtype 3.15–3.2.

Beyersdorf-Kuis U. Trieloff M. Cartwright J. A. Bennett J. W. Ott U.
Complex History of Chondrules and Matrix from CR3 Chondrites MET 00426 and MET 99177 [1999]
We have analyzed highly primitive CR3 chondrites to search for pre-irradiation effects. QUE 99177 seems the best candidate for solar nebular pre-irradiation of chondrules.

Ma C. Beckett J. R. Connolly H. C. Jr. Rossman G. R.
Discovery of Meteoritic Loveringite, Ca(Ti,Fe,Cr,Mg)21O38, in an Allende Chondrule: Late-Stage Crystallization in a Melt Droplet [1443]
We report the first occurrence of meteoritic loveringite, a late-stage crystallization product of a cooling chondrule melt along with zirconolite and apatite.

Ma C. Krot A. N. Bizzarro M.
Discovery of Meteoritic Dmisteinbergite (Hexagonal CaAl2Si2O8) in the Allende Type B FUN CAI STP-1: A New Refractory Mineral [1440]
We report the first occurrence of dmisteinbergite in a meteorite as a new refractory silicate in a CAI, likely formed from a silicate melt via rapid cooling.

Petaev M. I. Jacobsen S. B. Krot A. N. Holst J. Bizzarro M.
REE and U Fractionation in the Solar Nebula: Implications for Redox Processes During CAI Formation [2072]
Negative Ce anomaly in the Type B2 FUN CAI STP-1 results from evaporation at reducing conditions, consistent with low Ti4+/Ti3+ ratio in its pyroxene.

An Ion Microprobe Study of FUN-Like Hibonite-Bearing Inclusions from the Murchison (CM2) Meteorite [1870]
We found two FUN-like inclusions from the Murchison, which exhibit large mass-dependent fractionation in Mg isotopes (~50%/amu) and negative anomaly in 54Ti.
Kööp L.  Davis A. M.  Heck P. R.  
Morphology of Hibonite-Bearing Inclusions Separated from the Murchison Meteorite  [#2736]
We present the morphology of hibonite-rich inclusions separated for isotopic studies and show differences between acid-treated and untreated inclusions.

Komatsu M.  Fagan T. J.  Mikouchi T.  
Manganese-Rich Olivine in AOAs: Implications for Formation and Alteration Conditions  [#1847]
Mn-rich olivine in AOAs can be a sensitive indicator for thermal processes such as annealing in the solar nebula and parent body alteration.

Paque J. M.  Burnett D. S.  Beckett J. R.  Guan Y.  Ishii H. A.  
Low Temperature Carbonate Control of Barium in Igneous Ca-, Al-Rich Inclusions  [#2505]
Using standard and nano-SIMS plus FIB/TEM, we find some Ba-rich carbonate alteration in a Leoville CAI. An Allende CAI has one Ba-rich perovskite in 45 spots.

Harries D.  Schwander D.  Palme H.  Langenhorst F.  
Niobium- and Platinum-Rich Refractory Metal Alloys from a Type B CAI  [#1927]
Nb- and Pt-rich refractory alloys from an Allende type B CAI were studied by FIB-TEM. The results are discussed in terms of a possible condensation origin.

Jordan M. K.  Young E. D.  Jacobsen S. B.  
Mg, Si Isotope Fractionation in Allende CAI SJ101 as a Result of Condensation  [#3052]
We present new Mg and Si laser ablation MC-ICPMS data for an unusual Allende CAI and compare these results with models for condensation.

POSTER SESSION II: CHONDRITES OTHER
Thursday, 6:00 p.m.  Town Center Exhibit Area  [R706]

Ustunisik G.  Ebel D. S.  Boesenberg J. S.  
Experimental Confirmation of Predicted Condensed Phase Assemblages in Dust-Enriched Systems  [#2260]
Experiments were done to test predictions of VAPORS code on constraining mineral-liquid equilibria in dust-enriched systems.

Tachibana S.  Takigawa A.  
Condensation of Magnesium Silicates in the System of Mg$_2$SiO$_4$-H$_2$O-H$_2$: Development of Low-Pressure Infrared Furnace  [#1799]
We report our improvements of a low-pressure infrared furnace and experimental techniques for condensation of Mg silicates under protoplanetary disk conditions.

Nakanishi N.  Yokoyama T.  Usui T.  
Determination of Osmium Isotope Compositions in Metal Phases from CB Chondrites Using a Micro Sampling Technique  [#2407]
Osmium-isotopic ratio measurements to understand the origin of metal phases in CB chondrites using microsampling technique.

Okui W.  Yokoyama T.  
Strontium Stable Isotopic Anomalies in Primitive Meteorites and Chondrules  [#2776]
We present Sr-isotopic data in bulk rocks and chondrules, and show that chondrules have $\mu^{84}$Sr values greater than the bulk of their host meteorite.
Izawa M. R. M. Craig M. A. Cloutis E. A. POSTER LOCATION #57
Spectral Variations in the Tagish Lake Carbonaceous Chondrite in the Ultraviolet, Visible, and Near-Infrared [#3019]
UV-Vis-NIR reflectance spectra of diverse Tagish Lake lithologies show many possible weak spectral features that may be diagnostic of mineralogical variations.

Ali A. Jabeen I. Banerjee N. R. POSTER LOCATION #58
Advances in Triple Oxygen Isotope Analyses of Terrestrial and Extraterrestrial Samples at Western University Canada [#2873]
High-precision data of triple-oxygen isotopes using CO2 laser-BrF5 extraction mass spectrometry is applied to define longest TFL and successful meteorite characterization.

Lee M. Y. P. Bussemann H. Bischoff A. Claydon J. L. Crowther S. A. et al. POSTER LOCATION #59
The Primordially Trapped Noble Gas Component in the Rumuruti Parent Body [#2681]
Correcting new experimental and literature data for additional components, we determined the primordially incorporated noble gases of the Rumuruti parent body.

Edey D. R. McCausland P. J. A. Holdsworth D. W. Flemming R. L. POSTER LOCATION #60
Extended Dynamic Range Micro-Computed Tomography of Meteorites Using a Biomedical Scanner [#2693]
Using empirical data gathered from scanning a calibration phantom it is possible to reduce or remove offending artifacts from previously collected data.

Andronikov A. V. Lauretta D. S. Connolly H. C. Jr. Andronikova I. E. POSTER LOCATION #61
Determination of Trace-Element Bulk Composition of Equilibrated Ordinary Chondrite Meteorite Samples by LA-ICP-MS Using Various Reference Materials [#1603]
We present results of LA-ICP-MS analyses of pellets prepared from EOC for the OSIRIS-REx program. Various reference materials were used for comparison.

Simon S. B. Sutton S. R. Grossman L. POSTER LOCATION #62
The Valence of Ti in Enstatite Chondrites: Not What you Might Think [#2270]
Enstatite chondrites are dominated by reduced assemblages but they also contain FeO-bearing pyroxene and olivine, so we investigated the valence of Ti in these phases.

Srinivasan P. Simon J. I. Cuzzi J. N. POSTER LOCATION #63
Refractory Inclusion Size Distribution and Fabric Measured in a Large Slab of the Allende CV3 Chondrite [#2580]
Refractory inclusion size distribution and fabric measured in a large slab of the Allende CV3 chondrite.

Stroud R. M. Bassim N. D. Scott K. Nittler L. R. Herd C. D. K. POSTER LOCATION #64
Development of 3D Nanoscale Analysis Methods with Focused Ion Beam Tomography and Correlative Electron Microscopy: Application to Tagish Lake Matrix [#2548]
We are developing FIB-based methods for tomographic analysis at the 50-nm or smaller scale, to improve our understanding of matrix mineralogy.

Harrington R. Righter K. POSTER LOCATION #65
Carbonaceous Chondrite Thin Section Preparation [#2206]
Carbonaceous chondrite meteorites are popular yet pose difficulties in making thin sections; a summary of NASA-JSC thin section lab approaches will be presented.

Ogliore R. C. Jilly C. E. POSTER LOCATION #66
Gigapixel Optical Microscopy for Meteorite Characterization [#1023]
We describe an open-source optical microscopy system to acquire and display gigapixel micrographs of meteorite thin sections up to a fem cm in size.
McBride K. M.  Satterwhite C. E.  Righter K.  
US Antarctic CR Chondrites: A limited Resource Providing Material for a Broad Array of 
Planetary Sciences [2325]
U.S. Antarctic CR chondrites enjoy great popularity for a broad range of disciplines in planetary science, but 
material is of limited quantity: Let’s go get more!

The Holbrook Meteorite — 99 Years out in the Weather [2883]
The Holbrook meteorite fell in 1912. Collection of samples in 1912, 1931, 1968, and 2011 demonstrates that 
terrestrial weathering takes place rapidly.

Solar Wind-Derived Helium and Neon in Sediment-Dispersed Extraterrestrial Chromite Grains from the 
Mid-Ordovician Lynna River Section, Russia [1014]
Chromite grains from Ordovician rocks are identified as fossil micrometeorites containing solar wind gases and 
having been exposed to GCR+SCR for 0.17 to 13 Ma.

Yokoyama T.  Misawa K.  Okano O.  Shih C.-Y.  Nyquist L. E. et al.  
K-Ca Dating of Alkali-Rich Fragments in the Y–74442 and Bhola LL-Chondritic Breccias [1972]
We report preliminary results of K-Ca-isotopic systematics of alkali-rich fragments in the LL-chondritic breccias, 
Y–74442 and Bhola.

Berlanga G.  Hibbitts C. A.  Takir D.  Dyar M. D.  
Spectral Nature of CO₂ Adsorption on Meteorites [2904]
IR reflectance spectra of CO₂ adsorption onto outer main belt carbonaceous chondrite meteorites under high vacuum 
and cryogenic conditions.

Moyano-Cambero C. E.  Trigo-Rodriguez J. M.  Llorca J.  
UV-NIR Spectra of the Most Reflective Carbonaceous Chondrite Groups: CH, CR and R [1533]
The R, CR, and CH groups of CCs exhibit high reflectivity in the UV to NIR window. The main reason for that is a 
progressive increase in the abundance of metal.

Beck P.  Garenne A.  Bonal L.  Quirico E.  Montes-Hernandez G. et al.  
Absorption Spectra (2–25 microns) of Carbonaceous Chondrites (CI, CM, CV and CR): Mineralogy and 
“Water” Abundance [1516]
We present transmission infrared spectra of carbonaceous chondrites, revealing information on the mineralogy, 
water abundance, and then parent body processes.

Granahan J. C.  
A Comparison of Ordinary Chondrites with 243 Ida and Dactyl [1045]
A comparison study of Galileo spacecraft asteroid 243 Ida and satellite Dactyl infrared signatures with those of 
ordinary chondrite meteorites.

Sears D. W. G.  
The Sutter’s Mill CM Chondrite and the Tissint Shergottite: First Data from the NASA Ames 
Thermoluminescence Laboratory [2376]
Sutter’s Mill has been heated to ~300°C, probably during atmospheric passage. Tissint cooled slowly after ejection 
from Mars (~Shergotty), implying a large object.
**POSTER LOCATION #76**

*Thermal History of Sutter’s Mill CM Carbonaceous Chondrite Fall from Water-Abundance and the Structure of its Organic Matter [#1521]*

Our study of fragment Sutter’s Mill fragment SM18 by TGA, Raman, and IR spectroscopy reveals that it experienced significant heating leading to dehydration.

Beauford R. E.  Arnold S. K.  Sears D.  
**POSTER LOCATION #77**

*The Macrostructure of the Sutter’s Mill CM Chondrite Regolith Breccia [#1683]*

Lithologic variation in the Sutter’s Mill CM chondrite records precursor materials and surface processes that contributed to regolith formation.

**POSTER LOCATION #78**

*The Abundance and Enantiomeric Composition of Amino Acids in the Sutter’s Mill Carbonaceous Chondrite [#1189]*

Amino acids were identified in three separate fragments of the Sutter’s Mill meteorite. Several non-protein amino acids are likely extraterrestrial in origin.

Dillon J.  Tarozo R.  Yin Q.  Huang Y.  
**POSTER LOCATION #79**

*Analysis of Carboxylic Acid Compounds in the Sutter’s Mill Meteorite [#2916]*

We analyzed and quantified monocarboxylic acids in the Sutter’s Mill meteorite sample using solid-phase microextraction followed by GCMS analysis.

Flynn G. J.  Wirick S.  Sandford S. A.  Nuevo M.  
**POSTER LOCATION #80**

*Infrared Analyses of Minerals and Organics in the Sutter’s Mill Meteorite [#1595]*

Infrared spectroscopy of two Sutter’s Mill samples shows olivine, pyroxene, clay, carbonate, organic similar to IDPs and possible organic contamination.

Haberle C. W.  Garvie L. A. J.  Domanik K.  Christensen P. R.  
**POSTER LOCATION #81**

*Calcium-Sulfur-Chlorine Bearing Phases Within Sutter’s Mill Sample SM3 (Pre-Rain) [#2810]*

We present results of an SEM investigation of Sutter’s Mill sample SM3 focusing on Ca-S-Cl-bearing phases randomly distributed across the section investigated.

Ott U.  Herrmann S.  Haubold R.  Samu S.  Yin Q.-Z.  
**POSTER LOCATION #82**

*Noble Gases and Cosmic Ray Exposure of Sutter’s Mill CM Chondrite [#1849]*

Cosmic ray exposure age of Sutter’s Mill is exceedingly short (0.019 Ma), shorter than Jenniskens et al. (2012) report, an order of magnitude shorter than Maribo.

Fries M.  Matson R.  Schaefer J.  Fries J.  Hankey M.  
**POSTER LOCATION #83**

*Faster Recovery, Better Science: Meteorite Fall Events Detected with Weather Radars and Seismometers in 2012 [#2935]*

Rocks rain from above / Many ready at the reins / New methods reign too.

Yamakawa A.  Yin Q.-Z.  
**POSTER LOCATION #84**

*The Chromium Isotopic Studies of Sutter’s Mill CM-type Carbonaceous Chondrite: Implications for Isotopic Heterogeneities of the Solar System [#2418]*

We will present the chromium-isotopic studies, $^{53}$Mn-$^{53}$Cr chronology and $^{54}$Cr-isotopic anomalies, of the newly discovered Sutter’s Mill meteorite (CM-type).

Sandford S. A.  Nuevo M.  Flynn G. J.  Wirick S.  
**POSTER LOCATION #85**

*Mid-Infrared Study of Samples from Several Stones from the Sutter’s Mill Meteorite [#1663]*

We report on the spectra of samples from two stones from the Sutter’s Mill meteorite. The spectra are dominated by phyllosilicates, carbonates, and organics.
Beauford R. E. Sears D.  
*Timing of Fine-Grained Rim Formation in the Sutter’s Mill CM Chondrite* [#1692]
The Sutter’s Mill CM chondrite offers constraints on timing and insights into context of fine-grained rim formation.

Kohl I. E. Yin Q. Z. Young E. D.  
*Sutter’s Mill Meteorite Oxygen Isotopes: More Evidence for Water-Rock Open System Alteration* [#3005]
We report new oxygen-isotope data for the Sutter’s Mill meteorite and interpret it in the context of fluid-rock interactions.

Wallace S. W. Ebel D. S. Hill M. G.  
*Sutter’s Mill: Using Computed Tomography to Curate Scientifically Important Meteorites* [#2297]
In this study, computed tomography imaging of a whole specimen of the Sutter’s Mill meteorite is used to locate potential targets before sectioning.

---

**POSTER SESSION II: ANALYSIS OF ITOKOWA SAMPLES**  
Thursday, 6:00 p.m.  Town Center Exhibit Area  [R708]

*The Mass, Morphology, and Internal Structures of Three Particles from the Hayabusa Sample Return Mission, Analyzed with Synchrotron Radiation X-Ray Tomographic Microscopy* [#1937]
Synchrotron X-ray tomographic microscopy of three particles brought back by Hayabusa, calculation of precise masses from volume and density of constituent minerals.

Böttger U. Alwmark C. Bajt S. Busemann H. Gilmour J. D. et al.  
*Raman Microscopy of Hayabusa Particle RA-QD02-0051* [#2092]
Raman measurements are performed on Hayabusa sample RA-QD02-0051 to identify the mineral phases of the particle. It consists of olivine, pyroxene, and feldspar.

*Noble Gas Analysis of Two Hayabusa Samples as the First International A/O Investigation: A Progress Report* [#1976]
Noble gases of two Hayabusa samples show solar noble gas signature, which certify them originated from the surface of asteroid Itokawa.

Noguchi T. Hicks L. J. Bridges J. C. Gurman S. J. Kimura M.  
*Comparing Asteroid Itokawa Samples to the Tuxtuac LL5 Chondrite with X-Ray Absorption Spectroscopy* [#1147]
We measured XAS of four allocated Itokawa grains at the diamond light source to discuss the redox states experienced by Itokawa grains and LL chondrites.

Thompson M. S. Zega T. J.  
*Microstructural and Chemical Analysis of Soils from Itokawa: Evidence for Space Weathering* [#2593]
We report on space weathering characteristics of Itokawa soils through microstructural and chemical analyses using the transmission electron microscope.

*Oxygen Three-Isotope Ratios of Silicate Particles Returned from Asteroid Itokawa by the Hayabusa Spacecraft: A Strong Link to Equilibrated LL Chondrites* [#1360]
Oxygen three-isotope ratios of six silicate particles returned from asteroid Itokawa are similar to equilibrated LL chondrites, especially LL6 chondrites.
MacLennan E. M.  Emery J. P.  Trilling D. E.  POSTER LOCATION #95
Thermal Inertia of Asteroids from Multi-Epoch Observations by WISE [#2757]
We employ a thermophysical model, analyzing data taken by the Wide-Field Infrared Survey Telescope at multiple epochs, to constrain thermal inertia for objects.

Crane K. T.  Minton D. A.  Emery J. P.  POSTER LOCATION #96
Thermal Inertia of a Metallic Regolith: A Simulant Sample Experiment [#1018]
Calculated values of thermal inertia of metallic regolith simulant are reasonably close to the thermal inertia measured for M-type asteroid 216 Kleopatra.

Mellon M. T.  McKay C. P.  POSTER LOCATION #97
Thermal Conductivity of Planetary Regoliths: The Effects of Pebbles and Cobbles in a Fine Grained Matrix [#2864]
We examine the effects of embedded pebble and cobble heterogeneities on the thermal conductivity of an otherwise fine-grained planetary regolith.

Starukhina L. V.  POSTER LOCATION #98
On the Thermodynamic Constraints on Dust Release: Implication to the Structure and Size of Dust Particles in Cometary Comas [#2252]
Dust detachment from comet nuclei is favored at curvature radii in the contacts <0.1 µm, for small grains and their aggregates cemented by ice bridges of r ~10 nm.

Piquette M.  Horányi M.  Lihkanski A.  POSTER LOCATION #99
Effects of Surface Topography on Dust Dynamics in the Lunar Plasma Environment [#3076]
The lunar surface develops a complex plasma environment in which charged dust is allowed to interact dynamically. Our studies model this interaction.

Tankosic D.  Abbas M. M.  POSTER LOCATION #100
Study of the Effects of the Electric Field on Charging Measurements on Individual Micron-Size Dust Grains by Secondary Electron Emissions [#2807]
In this paper we give a more elaborate discussion about the possible effects of the AC field in the EDB on the measurements of dust charging by electron impact.

Dust Levitation due to Instantaneous Charge-Up [#2205]
In this study we carry out numerical simulation to trace the motion of photoelectrically charged-up dust grains on and above asteroids and the Moon.

Durda D. D.  Roark S. E.  Scheeres D. J.  Sanchez P.  Devaud G.  et al.  POSTER LOCATION #102
Experimental Approach and Apparatus for Laboratory Investigation of Asteroid Regolith Properties [#2287]
We describe a novel experimental approach and the laboratory apparatus for studies of the properties of asteroid regolith analogs.

Munsat T.  Collette A.  Drake K.  Grün E.  Horányi M.  et al.  POSTER LOCATION #103
Recent Science Results from the CCLDAS Dust Accelerator [#2585]
We present a description of a new 3-MV linear micrometeoroid accelerator and an overview of our recent science results from this facility.
Rickman D. L.  
*Preliminary Measurement of Lunar Particle Shapes [#2910]*
A method for obtaining statistical robust measures of particle shape from thin sections of the lunar regolith is demonstrated.

Rout S. S.  Dohnen R.  Klemme S.  Baither D.  Morlok A.  et al.  
*Growth of Nano Iron Inclusions in Films Produced by Pulsed Laser Irradiation of Olivine: Simulations of Space Weathering on Mercury [#2721]*
Thin amorphous silicate films, prepared by pulsed laser irradiation of San Carlos olivine, were annelaed at high temperature to see the change using TEM.

Markley M. M.  Gillis-Davis J. J.  Bradley J. P.  
*Comparison of Laser Space Weathering Flux on the Spectral Changes of Olivine [#2770]*
Manipulating pulsed laser energy and flux to simulate space weathering and the spectral changes involved on a sample.

Cuda J.  Filip J.  Tucek J.  Kohout T.  Skala R.  et al.  
*Space Weathering Simulations Through Laboratory Production of Iron Nanoparticles on Mineral Grains [#2524]*
Presence of artificially produced 60-nm metallic nanoparticles on olivine powder grains caused darkening and shallowing of absorption bands, but not reddening.

Noble S. K.  Keller L. P.  Christoffersen R.  Rahman Z.  
*Lateral Variations in Lunar Weathering Patina on Centimeter to Nanometer Scales [#1298]*
Two distinct types of patina are identified and described from SEM/TEM observations of a TS of 76015. Both types develop rapidly on exposed rock surfaces.

*Hydroxyl in Lunar Regolith: Dependence on Soil Composition and Maturity [#2203]*
Distribution of water in lunar regolith as a function of soil composition and maturity.

Hurley D. M.  Farrell W. M.  
*Solar Wind Fluence to the Lunar Surface [#2015]*
We investigate the contribution of solar wind to the inventory of OH on the surface of the Moon as a function of time and selenographic position.

---

**POSTER SESSION II: DIFFERENTIATED METEORITES AND BODIES**

Thursday, 6:00 p.m.  Town Center Exhibit Area  [R710]

Fernandes V. A.  Burgess R.  Crowther S. A.  Fritz J. P.  Gilmour J. D.  et al.  
*40Ar-39Ar and Noble Gas Systematics of the Ungrouped Achondrite Northwest Africa 6704 [#1956]*
NWA 6704 petrology, noble gas and Ar-Ar data suggest this achondrite experienced at least two thermal events after crystallization:  $4.52 \pm 0.01$ and $\leq 2.20 \pm 0.33$ Ga.

Buikin A. I.  Verchovsky A. B.  Lorenz C. A.  Skripnik A. Ya.  Korochantseva E. V.  
*Noble Gases and Nitrogen Released by Crushing from Pesyanoe Aubrite [#1141]*
Two enstatite lithologies of the Pesyanoe aubrite are different in Ar- and N-isotopic compositions.

Shirai N.  Yamaguchi A.  Sekimoto S.  Ebihara M.  
*Geochemistry of Unbrecciated Diogenite, Yamato 002875 [#2058]*
We analyzed unbrecciated diogenite Yamato 002875 for determination of bulk chemical compositions and compared this meteorite with other diogenites.
Wood I. Shearer C. K. Burger P. V. Agee C. B.  
*POSTER LOCATION #114*

**Exploring the Crust of 4 Vesta: Examination of Magmatic Clasts in Howardite NWA6817** [#1698]

We examine howardite NWA 6817 for additional 4 Vesta crustal lithologies and their implication for the thermal history of the parent body.

Irving A. J. Kuehner S. M. Ziegler K.  
*POSTER LOCATION #115*

**Petrology and Oxygen Isotopic Composition of Brachinite-Like Achondrites Northwest Africa 7388 and Northwest Africa 7605, and Evidence for Late-Stage Methane-Triggered Reduction** [#2192]

Secondary metal + opx assemblages in some brachinitic achondrites indicate pervasive reduction of olivine. The fabric of NWA 7605 implies plastic flow.

Singerling S. A. McCoy T. J. Gardner-Vandy K. G.  
*POSTER LOCATION #116*

**Possible Evidence for Sulfidization Reactions in the Miller Range Brachinites(?)** [#1669]

We studied the two-phase symplectite texture observed in the MIL 09 ungrouped achondrites and conclude that it is likely the result of a sulfidization reaction.

Aoyagi Y. Mikouchi T. Goodrich C. A.  
*POSTER LOCATION #117*

**New Observations on Grain Boundary Metal in Ureilitic Fragments of Almahata Sitta** [#1448]

We found mixtures of two iron phases, cohenite and schreibersite, in the Almahata Sitta #S138, suggesting shock melting with different amounts of Fe, C, and P.

*POSTER LOCATION #118*

**Petrology of Acapulcoites and Iodranites and the Anomalous Achondrite Lewis Cliff 88763** [#2653]

Primitive achondrite petrology provides clues to early planetary differentiation and the achondrite LEW 88763 indicates multiple brachinite-like parent bodies.

Nagy Sz. Gyollai I. Bérczi Sz.  
*POSTER LOCATION #119*

**Microstructural and Chemical Characteristics of Akimotoite from NWA 5011 Meteorite** [#1345]

The abstract contains our results about the microstructural types of akimotoite, and high-temperature mineralogical evidence for the shock-vein formation.

Nagy Sz. Fintor K. Pál-Molnár E. Gyollai I. Veres M.  
*POSTER LOCATION #120*

**Evidence for Significant Cation Disordering in Ringwoodite from NWA 5011 and Tenham Shocked Chondrite: A Possible Disordered Unrelaxed Ringwoodite Structure** [#1177]

In this abstract we newly investigated and interpreted our earlier theory about the 880 cm$^{-1}$ raman peak in ringwoodite spectra.

Sugiura N.  
*POSTER LOCATION #121*

**A Preliminary Petrographic Study of Several Mesosiderites** [#1176]

Preliminary observations were made on several mesosiderites. Northwest Africa 1878 appears to be a primitive mesosiderite that experienced only minor reheating.

Sipiera P. P. Irving A. J. Kuehner S. M. Jerman G. Chen G. et al.  
*POSTER LOCATION #122*

**Mineralogy and Trace Element Chemistry of the Elizabeth (Illinois) and Fairburn (South Dakota) IAB Irons** [#2624]

We document two American IAB irons, both of which have anomalous features.

Albarède F. Bouchet R. A. Blichert-Toft J.  
*POSTER LOCATION #123*

**Siderophile Elements in IVA Irons and the Compaction of Their Parent Asteroidal Core** [#1416]

Siderophile-element variations in IVAs do not form a crystallization sequence but can be reconciled with compaction of a solid metal core with sulfide blebs.

Kruijer T. S. Sprung P. Kleine T. Leya I. Wieler R.  
*POSTER LOCATION #124*

**Abundance and Isotopic Composition of Cadmium in Iron Meteorites** [#1980]

We report high-precision Cd concentration data for several irons, and investigate the potential of Cd isotopes as neutron dosimeter for iron meteorites.
Papanastassiou D. A.  Chen J. H.  Weiss B. P.  
**POSTER LOCATION #125**  
*Fe-Ni Isotope Systematics in the Eagle Station Pallasite [2684]*  
We investigated the short-lived $^{60}$Fe-$^{56}$Ni chronometer in pallasites and the potential for isotope anomalies in $^{64}$Ni in the Eagle Station pallasite.

Korochantsev A. V.  Lorenz C. A.  Ivanova M. A.  Teplyakova S. N.  Kononkova N. N.  et al.  
**POSTER LOCATION #126**  
*Karavannoe: A New Member of the Eagle Station Pallasite Grouplet [2020]*  
We describe circumstances of the Karavannoe pallasite find and report results on its petrography, mineralogy, chemistry, and oxygen-isotope composition.

**POSTER LOCATION #127**  
*Proton Tomography of Meteorites Milton and Abbott [1756]*  
Proton radiography represents a new capability in nondestructive 3-D imaging of meteorites up to 12 cm, generating images similar to a CT scan.

---

**POSTER SESSION II: CERES**  
**Thursday, 6:00 p.m.  Town Center Exhibit Area [R711]**

Bland M. T.  Singer K. N.  McKinnon W. B.  
**POSTER LOCATION #129**  
*The Surface Topography of Ceres: Pre-Dawn Predictions for Extensive Viscous Relaxation [1655]*  
Warm surface temps and a putative ice layer result in extensive viscous relaxation of even small impact craters. Equatorial/polar craters are erased/preserved.

Dombard A. J.  Schenk P. M.  
**POSTER LOCATION #130**  
*The Giant Cue Ball: Efficient Relaxation of Ceres’ Craters [1798]*  
We model the relaxation of Ceres’ craters, finding only the freshest and highest-latitude craters should show any significant topography to the Dawn spacecraft.

Blewett D. T.  Levy C. L.  
**POSTER LOCATION #131**  
*Radiative-Transfer Model Reflectance Spectra of Potential Ceres Mineral Assemblages [1271]*  
Model reflectance spectra for mixtures of Ceres analog phases. Assessment of the Dawn Framing Camera filters that may best distinguish among the analogs.

Neveu M.  Desch S. J.  Castillo-Rogez J. C.  
**POSTER LOCATION #132**  
*Cracking in Ceres’ Core as an Opportunity for Late Hydrothermal Activity [2216]*  
Calculations of the cracking depth and timescale of hydrothermal circulation in Ceres’ core to estimate the extent of geochemical processes in Ceres’ history.

---

**POSTER SESSION II: SMALL BODY PHYSICS: KEEPING IT TOGETHER**  
**Thursday, 6:00 p.m.  Town Center Exhibit Area [R712]**

Korycansky D. G.  
**POSTER LOCATION #133**  
*Structural Modeling of Rubble Piles in Two and Three Dimensions [1378]*  
We present results from a new method of modeling the structure of rubble piles.

Durda D. D.  Richardson D. C.  Asphaug E.  Movshovitz N.  
**POSTER LOCATION #134**  
*Size Dependence of Coefficient of Restitution: Small-Scale Experiments and the Effects of Rotation [2263]*  
We present results of laboratory experiments to determine the coefficient of restitution in low-speed rock-on-rock impacts.
Springmann A.  Taylor P. A.  Howell E. S.  Nolan M. C.  
*POSTER LOCATION #135*

*Are the Radar Scattering Properties of Near-Earth Asteroids Correlated with Size, Shape, or Spin? [#2915]*

We report on the ongoing investigation of near-Earth asteroids using the Arecibo Observatory planetary radar system, looking at NEA size and surface roughness.

Lai H. R.  Russell C. T.  Wei H. Y.  Zhang T. L.  
*POSTER LOCATION #136*

*Lose of Co-orbiting Materials in the Orbit of Asteroid 2201 Oljato Deduced from Interplanetary Field Enhancements Records [#1668]*

Oljato has lost its co-orbiting materials, which can collide with materials in Venus’ orbital plane, producing IFEs detected inside the Oljato sensitive region.

Cotto-Figueroa D.  Statler T. S.  Richardson D. C.  Tanga P.  
*POSTER LOCATION #137*

*Radiation Recoil Effects on the Dynamical Evolution of Asteroids [#2945]*

We self-consistently model the YORP effect on the spin states of dynamically evolving aggregates.

Adler J. B.  Paige D. A.  Schlichting H. E.  
*POSTER LOCATION #138*

*Computing the Diurnal Yarkovsky Drift Rate for a Shape Model [#2527]*

We compute Yarkovsky forces using a three-dimensional ray-tracing thermal model that tracks photon momentum from direct and indirect solar and infrared photons.

Ipatov S. I.  
*POSTER LOCATION #139*

*Angular Momenta of Collided Rarefied Preplanetesimals [#1488]*

The angular momenta of rarefied preplanetesimals needed for formation of small-body binaries can be obtained at collisions of preplanetesimals.

Voropaev S. A.  
*POSTER LOCATION #140*

*Gravitational Stresses in Hyperion [#1135]*

Hyperion is modeled as homogeneous, elastic two-axial ellipsoid subject to self-gravitational stress by means of exact analytical treatment.

POSTER SESSION II: POTENTIALLY HAZARDOUS ASTEROIDS

Thursday, 6:00 p.m.  Town Center Exhibit Area  [R713]

Howley K.  Dearborn D.  Elliott J.  Gibbard S.  Lomov I. et al.  
*POSTER LOCATION #141*

*Overview of Collisional-Threat Mitigation Activities at Lawrence Livermore National Laboratory [#2529]*

Overview of our work at LLNL employing a variety of strategies important to diverting objects on a collision course with Earth.

Herbold E. B.  Lomov I.  Miller P.  Antoun T. A.  
*POSTER LOCATION #142*

*Influence of Morphological and Mechanical Properties on Standoff Mitigation of Potentially Hazardous Asteroids [#2672]*

We compare the dispersion of several types of asteroid objects where porosity and strength are varied as well as different heterogeneous internal structures.

Straub J.  Venkataramanasastrty A.  
*POSTER LOCATION #143*

*A Space Debris-Enhanced Intervention Mission to a Near-Earth Asteroid [#2449]*

The use of space debris is used for incorporation in a Earth impactor intervention mission to increase craft mass and decrease propellant and thus launch costs.

Vodniza A. Q. Prof.  Pereira M. R.  
*POSTER LOCATION #144*

*The Asteroid 2012 QG42 [#1329]*

From our observatory we captured several pictures and astrometry data during four days. We calculated the orbital elements based on 125 observations.
**POSTER SESSION II: COMETS AND ICY SMALL BODIES**

Thursday, 6:00 p.m.  Town Center Exhibit Area  [R714]

Milam S. N.  Charnley S. B.  Gicquel A.  Cordiner M.  Kuan Y. J.  et al.  
*POSTER LOCATION #145*

*Multiwavelength Observations of Recent Comets [#2963]*
Recent results of multiwavelength observations toward recent comets C/2009 P1 (Garradd), C/2012 S1 (ISON), C/2012 F6 (Lemmon), and C/2011 L4 (PanSTARRS).

Raponi A.  Ciarniello M.  Filacchione G.  Capaccioni F.  Farnham T.  
*POSTER LOCATION #146*

*Spectrophotometric Analysis of Water Ice Regions on the Surface of the Comet 9P/Tempel 1 [#1507]*
We show properties of exposed water ice on the surface of the Comet Tempel 1 obtained from the observations of the Deep Impact spacecraft on 4 July 2005.

Steckloff J. K.  Melosh H. J.  
*POSTER LOCATION #147*

*The Dynamics of Grain Splitting in Cometary Jets [#2903]*
We model grain splitting in cometary jets and its implications for the opacities within the observed jets of Comet Tempel 1.

Cordiner M. A.  Charnley S. B.  
*POSTER LOCATION #148*

*Models for Cometary Comae Containing Negative Ions [#2729]*
We present details of a new chemical-hydrodynamic model for cometary comae that includes — for the first time — atomic and molecular negative ions (anions).

Hilchenbach M.  Broilos C.  Cotton H.  Engrand C.  Hornung K.  et al.  
*POSTER LOCATION #149*

*Laboratory Secondary Ion Mass Spectra of Cometary Analog Material [#1816]*
Secondary ion mass spectrometer (SIMS) COSIMA onboard Rosetta and mass spectra interpretation with statistical methods.

Yokochi R.  Marboeuf U.  Quirico E.  Schmitt B.  
*POSTER LOCATION #150*

*Pressure-Dependent Race Gas Trapping in Amorphous Water Ice at 77 K: Implications for Determining Conditions of Comet Formation [#1439]*
Trace gas trapping efficiency in amorphous water ice at 77K is gas pressure-dependent, regardless of ice deposition rate and gas/H2O ratio in the gas phase.

Sarid G.  Brunetto R.  DeMeo F. E.  Kueppers M.  
*POSTER LOCATION #151*

*The Carbon Did It — Masking Surface Ice Features on Small Distant Bodies [#1181]*
We present a model for icy surfaces, which is based on the effective reflectance spectra of subresolution carbonaceous inclusions in the aggregate particle.

---

**POSTER SESSION II: PHOBOS AND DEIMOS**

Thursday, 6:00 p.m.  Town Center Exhibit Area  [R715]

Kokhanov A. A.  Basilevsky A. T.  Karachevtseva I. P.  
*POSTER LOCATION #153*

*Depth/Diameter Ratio and Inner Walls Steepness of Large Phobos Craters [#2289]*
Using new DTM of Phobos made at MIIGAiK, 23 craters ≥2 km in diameter were measured for depth/diameter ratio and maximum steepness of the crater inner walls.

Schmedemann N.  Michael G. G.  Ivanov B. A.  Murray J.  Neukum G.  
*POSTER LOCATION #154*

*Crater Retention Ages of Phobos Based on a Lunar-Like Chronology [#2193]*
We derived lunar-like chronologies for two cases of Phobos’ origin. We date average surface, crater Stickney, and different sets of grooves.
Correlations between the evolution of Phobos’ dynamical topography and surface modification processes suggest some of its surface features are relatively young.

Lemmon M. T. Bell J. F. III Malin M. C. Bean K. M. Vasavada A. R. et al.  

Astrometric Observations of Phobos and Deimos During Solar Transits Imaged by the Curiosity Mastcam [#1787]  

Two moons in the sky, wandering by the Sun’s face, their orbits constrained.

POSTER SESSION II: REMOTE SENSING OF SMALL BODIES  
Thursday, 6:00 p.m. Town Center Exhibit Area [R716]


Optical Observations of NEA 162173 (1999 JU3) During the 2011–2012 [#3068]  
Observations of NEA 162173 (1999 JU3) during 2011–2012 is the only chance before the launch of Hayabusa-2. Results are consistent with the previous apparition.

Lucas M. P. Emery J. P.  

Surface Mineralogy of Mars-Crossing Asteroid 1747 Wright: Analogous to the H Chondrites [#1813]  
Here we present the VISNIR spectrum and detailed surface mineralogy of the Mars-crossing asteroid 1747 Wright, heretofore only recorded in visible wavelengths.

Fieber-Beyer S. K. Gaffey M. J.  

Near-Infrared Spectroscopy of 3:1 Kirkwood Gap Asteroids: A Battalion of Basalts [#1352]  
3:1 Kirkwood Gap asteroids exhibit absorption features typical of anhydrous mafic silicates and derive from partial melt residues, cumulates, or differentiation.

Masoumzadeh N. Tubiana C. Vincent J. -B. Sierks H.  

Photometric Analysis of Asteroid (21) Lutetia [#1017]  
Images obtained by the OSIRIS cameras onboard ESA’s Rosetta spacecraft are adopted to analyze photometry of the asteroid (21) Lutetia using the Hapke model.

Hirabayashi M. Scheeres D. J. Holsapple K. A.  

Constraints on the Size of Asteroid 216 Kleopatra Using Internal Stresses [#1592]  
The size of Kleopatra is constrained using an internal stress failure analysis. We find that Kleopatra has likely undergone plastic deformation in its past.

Reddy V. Sanchez J. A. Bottke W. F. Gaffey M. J. Le Corre L. et al.  

Composition of (1696) Nurmela: The Second Largest Member of Baptistina Asteroid Family [#1093]  
We show that the two largest members of the Baptistina asteroid family are interlopers and not the source of the K/T impactor that killed the dinosaurs.

Roberts R. V. Gaffey M. J. Fieber-Beyer S. K.  

Mineralogical Assessment of two Gefion Family Asteroids: 1433 Geramtina and 4182 Mount Locke [#2713]  
We present the analysis of spectra of two core members of the Gefion dynamical family. We are testing this family as the source of the L chondrites.

Izawa M. R. M. Applin D. Mann P. Craig M. A. Cloutis E. A.  

Ultraviolet, Visible and Near-Infrared Reflectance Spectroscopy of Highly-Reduced Phases Under Oxygen- and Water-Free Conditions [#1788]  
Reflectance spectra (250–2500 nm) of CaS, TiN, CrN, nanophase Fe and nanophase graphite have been collected under anhydrous, oxygen-free conditions.
Cloutis E. A.  Hudon P.  Hiroi T.  Gaffey M. J.  Mann P.  et al.  

**POSTER LOCATION #165**  
*Possible Causes of Blue Slopes (~0.5–2.5 µm) in Carbonaceous Chondrite Spectra [#1550]*  
Dark and blue-sloped carbonaceous chondrite spectra may be due to abundant fine-grained magnetite or carbon-rich opaques, heating, or fine-free powders.

---

**POSTER SESSION II: CRATERING ON SMALL BODIES**  
Thursday, 6:00 p.m.  Town Center Exhibit Area  
[R717]

Holsapple K. A.  Housen K. R.  
*The Third Regime of Cratering: Spall Craters [#2733]*  
We present scaling for spall-dominated craters. All craters on small rocky bodies will be spall craters, with dramatic consequences on the surface morphology.

McDonald C. R.  Lipman M. D.  Strait M. M.  Flynn G. J.  Durda D. D.  
*Image Analysis of Foil Detectors in Astroid Impact Studies [#3037]*  
Developing methods for image analysis of impact disruption foil detectors.

Patmore E. B.  Strait M. M.  Flynn G. J.  Durda D. D.  
*Video Analysis of High Speed Asteroid Impact Simulations [#2982]*  
High-speed video analysis of simulated asteroid impacts using computer software to find the trajectory and velocity of particles.

Owen J. M.  
*Advances in Meshless Modeling of Material Damage [#1047]*  
We discuss meshless computational methods for modeling materials undergoing strain and failure, appropriate for application to impacts and cratering.

Friedrich J. M.  Weisberg M. K.  Rivers M. L.  
*Dynamic Collisional Evolution of an Asteroid: An Unambiguous Record of the Sequence and Intensity of Multiple Impacts in the NWA 7298 H Chondrite [#1571]*  
We present 3-D petrographic evidence for a sequence of multiple impact events of varying intensity occurring on the H-chondrite parent asteroid.

---

**POSTER SESSION II: IMPACT CRATERING: EXPERIMENTS, MODELING, AND LABORATORY STUDIES**  
Thursday, 6:00 p.m.  Town Center Exhibit Area  
[R718]

Bogard D. D.  
*Analysis of Thermal Conditions Required to Reset Ar-Ar Ages [#1022]*  
I give general graphical relationships among temperature, impact deposit size, and Ar diffusion characteristics required to reset Ar-Ar ages in a thermal event.

Wright S. P.  
*Decompression Cracks in Altered Basalt Subjected to Solid-State Shock Pressures: A New Macroscopic Shock Texture [#1010]*  
In Class 2 (~20–40 GPa) shocked basalts, which are solid-state (no melting), decompression cracks form in altered protoliths at Lonar Crater, India.
Steinhardt W. M.  Stewart S. T.  
*POSTER LOCATION* #173

**Shock Thermodynamics of Mantle Rocks: Rockport Fayalite [#2826]**

Shock Hugoniot and post-shock temperature measurements of Rockport fayalite show a two-wave structure and complicated temperature field.

Losiak A. I.  Koeberl C.  
*POSTER LOCATION* #174

**Relation of the Shock Field Heterogeneity to Shock Pressure Estimations based on PDFs Characteristics [#1667]**

The abstract discusses problems related to using PDFs to estimate the average shock pressure in heterogeneous, multi-mineral, multi-grain, and porous samples.

*POSTER LOCATION* #175

**XRD Patterns of Glassy Impactites: Amorphous Curve Fitting and Composition Determination with Implications for Mars [#2319]**

The XRD pattern of amorphous glasses can be used to identify source/composition despite lack of crystalline phases. This is particularly relevant for MSL and Mars.

*POSTER LOCATION* #176

**Exploring the Physical Diversity of Impact Breccias [#2869]**

Macroscopic study of the diverse physical character of impact breccias. Intra- and inter-crater variability and its meaning in terms of geological processes.

Shu A. J.  Bugiel S.  Grün E.  Hillier J.  Horányi M.  et al.  
*POSTER LOCATION* #177

**Cratering Studies in Thin Polyvinylidene Fluoride Films [#2490]**

Using 3-D stereophotogrammetry, a new crater scaling law in PVDF is being determined to expand capabilities of PVDF dust detectors.

*POSTER LOCATION* #178

**Penetration Depth of Dust Grains into Highly Porous Primitive Bodies [#1824]**

To investigate the penetration depth of dust into small primitive bodies, we conducted impact experiments and obtained a deceleration model of dust penetration.

Sommer F. D.  Hoerth T.  Poelchau M. H.  Kenkmann T.  Deutsch A.  
*POSTER LOCATION* #179

**Fragmentation and Ejection Behavior in Impact Experiments — The MEMIN Project [#2279]**

We analyze and compare the ejecta behavior for experiments on dry and water-saturated sandstone and characterize the material for different ejection stages.

Fujira Y.  Arakawa M.  Yasui M.  Hasegawa S.  Shimaki Y.  
*POSTER LOCATION* #180

**Experimental Study on Impact Disruption of Rocky Rubble-Pile Bodies: Effect of Disruption of Constituent Boulders on Reaccumulation Process [#1682]**

Laboratory impact experiments of rubble-pile bodies clarified that most of the impact energy was consumed by the disruption of constituent boulders.

Goldberg D.  Schultz P. H.  Hermalyn B.  
*POSTER LOCATION* #181

**Effect of Projectile Density and Impact Angle on Ejecta-Thickness Decay Relations [#2716]**

Ejecta-thickness decay relations for different impact conditions (vertical, oblique) are related to cylindrical, rather than volumetric, final crater growth.

Drake K. D.  Horányi M.  
*POSTER LOCATION* #182

**Ejecta from Hypervelocity Dust Impacts [#1577]**

We measured the time characteristics and intensities of light flashes produced on a quartz disc from primary and secondary hypervelocity impacts.
Collette A. Mocker A. Drake K. Sternovsky Z. Munsat T. et al. POSTER LOCATION #183
Four-Color Temperature and Power Measurements in Hypervelocity Dust Impact [#2805]
We present time-resolved, four-color measurements of the light flash caused by hypervelocity dust impact across a variety of target materials.

Miljkovic K. Price M. C. Wozniakiewicz P. J. Mason N. J. Zarnecki J. C. POSTER LOCATION #184
Impact-Induced Devolatilization of Natural Gypsum and Plaster of Paris: An Infra-Red and Raman Spectroscopic Study [#1940]
IR and Raman spectroscopy are able to quantify degree of devolatilization that occurs in an impact. IR appears to be a more sensitive tracer of water loss than Raman.

Buhl E. Poelchau M. H. Dresen G. Kenkmann T. POSTER LOCATION #185
Particle Size Distribution in a Hypervelocity Impact Experiment on Dry Sandstone [#1463]
The subsurface particle size distribution of an experimental impact crater was systematically determined to study and quantify impact-induced fragmentation.

Ormö J. Housen K. R. Melero-Asensio I. Rossi A. P. POSTER LOCATION #186
Target Influence in Gravity Dominated Cratering: The Case for Concentric Craters [#1939]
We use 1G and 150G impact experiments to show how the target may influence the crater morphology also at gravity dominated cratering.

Hoerth T. Kuder J. Nau S. Schäfer F. Thoma K. et al. POSTER LOCATION #187
In Situ Measurements of Impact-Induced Pressure Waves in Sandstone Targets [#1992]
We present a method for the measurement of impact-induced pressure waves within the target material that was applied to an impact experiment on sandstone.

Stickle A. M. Kimberley J. Ramesh K. T. POSTER LOCATION #188
Dynamic Strength Experiments on Basalt with Applications to Cratering on Mercury [#3021]
New models of material behavior based on dynamic strength experiments for basalt could provide clues into puzzling observations of Mercury’s cratering record.

Dahl J. M. Schultz P. H. POSTER LOCATION #189
Stress Wave Rise Time Asymmetries in Experimental Oblique Impacts [#2388]
Measurements of shock rise times show that they are a function of both peak particle velocity and location relative to impact. This may affect fragmentation.

Richardson J. E. Kedar S. POSTER LOCATION #190
An Experimental Investigation of the Seismic Signal Produced by Hypervelocity Impacts [#2863]
We conducted a series of impact experiments at the NASA AVGR to explore the seismic signal produced by impacts at various speeds, angles, and target materials.

Jogi P. Paige D. POSTER LOCATION #191
Two Body Dynamics and the Velocity Structure of Ejecta Ballistics in Antipodal and General Trajectory Reconstructions [#2703]
We contrast antipodal ballistic connections with those of less spatial symmetry using Tycho Crater on the Moon as an example.

Korycansky D. G. POSTER LOCATION #192
Energy Conservation and Partition in CTH Impact Simulations [#1370]
We examine the energy conservation and partition of energy into different forms (kinetic, internal, gravitational) for simulations using the CTH hydrocode.
Plesko C. S.  
**POSTER LOCATION #193**

*Exploring the Effects of Pre-Existing Target Faults on Crater Morphology* [#2896]

I explore the effects of preexisting tectonic features on impact cratering, and whether modification happens in the excavation or modification phase.

Kendall J. D.  Melosh H. J.  
**POSTER LOCATION #194**

*Impacts into Laterally Heterogeneous Surfaces* [#2845]

Numerical simulations of impacts into vertically separated surfaces allows us to examine small crater morphology along mare and highland boundaries on the Moon.

Shuvalov V.  Dypvik H.  
**POSTER LOCATION #195**

*Ejecta Distribution from Small Impacts* [#1054]

The numerical simulations presented demonstrate that impact scale has a considerable influence on ejecta expansion and deposition.

Rovny J.  Owen J. M.  Howley K. M.  Wasem J. V.  
**POSTER LOCATION #196**

*Modeling Impact Cratering on Phobos* [#1076]

We present 3-D modeling results of the impact creating Stickney crater on Phobos, and discuss effects of resolution, impactor properties, and physics model.

Ramsley K. R.  Head J. W. III  
**POSTER LOCATION #197**

*Mars Impact Ejecta in the Regolith of Phobos: Bulk Concentration and Distribution* [#1251]

We predict that recent ejecta deposits from Mars in the regolith of Phobos have a bulk concentration of ~150 ppm and are uniformly distributed across Phobos.

Martellato E.  Benkhoff J.  Preusker F.  Cremonese G.  Foing B. H.  et al.  
**POSTER LOCATION #198**

*Numerical Modeling of Raditladi and Rachmaninoff Basins* [#1405]

We modeled with iSALE code the formation of Raditladi and Rachmaninoff, two peak-ring basins on Mercury. We compare modeling results and MESSENGER DTM profiles.

Elbeshausen D.  Wünnemann K.  
**POSTER LOCATION #199**

*Crater Formation in the Transition from Circular to Elliptical Impact Structures* [#1916]

We studied numerically how both circular and elliptical impact structures form and propose a consistent concept of crater formation for arbitrary impact angles.

Richardson J. E.  
**POSTER LOCATION #200**

*Three-Dimensional Modeling of Crater Degradation via the Effects of Impact Induced Seismic Shaking, with Comparison to Crater Count Data* [#2397]

Utilizing a 3-D numerical model that computes the local slope degradation resulting from individual impacts, the cratering record of 433 Eros can be reproduced.

Kenkmann T.  Zwiessler R.  Krietsch H.  
**POSTER LOCATION #201**

*Formation and Kinematic Evolution of Crater Pits: Analog Modeling* [#1531]

Low-velocity impacts into granular glass beads targets were analyzed with PIV technology to investigate the formation of penetration holes and their collapse.

Lock S. J.  Stewart S. T.  
**POSTER LOCATION #202**

*Atmospheric Loss During High Angular Momentum Giant Impacts* [#2608]

High angular momentum giant impacts may allow the large atmospheric loss fractions inferred for the early Earth from noble gas isotopic measurements.

Swift D. C.  Mulford R. N.  Chen L.  Milathianaki D.  El-Dasher B.  et al.  
**POSTER LOCATION #203**

*Atmospheric Breakup of Meteoroids and the Strength of Fe-Ni* [#3090]

Meteoroid breakup depends on the material strength and the flow field. We have measured new Fe-Ni strengths, and performed hydrosimulations of the flow.
Kuwahara H. K.  Sugita S. S.  **POSTER LOCATION #204**
*Methan-Rich Impact-Induced Atmospheres on Mars and Post-Accretion Earth [1982]*
We modeled chemistry within adiabatically expanding impact-induced vapor, and found the atmospheres of Mars and post-accretion Earth may have been rich in CH₄.

**POSTER SESSION II: CRATERS:**
STATISTICS, MAPS, OBSERVATIONS, AND TECHNIQUES
Thursday, 6:00 p.m.  Town Center Exhibit Area [R719]

Byrne C. J.  **POSTER LOCATION #205**
*A Proposed Explanation of How Craters and Basins Become more Shallow with Size [1412]*
The transition between simple and complex craters occurs when the ambient pressure at the crater depth is about 10 kg per meter squared for all rocky bodies.

Kneissl T.  Michael G.  **POSTER LOCATION #206**
*Crater Size-Frequency Measurements on Linear Features — Buffered Crater Counting in ArcGIS [1079]*
In this work we would like to introduce the buffered crater counting analysis as a new functionality of the CraterTools software for ArcGIS.

Pina P.  Marques J. S.  **POSTER LOCATION #207**
*Accurate Delineation of Impact Craters by Image Analysis [1128]*
Two image analysis solutions for the delineation of craters are introduced and tested: one based on polar coordinates, the other on mathematical morphology.

Vijayan S.  Vani K.  Sanjeevi S.  **POSTER LOCATION #208**
*Crater Detection, Classification and Contextual Information Extraction in Lunar Images Using Profile-Based Algorithm [1931]*
CDA capable to detect craters, classify them according to their type (round/flat floor), indicates presence of ejecta and associates with corresponding crater.

van der Bogert C. H.  Hiesinger H.  Krüger T.  McEwen A. S.  Dundas C.  **POSTER LOCATION #209**
*New Evidence for Target Property Influence on Crater Size-Frequency Distribution Measurements [1962]*
Measurements of craters in the strength- to gravity-scaling transition range show target properties explain significant discrepancies in CSFDs for coeval units.

Wagner R. V.  Robinson M. S.  Speyerer E. J.  Mahanti P.  **POSTER LOCATION #210**
*Topography of 20-km Diameter Craters on the Moon [2924]*
We characterized the slopes of five 20-km-diameter lunar craters of varying ages, and found that the maximum angle of granular material is 36°.

Kuriyama Y.  Ohtake M.  Haruyama J.  Iwata T.  Hirata N.  **POSTER LOCATION #211**
*Implications for Timescale of Central Peak Formation Estimated by Impact Melts on Central Peaks of Lunar Craters [1402]*
We confirmed half of Copernican-aged lunar complex craters have impact melt on their central peaks, and this could constrain timescale of peak formation.

Li Y.  Xiao Z. Y.  Tang Z. S.  **POSTER LOCATION #212**
*The Unreliability of Small Crater Counts: A Case Study in Sinus Iridum on the Moon [2284]*
Discusses unreliabilities in age dating by contamination of secondaries and the anomalous distribution of craters smaller than 1 km at various locations in Sinus Iridum.
Bray V. J. Artemieva N. A. Neish C. D. McEwen A. S. McElwaine J. N. POSTER LOCATION #213
Impact Melt Entrained in the Ballistic Ejecta of Lunar Craters [#2782]
We are surveying ejecta blankets of fresh lunar craters with LROC and Mini-RF to study the complex interaction of ejecta and impact melt.

Williams J.-P. Pathare A. V. POSTER LOCATION #214
The Size-Frequency Distribution of Small Craters on the Moon and Mars [#2832]
The size distribution of terrestrial fireballs, scaled appropriately for the Moon and Mars, can reproduce crater retention ages of young surfaces.

Tornabene L. L. Ling V. Osinski G. R. Boyce J. M. Harrison T. N. et al. POSTER LOCATION #215
A Revised Global Depth-Diameter Scaling Relationship for Mars Based on Pitted Impact Melt-Bearing Craters [#2592]
Here we present a revised global depth-diameter relationship for Mars based on pitted-impact melt-bearing craters.

Wulf G. Pietrek A. Kenkmann T. POSTER LOCATION #216
Blocks and Megablocks in the Ejecta Layers of a Double-Layer-Ejecta (DLE) Crater on Mars [#1453]
We present the block distribution and orientation of coarse materials exposed at the surface of the two distinct ejecta layers of a DLE crater on Mars.

Harrison T. N. Tornabene L. L. Osinski G. R. POSTER LOCATION #217
Emplacement Chronology of Double Layer Crater Ejecta on Mars [#1702]
We investigate morphological evidence to determine the depositional order of the inner vs. outer ejecta layers of martian double layer ejecta craters.

Pietrek A. Wulf G. Kenkmann T. POSTER LOCATION #218
Detailed Geological Mapping (1:80,000-Scale) of Steinheim Crater, Mars [#1465]
We present a detailed geological map of the ejecta blanket and crater interior of Steinheim Crater, a DLE crater on Mars.

Ding N. Bray V. J. McEwen A. S. Mattson S. S. Tornabene L. L. et al. POSTER LOCATION #219
Mapping the Ritchey Crater Central Uplift, Mars [#2798]
We are mapping the central uplifts of large craters and reconstructing the pre-impact stratigraphy, to better understand the Noachian stratigraphy of Mars.

Robbins S. J. Hynek B. M. POSTER LOCATION #220
The Population of Secondary Impact Craters on Mars [#2644]
Population of martian secondary craters examined on a global and local basis shows they can be a significant contaminant at the kilometer level.

Watters W. A. Geiger L. Fendrock M. POSTER LOCATION #221
Shape Distribution of Fresh Martian Impact Craters from High-Resolution DEMs [#3081]
We present the shape distribution of simple, fresh martian impact craters (20 m < D < 5 km) measured from HiRISE-derived digital elevation models.

Dampitz A. L. Dombard A. J. POSTER LOCATION #222
Testing Models for the Formation of the Equatorial Ridge on Saturn’s Moon Iapetus via Crater Counting [#3036]
We develop a database to examine the crater population, test the various models of ridge formation, and assess the age of the ridge.
<table>
<thead>
<tr>
<th>Poster Location</th>
<th>Poster Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>#223</td>
<td>Earth’s Expected Impact Crater Record on Regional and Global Scales [2838]</td>
</tr>
<tr>
<td>#224</td>
<td>Planar Deformation Features in Quartz at the Newly Discovered Prince Albert Impact Structure, Northwest Territories, Canada [2602]</td>
</tr>
<tr>
<td>#225</td>
<td>Using Microstratigraphy and Stromatolite Clastic Behavior to Characterize the Emplacement of the Sudbury Impact Layer in Ontario and Minnesota [2709]</td>
</tr>
<tr>
<td>#226</td>
<td>Remote Sensing Study of the Slate Islands Impact Structure, Canada [2389]</td>
</tr>
<tr>
<td>#227</td>
<td>Whitestone Meteorite Impact Crater: Distribution, Texture, and Mineralogy of Meteorites and the Discovery of Carbon Spherules Possibly Associated with the Impact Event [2316]</td>
</tr>
<tr>
<td>#228</td>
<td>Planar Deformation Features from the Onaping Formation of the Sudbury Impact Structure, Canada [1651]</td>
</tr>
<tr>
<td>#229</td>
<td>The Age of the Lake Saint Martin Impact Structure (Manitoba, Canada) [2001]</td>
</tr>
<tr>
<td>#230</td>
<td>Rock Elm Crater, Pierce County, WI: Stratigraphy of a Recently Exposed Proposed Central Peak Outcrop and Characterization of Soils [2700]</td>
</tr>
<tr>
<td>#231</td>
<td>The Sedimentary Record of a Small, Deeply Eroded Impact Structure: A Search for Detrital Shocked Minerals and Extraterrestrial Chromites in Sediments Eroded from the Ordovician Rock Elm Impact Structure (USA) [2028]</td>
</tr>
</tbody>
</table>

Platz T. Michael G. G. Hartmann O. Kenkmann T. We present a method to calculate expected impact-crater populations on Earth. This may enhance the search for new terrestrial impact sites.

Pickersgill A. E. Osinski G. R. We present here the first report of PDFs in quartz from the newly discovered Prince Albert impact structure, confirming its hypervelocity impact origin.

Reed J. P. Maslowski M. L. Stromback T. J. Nuhn A. M. Osinski G. R. Tornabene L. L. We will present the compilation and analysis of a geodatabase of the Slate Islands Impact Structure, Canada, that will augment field studies this summer.

Newman J. D. Herd C. D. K. We report a typical IIIAB composition with distorted textures, and porous carbon spherules discovered at the crater site may relate to the impact event.

Anders D. Osinski G. R. Grieve R. A. F. We present a new precise age of 227.4 ± 0.8 Ma (2σ) for the ≥40 km Lake St. Martin impact structure, Manitoba, Canada.

Schmieder M. Jourdan F. Tohver E. Mayers C. Frew A. et al. New studies at the Rock Elm crater — stratigraphy of a potential new central peak outcrop and a comparison of soils developed within and outside the crater.

Detrital Shocked Quartz in Modern Sediments Eroded from the Rock Elm Impact Structure, Wisconsin, USA

A search was made for detrital shocked quartz in the Rock Elm impact structure (USA) in a modern fluvial system, confirming its presence in modern alluvium.

The Flynn Creek Crater Drill Core Collection at the USGS in Flagstaff, Arizona

The USGS in Flagstaff, AZ, maintains a collection of drill cores from Flynn Creek crater. The cores are being inventoried for use by the scientific community.

A Unique Bicolored Bediasite from Brazos, County, Texas

A uniquely bicolored bediasite tektite specimen has been found and examined by electron microprobe analysis, resulting in an interesting variation of oxide quantities.

The Kilmichael (Mississippi), A Possible Impact Structure

The Kilmichael, Mississippi, structure has been proposed as a meteorite impact site. This study examines drill cores from the site to evaluate this hypothesis.

Revisiting Kilmichael (Mississippi), A Possible Impact Structure

Reconstruction of the Western Rim of the Wetumpka Impact Structure: Clues to the Excavation Process in a Foliated Metasedimentary Target

Structural measurements reveal a significant fold structure produced by impact excavation within the western rim of the Wetumpka impact structure.

Absence of Shocked Quartz at Cretaceous/Paleogene (K/Pg) Sites In the New Jersey Coastal Plain

Biosratigraphic and geochemical signatures are discordant at the K/Pg boundary in Monmouth County, NJ. Impact-shocked quartz would resolve this controversy.

The K-Pg Impactor was Likely a High Velocity Comet

Examining the geophysical and geochemical constraints on the nature of the K-Pg impactor indicates that it is likely (>95%) a high-velocity comet.

Direct Gas Analysis Experiment of Impact-Vaporized Carbonaceous Chondrites

Laser gun impact experiments and direct gas analysis were conducted to investigate the sulfur chemistry in carbonaceous chondritic impact vapor clouds.

Chemosynthesis and Transport of Pollutants from Impact Ejecta Reentry

A new method for calculation of pollutants produced from Chicxulub impact ejecta reentry was devised, using nonequilibrium chemistry and atmospheric transport.
Magnetic Properties and Micro Raman Spectroscopy of a Central American Tektite from Belize

The magnetic signature of the Belize tektite differs from that of the Australasian tektites, which would support the hypothesis of separate (parallel) impacts.

Soil Composition Inside the Possible Crater in Bolivia, Iturralde: Material Implying Impact Event of Low Density Meteorite

Iturralde may have formed under natural circumstances unrelated to an impact. However, there is the presence of millions of clusters of glass beads in sediment.

Update on the Current Knowledge of the Brazilian Impact Craters

We present an update on the current knowledge of the Brazilian impact craters, including confirmed ones and also some of the potential impact structures.

Santa Marta Crater: Macroscopic and Petrographic Evidences of a New Confirmed Impact Structure in Northeastern Brazil

Our analysis succeeded in identifying the first macro/micro evidences of the impact origin of Santa Marta, confirming it as the seventh Brazilian impact structure.

Gravity Signature of the Santa Marta Crater, a New Confirmed Impact Structure in Brazil

Santa Marta is a new confirmed impact strucure ~10–12 km located in Brazilian territory, which presents a low-gravity signature over the central elevation.

Shocked Quartz in the Målingen Structure — Evidence for a Small Twin Crater to the Lockne Impact Structure

Here we show that shocked quartz grains are present in the lower parts of the Målingen structure in central Sweden, thus proving that it is impact derived.

Modeling of Meteorite Impact-Induced Secondary Mass Wasting — Case Study by Means of the Bunte Breccia Ejecta Blanket at Ries Crater, Germany

We propose a numerical modeling to calculate the contribution of secondary mass wasting to the total volume and thickness of ejecta blankets at impact craters.

Accessory Minerals from Impact Melt Rocks of the Boltysh Structure, Ukraine. Native Mettals and Alloys

A short description of native metals (gold, silver, copper, platinum) and alloys from impact melt rocks of the Boltysh crater (Ukraine) is presented.

A Cathodoluminescence Study of Impact Melts and Rocks from El’gygytgyn: A Method to Distinguish Impact and Volcanic Melts?

Optical and SEM-CL investigation on shocked and unshocked volcanic rocks and glasses from the El’gygytgyn impact structure (Russia).

A New Geological Map of the El’gygytgyn Impact Structure, NE Russia

A new geological map of the El’gygytgyn impact structure (NE Russia) based on the results from the 2011 German-Russian expedition.
Ray D. Misra S. Arif M. POSTER LOCATION #253
Contrasting Aerodynamic Morphology and Geochemistry of Impact Spherules from Lonar Crater, India: Some Insights into Their Cooling History [#1031]
The morphochemical differences between the Lonar impact sub-mm and mm-sized spherules suggest different modes of their formation from the impact plume.

Komatsu G. Kumar P. S. Goto K. Sekine Y. Giri C. et al. POSTER LOCATION #254
The Drainage Systems Developing on the Hydrologically Active Impact Crater, Lonar, India [#1270]
Lonar Crater in India exhibits various drainage systems, occurring as groundwater emergence, inner wall degradation features, and channels incised on the ejecta.

Misra S. Arif M. Newsom H. E. Ray D. POSTER LOCATION #255
Hydrothermal Alteration of Lonar Crater Basalts, India-Impact Related? [#1030]
The geochemistry of Lonar basalts suggest they are generated due to impact-induced hydrothermal alteration processes.

Jaret S. J. Glotch T. D. Wright S. P. POSTER LOCATION #256
Micro-FTIR and Micro-Raman Spectroscopy of a Shocked Basalt from the Lonar Crater, India [#2881]
Shock deformation in labradorite was analyzed with optical, micro-FTIR, and micro-Raman techniques.

Misra S. Panda D. Ray D. Newsom H. E. Dube A. et al. POSTER LOCATION #257
Geochemistry of Glassy Rocks from Ramgarh Structure, India [#1020]
We report the occurrence of Fe-, Co-, Ni-enriched particles within the glassy rocks from Ramgarh structure, India, which could be the impactor components.

Purohit V. Sisodia M. S. POSTER LOCATION #258
Universal-Stage Measurements of Planar Deformation Features in Shocked Quartz Grains Recovered from Ramgarh Structure [#1151]
The study of planar cleavages in shocked quartz grains from Ramgarh Structure using the universal stage proves them to be PDFs, thereby proving Ramgarh, India, to be an impact crater.

Sahoui R. Belhai D. Jambon A. POSTER LOCATION #259
Impact-Generated Carbonate Melts from the Talemzane Structure (Algeria) [#1184]
The Talemzane circular depression appears in the Earth Impact Database. Samples from the impact-melt-bearing breccias show evidence for the melting of limestone.

Xie Z. Zuo S. Dong Y. POSTER LOCATION #260
The Progress of Airburst Impact Origin Hypothesis of Taihu Lake Basin in Southeast of China in Around 7000 Years Ago [#1338]
We discuss the airburst impact origin hypothesis of Taihu lake basin ~7000 years ago, based on unique siderite concretions and deformed features in quartz.

Artemieva N. POSTER LOCATION #261
Numerical Modeling of the Australasian Strewn Field [#1410]
Modeling results show that the AAT strewn field may be produced by a moderate-sized impact into the oceanic shelf. The crater was destroyed immediately by water resurge.

Enos M. Krull Davatzes A. E. Thompson Stiegler M. POSTER LOCATION #262
XRF Analysis of Impact Spherules from Dales Gorge Member, Hamersley Group of Western Australia [#1643]
We present XRF analyses of impact spherules and adjacent sediments from the Hamersley in W. Australia.

Fry C. Samson C. Butler S. McCausland P. J. A. Herd R. K. POSTER LOCATION #263
3D Laser Imaging of Tektites [#2597]
3-D laser imaging has been used previously to model tektites. These models can be used to find density and to calculate the inertia and rotation period.
Costa B.  Klingelhöfer G.  Alves E.  POSTER LOCATION #264
Backscattering Mössbauer Studies on Tektides from Different Stream Fields [#3096]
Tektides are natural glasses originated from fused material spilled during a meteorite impact.

Tucker J. M.  Mukhopadhyay S.  POSTER LOCATION #265
Evidence for Multiple Giant Impacts and Magma Oceans from Mantle Noble Gases [#2990]
Measurement of high He/Ne ratios in MORBs requires multiple giant impact-induced atmosphere ejection and magma ocean outgassing episodes on the accreting Earth.

Kambhu D.  Simonson B. M.  POSTER LOCATION #266
Spatial Variation of Maximum Spherule Sizes in Distal Ejecta Layers Around the Archean-Proterozoic Boundary [#1427]
Comparisons of spherule sizes in three layers correlated from Western Australia to South Africa help constrain projectile size estimates and Archean paleogeography.

Nabelek L.  Kletetschka G.  Kadlec J.  West A.  Bunch T. E.  et al.  POSTER LOCATION #267
Magnetism of Microspheres from the Proposed Younger Dryas Impact Event 12,900 Years Ago [#1707]
No excess magnetization of the Younger Dryas microspheres refutes the hypothesis that these microspheres could have formed during lightning discharges.

Kuzmicheva M. Yu.  Losseva T. V.  POSTER LOCATION #268
Transient Magnetic Fields Generated by Post-Impact Plumes [#2765]
A role of impact ejecta and plume in providing magnetic crust anomalies is discussed. Geomagnetic disturbances occur while plume moves across the geomagnetic field.

Miura Y.  POSTER LOCATION #269
Significant Roles of Light (H2O, OH)-Bearing Phases by Three Phase-State Changes: Macro to Nano-Phases on Planets, Satellites and Asteroids [#3098]
H2O phase can be discussed in the phase diagram in quick and huge reaction process. Ocean water can be obtained mainly in global planetary impact.

Miura Y.  POSTER LOCATION #270
New Concept of Planetary Surfaces by Impact Growth Process with Remnants of Phase Changes [#1654]
New concept of planetary surfaces is proposed by impact growth through three material states with impacts on wider hard rock and smaller soft rocks.

Ambrose W. A.  POSTER LOCATION #271
Distribution and Origin of Imbrium Ejecta in the Cleomedes Quadrangle, North and Northwest Crism Basin [#1050]
More than 70 southeast-trending radial valleys and other ejecta features on the north and northwest margins of the Crism Basin are Imbrian in age.

Artemieva N.  POSTER LOCATION #272
Tycho Crater Ejecta [#1413]
Tycho distal ejecta (including melt) are deposited at its antipode in the amounts resolved by remote sensing as well as on Earth in proper stratigraphic layers.
Gusakova E. N.  Basilevsky A. T.  Kreslavsky M. A.  Karachevtseva I. P.  
**POSTER LOCATION #273**

*Morphometry of Small Impact Craters in the Lunokhod 1 Study Area [#1174]*

Analyzing LROC NAC images and derived DTM diameters, depths, and maximum steepnesses of inner walls of small impact craters of the Lunokhod 1 area measured.

Lu Y.  Ping J. S.  Shevchenko V. V.  
**POSTER LOCATION #274**

*Morphological Features of the Slope Matter in Crater Schrodinger [#1437]*

We have studied the material in the slope in the lunar crater Schrodinger with the data from LRO and Chang’e-2.

Kamata S.  Sugita S.  Abe Y.  Ishihara Y.  Harada Y.  et al.  
**POSTER LOCATION #275**

*Highly Degraded Early Pre-Nectarian Impact Basins: Implications for the Timing of the Magma Ocean Solidification [#1491]*

Highly degraded topographies of early pre-Nectarian impact basins suggest that the lunar interior may be partially molten around formation ages of these basins.

Xiao Z.  Zeng Z.  Li Z.  
**POSTER LOCATION #276**

*A Relook at the Origin of Small Fractures in the Floor of Lunar Copernican-Aged Complex Craters [#1811]*

Solidification contraction may be the most plausible formation mechanism for small fractures in floors of lunar Copernican-aged complex craters.

Baker D. M. H.  Head J. W.  Cheek L. C.  Donaldson-Hanna K. L.  Pieters C. M.  
**POSTER LOCATION #277**

*M^3 Compositional Analysis of Peak-Ring Basins on the Moon: Implications for Peak-Ring Sampling Depth [#2734]*

Hyperspectral data from M^3 show anorthositic signatures in the rings of peak-ring basins. We suggest that peak rings are sampling upper crustal materials.

Clayton J.  Osinski G. R.  Tornabene L. L.  Kalynn J. D.  Johnson C. L.  
**POSTER LOCATION #278**

*Fresh Transitional Lunar Impact Craters [#2345]*

Mechanisms responsible for the transition from simple to transitional to complex craters on the Moon.

Kreslavsky M. A.  Head J. W.  Asphaug E.  
**POSTER LOCATION #279**

*Unusual Dense Clusters of Impact Craters on the Moon [#1759]*

Six dense linear geologically young clusters of impact craters are distinctive from clusters of secondaries and are hypothesized to be clusters of sesquinaries.

Shirley K. A.  Zanetti M.  Jolliff B.  van der Bogert C. H.  Hiesinger H.  
**POSTER LOCATION #280**

*Crater Size-Frequency Distribution Measurements and Age of the Compton-Belkovich Volcanic Complex [#2469]*

We discuss the timing of volcanic activity at the Compton-Belkovich volcanic complex using crater counts on LROC NAC and WAC images.

Ostrach L. R.  Robinson M. S.  
**POSTER LOCATION #281**

*Using Crater Size-Frequency Measurements to Distinguish Age Units Within Volcanic Smooth Plains — A New Approach [#1086]*

Areal crater density distinguished age units in Mare Imbrium without spectral data; an approach applicable to Mercury (no spectral variation in smooth plains).

Robbins S. J.  
**POSTER LOCATION #282**

*Revised Lunar Cratering Chronology for Planetary Geological Histories [#1619]*

New lunar images and crater counts on them result in a revised cratering chronology that alters crater-based age estimates on inner solar system surfaces.

Burgess E. E.  Frey H. V.  
**POSTER LOCATION #283**

*Improving the N(50) Crater Retention Age for South Pole-Aitken Basin [#1613]*

A better and significantly older N(50) crater retention age for South Pole-Aitken Basin is obtained by exploring the variation in N(50) ages within the basin.
**POSTER LOCATION #284**

Lunar Marius Hills Plateau Exhibiting the Early Imbrian Model Age [#1503]

We classified geological units of lunar Marius Hills Plateau by using SELENE data and found the youngest unit is Early Imbrian, older than previously estimated.

---

**POSTER SESSION II: LUNAR REMOTE SENSING**

Thursday, 6:00 p.m.  Town Center Exhibit Area  [R722]

Hood L. L. Richmond N. C. Spudis P. D.  
**POSTER LOCATION #285**

Origin of Strong Lunar Magnetic Anomalies: More Detailed Mapping and Examinations of LROC Imagery in Regions Antipodal to Young Basins [#1250]

Five young lunar basins have likely antipodal magnetization and landform modification signatures; an origin involving converging ejecta deposition is discussed.

**POSTER LOCATION #286**

The Solar Wind Interactions with Lunar Magnetic Anomalies: A Case Study of the Chang’e-2 Plasma Data Near the Serenitatis Antipode [#1381]

We present the first and preliminary results on the near-Moon plasma environment, based on the spectrogram data obtained with the SWID onboard Chang’e-2.

Spence H. E. Blake J. B. Case A. W. Golightly M. J. Joyce C. et al.  
**POSTER LOCATION #287**

Lunar Energetic Proton Albedo: Measured and Modeled Energy Spectra and Other Properties [#2667]

We use LRO CRaTER data to quantify properties of the lunar energetic proton albedo; models reveal it is a byproduct of cosmic-ray interactions in the regolith.

**POSTER LOCATION #288**

Cosmic Ray Albedo Proton Yield Correlated with Lunar Elemental Abundances [#2475]

The average yield of albedo protons from the maria is 1.1% higher than from the highlands, and local peaks in the yield correspond to peaks in trace elements.

Zhang J. Ling Z. C.  
**POSTER LOCATION #289**

Lunar Surface Reflectance Observed by the Chang’e-1 Imaging Interferometer (IIM) [#3100]

Chang’E-1 IIM reflectance validation.

**POSTER LOCATION #290**

Geologic Discoveries in Maria Basaltic Flow as Revealed by CE-2’s Microwave Observation [#1445]

Here we show the new geologic discoveries about maria basaltic flow as revealed from China’s Chang’e-2 four-channel microwave observation of the Moon.

Tsang K. T. Zhang Y. C. Chan K. T.  
**POSTER LOCATION #291**

Chang’E Microwave Brightness Temperature Data and Lunar Surface Characteristics [#1947]

With the much improved CE microwave TB data, we study local lunar surface and subsurface characteristics in combination with radiation transfer modeling result.

Zhang W. Bowles N. E.  
**POSTER LOCATION #292**

Chang’e-1 and Chang’e-2 Lunar Microwave Radiometer Data Analysis and Lunar Subsurface Temperature Profile Modelling [#2025]

We proposed a new microwave transfer model to assist with retrieving lunar heat flow and subsurface temperature structure, and CE-1 and CE-2 data were analyzed.
Fa W. Fang T.  
**POSTER LOCATION #293**

*Analysis of High-Frequency Brightness Temperature of Lunar Surface from Chang’e-2 Microwave Radiometer and Investigations of Mean Diurnal Temperature of Regolith Layer [#1472]*

We analyzed factors that affect lunar surface brightness temperature using Chang’e-2 microwave data, and mean diurnal temperature of regolith was inverted.

Ishiyama K. Kumamoto A. Ono T. Yamaguchi Y. Haruyama J. et al.  
**POSTER LOCATION #294**

*Estimation of the Permittivity and Porosity of the Lunar Uppermost Basalt Layer Based on the Observation Data of the SELENE Spacecraft [#1493]*

The permittivity of the lunar uppermost basalt layer is estimated by using a new estimation method. Using the result, the porosity is also estimated.

Hareyama M. Karouji Y. Yamashita N. Fujibayashi Y. Nagaoka H. et al.  
**POSTER LOCATION #295**

*Lunar Iron and Uranium Distribution Obtained by SELENE(Kaguya) Gamma-Ray Spectrometer [#1871]*

This work reports global abundance maps of lunar uranium and iron oxide and their correlation obtained by SELENE (Kaguya) Gamma-ray Spectrometer.

**POSTER LOCATION #296**

*Significance of Kaguya GRS-Detected Si Bundance and Distribution [#2034]*

A Si elemental map was produced by the data of the Kaguya Gamma Ray Spectrometer (KGRS) and the KGRS data were compared with Apollo data.

Peplowski P. N. Lawrence D. J.  
**POSTER LOCATION #297**

*New Insights into the Global Composition of the Lunar Surface from High-Energy Gamma Rays Measured by Lunar Prospector [#1541]*

This new technique for analyzing gamma-ray spectra reveals previously unobserved compositional variability, including a global Mg abundance map.

**POSTER LOCATION #298**

*Hydrogen-Bearing Volatiles at the Lunar Terminator [#2946]*

LRO/LEND detects evidence of hydrogen concentrated at the lunar equatorial terminator.

Miller R. S. Lawrence D. J.  
**POSTER LOCATION #299**

*Identification of Surface Hydrogen Enhancements Within Shackleton Crater at the Moon’s South Pole [#2228]*

Enhanced hydrogen abundances have been identified within the Moon’s Shackleton Crater using fast neutron data from the Lunar Prospector mission.

Yang H. W. Zhao W. J. Wu Z. H.  
**POSTER LOCATION #300**

*Water Ice on the Moon [#1885]*

Overviews of detection of water ice on the Moon from historical and recent missions. New scientific views for it are established in multidiscipline integration.

**POSTER LOCATION #301**

*Estimation of the Hydrogen Concentration in Lunar South Polar Regions of Permafrost in Vicinity of Cabeus and Shoemaker Craters [#2741]*

Results of estimations of hydrogen concentration in regolith at vicinity of Cabeus and Shoemaker craters are presented. The estimations are based on LEND data.

**POSTER LOCATION #302**

*Albedo of Permanently Shadowed Regions (PSR) at the Lunar South Pole [#2677]*

Reflectance measurements from LOLA show that normal albedos of permanently shadowed regions at the south pole to be anomalously bright.
Koeber S. D.  Robinson M. S.  
**POSTER LOCATION #303**
LROC Observations of Permanently Shadowed Regions [\#2588]  
NAC images will be analyzed for evidence of surface frosts, unusual morphologies from ice rich regolith, and potential landing sites for future in situ work.

Bhattacharya S.  Saran S.  Chauhan P.  Das A.  Ajai  
**POSTER LOCATION #304**
Study of Regional Dark Mantle Deposits (RDMDs) at Sinus Aestuum in the Central Nearside of the Moon Using High Resolution Data from Recent Lunar Missions [\#1387]  
Composition and morphology Aestuum RDMDs have been studied using high-resolution data from recent lunar missions. Multiple fissure/vents have been identified.

Klimczak C.  
**POSTER LOCATION #305**
*Igneous Dikes on the Moon: Evidence from Lunar Orbiter Laser Altimeter Topography* [\#1391]  
Topographic signatures across lunar troughs associated with mare-filled basins indicate that they are the surface manifestations of igneous dikes at depth.

Tye A. R.  Head J. W.  
**POSTER LOCATION #306**
*Mare Tranquillitatis: Distribution of Mare Domes, Relation to Broad Mare Rise, and Evidence of a Previously Unrecognized Basin from LOLA Altimetric Data* [\#1319]  
Inhomogeneous mare dome distribution within a previously unrecognized impact basin and coextensive broad mare rise indicate an important mare source region.

Clegg R. N.  Jolliff B. L.  Robinson M. S.  Hapke B. W.  Plescia J. B.  
**POSTER LOCATION #307**
*Photometry of Lunar Landing Sites Using LROC NAC Images and Hapke Modeling* [\#2171]  
The effects of rocket exhaust on lunar soil reflectance properties have been investigated using LROC NAC images and Hapke photometric modeling.

Retherford K. D.  Greathouse T. K.  Gladstone G. R.  
**POSTER LOCATION #308**
*LRO-Lyman Alpha Mapping Project (LAMP) Observations of the GRAIL Impacts* [\#3004]  
LRO/LAMP detected emissions from Hg and H atoms in the expanding gas plumes from the GRAIL spacecraft impacts on 17 December 2012.

**POSTER LOCATION #309**
*Modeling the Vapor Release from the GRAIL Impacts on the Moon* [\#2029]  
Simulations of the vapor plume produced by the impacts of the GRAIL spacecraft on the Moon show the gas from the perspective of the LRO LAMP observations.

**POSTER LOCATION #310**
*Impact Melt Deposits at Tsiolkovskiy Crater: Constraints on Crater Age* [\#1585]  
High rock abundance / Around Tsiolkovskiy Crater / Fresh impact melt flows?

Williams J.-P.  Petro N. E.  Greenhagen B. T.  Neish C.  
**POSTER LOCATION #311**
*Inferred Age of Mare Fill in Tsiolkovskiy Crater: Constraints on the Preservation of Exterior Impact Melt Deposits* [\#2756]  
Crater counts on the floor of Tsiolkovskiy crater suggest that the interior mare fill is between 3.12 and 3.41 Ga, younger than previous estimates.

**POSTER LOCATION #312**
*Bistatic Radar Observations of the Moon Using the Arecibo Observatory & Mini-RF on LRO* [\#2816]  
Using the Arecibo and Mini-RF radars we have produced the first lunar radar images with nonzero bistatic angles.
Aye K.-M. Paige D. A. Foote M. C. Greenhagen B. T. Siegler M. A.  
**POSTER LOCATION #313**
*The Coldest Place on the Moon [#3016]*
Recalibration of the Diviner dataset will lead to an improved understanding of the uncertainties of radiometric measurements for the coldest place on the Moon.

**POSTER LOCATION #314**
*Characterization of Lunar Polar and Non-Polar Permanent Shadow Physical and Thermal Characteristics via Mini-RF and DIVINER [#2590]*
Polar and nonpolar permanent shadows are characterized for thermal and radar scattering properties with varying latitude using LRO’s Mini-RF and DIVINER data.

Calla O. P. N. Mathur S. Jangid M.  
**POSTER LOCATION #315**
*Study of Plato Crater with the Mini-RF [#1854]*
Electrical properties of Plato Crater has been studied using S and X-band of Mini-RF and results are validated with Chang’e-1 and LRO’s Diviner data.

**POSTER LOCATION #316**
*Radar Observations of Lunar Hollow Terrain [#2146]*
Radar detects pyroclastic deposits at some, but not all, of the enigmatic lunar hollows. Were volatiles important to their formation?

Paige D. A. Greenhagen B. T.  
**POSTER LOCATION #317**
*Diviner Lunar Radiometer Experiment Extended Mission Results: Thermal, Thermophysical and Compositional Properties [#2492]*
Diviner extended mission results provide new constraints on lunar geology, geochemistry, and volatiles.

Patterson G. W. Cahill J. T. S. Bussey D. B. J.  
**POSTER LOCATION #318**
*Characterization of Lunar Crater Ejecta Deposits Using Radar Data from the Mini-RF Instrument on LRO [#2380]*
Using the crater Byrgius A as an example, we demonstrate how radar data can be used to differentiate between materials within ejecta deposits.

Sefton-Nash E. Siegler M. A. Paige D. A.  
**POSTER LOCATION #319**
*Thermal Extremes in Permanently Shadowed Regions at the Lunar South Pole [#2617]*
Thermal extremes at the lunar south pole and the implications for surface thermophysical properties in permanently shadowed regions.

**POSTER LOCATION #320**
*Global Distribution of Radar-Bright Halos on the Moon Detected by LRO Mini-RF [#2107]*
Radar bright halos / Smaller ones are lost quickly / While old guys linger.

Xiao Y. Fa W. Kobayashi T.  
**POSTER LOCATION #321**
*Thickness of Pyroclastic Deposits for Aestuum Region: Initial Results from Kaguya Lunar Radar Sounder [#1341]*
In this abstract, thickness and subsurface dielectric constant in lunar pyroclastic deposits at Aestuum are estimated with a two-layer model using Kaguya LRS data.

Opanasenko N. Shkuratov Y. Kaydash V. Korokhin V. Velikodsky Y. et al.  
**POSTER LOCATION #322**
*Preliminary Mapping Negative Polarization of the Lunar Nearside [#1354]*
The Moon reveals a complicated phase curve of linear polarization. We map and discuss the polarization degree near P_{min} of the lunar nearside.
Campbell B. A.  Campbell D. B.  Carter L. M.  
Morgan G. A.  Hawke B. R.  et al.  

POSTER LOCATION #323

Earth-Based Radar Data for the Moon at 12.6-cm and 70-cm Wavelengths: Mapping Update and Science Results [#2291]

We present an update and science results from Earth-based radar mapping of the Moon at 12.6-cm and 70-cm wavelengths using the Arecibo Observatory and Green Bank Telescope.

Dhingra D.  Wiseman S.  Pieters C. M.  

POSTER LOCATION #324

Non-Linear Mixing Analysis of Impact Melt on Copernicus Crater Floor Using Hapke’s Radiative Transfer Model [#2310]

Hapke’s radiative transfer model is used to quantitatively unmix and map mineralogically and/or texturally distinct impact melt units on the Copernicus crater floor.

Besse S.  Staid M.  Hiesinger H.  

POSTER LOCATION #325

Spectroscopic Analysis of Flooded Craters from Oceanus Procellarum [#1933]

Spectral properties of flooded craters has been performed. Preliminary results show that few craters share the high-olivine content of Marius.

Staid M.  Besse S.  

POSTER LOCATION #326

Spectral and Stratigraphic Mapping of Lava Flows in Mare Imbrium [#2661]

The mineralogy of volcanic flows in Mare Imbrium is examined using spectral data from NASA’s Moon Mineralogy Mapper and data from other recent lunar missions.

Indhu V.  Srivastava N.  Murty S. V. S.  

POSTER LOCATION #327

Spectral Reflectance Studies of Selected Young Basalts on the Moon Using M3 Datasets from Chandrayaan-1 [#1185]

L- 2 M3 data have revealed that young basalts near Litchenberg crater may have slightly higher olivine content than the ones near Aristarchus crater.

Jawin E. R.  Besse S.  Mazrouei S.  Gaddis L. R.  Sunshine J. M.  

POSTER LOCATION #328

Spectral Signatures of Lunar Pyroclastic Deposits in Moon Mineralogy Mapper (M3) Data [#1662]

We use spectroscopic data from the Moon Mineralogy Mapper (M3) to characterize the 1- and 2-µm absorption bands of pyroclastic deposits across the lunar nearside.

Shankar B.  Osinski G. R.  Antonenko I.  

POSTER LOCATION #329

Multispectral Analyses of Kovalevskaya Crater on the Lunar Farside [#2094]

Kovalevskaya crater is a 113-km complex crater with an uplifted peak. This study summarizes the results of a multispectral study of associated impactite units.

Whitten J. L.  Head J. W.  Pieters C. M.  Vaughan W. M.  

POSTER LOCATION #330

Mafic Anomaly in Ptolemaeus Crater [#2461]

Ptolemaeus crater floor deposits appear anomalous compared to adjacent craters. A mafic anomaly has been found on the crater floor and its origin is investigated.

Ling Z. C.  Zhang J.  Liu J. Z.  

POSTER LOCATION #331

Lunar Iron and Titanium Distributions for LQ-4 Region [#2992]

We have obtained new FeO and TiO2 models by using the IIM data. Our FeO and TiO2 algorithms show obvious improvements in comparisons with previous studies.

Yamamoto A.  Furuta R.  Ohtake M.  Haruyama J.  Matsunaga T.  et al.  

POSTER LOCATION #332

TiO2, FeO, and Texture Analysis Map of Lunar Crater Ina, Based on SELENE Multi-Band Imager Data [#1855]

In this study, TiO2, FeO, and texture map in/around lunar crater Ina are prepared from SELENE Multi-band Imager data.
Nakamura R. Yamamoto S. Ishihara Y. Yokota Y. Matsunaga T. POSTER LOCATION #333

Differentiation of Impact-generated Magma Seas on the Moon as Revealed by Spectral Profiler Onboard Kaguya [#1988]

We summarize the highlights of the hyperspectral surveys by Kaguya and discuss the implications on the formation and evolution of lunar crust.

Yokota Y. Matsunaga T. Ohtake M. Haruyama J. Nakamura R. et al. POSTER LOCATION #334

Vis-NIR Spectral Continuum Slope of Lunar High Latitude Regions Observed by SELENE Spectral Profiler [#3025]

Relationship between the low Vis-NIR spectral continuum slope area in the lunar high-latitude region and topography is investigated.

Ohtake M. Takeda H. Matsunaga T. Yokota Y. Haruyama J. et al. POSTER LOCATION #335

Negative Correlation Between Primitive Farside Highland Materials and Mafic Silicate Abundance on the Moon [#1850]

The mafic silicate abundance to Mg# of the lunar farside are negatively correlated suggesting a continuous Mg-Fe differentiation mechanism.

Krüger T. van der Bogert C. H. Hiesinger H. POSTER LOCATION #336

New High-Resolution Melt Distribution Map and Topographic Analysis of Tycho Crater [#2152]

We present a new topographical analysis and a high-resolution melt pool distribution map that both show strong evidence for an oblique impact from the southwest.

Pasckert J. H. Hiesinger H. van der Bogert C. H. POSTER LOCATION #337

Small, Young Volcanic Deposits Around the Lunar Farside Craters Rosseland, Bolyai, and Roche [#2024]

We have dated several small mare deposits around the lunar farside craters Pauli and Rosseland, by performing crater size-frequency distribution measurements.

Gaddis L. R. Laura J. Hare T. M. Milazzo M. Garlant A. et al. POSTER LOCATION #338

New Views of the Emplacement of the Orientale Annular Pyroclastic Deposit [#2587]

A simple ballistic model of the emplacement of pyroclasts on a topographic model of the lunar surface is applied to the Orientale annular deposit.


Remote Sensing Investigations of Dark Mantle Deposits on the Southeastern Limb of the Moon [#2723]

We are investigating dark-mantle deposits on the southeast limb of the Moon. This region is characterized by a combination of effusive and pyroclastic deposits.


An Investigation of Cryptomare and Pyroclastic Deposits in the Gassendi Region of the Moon [#1894]

LROC NAC and WAC images and other spacecraft data were used to investigate cryptomare and pyroclastic deposits in the Gassendi region of the Moon.

Lawrence S. J. Stopar J. D. Robinson M. S. Hawke B. R. Jolliff B. L. et al. POSTER LOCATION #341

Mare Deposits in the Australe Region: Extent, Topography, and Stratigraphy [#2671]

LROC Wide Angle Camera data products are used to map the distribution and topography of the basalt deposits comprising Mare Australe.

Kramer G. Y. Jaiswal B. Hawke B. R. Giguere T. A. POSTER LOCATION #342

The Basalts of Mare Frigoris [#2947]

We mapped the mare units at Mare Frigoris. For each unit we modeled the VIS-NIR spectrum representative of the pristine basalt.
Chandnani M. Kramer G. Y.  Fessler B.  Öhman T.  Kring D. A.  POSTER LOCATION #343
Deep Crustal Lunar Lithologies Exposed in the South-Western Peak Ring of the Schrödinger Basin [#1938]
The created geological map shows the lithologic diversity of Schrödinger basin’s peak ring. Two faults and a graben cut through it and offset the lithologies.

Vaughan W. M.  Head J. W.  POSTER LOCATION #344
Modeling the South Pole-Aitken Basin Subsurface [#2012]
Modeled cumulate strata produced by impact melt differentiation in the South Pole-Aitken basin match central peak constraints.

Petro N. E.  Jolliff B. L.  POSTER LOCATION #345
Thin Crust in the South Pole-Aitken Basin and Samples from the Mantle? Implications for South Pole-Aitken Basin Sampling in Light of Recent Grail Results [#2724]
GRAIL results suggest that the crust is thin inside SPA. Two basins in SPA are expected to excavate deep into the mantle. Implications for samples are discussed.

Nahm A. L.  Velasco A. A.  POSTER LOCATION #346
Seismic Energy Release from Moonquakes on Small Lunar Lobate Scarps [#1422]
Lobate scarps / Released lots of energy / Through many small quakes.

Mapping Lobate Scarps on the Moon [#2777]
We are digitizing lobate scarps in a GIS to identify, age date, and understand the spatial distribution of these tectonic features, using LROC and LOLA data.

Garry W. B.  Hawke B. R.  Crites S.  Giguere T.  Lucey P. G.  POSTER LOCATION #348
Optical Maturity (OMAT) of Ina ‘D-Caldera’, the Moon [#3058]
An analysis of the optical maturity and reflectance properties of Ina.

Demidov N. E.  Basilevsky A. T.  POSTER LOCATION #349
Rock Fragments Height/Diameter Ratio as Measured on the Lunokhod and Apollo Surface Panoramas [#1859]
Height to diameter ratios of rock fragments of the decimeter size have been measured on the Lunokhod 1 and 2 TV panoramas and the Apollo surface panoramas.

Wood C. A.  Leon P.  Gonzalez D.  Zambelli M.  Hentzel R.  et al.  POSTER LOCATION #350
V is for Vents:  Cloud-Sourcing the Discovery, Description, Dimensions and Distribution of Lunar V-Vents [#1710]
V-vents are small, tapered lunar vents with v-shaped cross-sections that erupted explosively to produce pyroclastic deposits.

Antonenko I.  Robbins S. J.  Gay P. L.  Lehan C.  Moore J.  POSTER LOCATION #351
Effects of Incidence Angle on Crater Detection and the Lunar Ioschron System:  Preliminary Results from the CosmoQuest MoonMappers Citizen Science Project [#2705]
Solar incidence angle greatly affects the number of craters found on a surface, and we show this as a first study of a lunar mapping citizen science project.

POSTER SESSION II:  GETTING RESULTS FOR THE MOON: DATA FUSION, MODEL IMPROVEMENTS, AND EMERGING TECHNOLOGY
Thursday, 6:00 p.m.  Town Center Exhibit Area [R723]

Bamford R. A.  Alves E. P.  Kellett B.  Bradford W. J.  Silva L.  et al.  POSTER LOCATION #353
Lunar Swirls and Mini-Magnetospheres:  Laboratory Experiments and Kinetic Simulations of the Plasma Processes of the Very Small [#1292]
Electron-scale collisionless plasma processes in theory simulations and laboratory experiments are shown to account for in situ observations made by spacecraft.
Poston M. J.  Aleksandrov A. B.  Grieves G. A.  
Hibbitts C. A.  Dyar M. D.  et al.  **POSTER LOCATION #354**

Thermal Stability of Adsorbed Water Molecules on Lunar Materials [2177]
Experimental determination of thermal desorption activation energies for water on lunar samples and implications for water retention and migration on the Moon.

Jordan A. P.  Stubbs T. J.  Joyce C. J.  Schwadron N. A.  Spence H. E.  et al.  **POSTER LOCATION #355**
The Formation of Molecular Hydrogen from Water Ice in the Lunar Regolith by Energetic Charged Particles [2668]
Energetic charged particles can dissociate water in the lunar regolith and create molecular hydrogen. We estimate how much forms and compare with observations.

Grava C.  Chaufray J.-Y.  Retherford K. D.  
Gladstone G. R.  Hurley D. M.  et al.  **POSTER LOCATION #356**
Lunar Exospheric Argon Modeling [2804]
We will present preliminary results of a MC model of lunar Ar exosphere, in order to explain its behavior and its detectability by LRO/LAMP UV spectrograph.

Patrick E. L.  Mandt K. E.  Escobedo S.  Winters G.  Miller G.  et al.  **POSTER LOCATION #357**
Polar Regolith Environment Molecular Impact Simulation Experiment (PREMISE) [2996]
A laboratory system to simulate the lunar surface was constructed for modeling volatile gas exposure to the lunar regolith.

Zimmerman M. I.  Carter L. M.  Farrell W. M.  Bleacher J. E.  Petro N. E.  et al.  **POSTER LOCATION #358**
Electromagnetic Simulations of Ground-Penetrating Radar Near Lunar Pits and Lava Tubes [1761]
Full-wave simulations of ground-penetrating radar can resolve lunar pits and tubes, enabling studies of “where to hide” from solar radiation and plasma.

Thompson T. W.  Ustinov E. A.  **POSTER LOCATION #359**
Updated Model of Radar Backscatter for Rough Lunar Craters [1051]
Modeling of radar backscattering from lunar craters based on a mixture of specular and diffuse scattering was updated based on unpublished 1980s data.

Dharmendra Pandey  Sriram Saran  Anup Das  Manab Chakraborty  **POSTER LOCATION #360**
A Simplistic Approach to Model Radar Backscatter from Lunar Regolith [1941]
A simple two-layer radar backscatter model based on rough surface scattering was implemented to study the physical properties of the lunar regolith.

Pandey D.  Das Anup.  Saran Sriram.  Chakraborty Manab.  **POSTER LOCATION #361**
Scattering Characteristics of Lunar Regolith with Respect to Dual Frequency SAR: Preliminary Simulation Results [1269]
This work describes preliminary simulation results of radar backscatter over the lunar surface for Chandrayaan-2 dual-frequency SAR ISRO’s future mission.

Jordan A. P.  Stubbs T. J.  Wilson J. K.  Schwadron N. A.  Spence H. E.  **POSTER LOCATION #362**
Dielectric Breakdown in the Lunar Regolith [2433]
Energetic charged particles can deposit their charge within the lunar regolith, creating strong subsurface electric fields and perhaps dielectric breakdown.

Colaprete A.  Elphic R. C.  Landis D.  Karcz J.  Osetinsky L.  et al.  **POSTER LOCATION #363**
Overview of the LADEE Ultraviolet-Visible Spectrometer: Design, Performance, and Planned Operations [2293]
This talk will detail the design, performance, and planned operations of the LADEE Ultraviolet and Visible Spectrometer.
The Lunar Atmosphere and Dust Environment Explorer (LADEE): T-Minus 6 Months and Counting [#3112]
As of March 2013, the LADEE mission is six months from launch. Find out what mysteries from the Apollo era LADEE will attempt to unveil.

Studying on the Calibration Method for Chang’e-3 Pancam [#1556]
Camera Calibration for Chang’e-3 Panoramic Camera (Pancam).

Recent Results and Plans for the Extended Science Mission for the Lunar Reconnaissance Orbiter Mission [#1951]
Update of the Lunar Reconnaissance Orbiter Mission, including a description of the extended mission and recent results.

Challenges and Successes of In-Flight LROC WAC Dark Calibration [#1943]
Logistics and behavior of the LROC Wide Angle Camera dark calibration. The high data rate of LROC yields calibration results that are rare in planetary missions.

Temperature Dependent Spectral Responsivity of the LROC WAC [#2412]
We corrected the global color artifacts in LROC WAC multispectral mosaics by calculating the spectral responsivity change as a function of CCD temperature.

The Model of “Surficial” Water Cycle to Explain Recent Observational Indication of the Presence of Lunar Hydration Cycle Based on Time Variation of Lunar Epithermal Neutron Flux [#3001]
We report on the use of Geant4 Monte Carlo simulations to analysis of variations of hydrogen concentration.

Prospecting for Polar Volatiles: Results from the RESOLVE Field Test [#3012]
The RESOLVE analog mission simulation in Hawai’i accomplished all major goals for a lunar polar volatiles mission.

Laboratory Reflectance Spectroscopy of Lunar Anorthosites: Implications for Interpreting the Mineralogy of the Moon’s Highland Crust from Remote Sensing Data [#2387]
Reflectance spectra of four Apollo 16 anorthosites are reported and analyzed in comparison with plagioclase separates from various lunar rock types.

Plagioclase Influence in Mixtures with very low Mafic Mineral Content [#1490]
In this abstract we describe plagioclase behavior when mixed with low mafic mineral contents, in order to understand lunar highland mineralogical composition.

Composition and Crystallinity Analysis of Lunar Dark Mantle Deposits [#1473]
We estimated composition and crystallinity of dark mantle deposits on the Moon by using SELENE MI data, and suggest a heterogeneity of lunar mantle composition.

Automatic Extraction of Unique Spectral Signatures from the M3 Database [#3056]
A parameter based method for automatic end-member detection for M3 data using linear unmixing algorithms.
Clenet H., Isaacson P. J., Gillet Ph. POSTER LOCATION #375
Systematic Mapping of Mafic Minerals on the Moon: An Improved Approach Based on Modified Gaussian Model Applied to M3 Data [#1494]
We studied Stevinus crater region with M3 data. MGM is used to characterize mafic rocks. We observe local compositional variations in pyroxene composition.

Zhang W., Bowles N. E. POSTER LOCATION #376
Mapping Lunar TiO2 and FeO with Chandrayaan-1 M3 Data [#1212]
In this study, visible to near-infrared reflectance data acquired by the Moon Mineralogy Mapper are used to investigate the mineralogy of the lunar surface.

Bhatt M., Mall U., Wöhler C., Bugiolacchi R., Bereznay A. et al. POSTER LOCATION #377
Modifications to the Iron Abundance Algorithm Based on Moon Mineralogy Mapper Imager On-Board Chandrayaan-1 [#1590]
The FeO abundance estimation algorithm based on the 2-μm absorption band has been modified for photometrically and topographically corrected M3 data.

Leveraging M3 and Diviner Data to Resolve Global and Regional Differences in Lunar Iron Abundance [#2442]
An effort to resolve differences in lunar surface FeO abundance estimates derived from Clementine, Lunar Prospector, M3, and DIVINER.

Chen S. B., Wang J. R., Guo P. Z. POSTER LOCATION #379
Comparison Between the Spectral Unmixing and Multiple Regression Analysis for Mineral Retrieval from M3 Data [#1893]
There present the comparison between spectral unmixing and multiple regression analysis to retrieve the mineral abundance from M3 data. It depends on mineral.

Liu D., Li L. Prof., Zhang Y. Z. POSTER LOCATION #380
Sensitivity Analysis for Hapke’s Radiative Transfer Model [#1290]
Quantitative analysis of relative significance of factors in regulating the Hapke’s RTM simulated reflectance via EFAST.

Ishihara Y., Kouyama T., Nakamura R., Tsuchida S., Matsunaga T. et al. POSTER LOCATION #381
Development of a New Lunar Radiometric Calibration Model Based on SELENE/SP for Japanese Future Hyper Spectral Mission HISUI [#1726]
A new lunar calibration model for Earth observation sensors is developed using SELENE/SP lunar reflectance and photometric function model.

Antonenko I. POSTER LOCATION #382
Re-Examining the Identification of Dark-Haloed Impact Craters: New Criteria for Modern Data Sets [#2607]
Examination of dark-haloed impact craters in new lunar data suggests identification should focus on composition and topography, not halo symmetry and maturity.

Jackson T. L., Farrell W. M. POSTER LOCATION #383
Rover Wheel Charging Within a Lunar Crater [#1569]
We advance the wheel charging model by varying parameters and incorporating a new dust sticking term to determine how dust affects charge remediation.
**POSTER LOCATION #385**

*Shock Experiments on Basalt-Ferric Sulfate Mixes at 21 GPa and 49 GPa and Their Relevance to Martian Meteorite Impact Glasses [#2627]*

We conducted laboratory shock experiments at 21 and 49 GPa on Columbia River Basalts, and the ferric sulfate mix reveals that ferric sulfate is reduced to iron sulfide.

Usui T. Rapp J. F. Draper D. S.  
**POSTER LOCATION #386**

*Search for a High-Pressure Multiple-Saturation Point for a Martian Primitive Basalt [#2877]*

We report high-pressure near-liquidus phase relations of synthetic Yamato 980459 to constrain possible origins of near-primary martian magmas.

Rapp J. F. Draper D. S. Mercer C. M.  
**POSTER LOCATION #387**

*Anhydrous Liquid Line of Descent of Yamato 980459 and Evolution of Martian Parental Magmas [#1688]*

We present new experimental data on the evolution of a Y98-like parental melt, and the implications for basaltic magma genesis on Mars.

**POSTER LOCATION #388**

*Importance of Considering Melt Activity Coefficients and Charge-Balancing Substitution Mechanisms when Understanding Partitioning in Olivine [#1555]*

New olivine-melt partitioning experiments yield insights into melt activities and charge-balancing substitution mechanisms.

Armstrong L. S. Hirschmann M. M.  
**POSTER LOCATION #389**

*Solubility of C-O-H Volatiles in Water-Poor Martian Basalt: The Effect of fCO Variation [#3046]*

We present preliminary experimental determinations reduced C-O-H volatile solubility in basaltic magmas as a function of water content, fO2, and fCO.

McCubbin F. M. Vander Kaaden K. E. Whitson E. S. Bell A. S. Shearer C. K.  
**POSTER LOCATION #390**

*Partitioning of F and Cl Between Apatite and a Synthetic Shergottite Liquid (QUE 94201) at 1 and 4 GPa from 950 to 1450 °C [#2748]*

Experiments on the partitioning of F and Cl between apatite and an analog martian silicate melt show a strong temperature dependence on exchange coefficients.

Bell A. S. Burger P. V. Le L. Papike J. J. Jones J. H. et al.  
**POSTER LOCATION #391**

*The Effects of Oxygen Fugacity on the Crystallization Sequence and Cr Partitioning of an Analog Y-98 Liquid [#1599]*

Experiments conducted in this study aim to elucidate the role of temperature and fO2 on trace-element partitioning in an analog Y-98 composition.

**POSTER LOCATION #392**


We introduce a new, potentially powerful oxybarometer, V partitioning between spinel and olivine, which can be used when no melt is preserved in the meteorite.

Ding S. D. Dasgupta R. D.  
**POSTER LOCATION #393**

*Sulfur Concentration of Martian Magmas at Sulfide Saturation at High Pressures and Temperatures — Implications for Deep Sulfur Cycle on Mars [#1713]*

To constrain sulfur cycle of Mars, melt-sulfide equilibria were simulated to obtain sulfur content of martian magmas at sulfide saturation at 1–3 GPa.
Melting of a Primitive Martian Mantle at 1–2 GPa: Experimental Constraints on the Origin of Basalts on Mars [#2542]

Experiments provide potential melt compositions that are compared to meteorites and surface lavas to discuss the diversity of basaltic magmatism on Mars.

High Pressure Behavior of Iron Alloys: Insights into Planetary Cores [#1820]

We will report new results on energetics, equation of state, and elasticity of iron alloys at conditions relevant to planetary cores.

Polybaric Crystallization of Gusev Alkaline Basalts [#1265]

We constrained the formation of alkaline magma on Mars by polybaric fractional crystallization from primary magma using Gusev alkaline basalt compositions.

CSD Measurements on Olivine Grains in the Tissint Meteorite [#1266]

We used crystal size distribution analysis on the shergottite Tissint to better understand and compare its growth history to other olivine-phyric shergottites.

Rock-Magnetics and Remanence Properties of Yamato 980459 (Y-980459) [#2307]

This study examines magnetic recording assemblages and remanence properties of the SNC martian meteorite Y-980459, a primitive member of the shergottite group.

Chemical Composition of Four Shergottites from Northwest Africa (NWA 2800, NWA 5214, NWA 5990, NWA 6342) [#1738]

Laser ablation ICP-MS was used to obtain a complete dataset for the abundances of 71 elements in the 11 martian meteorites.

Peering Through a Martian Veil: ALHA 84001 Sm-Nd Age Revisited [#2182]

$^{147}$Sm-$^{143}$Nd data (n = 22) and $^{146}$Sm-$^{142}$Nd data (n = 16) give the igneous crystallization age of ALH84001 as >4.4 Ga. REE abundances in the parent magma are modeled.

Constraints on Fabric-Forming Mechanisms in Shergottite NWA 6963: Results from Mineralogy and Shape-Preferred Orientation [#2124]

We combine 2-D shape-preferred orientation and mineral chemistry of NWA 6963 to constrain the processes that formed magmatic fabrics on Mars.

Can Merrillite Provide Information on Water in Martian Meteorites? Preliminary Results from Los Angeles and QUE 94201 [#2578]

The development of methodology for water and D/H ion microprobe analysis of merrillite.

Apatite and Merrillite from Martian Meteorite NWA 7034 [#2601]

Phosphate minerals from different textural regimes were contrasted to provide new insight into melt volatiles and fluids in martian meteorite NWA 7034.
Kuchka C. R.  Walton E. L.  Herd C. D. K.  
POSTER LOCATION #404
Shock Melt Features in Los Angeles and Tissint: A Comparison [3043]
Shock metamorphic mineralogy and melt features of the highly differentiated Los Angeles and the more primitive olivine-phyric Tissint meteorites are compared.

POSTER LOCATION #405
Compositions of Magmatic and Impact Melt Sulfides in Tissint and EETA79001: Precursors of Immiscible Sulfide Melt Blebs in Shergottite Impact Melts [1715]
Compositions of sulfide impact melt blebs in Tissint and EET A79001 suggest that they have various precursors, and are not derived solely by melting pyrrhotite.

Summerson I.  Greshake A.  Fritz J.  Reimold W. U.  
POSTER LOCATION #407
High-Pressure Phases in a Melt Pocket Within an Olivine Macrocryst in the Tissint Martian Meteorite [1974]
High-pressure phases of olivine and chromite were identified in a melt pocket within an olivine macrocryst in the Tissint meteorite.

Sonzogni Y.  Treiman A. H.  
POSTER LOCATION #408
Small Melt Inclusions in Olivines from Martian Meteorites: Value for Constraining Original Melt Compositions [1049]
In olivine crystals of the Tissint shergottite, small glassy melt inclusions and large partly crystalline melt inclusions have the same bulk compositions.

Stephen N. R.  Genge M. J.  Russell S. S.  Schofield P. F.  
POSTER LOCATION #409
Turning Tissint Inside Out; Searching for its Launch Pair(s) from Mars [2131]
“Mars meteorite, is paired with others they say, but not so sure now…” We present various new data implicating a possibly different source region for Tissint.

Hu J.  Sharp T. G.  Walton E. L.  
POSTER LOCATION #410
Shock Effects in Tissint II: Olivine Transformation to Silicate Perovskite and Oxide [1041]
This study presents olivine dissociation to Mg-perovskite plus oxide in Tissint, suggesting a very high shock pressure and distinct impact condition on Mars.

Walton E. L.  Sharp T. G.  Hu J.  Filiberto J.  
POSTER LOCATION #411
Shock Metamorphism of the Tissint Martian Meteorite I: Constraints on Shock Conditions and Post-Shock Thermal History [1039]
Shock in martian meteorite Tissint has been characterized by Raman, TEM, and XRD. Minerals preserved in and around shock veins vary depending on vein thickness.

Lindsay F. N.  Osmond J.  Delaney J. S.  Herzog G. F.  Turrin B.  et al.  
POSTER LOCATION #412
Ar/Ar Systematics of Martian Meteorite NWA 2975 [2911]
Ar-Ar data for single grains from basaltic shergottite NWA 2975 yield an age of 300 Ma with no evidence of a trapped 40Ar component that correlates with 36Ar.

Varela M. E.  Zinner E.  
POSTER LOCATION #413
Glass-Bearing Inclusions in Shergotty [1501]
We report results on major- and trace-element compositions of glass inclusions in Shergotty.

Mikouchi T.  Takenouchi A.  Inoue S.  Kogure T.  Kurihara T.  
POSTER LOCATION #414
Iron Nano-Particles in Olivine from the NWA 1950 Shergottite: Additional Complexity [1098]
Our TEM analysis on NWA 1950 olivine showed coexisting nanoparticles of Fe metal and oxide, suggesting the phase change upon cooling after shock.
**POSTER LOCATION #415**  
*Impact Excavation of Martian Meteorites: Index from Shock Formed Minerals [#1371]*  
Discovery of additional large high-P minerals in olivine-phyric shergottites, the implication of impact launch and effect on radiometric ages of the samples.

Poulet F., Carter J.  
**POSTER LOCATION #416**  
*Identification of a New Rock Type on Mars: Anorthosite [#1451]*  
Report of anorthosite rocks on Mars.

Nazarian A. H., Rogers A. D.  
**POSTER LOCATION #417**  
*Thermal Infrared Spectral Characterization of the Gorgonum-Atlantis Subregion of Mars’ Eridania Basin [#2628]*  
Study of a portion of the Eridania Basin using Thermal Emission Imaging System data to classify the spectral character and mineralogy of the region.

**POSTER LOCATION #418**  
*Compositional Similarities Among Martian Meteorites, Regional Gamma Ray Data, and In Situ Lander Measurements: Implications for Igneous Processes [#2472]*  
We compare GRS, in situ, and martian meteorite data to place the meteorites in a global/regional context and shed light on past igneous processes on Mars.

Jacob S. R., Hammer J. E., Welsch B.  
**POSTER LOCATION #419**  
*Interpreting Magmatic Processes from Clinopyroxene in Terrestrial Ankaramite Lavas: A Procedural Blueprint for the Nakhlites? [#3084]*  
We looked at clinopyroxene crystals from a Maui ankaramite lava flow as a possible analog to the martian nakhlites.

Rozel A., Clenet H., Douté S., Quantin C.  
**POSTER LOCATION #420**  
*Hyperspectral Data Processing Using Neural Networks: Preliminary Results for Mafix Minerals in SNC’s Meteorites [#1469]*  
We use a neural network to detect and characterize mafic signatures on SNC meteorites, after a training on synthetic laboratory samples of similar composition.

**POSTER LOCATION #421**  
*Search for Spectral Analogue Sites of Martian Meteorites Using NIR Data [#2265]*  
We tried to identify possible source regions for martian meteorite by comparing their spectral properties with those of the martian surface using NIR OMEGA data.

**POSTER LOCATION #422**  
*Mojave Crater: Possible Source for Martian Meteorites [#2257]*  
Mojave Crater, just a few million years old, could be the source crater for martian meteorites. This crater is significantly larger than sources previously suggested.

Price M. C., Parnell J., Wozniakiewicz P. J., Kearsley A. T., McMahon S., et al.  
**POSTER LOCATION #423**  
*Gas Retention in Basaltic Rocks following Hypervelocity Impact: Implications for Methane on Mars [#1935]*  
Possible sources of any methane on Mars include impact evolved methane from basalt. We present data showing that excess methane is NOT produced via this route.

Gou S., Di K., Yue Z., Wang J.  
**POSTER LOCATION #424**  
*Reanalysis of MGS-TES Data with Detected/Known Minerals and its Implications for Geologic Evolution of Mars Crust [#1255]*  
Unmixing results of MGS-TES by the use of detected or known minerals as priori knowledge show that the martian crust is subalkaline, with basaltic andesite dominant.

Skok J. R., Mustard J. F., Tornabene L. L., Karunatillake S.  
**POSTER LOCATION #425**  
*Petrologic Implications of Martian Igneous Crustal Formation Based on Remote Observations [#2253]*  
Remote observations of excavated ancient martian crust are used to examine the history of the planet’s formation.
Bell J. F. III  Lai J. C.  Horgan B.  Wellington D. F.  

**POSTER LOCATION #426**

*Characterizing the Bedrock Mineralogy of Dusty Regions of Mars Using Remote Sensing of Low Albedo “Windows” Through the Dust [#2416]*

We are using a variety of Mars orbital datasets to identify and characterize the mineralogy of small low-albedo “windows” in the planet’s dustiest regions.

Ody A.  Poulet F.  Bibring J.-P.  Loizeau D.  Langevin Y.  et al.  

**POSTER LOCATION #427**

*What does Olivine tell us About Volcanic and Magmatic Martian Evolution? [#2132]*

Here we present constraints on the volcanic and magmatic evolution of Mars resulting from global and detailed investigations of olivine-bearing contexts.

Sinha R. K.  Murty S. V. S.  

**POSTER LOCATION #428**

*Nature and Distribution of Olivine in Moreux Crater in Northern Mid-Latitude of Mars [#1179]*

A coordinated NIR/TIR spectral analysis of intercrater dunes within Moreux crater suggests that they are Mg-rich olivine with a composition ~ Fo8-91.

Hanna R. D.  Hamilton V. E.  

**POSTER LOCATION #429**

*Complications in Correlating Thermal Inertia and Olivine Abundance on Mars [#2235]*

We examine correlations between thermal inertia and olivine abundance on Mars and discuss how it can be complicated by local geology and scale of observation.

Morgan M. F.  Murchie S. L.  

**POSTER LOCATION #430**

*Fresh Craters as Probes of Composition in Dust-Covered Regions Of Mars [#2803]*

We use MRO/CRISM observations of recent impacts in dust-covered regions of Mars to explore the surface composition hidden by dust.

Gross C.  Sowe M.  

**POSTER LOCATION #431**

*Soffen Crater in the Terra Cimmeria Region of Mars [#2470]*

We search for several types of hydrated minerals in order to test the hypotheses of impact-induced hydrothermalism vs. excavation models.

**POSTER SESSION II: FLUIDS ON MARS: OCEANS, LAKES, VALLEYS, GULLIES, RSLs, AND ANALOGS**

Thursday, 6:00 p.m.  Town Center Exhibit Area  [R725]

Oehler D. Z.  Allen C. C.  

**POSTER LOCATION #433**

*New Support for Hypotheses of an Ancient Ocean on Mars [#1162]*

Giant polygons in the martian lowlands may reflect ancient bodies of water in which major accumulations of fine-grained sediments were deposited.

Wilson S. A.  Grant J. A.  Howard A. D.  

**POSTER LOCATION #434**

*Inventory of Equatorial Alluvial Fans and Deltas on Mars [#2710]*

This systematic investigation of CTX data in the equatorial region of Mars quintuples the number of craters with fans and doubles the number of deltas.

Glines N. H.  Fassett C. I.  

**POSTER LOCATION #435**

*Evidence for Groundwater Sapping on Mars from Junction Angles of Nirgal Vallis Tributaries [#2011]*

Seepage erosion on Mars is controversial. We examine junction angles of Nirgal Vallis tributaries to test whether observations are consistent with sapping.

Fairén A. G.  Davies N. S.  Squyres S. W.  

**POSTER LOCATION #436**

*Equatorial Ground Ice and Meandering Rivers on Mars [#2948]*

Permafrost is a compelling source of bank stability on martian inverted-relief channels.
Morphometry is used to compare martian valley networks with terrestrial drainage basins to determine if valley networks were formed by surface runoff.

CTX, HiRISE, and HRSC data was used to constrain the formation time of two martian outflow channels, Waikato and Reull Vallis, to a period between 3.52 and 3.67 Ga.

Preliminary results of mapping and crater counting within the head depression region of Harmakhis Vallis, Mars based on the CTX and HiRISE images.

We show the Dao Vallis floor to consist of many units with distinct ages, e.g., patches of original canyon floor, and viscous flows resurfaced in the last few Ma.

We mapped 387 candidate closed-basin lakes in impact craters, in a distribution far more widespread across the southern highlands than previously thought.

Extensive LLDs cover the SW plateau of Juventae Chasma. We conduct sedimentological and stratigraphical analysis of the outcrops and their morphological patterns.

We present the results from our analysis of the Eridania basin, Mars; to constrain paleolake levels and to determine formation mechanisms for chaos knob fields.

Investigation of the fluvial and sedimentary history of the eastern plains located within the Hellas basin using up-to-date imagery.

Ridge orientations in Sinus Meridians follow the regional slope, suggesting a fluvial interpretation is possible.
Jacobsen R. E.  Burr D. M.  
**POSTER LOCATION #447**

*Local-Scale Stratigraphy of Inverted Fluvial Features in Aeolis Dorsa, Western Medusae Fossae Formation, Mars* [#2165]

We use various stratal markers to construct three inverted fluvial feature stratigraphies, which describe a diverse history of fluvial activity in Aeolis Dorsa.

**POSTER LOCATION #448**

*Hyperconcentrated Flow Deposits and Valley Formation of Havel Vallis, Xanthe Terra, Mars* [#2886]

Two scenarios are presented about how Havel Vallis may have formed. The observation of hyperconcentrated flow deposits associated with valley formation is included.

Allender E. J.  Lucieer A.  
**POSTER LOCATION #449**

*Mineral Composition of Gully Features Within Hale Crater, Mars* [#1485]

An investigation into the mineral composition of gully features within Hale Crater using CRISM hyperspectral imagery and a HiRISE DEM.

Travis B. J.  Feldman W. C.  
**POSTER LOCATION #450**

*Surface Features and Brine Convection in the Martian Near-Surface* [#2820]

Numerical simulation of convection of presumed brines in the near surface results in patterns of surface deformation similar to observed polygons on Mars.

Cedillo-Flores Y.  Treiman A. H.  Lasue J.  Clifford S. M.  
**POSTER LOCATION #451**

*CO₂ Gas Fluidization: A Possible Mechanism for the Formation of Martian Polar Gullies* [#1769]

Martian gully landforms have been interpreted as evidence for liquid H₂O. Gullies are also present in polar regions where temperatures are too low for liquid water.

Ito G.  Sylvem M.  Dixon J. C.  
**POSTER LOCATION #452**

*Understanding the Role of CO₂ Frost Sublimation on Martian Gullies* [#2144]

Gullies on Mars may have been formed by CO₂ sublimation. In this experiment, we explore the effect of CO₂ sublimation on a typical martian slope.

Raack J.  Reiss D.  Vincendon M.  Ruesch O.  Appéré T.  et al.  
**POSTER LOCATION #453**

*Seasonal Activity of Gullies in South Polar Pits* [#2067]

With images, temperature, and spectral data we analyzed the timing of changes to detect the possible medium and mechanism initiating present day gully activity.

Ojha L.  Wray J. J.  McEwen A. S.  Murchie S. L.  
**POSTER LOCATION #454**

*Spectral Constraints on the Nature and Formation Mechanism of Recurring Slope Lineae* [#2423]

Recurring slope lineae (RSL) are inferred to be briny flow on present-day Mars. Here, we present results from our search for spectroscopic evidence for brines.

Farris H.  Chevrier V. F.  Dixon J. C. Ph D  de Mijolla G. M.  
**POSTER LOCATION #455**

*Experimental Simulations of Recurrent Slope Lineae on the Surface of Mars* [#2670]

RSLs are small slope features found on the martian surface. In this work, we attempt to quantify the effect of low temperature and viscosity on their morphology.

Marra W. A.  Kleinmans M. G.  Hauber E.  McLelland S. J.  Murphy B. J.  et al.  
**POSTER LOCATION #456**

*Diagnostic Morphology for Martian Groundwater Outflows from Flume Experiments* [#1899]

Morphological characteristics and identification of martian valleys formed by several types of groundwater systems, using laboratory flume experiments.

Arfstrom J. D.  
**POSTER LOCATION #457**

*Tunnel Valleys as Terrestrial Analogs of the Inner Channels of Kasei Valles, Mars* [#1001]

Two inner channels of Kasei Valles share several characteristics with tunnel valleys. Critically, water erupted to carry a sediment load to a higher elevation.
Kraal E. R.  
Connecting the Surface Morphology of Alluvial Fans to Precipitation and Climate: The Atacama Desert as an Analog for Mars [#2413]  
Application of a terrestrial study of sediment transport and surface flow on alluvial fans compared to climate records as an analog to martian alluvial fans.

Harmon J. K.  
Radar Imagery of the Chryse-Xanthe Region, Mars [#1411]  
Arecibo radar imagery of the Chryse-Xanthe region of Mars shows bright depolarized features associated with aqueous deposition/modification.

---

POSTER SESSION II: MARTIAN WATER AND SECONDARY MINERALOGY  
Thursday, 6:00 p.m.  Town Center Exhibit Area  [R726]

Harner P. L.  Gilmore M. S.  Greenwood J. P.  
Laboratory Simulations of Potential Martian Evaporites and Their Spectral Signatures [#2714]  
We create and evaporate theoretical brines and analyze the resultant salts to determine effects on their visible and near-infrared spectral signatures.

Tomkinson T.  Lee M. R.  Mark D. F.  Stuart F. M.  Smith C. L.  
Quantifying the Timescales of Fluid-Rock Interaction on Mars Using the Nakhlite Meteorites [#1206]  
Etch pits within olivine grains from the nakhlite meteorites reveal the magnitude and timescale of water-mediated alteration of the martian crust.

Poulet F.  Carter J.  Wang A.  Ruff S. W.  
Integrating In Situ and Orbital Data of Mars: A Water Story at Gusev Crater [#1414]  
To reconcile analyses from orbital and rover-based observations for the purpose of relating the aqueous episodes that occurred at Gusev Crater, Mars.

Gainey S. R.  Hausrath E. M.  Hurowitz J. A.  
Clay Mineral Precipitation and Implications for Mars [#2954]  
Clay mineral precipitation and igneous rock alteration, implications for martian stratigraphy.

Catalano J. G.  Beehr A. R.  
Theoretical and Experimental Constraints on the Formation and Alteration of Iron-Bearing Phyllosilicates on Mars [#1294]  
Modeling and experiments demonstrate that ferric smectites observed on Mars may be oxidation products of precursor ferrous clays formed during the Noachian.

Che C.  Glotch T. D.  
Dehydrated and Dehydroxylated Phyllosilicates on Mars: Assessment of Post-depositional Alteration of Martian Sedimentary Deposits [#2261]  
We examined multiple remote sensing datasets for evidence of the existence of thermally altered phyllosilicates on Mars.

Adeli S.  Hauber E.  Le Deit L.  Jaumann R.  
Different Phyllosilicate-Rich Materials on the Terra Sirenum Region, Mars [#2752]  
Using the CRISM data and high-resolution images, we have studied the morphology and the mineralogical composition of chaotic materials in Terra Sirenum.

---
Bultel B., Quantin C., Andreani M., Clenet H.  
**POSTER LOCATION #468**  
*Identification of Phyllosilicates in Crustal Outcrops Between Hellas and Isidis Basins (Mars) Using Combinaison of Near 2.3–2.5 µm Absorptions on Crism Data [2078]*  
Smectite, serpentine, chlorite are detected on CRISM data suggesting an alteration driven by a pressure/temperature gradient.

**POSTER LOCATION #469**  
*Evidence for Multiple Widespread Buried Phyllosilicate-Bearing Layers Between Argyre and Valles Marineris [2331]*  
Widespread phyllosilicate-bearing layers have been identified in northwest Noachis Terra: two separate layers of Fe/Mg-smectites bracketing a Al-smectite layer.

Viviano C. E., Murchie S. L., Johnson J. R., Seelos F. P.  
**POSTER LOCATION #470**  
*The Distribution and Mineralogy of Hydrated Minerals in Wall and Floor Material of Valles Marineris [2909]*  
Fe/Mg-phyllosilicate in western Valles Marineris wall rock suggests surface clays were buried by Hesperian lava and do not plunge below the surface to the west.

**POSTER LOCATION #471**  
*Experimental Leaching Processes and the Formation of Sulfates with Sulfuric Acid on Terrestrial Rocks, Martian-Like Rocks and the Martian Meteorite Tissint Related to the Formation of ILD’s on Mars [2014]*  
An experimental design of chemical reaction between sulfuric acid (H₂SO₄) and rocks at elevated temperatures related to massive sulfate deposits on planet Mars.

Grindrod P. M., Warner N. H., Schwartz C., Gupta S.  
**POSTER LOCATION #472**  
*Fans and Phyllosilicates in Coprates Catena, Mars [1901]*  
We have studied two stepped fan systems, probably Hesperian in age, and associated light-toned deposits that contain phyllosilicates in Coprates Catena, Mars.

Tangari A. C., Marinangeli L., Piluso E., Pompilio L., Scarciglia F.  
**POSTER LOCATION #473**  
*Pedogenetic Processes on Mars and Terrestrial Analogues [2018]*  
Reconstruction of the alteration processes responsible of the formation of clay-rich soils on Mars based on the study of terrestrial analogues.

Fergason R. L., Gaddis L. R., Rogers A. D.  
**POSTER LOCATION #474**  
*Hematite-Bearing Materials in Candor Chasma, Mars: Identification of New Localities, Analysis, and Implications [2618]*  
This work describes the association between low albedo deposits, light-toned material, and hematite-bearing material in Candor Chasma, Mars.

Jain N., Bhattacharya S., Chauhan P., Ajai  
**POSTER LOCATION #475**  
*Study of Carbonates, Hydrous Sulfates and Phyllosilicates from the Capri Chasma Region of Valles Marineris on Mars Based on MRO-CRISM Observations [1388]*  
Spectroscopic study of Capri Chasma has been carried out based on MRO-CRISM hyperspectral data. The presence of carbonates and hydrous sulfates has been confirmed.

Liu Y., Arvidson R. E., Catalano J. G.  
**POSTER LOCATION #476**  
*Spectral Identification and Stratigraphic Study of Phyllosilicates and Hydrated Sulfates in the Southwestern of Melas Chasma and Environmental Implications on Mars [1645]*  
We identified interbedded monohydrated sulfate and Fe-smectite deposits unconformably overlain by monohydrated sulfates over the southwestern of Melas Chasma.

Weitz C. M., Noe Dobrea E. Z., Wray J. J.  
**POSTER LOCATION #477**  
*Gypsum, Jarosite, and Other Minerals Associated with a Blocky Deposit in Western Melas Chasma [2076]*  
We have identified several minerals associated with a blocky deposit in western Melas Chasma, including gypsum, jarosite, and other sulfates.
Noel A. J.  Bishop J. L.  POSTER LOCATION #478
CRISM Analyses of Juventae Chasma: Mineralogy and Morphology of Interior Layered Deposits at Mound B [#1736]
The use of additional CRISM images and updated calibration allows us to build upon previous analyses and better identify the sulfates present.

Goudge T. A.  Mustard J. F.  Head J. W.  Salvatore M. R.  POSTER LOCATION #479
Integrating CRISM and TES Hyperspectral Data to Characterize a Massive Kaolin-Group Mineral Deposit in Kashira Crater, Mars [#1377]
We present results integrating TES and CRISM data to estimate the quantitative abundance of a kaolin-group mineral within a deposit in Kashira Crater, Mars.

Sun V. Z.  Milliken R. E.  POSTER LOCATION #480
Geologic and Mineralogic Mapping to Determine the Origin of Clay Minerals in Ritchey Crater, Mars [#2675]
We present geologic and mineralogic maps of post-Noachian Ritchey Crater, Mars, to determine detrital or authigenic origin of clays in the crater.

Wilhelm M. B.  Bishop J. L.  Wray J. J.  Ojha L.  POSTER LOCATION #481
Structural Variations in the Ancient Phyllosilicates at Mawrth Vallis, Mars [#2440]
We seek to investigate variations in the structure of mineralogically distinct phyllosilicate strata at Mawrth Vallis, Mars to constrain depositional processes.

Flahaut J.  Poulet F.  Carter J.  Bibring J.-P.  Murchie S. L.  POSTER LOCATION #482
Embedded Phyllosilicates and Sulfates in Eastern Meridiani: An Other Gale Crater? [#2035]
We report the occurrence of mixed clays and sulfates within the etched terrains of Meridiani. Their stratigraphy is similar to the one observed in Gale Crater.

Di Achille G.  Popa C.  Silvestro S.  Wray J. J.  Carrozzo F. G.  et al.  POSTER LOCATION #483
High Resolution Morphometry and Mineralogy of the Shalbatana Paleolacustrine Deposits (Mars) Using MRO HiRISE and CRISM Data [#3027]
We report on the analysis of data recently acquired by the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) over the Shalbatana Vallis paleolake.

Chatzitheodoridis E.  Haigh S.  Lyon I.  POSTER LOCATION #484
Crystalline Clays in an Intriguing Ovoid Structure in Nakhla [#2040]
Ovoid in Nakhla, crystalline clays shown by TEM in walls. Different possible origins of the structure including exobiological are evaluated.

Melwani Daswani M.  Schwenzer S. P.  Wright I. P.  Grady M. M.  POSTER LOCATION #485
Low Temperature Near-Surface Thermochemical Modelling of the Alteration Assemblage in Martian Meteorite ALH 84001 [#2712]
Models of aqueous alteration at low temperature produced secondary mineralogy resembling the observed minerals in early martian meteorite ALH 84001.

Robertson K. M.  Milliken R. E.  Ruff S.  Farmer J.  Shock E.  POSTER LOCATION #486
Can Vis-NIR Reflectance Spectra be used to Assess Formation Environments of Opaline Silica on Mars? [#1612]
Opaline silica deposits from different environments are analyzed. We assess whether VIS-NIR spectral properties can distinguish between formation environments.

Horgan B.  Smith R.  Mann P.  Stromberg J.  Cloutis E. A.  et al.  POSTER LOCATION #487
New Evidence for a Weathering Origin for the High-Silica Component of TES Surface Type 2 on Mars [#3032]
The high-silica component of TES Surface Type 2 is shown to be consistent with leached glass, based on lab spectra and global correlation with near-IR spectra.
Bandfield J. L. Amador E. S. Thomas N. H.  
**POSTER LOCATION #488**

*Extensive Hydrated Silica Materials in Western Hellas Basin, Mars [#1323]*

High concentrations of hydrated silica are present along a 650-km section of Hellas Basin. Neutral pH groundwater is a potential source of the deposits.

Ruff S. W. Hamilton V. E.  
**POSTER LOCATION #489**

*Amorphous Mars: Interpreting Growing Evidence for Poorly/Non-Crystalline Phases in Martian Materials [#1753]*

A growing list of observations of amorphous phases identified in martian materials motivates a reexamination of rocks seen by Spirit that bear such phases.

Tu V. Hausrath E. M.  
**POSTER LOCATION #490**

*Dissolution of Amorphous Al- and Fe-Phosphates: Implications for Phosphate Mobility on Mars [#2577]*

In this study, we measure the dissolution rates of and phosphate release from amorphous Al- and Fe-phosphates, to shed light on phosphate mobility on Mars.

Adcock C. T. Hausrath E. M.  
**POSTER LOCATION #491**

*Interpretation of Phosphate Mobility on Mars Based on Terrestrial Mars-analog Basalts and Reactive Transport Modeling [#2727]*

We examine phosphate mobility in a Mars analog environment and use a reactive transport model informed by analog observations to model Mars phosphate mobility.

Moyano-Cambero C. E. Trigo-Rodríguez J. M. Mestres N. Fraxedas J. Alonso-Azcárate J.  
**POSTER LOCATION #492**

*Studying Carbonate Globules in Allan Hills 84001 to Better Understand Aqueous Alteration in Early Mars [#2063]*

The carbonate globules contained in ALH 84001 can provide interesting information about the early aqueous processes on Mars, as they were formed 3.9 Gyr ago.

**POSTER LOCATION #493**

*Spectral Properties of Ca-, Mg- and Fe-bearing Carbonates [#1719]*

Spectral analyses are presented of several carbonates with variable Ca, Mg, and Fe to improve carbonate chemistry determinations on Mars through remote sensing.

Thomas N. H. Bandfield J. L.  
**POSTER LOCATION #494**

*Identification of Spectral Endmembers in CRISM Data Using Factor Analysis and Target Transformation [#1325]*

We tested CRISM data for the presence of carbonates using target transformation. Our methods also identified phyllosilicates and reduced spectral noise.

Goudge T. A. Mustard J. F. Head J. W. Fassett C. I.  
**POSTER LOCATION #495**

*Jezero Crater Paleolake, Mars: Assessing the Nature and Provenance of Alteration Minerals and Carbonates [#1376]*

The morphology and mineralogy of the Jezero crater paleolake and watershed have been investigated to assess the origin of hydrated minerals within the basin.

Wiseman S. M. Mustard J. F. Ehlmann B. L.  
**POSTER LOCATION #496**

*Assessing Variability Among Carbonate-Bearing Deposits on Mars [#2865]*

We further characterize spectral diversity and geologic context of carbonate deposits on Mars with a focus on Nili Fossae. Small-scale variation is evident.

Edwards C. S. Ehlmann B. L.  
**POSTER LOCATION #497**

*The Nili Fossae Carbonate Plains as Viewed by TES, THEMIS, and CRISM: Alteration of Ultramafic Rocks and Clay-Carbonate Stratigraphy [#2424]*

We provide a linked view of geologically significant units in Nili Fossae using multiple compositional datasets to constrain the geologic history of the region.
Liberi F. Pompilio L. Marinangeli L. Piluso E. Rosatelli G. et al. \textit{POSTER LOCATION} #498
\textit{The Search of Carbonates on Mars: Volcanic Versus Sedimentary Origin} [\#1997]
We compare the mineralogy of carbonates on Mars and terrestrial carbonatites using XRD and reflectance spectroscopy to unravel the origin of carbonates on Mars.

Carrozzo F. G. Bellucci G. Altieri F. D’Aversa E. \textit{POSTER LOCATION} #499
\textit{Detection of Carbonate Bearing-Rocks in Craters Uplifts of Tyrrhena Terra, Mars} [\#2241]
In this work we report the putative orbital detection of carbonates in the uplift of two unnamed craters in Tyrrhena Terra using CRISM data.

McHenry L. J. Ruffini J. M. Gerard T. L. Walters G. L. \textit{POSTER LOCATION} #500
\textit{Secondary Minerals in Basaltic Caves: Analog for Mars Surface and Subsurface Mineralogy} [\#2758]
Basaltic caves in Idaho, California, and Hawaii preserve secondary hematite, silica, and soluble sulfates, similar to those observed at Meridiani Planum, Mars.

\textit{Oxidative Weathering on Mars and Implications for Chemical Alteration During the Amazonian Epoch} [\#1339]
Oxidative weathering products are modeled at high abundances across the martian surface, implying cold and dry alteration processes during the Amazonian epoch.

Yant M. H. Rogers A. D. Nekvasil H. Zhao Y.-y. S. \textit{POSTER LOCATION} #502
\textit{Spectral Characterization of Acid Weathering on Martian Basaltic Glass} [\#1543]
Synthetic martian basalt geochemical experiments linked with IR spectral measurements, in order to understand surface weathering on Mars.

Leftwich K. M. Bish D. L. Chen C. H. \textit{POSTER LOCATION} #503
\textit{Crystal Structure of a New Na$_2$Mg(SO$_4$)$_2$*16H$_2$O Hydrate Phase Measured Under Mars-Relevant Conditions} [\#2795]
This work describes the crystal structure of a new, low-temperature phase in the Na$_2$Mg(SO$_4$)$_2$-H$_2$O system that is stable under most martian conditions.

Nuding D. L. Gough R. V. Chevrier V. F. Tolbert M. A. \textit{POSTER LOCATION} #504
\textit{Deliquescence of Calcium Perchlorate: An Investigation of Stable Aqueous Solutions Relevant to Mars} [\#2584]
To understand the phase of Ca(ClO$_4$)$_2$ on the martian surface, we report the humidity where deliquescence and efflorescence occur over a range of temperatures.

Cull S. Kennedy E. Clark A. \textit{POSTER LOCATION} #505
\textit{Complex Distribution of Perchlorate at the Mars Phoenix Landing Site} [\#1593]
Multispectral mapping of the Mars Phoenix landing site shows perchlorate salt widely distributed in concentrated patches, both on the surface and subsurface.

Quinn R. C. Pacheco D. J. \textit{POSTER LOCATION} #506
\textit{Production of Chlorinated Hydrocarbons During the Thermal Decomposition of Metal Carbonates and Perchlorate Salts} [\#2664]
We show that the thermal decomposition of carbonates in the presence of metal catalysts and perchlorates can result in the formation of CH$_3$Cl and CH$_2$Cl$_2$.

Toner J. D. Catling D. C. Light B. \textit{POSTER LOCATION} #507
\textit{Reanalysis of Wet Chemistry Laboratory Data with Implications for Parent Salt Assemblages at the Phoenix Site} [\#1639]
Investigation of data from the Mars Phoenix Wet Chemistry Laboratory experiment using improvements to original analyses, including Kalman noise filtering.
<table>
<thead>
<tr>
<th>Poster Location</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>#508</td>
<td>Chloride-Fe/Mg Clays Deposits on Mars: Morphologic and Age Constraints from a Selected Site</td>
<td>Ruesch O.  Poulet F.  Vincendon M.  Erkeling G.  Reiss D.  et al.</td>
</tr>
<tr>
<td>#2210</td>
<td>Insights into the formation processes and the timing of chloride–Fe/Mg clay-bearing deposits on Mars.</td>
<td></td>
</tr>
<tr>
<td>#509</td>
<td>Distribution, Detection, and Implications of Chlorine Salts on Mars</td>
<td>Hanley J.  Chevrier V. F.  Mellon M.</td>
</tr>
<tr>
<td>#2923</td>
<td>Chlorine is on Mars / May be oxidized or not / Crucial for water.</td>
<td></td>
</tr>
<tr>
<td>#510</td>
<td>Spectral Reflectance Properties of Common Metal-Oxalates Exposed to Simulated Mars Surface Conditions: Implications in the Search for Extinct or Extant Life on Mars</td>
<td>Applin D. M.  Cloutis E. A.  Izawa M. R. M.</td>
</tr>
<tr>
<td>#2839</td>
<td>Spectral reflectance (0.35–5.2 μm) properties of Ca and Mg-oxalates when exposed to simulated Mars surface conditions are investigated.</td>
<td></td>
</tr>
<tr>
<td>#511</td>
<td>Mid-Infrared Spectral Effects of Thermally Isolated Dust Coated Surfaces</td>
<td>Rivera-Hernández F.  Bandfield J. L.  Ruff S. W.</td>
</tr>
<tr>
<td>#2674</td>
<td>Laboratory measurements and modeling are combined to understand the behavior and underlying physics of how thin dust coatings can affect TIR spectral data.</td>
<td></td>
</tr>
<tr>
<td>#1614</td>
<td>The efficacy of both the Hapke and Shkuratov models is assessed in estimating modal mineralogy of montmorillonite-gypsum mixtures in the VNIR wavelength range.</td>
<td></td>
</tr>
<tr>
<td>#2337</td>
<td>We present numerical models to assess quantitatively how wrong it is to assume that Mars minerals do not clump and whether it misleads spacecraft identifications.</td>
<td></td>
</tr>
<tr>
<td>#514</td>
<td>Initial Estimates of Optical Constants of Mars Candidate Materials</td>
<td>Roush T. L.  Brown A.  Bishop J.  Blake D.  Bristow T. F.</td>
</tr>
<tr>
<td>#1297</td>
<td>We estimated visible and near-infrared optical constants of H2O- and OH-bearing materials to enable their quantitative abundance determination on Mars.</td>
<td></td>
</tr>
<tr>
<td>#515</td>
<td>Visible and Near Infrared Optical Constants of Synthetic Jarosite</td>
<td>Sklute E. C.  Glotch T. D.  Woerner W.</td>
</tr>
<tr>
<td>#2142</td>
<td>VNIR data for three grain sizes of a synthetic K-jarosite were processed using a Hapke inversion to obtain the wavelength dependent optical constants n and k.</td>
<td></td>
</tr>
<tr>
<td>#2623</td>
<td>We will apply a PIXON reconstruction technique to the MONS epithermal data over the full surface of Mars to produce an accurate H distribution map.</td>
<td></td>
</tr>
<tr>
<td>#517</td>
<td>Reappraisal of Mars 3µm Water Spectral Feature Using OMEGA/Mex</td>
<td>Audouard J.  Poulet F.  Vincendon M.  Bibring J. -P.  Gondet B.  et al.</td>
</tr>
<tr>
<td>#2127</td>
<td>We study the 3-µm water spectral feature using four martian years of OMEGA data. We intent to discriminate the different contributors to this ubiquitous absorption.</td>
<td></td>
</tr>
<tr>
<td>#1273</td>
<td>JMARS stands for Java Mission-planning and Analysis for Remote Sensing. We will develop a chemical composition detection tool and implant it in JMARS.</td>
<td></td>
</tr>
</tbody>
</table>
**POSTER LOCATION #519**

*CRISM Hyperspectral Targeted Observation Local Area Mosaics [#2563]*

We report on a CRISM hyperspectral targeted observation mosaicking procedure that supports the generation of scientifically compelling local area mosaics.

**POSTER LOCATION #520**

*Mapping Minerals on Mars with CRISM: Atmospheric and Photometric Correction for MRDR Map Tiles, Version 2, and Comparison to OMEGA [#1581]*

We assess a new version (version 2, v2) of photometric and atmospheric corrections applied to 72-band multispectral mapping data from the CRISM instrument.

Rohani N.  Parente M.  
**POSTER LOCATION #521**

*Endmember Detection in CRISM Images Using Graphs [#2894]*

Endmembers, the boundary points of the data cloud, have the smallest value of betweenness centrality. The spectra of endmembers detected for two images are given.

---

Ivanov A. B.  Frigeri A.  
**POSTER LOCATION #523**

*Geographic Information System (GIS) Database for MARSIS Data [#1983]*

This is a pilot project to create a GIS-enabled database of MARSIS data. We expect to showcase a prototype and collect community feedback on its features.

Hargitai H. I.  
**POSTER LOCATION #524**

*Live Monitoring of Development of Ice and Snow Features as Planetary Analogs on Lake Balaton [#2162]*

The development of features in ice and of snow bedforms on ice was monitored during the winter of 2011/2012 on Lake Balaton, Hungary.

Becerra P.  Byrne S.  Brown A. J.  
**POSTER LOCATION #525**

*Frost Halos on the South Polar Residual Cap of Mars [#1284]*

We present the analysis of observations of bright albedo features that appeared in 2007 around pits and scarps in the south polar residual cap of Mars.

Portyankina G.  Pommerol A.  Aye K.-M.  Hansen C.  Thomas N.  
**POSTER LOCATION #526**

*Spring Sublimation on Mars: Do Northern and Southern Hemispheres tell us the Same Story? [#1776]*

Similarities in spring activity that we observe in polar areas point to that processes related to the solid state greenhouse effect act in both hemispheres.

Hansen C. J.  Byrne S.  Bourke M. C.  McEwen A. S.  Pommerol A.  et al.  
**POSTER LOCATION #527**

*HiRISE Images and Investigation of Northern Spring on Mars [#1805]*

Three northern martian springs have been studied using HiRISE, the imager on MRO, to investigate seasonal processes and interannual variability.

Russell P. S.  Byrne S.  Pathare A.  
**POSTER LOCATION #528**

*Geographic Variation and Seasonal Evolution of Steep North Polar Scarps on Mars [#2940]*

Systematic and quantitative characterization of NPLD scarps w/ slope >30° and track seasonal changes at two scarps.

Alam M.  Selvans M. M.  Campbell B. A.  Watters T. R.  
**POSTER LOCATION #529**

*Identifying Concentrated Layering in the Basal Unit of Planum Boreum, Using SHARAD Data [#3014]*

We examine SHARAD radargrams for layers in the basal unit of Planum Boreum at Mars’ north pole.
Object Based Image Analysis for Remote Sensing of Planetary Surfaces [ID1527]
Method validity of object-based image analysis with respect to the study of surface geomorphology of the martian south polar cap.

Density Variations of Seasonal CO₂ at the Phoenix Landing Site, Mars [ID2535]
Density of seasonal CO₂ ice was analyzed at the Phoenix Landing Site in MY 29. We propose that the ice begins as snow, anneals into slab, and then fractures.

Thermally induced stresses within ice are modeled and found to be a plausible explanation for the highly fractured appearance of steep martian polar cliffs.

Earliest Accumulation History of the North Polar Layered Deposits, Mars from SHARAD Radar-Facies Mapping [ID2460]
Detailed mapping of the lowermost NPLD with many SHARAD observations reveals two depositional retreats that may correlate with modeled NPLD growth.

We present a new approach to constraining the volume of CCF deposits on Mars based on crater depth/diameter profile relationships and CTX image data.

Ground-Based Thermal Analysis of a Terrestrial Rock Glacier as an Analog to Martian Lobate Debris Aprons [ID2936]
Cold at night, dawn breaks / Albedo, slope, rock — respond / Thermal inertia. Rock and ice flowed / Downhill once, sorting — still now / We imagine... Mars.

Inter-Laboratory Investigations of the Effects of Particulates on flow of Fine-Grained Ice [ID2739]
Experiments at Brown and MIT show that small amounts of dust significantly affect ice rheology: Differences in lab results may elucidate governing mechanisms.

We explore a glacial substrate model for double-layered ejecta (DLE) crater formation, wherein an ice and snow layer is responsible for their characteristics.

The characteristics of perchlorate brines for in situ segregation and habitability are explored.

A comparison of quantitative geometric and topological parameters that have been collected from examples of terrestrial and martian polygonal networks.
Bramson A. M.  Byrne S.  Mattson S.  Plaut J. J.  
**POSTER LOCATION #540**

**Terraced Craters and Subsurface Ice in Arcadia Planitia, Mars [2905]**

We map terraced craters in a region where SHARAD detects a subsurface reflection to constrain the depth of the interface and thus the composition of the layer.

Haltigin T. W.  Dutilleul P.  Pollard W. H.  
**POSTER LOCATION #541**

**Landform Scale Co-Evolution of Polygonal Terrain Networks and Scalloped Depressions, Utopia Planitia, Mars [2849]**

We provide evidence that the development of two separate surface features are intrinsically linked, demonstrating that the landscape is a co-evolving system.

Landis M. E.  Barlow N. G.  
**POSTER LOCATION #542**

**Impact Crater Analysis of Southcentral Arabia Terra and Implications for Volatiles [1293]**

We are using crater morphologies to investigate the role of surficial and subsurface volatiles in the evolution of the ancient Arabia Terra region of Mars.

Pathare A.  Winebrenner D.  Kountik M.  Waddington E.  
**POSTER LOCATION #543**

**Glacial Flow Modeling of Martian Lobate Debris Aprons [2687]**

We will utilize a glacial flow model incorporating slope-dependent sublimation to assess whether martian lobate debris aprons share a common global rheology.

Bondarenko N. V.  Dulova I. A.  Kornienko Yu. V.  
**POSTER LOCATION #544**

**Improved Photoclinometry Method: Topography of Large-Scale Polygons at the Phoenix Landing Site from a set of Images [2669]**

Using the improved photoclinometry method we estimated that topographic amplitude of 50–90-m polygons in the vicinity of Phoenix landing site is 35–50 cm.

Beach M. J.  Head J. W.  
**POSTER LOCATION #545**

**Constraints on the Timing of Obliquity Variations During the Amazonian from Dating of Glacial-Related Concentric Crater Fill Deposits on Mars [1161]**

We test the obliquity history of Mars, using the distribution of ages of concentric crater fill deposits as a proxy for periods of ice migration.

Arfstrom J. D.  
**POSTER LOCATION #546**

**A Valley Glacier Remnant of the Main Trough of Kasei Valles, Mars [1002]**

It appears that the head of the main trough of Kasei Valles contains the remnant of a valley glacier.

Kerrigan M. C.  Osinski G. R.  Van De Wiel M.  
**POSTER LOCATION #547**

**The Periglacial Landscape of Utopia Planitia; Geologic Evidence for Recent Climate Change on Mars [2651]**

We map the periglacial landscape of Utopia Planitia and combine geologic evidence with climate model predictions to reconstruct recent climate change on Mars.

Ivanov M. A.  Hiesinger H.  Erkeling G.  Reiss D.  
**POSTER LOCATION #548**

**Evidence for possible Hesperian Glaciation in Utopia Planitia on Mars [1127]**

Ridges near contact of VBF in southern Utopia Planitia may represent eskers/moraines and suggest large-scale glaciation in this region during the late Hesperian.
Hobbs S. W.  Paull D. J.  Clarke J. D. A.  

_**POSTER LOCATION #549**_

*A Comparative Analysis of Semi-Arid and Periglacial Gullies — Implications for Mars* [#1095]

We analysed periglacial gullies in New Zealand and semi-arid gullies in South Australia and compared them to gullies in Noachis Terra, Mars.

---

**POSTER SESSION II: PLANETARY AEOLIAN PROCESSES:
EROSION, DEPOSITION, BEDFORMS, AND SIMULATIONS**

**Thursday, 6:00 p.m.  Town Center Exhibit Area** [R729]

Williams D. A.  

**POSTER LOCATION #550**

*NASA’s Planetary Aeolian Laboratory:  Exploring Aeolian Processes on Earth, Mars, and Titan* [#1226]

This presentation reviews the facilities, equipment, and new procedures to use NASA’s Planetary Aeolian Lab, including wind tunnels to conduct aeolian research.

Kienenberger R. L.  Greeley R.  Williams D. A.  

**POSTER LOCATION #551**

*Distribution of Windblown Sediment in Small Craters on Mars:  Preliminary Wind Tunnel Simulations* [#1670]

We present the results of preliminary wind tunnel simulations for comparison to asymmetric aeolian deposits within secondary craters in Gusev Crater, Mars.

Mills N. T.  Radebaugh J.  Le Gall A.  

**POSTER LOCATION #552**

*Ongoing Measurements of Dune Width and Spacing on Titan Reveal Dune Field Properties* [#2305]

Saturn’s moon Titan is home to dunes similar to those found on Earth. Measurements of dune parameters have been made in order to help interpret Titan’s climate.

Arnold K.  Radebaugh J.  Le Gall A.  Turtle E. P.  Lorenz R. D.  et al.  

**POSTER LOCATION #553**

*Total Sand Volume Estimates on Titan from Cassini SAR, HiSAR, and ISS* [#2457]

The total organic inventory from dunes on Saturn’s moon, Titan, measured in SAR and HiSAR images is ~150,000–300,000 km³ or ~14% global coverage.

Hayward R. K.  Fenton L. K.  Titus T. N.  

**POSTER LOCATION #554**

*Mars Global Digital Dune Database:  Global Wind Direction Observations* [#1075]

We discuss global distribution of dune fields and discuss global wind directions, as derived from dune centroid azimuth and slipface orientations.

Sefton-Nash E.  Teanby N. A.  Clancy R.  Newman C.  

**POSTER LOCATION #555**

*Comparison of Short and Long-Lived Aeolian Feature Orientation with GCM Vectors to Infer Past Climate Variability on Mars* [#3074]

We compare short (dune) and long-lived (yardang) aeolian feature orientation with GCM vectors to infer past climate variability on Mars.


**POSTER LOCATION #556**

*Mars Albedo Changes During 2004–2010* [#2221]

We used OMEGA data to calculate the hemispherical solar albedo of Mars’ surface. Observations obtained over 4 Mars years show major and noncyclic surface changes.

Chilton H.  Phillips C.  

**POSTER LOCATION #557**

*Temporal Contrast Changes in Dark Slope Streak on Mars* [#3109]

We attempt an initial evaluation of changes in Mars dark slope streak brightness relative to surroundings, corrected for incidence angle based on MOLA data.
<table>
<thead>
<tr>
<th>Poster Location</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>#558</td>
<td>Automated Image Analysis for Measuring Size and Shape of Martian Sand Grains: A Tool to Estimate Threshold Shear Velocities and to Compare Different Sand Samples</td>
<td>Kozakiewicz J.</td>
</tr>
<tr>
<td>#559</td>
<td>The Accuracy of 2D Assessment of Sediment Textures, and Application to Mars</td>
<td>Friday M. E., Fedo C. M., McGlynn I. O., McSween H. Y.</td>
</tr>
<tr>
<td>#560</td>
<td>Automated Determination of Martian Dust Devil Tracks Main Direction</td>
<td>Statella T., Pina P., Silva E. A.</td>
</tr>
<tr>
<td>#561</td>
<td>Albedo Contrast Determination in the Neighbourhood of Martian Dust Devil Tracks</td>
<td>Statella T., Pina P., Silva E. A.</td>
</tr>
<tr>
<td>#562</td>
<td>Dust Devil Horizontal Velocities and Directions of Motion on Mars Derived from CRISM and CTX/HiRISE Observations</td>
<td>Reiss D., Spiga A., Erkeling G.</td>
</tr>
<tr>
<td>#563</td>
<td>Thermophysical Characteristics of Mantled Terrestrial Volcanic Surfaces: Infrared Analogs to the Arisa Mons Flows</td>
<td>Price M. A., Ramsey M. S., Crown D. A.</td>
</tr>
<tr>
<td>#564</td>
<td>Pervasive Aeolian Activity Along Rover Curiosity’s Traverse in Gale Crater, Mars</td>
<td>Silvestro S., Vaz D. A., Ewing R. C., Rossi A. P., Fenton L. K., et al.</td>
</tr>
</tbody>
</table>
Baskakova M. A.  Kreslavsky M. A.  Karachevtseva I. P.  

*POSTER LOCATION #568*

*Aeolian Bedforms in Tharsis, Mars: New Insight from Populations of Small Craters [#1104]*

Aeolian bedforms are currently inactive, but were active in the geologically recent past. This indicates changes in wind regimes and/or atmospheric pressure.

Johnson M. B.  Zimbelman J. R.  

*POSTER LOCATION #569*

*Characterization of Small Sand Dunes on Mars [#2111]*

Ripples on sand dunes provide information about recent wind patterns. Mapping these features will further the understanding of martian winds and dune formation.

Berman D. C.  Balme M. R.  Michalski J. R.  Michaels T. I.  

*POSTER LOCATION #570*

*Further Investigations of Transverse Aeolian Ridges on Mars [#2359]*

We examine TARs in terms of their morphology/morphometry, mapping deposits, comparison with meteorology, composition, and their age and changes in time.

Sullivan R.  Zimbelman J.  

*POSTER LOCATION #571*

*Wind Tunnel and Field Studies of Coarse-Grained Ripples, Analogs for Features Examined at both MER Sites on Mars [#2219]*

Coarse-grained ripples (common at some Mars landing sites) are evaluated in the field and the lab to indicate how they might be recognized in ancient martian rocks.

Szumila I. T.  Bishop J. L.  Fenton L. K.  Brown A. J.  

*POSTER LOCATION #572*

*Composition and Morphology of Gypsum Dunes in Olympia Undae on Mars [#2123]*

Our analyses showed that gypsum is more abundant in primary dune crests than in secondary dunes and that TARs have been fully reoriented by the NE wind.

Ahrens C. J.  Titus T. N.  

*POSTER LOCATION #573*

*Mineral Analysis of Martian Dunes: Sediment Composition of Martian Dune Fields Using the Thermal Emission Spectrometer [#2096]*

In our study on mineral percentage conformity of the martian dune site, we evaluated Thermal Emission Spectrometer data and studied our analysis technique.

Tirsch D.  Sowe M.  Kneissl T.  Jaumann R.  

*POSTER LOCATION #574*

*Constraining the Exposure Time of the Dark Dune Material on Mars [#1928]*

We determine the maximum time of the dark aeolian sediment’s exposure to the martian atmosphere by determining the age of surfaces featuring emerging material.

Smith I. B.  Holt J. W.  Spiga A.  Howard A. D.  

*POSTER LOCATION #575*

*Aeolian Processes as Drivers of Landform Evolution on the South Pole of Mars [#1240]*

Visual observations and atmospheric modeling are combined to study the wind regime of the SPLD. Processes are similar to but more complicated than in the north.

Schwegman R. D.  Bourke M. C.  

*POSTER LOCATION #576*

*Analysis of Rock Breakdown Features at Gusev Crater Mars [#3086]*

Facet mapping technique applied to martian rocks can distinguish breakdown features between rock types.


*POSTER LOCATION #577*

*A New Feature on Jupiter: Comparison with Saturn’s Ribbon [#1110]*

Jupiter images from 2007 to present show a wavy feature at 30°N latitude, similar to Saturn’s “ribbon.” Its nature is studied and compared to the Saturn feature.
Takahashi Y.  Kuramoto K.  Hashimoto G. L.  Onishi M.  
What Controls the Tropopause Level of the Jovian Atmosphere? [2571]
The tropopause of the jovian atmosphere likely exists at 0.5-bar level or deeper. The visible cloud of Jupiter is implied to be mostly stratospheric cloud of NH₃.

Tejfel V. G.  Vdovichenko V. D.  Kirienko G. A.  Kharitonova G. A.  
Spectrophotometric Study of the Changes on Jupiter in 2009–2011 [1205]
The behavior of molecular absorption bands during SEB disappearance in 2010 has been studied.

The Effect of Metallicity on the Atmospheric Composition of GJ 436b [2678]
We explore how metallicity affects the composition of the “hot Neptune” exoplanet GJ 436b. Results are compared with Spitzer eclipse observations.

Zheng X. C.  Tian F.  
The Upper Atmosphere of 55 Cnc e [1475]
In this work we study the atmosphere stability of 55 Cnc e and the detectability of a possible carbon ion cloud surrounding the planet.

Simoncini E.  Grassi T.  
We introduce a new methodology (physical and computational) to calculate the extent of chemical disequilibrium of planetary atmospheres.

McMahon S.  James J. O.  Parnell J.  
Circumstellar Habitable Zones for Deep Biospheres [2931]
We extend the traditional habitable zone concept for planets with deep subsurface biospheres.

Tian F.  
Photochemistry in the Atmospheres of Habitable Planets Surrounding M Dwarfs [1953]
We model habitable planet’s atmospheres under UV spectra of M dwarfs, focusing on whether oxygen can build up to detectable levels by future TPF-like mission.

Williamson H. N.  Grebowsky J. M.  
Coordinate Transformations of Low Beta Regions in the Nightside Venus Ionosphere [1237]
We created a new coordinate system dependent on the direction of the interplanetary magnetic field to examine low-β regions in the venusian ionosphere.

Fukuhara T.  Taguchi M.  Futaguchi M.  Imamura T.  
Characteristic Features in Venus’ Cloud-Top Temperature Obtained by Akatsuki/LIR [1965]
This shows Venus nightside hemisphere obtained by the Longwave Infrared Camera (LIR) onboard Akatsuki, which is Japanese Venus climate orbiter.

Limaye S. S.  Kremic T.  Crisp D.  Glaze L. S.  Rodin A.  
Needed Observations near the Cloudtop Region of Venus and Potential Means to Obtain them [2728]
Needed observations near the cloudtops of Venus and the potential means to obtain them based on what we have learned about Venus to date from previous observations.

Scanlon K. E.  Head J. W.  
Downslope Winds and Melting Events in the Antarctic Dry Valleys and on Mars [2775]
We investigate the effects of foehn episodes on meltwater production in the Antarctic Dry Valleys and whether downslope winds could have melted ice on Mars.
Nuno R. G.  Paige D. A.  Zurek R. W.  

**POSTER LOCATION #589**

*Searching for Localized Water Vapor Sources on Mars Utilizing Viking MAWD Data [2794]*

We searched the raster averaged MAWD dataset for localized spikes of column water vapor content at mid-latitude regions, and found 87 points of interest.

Bapst J.  Wood S. E.  

**POSTER LOCATION #590**

*Seasonal Release of Water Vapor by Ground Ice on Mars: Implications for Surface Frosts and Atmospheric Water Abundance [2819]*

Seasonal subsurface water frost sublimates in late winter/early summer; possible diffusion of tens of precipitable micrometers of vapor to the surface/atmosphere.

Brown A. J.  Wolff M. J.  

**POSTER LOCATION #591**

*Climatology of the Martian Polar Regions: Three Mars Years of CRISM/MARCI Observations of Atmospheric Clouds and Dust [1874]*

We present the synthesis of CRISM EPF and MARCI data to examine the evolution of atmospheric water ice and dust opacity at both poles for MY 28–30.

Kerber L.  Forget F.  Wordsworth R.  

**POSTER LOCATION #592**

*Sulfur in the Early Martian Atmosphere Revisited: Experiments with a 3-D Global Climate Model [2296]*

The effect of SO$_2$, H$_2$S, and H$_2$SO$_4$ on the early martian atmosphere is explored using a 3-D global climate model.

Pandya S. H.  Joshipura K. N.  Vaishnav B. G.  

**POSTER LOCATION #593**

*Electron Interaction with the Dry Ice (CO$_2$ Ice) in the Polar Cap Regions of Planet Mars [2183]*

The present paper depicts our novel approach to consider for the electron inelastic interactions with dry ice in the polar cap regions of Mars.

Pandya S. H.  Joshipura K. N.  

**POSTER LOCATION #594**

*Electron Density and Ion Production Rate Calculations over the Martian Atmosphere [2147]*

As India and US are expecting Mars mission this year, we have planned to study the martian upper atmosphere-ionosphere by our quantum mechanical approach.

Takahashi Y. O.  Hayashi Y.-Y.  

**POSTER LOCATION #595**

*Meridional Circulation of Martian Middle Atmosphere Simulated by a Mars General Circulation Model [1464]*

Meridional circulation of martian middle atmosphere is investigated by use of Mars atmosphere general circulation model.

Leung C. W.S.  

**POSTER LOCATION #596**

*Mesoscale Meteorological Modeling at Gale Crater [2477]*

We investigate the atmosphere-surface interactions and wind regimes in the planetary boundary layer forced by heating and cooling over the regional topography.


**POSTER LOCATION #597**

*Evidence for Significantly Enriched Heavy Oxygen in Mars Atmosphere [3040]*

We present evidence for diurnal exchange of heavy isotope-enriched carbon dioxide between the Mars atmosphere and regolith.

Manga M.  Patel A.  Delbridge B.  Knappe E.  Birch S.  et al.  

**POSTER LOCATION #598**

*Constraints on Surface Conditions and Atmospheric Density Inferred from the Bomb Sag at Home Plate, Mars [1109]*

Experiments are used to interpret the bomb sag imaged by Spirit. We infer a wet surface. The penetration depth implies a much more dense atmosphere than today.
**POSTER LOCATION #600**

*Finalization of the Global Geologic Map of Europa [#2978]*
We present an update on the 1:15M global geologic map of Europa with insight into the formation and stratigraphic relationships between chaos and linea.

White O. L.  Schenk P. M.  
**POSTER LOCATION #601**

*A New Global Topographic Map of Io Using Galileo Stereo and Limb Data [#2484]*
We are creating a global topographic map of Io, controlled using Galileo limb profiles, which also represent an independent topographic database.

**POSTER LOCATION #602**

*Crater Dating of Geological Units on Mars: Methods and Application for the New Global Geological Map [#2340]*
For the new global geological map of Mars unit model ages were determined in a consistent way. Applied methods and approaches are described in detail.

Crown D. A.  Berman D. C.  Chuang F. C.  
**POSTER LOCATION #603**

*Geologic Mapping of the Southern Extent of Tharsis Volcanism in MTM -35137 Quadrangle, Daedalia Planum, Mars [#2499]*
Geologic and flow field mapping are being used to understand the styles and timing of volcanism at the southern margin of the Tharsis region of Mars.

Bleacher J. E.  Williams D. A.  Mouginis-Mark P. J.  Shean D.  Greeley R.  
**POSTER LOCATION #604**

*Geologic Map of the Olympus Mons Volcano, Mars [#2074]*
We discuss results from our geologic mapping project of the Olympus Mons volcano, Mars.

Garry W. B.  Williams D. A.  Bleacher J. E.  
**POSTER LOCATION #605**

*Geologic Mapping of Arsia and Pavonis Montes, Mars [#1647]*
Geologic mapping of two of the three Tharsis Montes volcanoes. Lava in the sky. A duo of a trio. Not paint by numbers.

Smith M. C.  Spudis P. D.  
**POSTER LOCATION #606**

*Geological Map of the Nectaris Basin and its Deposits [#1248]*
The purpose of this project is to update the geological map of the Nectaris basin in light of new data and to unravel its stratigraphy.

Fortezzo C. M.  Hare T. M.  
**POSTER LOCATION #607**

*Completed Digital Renovation of the 1:5,000,000 Lunar Geologic Map Series [#2114]*
We have completed digitizing the 1.5M-scale lunar maps to LOLA and WAC global basemaps and have them available for use in geographic information system formats.

Mest S. C.  Calzada-Diaz A.  Bleacher J. E.  Petro N. E.  Yingst R. A.  
**POSTER LOCATION #608**

*Update on the Scientific Characterization of Lunar Regions of Interest [#2630]*
We are using several datasets to characterize the geology, develop hypothetical traverses, and evaluate the scientific “value” of each lunar region of interest.
The Lunar Impact Crater Database: Update From the Polar Regions

We report on the construction of the Catalog of Large Lunar Impact Craters (diameters > 5 km), which here focuses on the north and south polar regions.

Hargitai H. I.

Art of Landing Site Cartography

We give examples of scientific maps and outreach maps of landing sites with special attention to its map design suitable for children.

Speyerer E. J. Lawrence S. J. Stopar J. D. Robinson M. S.

Traverse Planning Using Elevation Models Derived from LROC NAC Images

We describe a least-energy traverse planning tool that integrates LROC NAC DEMs and other data products to facilitate the design of future surface missions.

Calzada-Diaz A. Mest S. C.

Cartography and Design of Traverses for Future Scientific Expeditions to Mare Moscoviense ROI

A map of Mare Moscoviense ROI was created using data from Clementine and LRO missions. Three hypothetical traverses were designed to address geological questions.

Huang Yong. Hu X. Liu Q.

Relative Position Determination Between Lunar Lander and Rover Using Same Beam VLBI Technique

The simulation shows relative position accuracy between the lunar lander and the rover on the Chang’e-3 mission using same beam VLBI data will be better than 50 m.

Henriksen M. R. Robinson M. S. Speyerer E. J.

Overview of Lunar Reconnaissance Orbiter Camera Reduced Data Products

Images acquired by the Lunar Reconnaissance Orbiter Camera have been reduced into a set of publicly released digital map products and image mosaics.


Precision of “Tile-by-Tile” Photometric Solutions from LROC WAC Images

We performed uncertainty analysis of photometrically normalized images from the “tile-by-tile” method.


Data Visualization System and Data Utilization Promotion Activities of SELENE (Kaguya)

“Kaguya 3-D GIS” become more familiar application and promotion of data utilization of SELENE data will be into next stage.

McBride M. J. Williams D. R. Hills H. K. Turner N. E.

First Time Analysis of Completely Restored DTREM Instrument Data from Apollo 14 and 15

The Apollo 14 and 15 Dust, Thermal and Radiation Engineering Measurement (DTREM) datasets were restored and analyzed as a digital dataset for the first time.


Analysis of Light Time and Stellar Aberration Corrections in ISIS Using Lunar Reconnaissance Orbiter Narrow Angle Camera Images

Presents an analysis of light time and stellar aberration corrections in ISIS using images from the LROC Narrow Angle Camera and Apollo-era retroreflectors.
Anderson J. A.

*POSTER LOCATION #619*

Comparing Patch Orthorectification Algorithms in ISIS Based on Camera Type [#2069]

Comparison of ISIS patch orthorectification algorithms for framing, linescan/pushbroom, and pushframe cameras.


*POSTER LOCATION #620*

Support and Future Vision for the Integrated Software for Imagers and Spectrometers (ISIS) [#2546]

The new support process and future vision for the USGS ISIS package is discussed.

Becker K. J. Anderson J. A. Weller L. A. Becker T. L.

*POSTER LOCATION #621*


ISIS provides support for NASA mission instrument ground data processing systems. These collaborations have matured and improved ISIS for research scientists.

Hare T. M. Gaddis L. R. Baile M. S. LaVoie S. K.

*POSTER LOCATION #622*

Astropedia Annex: A PDS Imaging Node Repository for Geospatial Planetary Research Products [#2044]

Astropedia Annex is a new delivery portal in development by the PDS Imaging Node to support scientists who use PDS data to create derived geospatial products.

Baile M. S. Sucharski R. M. Akins S. W. Hare T. M. Gaddis L. R.

*POSTER LOCATION #623*

Using the PDS Planetary Image Locator Tool (PILOT) to Identify and Download Spacecraft Data for Research [#2246]

The Planetary Image Locator Tool (PILOT) is a web-based interface (http://pilot.wr.usgs.gov) that provides robust access to Planetary Data System image sets.

Archinal B. A. Becker T. L. Lee E. M. Edmundson K. L.

*POSTER LOCATION #624*

Initial Global Control Network and Mosaicking of ISS Images of Titan [#2957]

We report on the science and exploration enabling first global (all longitudes, +45° to −65° latitude) control network and controlled ISS mosaics of Titan.


*POSTER LOCATION #625*

Topographic Mapping of Titan: Completion of a Global Radargrammetric Control Network Opens the Floodgates for Stereo DTM Production [#2898]

Having controlled Cassini RADAR images of Titan, we are rapidly producing new topographic maps, revealing the secrets of the southern hemisphere.

Laura J. Hare T. M. Gaddis L. R.

*POSTER LOCATION #626*

Using Python, an Interactive Open-Source Programming Language for Planetary Data Processing [#2226]

Data analysis and visualization for planetary science is explored through three development and implementation use cases.

Garcia P. A. Stefanov W. L. Lofgren G. E. Todd N. S. Gaddis L. R.

*POSTER LOCATION #627*

PDS Archive Release of Apollo 11, Apollo 12, and Apollo 17 Lunar Rock Sample Images [#2646]

The NASA Planetary Data System (PDS) Imaging Node is pleased to announce the release of Lunar Rock Sample Image Archives for Apollo missions 11, 12, and 17.

Rickman D. L. Edmunson J. E.

*POSTER LOCATION #628*

Reference Images from Thin Sections of Lunar Regolith [#2503]

Reference images of lunar soil is needed for education and research. Three thin sections were imaged using reflected, plain and Xnicols. Data will be published by NTRS.

Williams D. R. Hills H. K. Guinness E. A. Taylor P. T. McBride M. J.

*POSTER LOCATION #629*

Lunar Data Node: Apollo Data Restoration and Archiving Update [#1620]

We present an update to the work being done on the restoration and archiving of Apollo data by the Lunar Data Node of the Planetary Data System.
POSTER LOCATION #630
MoonCapture: Concept for Transforming Lunar Document Archives into an Online Lunar Discovery and Planning Tool [#1238]
We discuss MoonCapture, a state of the art semantic web-based knowledge management tool for indepth analysis for lunar mission documentation.

POSTER LOCATION #631
Lunaserv Web Map Service: History, Implementation Details, Development, and Uses [#2609]
The Lunar Reconnaissance Orbiter Camera team developed a new web map service called Lunaserv that streamlines access to large planetary datasets.

POSTER LOCATION #632
Data Selection and Conversion Tool of Japanese Lunar Orbiter Kaguya for Integrated Science Analyses [#1846]
We are developing a data selection and conversion tool to handle Kaguya datasets to promote scientific analyses by combining multiple-instrument datasets.

POSTER LOCATION #633
A New Database of Craters 5-km-Diameter and Larger for the Moon: Western Nearside [#1679]
We are compiling a database of all lunar craters 5 km in diameter and larger. We present results for the western equatorial nearside region.

POSTER LOCATION #634
Albedo Reconstruction of the Apollo Metric Camera Zone [#1649]
The Apollo 15,16 and 17 Metric camera images are used to reconstruct at 10 meters/pixel the lunar albedo and cover approximately 16% of the lunar surface.

POSTER LOCATION #635
The LMMP is a web-based portal that enables lunar scientists, mission planners, and others to access mapped lunar data products from lunar missions.

POSTER LOCATION #636
Towards an International Planetary Data Standard Based on PDS4 [#1815]
The International Planetary Data Alliance (IPDA) and the Planetary Data System (PDS) are working toward a next-generation system based on the PDS4 standard.

POSTER LOCATION #637
Status of the Digitization of Lunar Orbiter Images From Original Master Tapes [#3044]
The Lunar Orbiter Image Recovery Project is digitizing from original master tapes the original images from the Lunar Orbiter Missions. This is our status.

POSTER LOCATION #638
Virtual Astronaut Developed for Selected Sites on Mars [#1204]
NASA’s PDS Geosciences Node’s Virtual Astronaut is a desktop and web-based interactive virtual environment for scientific visualization of Mars orbital and ground data.

POSTER LOCATION #639
Mercator — Using High Resolution Topography for Navigation [#2650]
Mercator generates synthetic panoramas from high-resolution topographic models to match surface-based panoramas to determine the location on the ground.

POSTER LOCATION #640
Inferring Crustal Stress-Strain on Venus Using Shield Fields: A MATLAB Software Tool [#2021]
Shield fields on Venus / Emplaced in response to stress / But when did they form?
Clark C. S.  Clark P. E.  
**POSTER LOCATION #641**
Systematic Utilization of Constant-Scale Natural Boundary Mapping for Interpreting Formation Processes of Celestial Objects [#1245]
We systematically apply CSNB mapping to identify patterns in feature distribution and interpret processes on a global scale on the range of celestial objects.

Neakrase L. D. V.  Huber L.  Rees S.  White D.  Gonzalez E.  et al.  
**POSTER LOCATION #642**
*Beta Testing the PDS4 Archive: Mars Phoenix Revisited [#2150]*
Beta testing of the PDS4 websites for delivering the Mars Phoenix Lander atmospheric data have been reviewed by external reviewers for content and usability.

**POSTER LOCATION #643**
*PlanetServer: Towards Online Analysis of Integrated Planetary Data [#2523]*
PlanetServer is an experimental WebGIS that allows for the online spectral and spatial analysis of hyperspectral CRISM data.

Pompilio L.  Pedrazzi G.  Pepe M.  Marinangeli L.  
**POSTER LOCATION #644**
*CLUEGO, an Informational Hyperspectral Classifier [#2005]*
The present research is focused on the development and testing of an hyperspectral classifier aimed at preserving the informational content of hypercubes.

---

**POSTER SESSION II: VENUS SURFACE AND INTERIOR**
Thursday, 6:00 p.m.  Town Center Exhibit Area [R733]

Graupner Bergmann M.  Hansen V. L.  
**POSTER LOCATION #645**
*Structural and Geologic Mapping of Southern Tellus Regio, Venus: Implications for Crustal Plateau Formation [#1542]*
Detailed mapping of southern Tellus Regio provides critical clues for crustal plateau evolution and has implications for existing formation hypotheses.

López I.  Hansen V. L.  
**POSTER LOCATION #646**
*Concentric Ring Graben Complex in Haasttse-Baad Tessera, Northern Aphrodite Terra (Venus): Endogenic vs Exogenic Origin and Implications [#1986]*
We describe a concentric ring graben complex in Haasttse-Baad Tessera, northern Aphrodite Terra and discuss possible forming mechanisms and their implications.

Hansen V. L.  López I.  
**POSTER LOCATION #647**
*Geologic Mapping of the Niobe and Aphrodite 1:10M Map Areas, Venus: Insights for Mapping Methodology and Implications for Venus Evolution [#2027]*
We present first-order results of geologic mapping of Niobe (0–57N/60–180E) and Aphrodite (0–57S/60–180E) with implications for methodology and Venus evolution.

Guseva E. N.  
**POSTER LOCATION #648**
*Comparative Morphometric Analysis of the Rifts of Venus (Atla, Beta-Phoebe) and Earth (Kenyan-Ethiopian Rift) [#2258]*
Comparison morphometric parameters of the rift valleys of Venus and Earth for possible future estimates of the thickness of lithosphere of Venus.

Lewis K. W.  Simons F. J.  Eggers G. L.  
**POSTER LOCATION #649**
*Maximum Likelihood Estimation of Lithospheric Thickness on Venus [#2612]*
We utilize a new, maximum likelihood-based technique to estimate elastic thickness and loading characteristics of the venusian lithosphere.
D’Incecco P.   Helbert J.  
*Global Scale Characterization of Venusian and Terrestrial Calderas* [#1524]  
In the present study we analyzed the areal and geometrical characteristics of venusian calderas through a comparison with terrestrial counterparts.

Matiella Novak M. A.   Buczkowski D. L.  
*Relative Timing of the Formation of Structural Features Around Irnini Mons, Venus* [#2119]  
An analysis of cross-cutting structural features in the region to better understand the stress history and timing of events associated with Irnini Mons, Venus.

*Planetary Data Access Through the Venus Orbital Data Explorer from the PDS Geosciences Node* [#1310]  
NASA’s PDS Geosciences Node’s Venus ODE supports web-based search and retrieve data from the Magellan mission and Venus-flyby portion of the MESSENGER mission.

Lang N. P.   Thomson B. J.  
*Testing of a MATLAB Statistical Tool at Chernava Colles, Venus* [#1808]  
We describe our efforts to better understand the geologic history recorded at individual venusian shield fields using a MATLAB-derived statistical tool.

---

**POSTER SESSION II: EXOBIOLOGY**

*Thursday, 6:00 p.m.   Town Center Exhibit Area*  

Westall F.  
*Nature and Analysis of Kerogen Associated with Early Archaean Biosignatures: Lessons for Mars* [#1346]  
The structural, compositional and distributional characteristics of Early Archaean kerogen can help in situ biosignature recognition on Mars.

Gross C.   Airo A.   Al-Samir M.   Sowe M.   Nabhan S.   et al.  
*Martian Crater-Lake Environments and Their Potential Range of Biological Deposits* [#2452]  
We present a range of potential crater-lake deposits that could form under abiotic and biotic settings.

McMahon S.   Parnell J.  
*Potential for Deep Hydrogenotrophic Life on Mars* [#2870]  
We discuss three possible sources of hydrogen for life in the martian subsurface: serpentinization, radiolysis, and seismic mechanoradical chemistry.

Castleberry P.   Harvey R. P.  
*Characterizing Rock-Water Interactions in a Simulated Martian Aquifer* [#2329]  
To look for markers / We cook a deep martian brine / Life’s needed or not?

Steiner M. H.   Hausrath E. H.   Sun H. J.  
*Synthesis of Potential Phosphate Mineral Biosignatures Under Mars Relevant Conditions* [#2761]  
Potential phosphate mineral biosignatures were formed in Mars-relevant solutions in the presence of microorganisms and extracellular polysaccharides.

Basilevsky A. T.  
*Mars Science Laboratory Search for Organics: Potential Contribution from Infall of Meteorites* [#1131]  
We suggest the technique through using the contents of Corg and Ni to distinguish in MSL studies indigenous martian organics from those brought by meteorites.
Abiotically Formed Redox Interfaces in Basalt Sand — A Mars Habitat of Interest

We compare sources of bioavailable energy in MSL reachable habitats. A source of energy in Mars basalt sands can be redox interfaces produced by solar irradiation.

Fisk M. Popa R. Bridges N. T. Rennó N. Mischna M. et al.

Habitability of Transgressing Mars Dunes

Moving dunes may create environments in which the energy and material needed to support life are continually replenished.

Perl S. M. McLennan S. M. Herkenhoff K. E. Berelson W. M. Corsetti F. A. et al.

Preservation Potential of Organic Matter in Secondary Porosity of the Burns Formation, Meridiani Planum, Mars

The purpose of this paper is to show how pore networks observed in the Burns Formation could retain organic matter, if present, in the martian subsurface.

Blanco A. Ángeles-Trigueros S. A. Castañeda-Posadas C. Ambrocio-Cruz S. P.

Fossilized Pollen Grains in Sedimentary Pyrite and its Significance for Life Prospection in Mars

The objective of this work is to provide a general description of pyritized pollen grains from Upper Cretaceous rocks from Mexico.


Microscopic Evidences of Replacement of Iron Sulfide by Iron Oxide in Macro Fossils: A Useful Tool for the Search of Life in Mars?

This paper reports crystals, framboids, and teeth and sockets in iron oxides in macrofossils from the Eagle Ford Fm (Cretaceous), at Coahuila state, Mexico.

Bost N. Loiselle L. Foucher F. Ramboz C. Westall F.

Synthesis of Basalts as an Analog to Gusev Crater Basalts, Mars: Interest for Astrobiology

Here we present the results of the synthesis of three samples of artificial basalts, similar to basalts observed in the crater Gusev on Mars.

Wright S. P. Newsom H. E.

Potential for Field and Sample Data of Lonar Crater, India as Astrobiological Analogs

Shocked altered basalt and shocked soil from Lonar Crater can be used as analogs for similar materials found by rovers or in martian meteorite melt veins.

Marnocha C. L. Dixon J. C.

Pyrosequencing Analysis of Bacterial Communities in Rock Coatings from Swedish Lapland

Pyrosequencing was used to investigate bacterial communities in Fe/Mn films, sulfate crusts, and aluminum glazes from Kärkevagge, Swedish Lapland.

Mickol R. L. Marnocha C. L.

Anaerobic Culturing Experiments of Sulfate Crusts, Fe/Mn Skins, and Aluminum Glazes from Kärkevagge, Swedish Lapland

Rock coatings from Kärkevagge, Swedish Lapland are host to anaerobic organisms, furthering the potential for rock coatings to serve as biosignatures on Mars.

Jänchen J. Meessen J. Ott S. Sánchez F. J. de la Torre R.

Low Temperature Interaction of Humidity with the Lichens Buellia Frigida and Circinaria Gyrosa

A quantitative study is presented of the water vapor interaction with extremophiles under close to martian surface conditions using adsorption methods.
**POSTER LOCATION #670**  
*Surveying the Survival of Cyanobacteria in Cryptobiotic Crust Under Martian Conditions* [#1971]  
We report survival tests of cyanobacteria in cryptobiotic crust under simulated martian conditions, where best survival was observed at salt tolerant organisms.

Mickol R. L. González-Medina J. M. Kral T. A.  
**POSTER LOCATION #671**  
*Variation in Evaporation Rates of Liquid Media at Low Pressure* [#1782]  
One obstacle hindering the growth of microorganisms under simulated martian conditions is the low surface pressure of the planet.

González-Medina J. M. Mickol R. L. Kral T. A.  
**POSTER LOCATION #672**  
*Testing Methanogen Growth at Low Pressure* [#1353]  
Methane on Mars was found at $10 \pm 3$ ppb. The source of methane is unknown. Is there a possible biological source? Methanogens microorganisms could be an option.

**POSTER LOCATION #673**  
*Alkaline Hydrothermal Vents: Assembling the Redox Protein Construction Kit on Icy Worlds* [#2341]  
Experiments simulating early Earth alkaline hydrothermal vents reveal iron sulfides capable of catalyzing the possible emergence of life on an icy world.

Kirby J. P. Cable M. L. Jones S. M. Davies A. G. Willis P. A.  
**POSTER LOCATION #674**  
*Concept For Remote Chemical Analysis of Enceladus Amino Acid Chirality* [#1829]  
Presented is an instrument concept to measure the chirality of amino acids via remote chemical analysis of ice dust particles emanating from Enceladus.

Barge L. M. Russell M. J. Kanik I.  
**POSTER LOCATION #675**  
*Fuel Cell Simulations of Hydrothermal Vents on Europa* [#2200]  
We simulated a hydrothermal system on an icy world in a membrane fuel cell experiment, to test whether ambient pH/Eh gradients can drive prebiotic chemistry.

Cable M. L. Stockton A. M. Mora M. F. Willis P. A.  
**POSTER LOCATION #676**  
*A Novel Protocol to Analyze Short- and Long-Chain Fatty Acids using Nonaqueous Microchip Capillary Electrophoresis* [#2921]  
We propose a new protocol for short- and long-chain saturated fatty acids using a microfluidic technique in ethanol with laser-induced fluorescence detection.

Quinn R. Elsaesser A. Ehrenfreund P. Ricco A. Breitenbach A. et al.  
**POSTER LOCATION #677**  
*OREOcube: ORganics Exposure in Orbit* [#2498]  
The OREOcube experiment will use in situ spectroscopy to study minerals and organic compounds exposed to LEO radiation conditions on an ISS external platform.

---

**POSTER SESSION II: ASTEROID ANALYSIS: MISSIONS AND TOOLS**  
Thursday, 6:00 p.m. Town Center Exhibit Area  

Iwata T. Kitazato K. Abe M. Ohtake M. Matsuura S. et al.  
**POSTER LOCATION #678**  
*Results of the Critical Design for NIRS3: The Near Infrared Spectrometer on Hayabusa-2* [#1908]  
NIRS3, the Near Infrared Spectrometer is a candidate scientific instrument for the Hayabusa-2 mission. We report the results of the critical design.
**POSTER LOCATION #679**  
*A Mobile Asteroid Surface Scout (MASCOT) for the Hayabusa 2 Mission to 1999 JU3: The Scientific Approach [#1500]*  
Mascot, a Mobile Asteroid Surface Scout, will support JAXA’\’s Hayabusa 2 mission to investigate in situ the C-type asteroid 1999 JU3.

Scheld D. L.  Hayden J. L.  Dryer C.  
**POSTER LOCATION #680**  
*Charming Asteroids and Comets — The Hummingbirds/Charm (HC) Asteroid/Comet Engineering Science Service (ACCESS) Missions [#2093]*  
A concept is described for multiple missions that will intercept and “interview” target NEOs/NEAs. A Charm is a gathering of hummingbirds.

Oklay N.  Vincent J.-B.  Sierks H.  
**POSTER LOCATION #681**  
*Filter Strategy for the Characterization of Minerals with OSIRIS [#2399]*  
Detection and separation of minerals with OSIRIS. This will allow us to characterize Comet 67P’s surface and study composition changes due to its activity.

**POSTER LOCATION #682**  
*Laser Return Signature of Analogs to OSIRIS-REx Target Asteroid (101955) 1999 RQ36 [#1584]*  
Determining RQ36 composition and texture: creating a reflectance database of terrestrial and meteorite analogs to compare to groundbased and OSIRIS-REx data.

Church C.  Fevig R.  
**POSTER LOCATION #683**  
*A Feasibility Study on the Characterization of the Internal Structure of Small Neos with Small Spacecraft [#2999]*  
This work addresses methods that can be used to characterize the internal structure of small NEOs through in situ measurements using small spacecraft.

Palmer E. E.  Sykes M. V.  Neese C. L.  Davis D. R.  
**POSTER LOCATION #684**  
*Small Bodies Image Browser — A Tool Allowing Simplified Access to the Dawn Mission Data [#2901]*  
SBIB does searches of images taken by Dawn at Vesta in a graphical and easy way. It allows data downloads in the most common image formats: ISIS, FITS, IMG, PNG.

Levengood S. P.  Shepard M. K.  Magri C.  Nolan M. C.  
**POSTER LOCATION #685**  
*Asteroid Shape Modeling with CUDA [#2299]*  
We modified the asteroid SHAPE software package to use of GPUs on CUDA platforms for faster shape modeling. We generate a new shape model of (2100) Ra-Shalom.

Doressoundiram A.  Roques F.  
**POSTER LOCATION #686**  
*Efficiency of Ground-Based Search for Outer Solar System Small Bodies by Serendipitous Stellar Occultations [#1155]*  
We propose high-speed photometry from the ground to exploit the occultation method for the exploration of the transneptunian region, with a high efficiency.
**PROGRAM AUTHOR INDEX**

* Denotes speaker.

<table>
<thead>
<tr>
<th>Name</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaron P. M.</td>
<td>W352</td>
</tr>
<tr>
<td>Abbas M. M.</td>
<td>R709</td>
</tr>
<tr>
<td>Abbey W.</td>
<td>T641</td>
</tr>
<tr>
<td>Abe K.</td>
<td>W355</td>
</tr>
<tr>
<td>Abe M.</td>
<td>F501, F551, R735</td>
</tr>
<tr>
<td>Abe S.</td>
<td>T638, T641</td>
</tr>
<tr>
<td>Abe Y.</td>
<td>R721</td>
</tr>
<tr>
<td>Abedin M. N.</td>
<td>T641</td>
</tr>
<tr>
<td>Abercromby A. F. J.</td>
<td>T645</td>
</tr>
<tr>
<td>Abou-Aly S.</td>
<td>F506</td>
</tr>
<tr>
<td>Abramov O.</td>
<td>R455*</td>
</tr>
<tr>
<td>Abreu N. M.</td>
<td>T607</td>
</tr>
<tr>
<td>Achilles C. N.</td>
<td>T202, T615, T618, T637</td>
</tr>
<tr>
<td>Acosta T. E.</td>
<td>T641</td>
</tr>
<tr>
<td>Acton C. H. Jr.</td>
<td>M152*</td>
</tr>
<tr>
<td>Adcock C. T.</td>
<td>R726</td>
</tr>
<tr>
<td>Adeli S.</td>
<td>R726</td>
</tr>
<tr>
<td>Adler C. B.</td>
<td>R712</td>
</tr>
<tr>
<td>Agee C. B.</td>
<td>M154, T201, W302*, W352, F552, T628, R710, R724</td>
</tr>
<tr>
<td>Agerton T.</td>
<td>T641</td>
</tr>
<tr>
<td>Aguilar J.</td>
<td>T254</td>
</tr>
<tr>
<td>Aharonson O.</td>
<td>T256, F551, T630, R732</td>
</tr>
<tr>
<td>Ahmed M.</td>
<td>T254</td>
</tr>
<tr>
<td>Ahmedi M.</td>
<td>T639</td>
</tr>
<tr>
<td>Ahn I.</td>
<td>T203</td>
</tr>
<tr>
<td>Ahrens C. J.</td>
<td>R729</td>
</tr>
<tr>
<td>Airey M. W.</td>
<td>T625</td>
</tr>
<tr>
<td>Airo A.</td>
<td>R734</td>
</tr>
<tr>
<td>Ajai F.505, R722, R726</td>
<td></td>
</tr>
<tr>
<td>Akins S. W.</td>
<td>M152, R732</td>
</tr>
<tr>
<td>Akiyama H.</td>
<td>T638</td>
</tr>
<tr>
<td>Akram W. M.</td>
<td>T603</td>
</tr>
<tr>
<td>Alam M.</td>
<td>R727</td>
</tr>
<tr>
<td>Albalat E.</td>
<td>T628</td>
</tr>
<tr>
<td>Albarréde F. W352, T628, R710</td>
<td></td>
</tr>
<tr>
<td>Albin E. F. M.</td>
<td>T634</td>
</tr>
<tr>
<td>Aldoroty R. J.</td>
<td>R720</td>
</tr>
<tr>
<td>Aleksandrov A. B.</td>
<td>R723</td>
</tr>
<tr>
<td>Aléon J.</td>
<td>R403*, T602</td>
</tr>
<tr>
<td>Alerstam E.</td>
<td>T641</td>
</tr>
<tr>
<td>Alexander C. M. O'D.</td>
<td>T203, W355*, F504, F552, T605, R701, R716</td>
</tr>
<tr>
<td>Alexander L.</td>
<td>T628</td>
</tr>
<tr>
<td>Alexandrov O.</td>
<td>R732</td>
</tr>
<tr>
<td>Alexeenko A.</td>
<td>R720</td>
</tr>
<tr>
<td>Ali A.</td>
<td>R706</td>
</tr>
<tr>
<td>Allen C. C.</td>
<td>M154*, T614, T638, R725</td>
</tr>
<tr>
<td>Allen J.</td>
<td>T633</td>
</tr>
<tr>
<td>Allender E. J.</td>
<td>R725</td>
</tr>
<tr>
<td>Allton J. A.</td>
<td>T601</td>
</tr>
<tr>
<td>Allton J. H.</td>
<td>T601, T638</td>
</tr>
<tr>
<td>Allwood A.</td>
<td>T641</td>
</tr>
<tr>
<td>Alonso-Azcarate J.</td>
<td>R726</td>
</tr>
<tr>
<td>Alonzo J.</td>
<td>R734</td>
</tr>
<tr>
<td>Al-Samir M.</td>
<td>R726, R734</td>
</tr>
<tr>
<td>Altieri F.</td>
<td>R726, R729</td>
</tr>
<tr>
<td>Altweck K.</td>
<td>T641</td>
</tr>
<tr>
<td>Alves E.</td>
<td>R720</td>
</tr>
<tr>
<td>Alves E. P.</td>
<td>R723</td>
</tr>
<tr>
<td>Alwmark C.</td>
<td>F501, R708, R720</td>
</tr>
<tr>
<td>Amador E. S.</td>
<td>F503*, R726</td>
</tr>
<tr>
<td>Amara S.</td>
<td>T612</td>
</tr>
<tr>
<td>Amari S.</td>
<td>F504</td>
</tr>
<tr>
<td>AMASE 2011 Team</td>
<td>T646</td>
</tr>
<tr>
<td>Ambrocio P.</td>
<td>R734</td>
</tr>
<tr>
<td>Ambrocio-Cruz S. P.</td>
<td>R734</td>
</tr>
<tr>
<td>Ambrose W. A.</td>
<td>R721</td>
</tr>
<tr>
<td>Amelin Y.</td>
<td>M104*, R403, T604</td>
</tr>
<tr>
<td>Ames D. E.</td>
<td>R718</td>
</tr>
<tr>
<td>Ames T. J.</td>
<td>T638</td>
</tr>
<tr>
<td>Ammannito E. W301, W351, F501, F551, T610, T611, T612</td>
<td></td>
</tr>
<tr>
<td>Amundsen H. E. F.</td>
<td>T646</td>
</tr>
<tr>
<td>Anand M.</td>
<td>W353, F505*, T628</td>
</tr>
<tr>
<td>Anders D.</td>
<td>F506*, R720</td>
</tr>
<tr>
<td>Andersen D. T.</td>
<td>T642</td>
</tr>
<tr>
<td>Anderson B. J.</td>
<td>W303</td>
</tr>
<tr>
<td>Anderson F. S.</td>
<td>T641</td>
</tr>
<tr>
<td>Anderson J. A.</td>
<td>M152, T641, R732</td>
</tr>
<tr>
<td>Anderson J. K.</td>
<td>T609, R724</td>
</tr>
<tr>
<td>Anderson J. L. B.</td>
<td>R720</td>
</tr>
<tr>
<td>Anderson L. K.</td>
<td>T609, R724</td>
</tr>
<tr>
<td>Anderson M.</td>
<td>T615, T618</td>
</tr>
<tr>
<td>Anderson R.</td>
<td>M102, M153, T615, T617, T618</td>
</tr>
<tr>
<td>Andrupokov A. V.</td>
<td>R701</td>
</tr>
<tr>
<td>Andronikov A. V.</td>
<td>R706</td>
</tr>
<tr>
<td>Andronikova I. E.</td>
<td>R706</td>
</tr>
<tr>
<td>Andronokov A.</td>
<td>R701</td>
</tr>
<tr>
<td>Angeles-Trigueros S. A.</td>
<td>R734</td>
</tr>
<tr>
<td>Antonelli M. A.</td>
<td>T603</td>
</tr>
<tr>
<td>Antonenko I.</td>
<td>R722, R723</td>
</tr>
<tr>
<td>Antoun T. A.</td>
<td>R713</td>
</tr>
<tr>
<td>Anup Das</td>
<td>R723</td>
</tr>
<tr>
<td>Aoyagi Y.</td>
<td>R710</td>
</tr>
<tr>
<td>Appel J. K.</td>
<td>T616</td>
</tr>
<tr>
<td>Appéré T.</td>
<td>R725</td>
</tr>
<tr>
<td>Applin D.</td>
<td>R716</td>
</tr>
<tr>
<td>Applin D. M.</td>
<td>R726</td>
</tr>
<tr>
<td>APXS and MSL Science</td>
<td></td>
</tr>
<tr>
<td>Teams T615</td>
<td></td>
</tr>
<tr>
<td>Arai T. W304*, T638, T641, R735</td>
<td></td>
</tr>
<tr>
<td>Arakawa M.</td>
<td>R405, T641, R718</td>
</tr>
<tr>
<td>Araki H.</td>
<td>T641, R721</td>
</tr>
<tr>
<td>Archer D. T202, F503, T618</td>
<td></td>
</tr>
<tr>
<td>Archer G. J.</td>
<td>R704</td>
</tr>
<tr>
<td>Archer P. D. Jr.</td>
<td>T202*, T618</td>
</tr>
<tr>
<td>Archinal B. A.</td>
<td>M152*, R732</td>
</tr>
<tr>
<td>Arevalo R. D. Jr.</td>
<td>T641</td>
</tr>
<tr>
<td>Arfstrom J. D. R725, R728</td>
<td></td>
</tr>
<tr>
<td>Arif M.</td>
<td>R720</td>
</tr>
<tr>
<td>Arimoto T.</td>
<td>R721, R723</td>
</tr>
<tr>
<td>Arkani-Hamed J.</td>
<td>T609, T612</td>
</tr>
<tr>
<td>Armieni C.</td>
<td>T616, T617, T618</td>
</tr>
<tr>
<td>Armstrong L. S.</td>
<td>R724</td>
</tr>
<tr>
<td>Armytage R.</td>
<td>R704</td>
</tr>
<tr>
<td>Armytage R. M. G.</td>
<td>T204*</td>
</tr>
<tr>
<td>Arnold G.</td>
<td>F551</td>
</tr>
</tbody>
</table>

Codes correspond to session codes used in the program, where the first letter indicates the day (M for Monday, T for Tuesday, etc.) and the three-digit number indicates the assigned session code.
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnold J.</td>
<td>T605</td>
</tr>
<tr>
<td>Arnold J. A.</td>
<td>W304*, R402</td>
</tr>
<tr>
<td>Arnold K.</td>
<td>T256, R729</td>
</tr>
<tr>
<td>Arnold S. K.</td>
<td>R707</td>
</tr>
<tr>
<td>Arondel A.</td>
<td>T639</td>
</tr>
<tr>
<td>Artemieva N.</td>
<td>R720, R721</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>W304*, R402, R719</td>
</tr>
<tr>
<td>Arnold S. K.</td>
<td>R707</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>T252*, F551, T614, T615, T617, T645, R726, R732, R733</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>R720</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R720</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>F553</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>T612</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R721</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>T617</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R722</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>T645</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R724</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>T641</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R725</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>R726</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R727</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>R728</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R729</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>R730</td>
</tr>
<tr>
<td>Artemieva N. A.</td>
<td>R732</td>
</tr>
<tr>
<td>Arvidson R. E.</td>
<td>R733</td>
</tr>
<tr>
<td>Asaduzzaman A. M.</td>
<td>T605, T606</td>
</tr>
<tr>
<td>Asche H.</td>
<td>T253</td>
</tr>
<tr>
<td>Ash R. D.</td>
<td>R401</td>
</tr>
<tr>
<td>Ashley J. W.</td>
<td>M103*</td>
</tr>
<tr>
<td>Asimow P. D.</td>
<td>T641, R724</td>
</tr>
<tr>
<td>Asmar S. W.</td>
<td>T255*, W301, W303, T603, T612</td>
</tr>
<tr>
<td>Asphaug E.</td>
<td>M101, T201, T608, R712, R721</td>
</tr>
<tr>
<td>Athena M. E. R.</td>
<td>T252</td>
</tr>
<tr>
<td>Athena Science Team</td>
<td>T252, R734</td>
</tr>
<tr>
<td>Atlaskin E.</td>
<td>T616</td>
</tr>
<tr>
<td>Atreya S. K.</td>
<td>M102, T202, T616, T617, T618</td>
</tr>
<tr>
<td>Atwood-Stone C.</td>
<td>R729</td>
</tr>
<tr>
<td>Aubele J. C.</td>
<td>T624, T634</td>
</tr>
<tr>
<td>Audouard J.</td>
<td>T614, T619, R726, R729</td>
</tr>
<tr>
<td>Aureli K. L.</td>
<td>R725</td>
</tr>
<tr>
<td>Austen H.-U.</td>
<td>R735</td>
</tr>
<tr>
<td>Aveline D.</td>
<td>T641</td>
</tr>
<tr>
<td>Avouac J.-P.</td>
<td>T614</td>
</tr>
<tr>
<td>Aye K.-M.</td>
<td>R722, R727</td>
</tr>
<tr>
<td>Ayhan B.</td>
<td>R726</td>
</tr>
<tr>
<td>Ayoub F.</td>
<td>T614</td>
</tr>
<tr>
<td>Ayres T. R.</td>
<td>T601</td>
</tr>
<tr>
<td>Bachmann O.</td>
<td>R401</td>
</tr>
<tr>
<td>Badders B. D.</td>
<td>T638, T645</td>
</tr>
<tr>
<td>Badescu M.</td>
<td>T641</td>
</tr>
<tr>
<td>Badjukov D. D.</td>
<td>R703</td>
</tr>
<tr>
<td>Baerg G.</td>
<td>T635</td>
</tr>
<tr>
<td>Baini M. S.</td>
<td>M152, R732</td>
</tr>
<tr>
<td>Bainin S.</td>
<td>R732</td>
</tr>
<tr>
<td>Bailleau K.</td>
<td>R403, T602</td>
</tr>
<tr>
<td>Baines K. H.</td>
<td>T630</td>
</tr>
<tr>
<td>Baither D.</td>
<td>R709</td>
</tr>
<tr>
<td>Bajo K.</td>
<td>T641</td>
</tr>
<tr>
<td>Baji S.</td>
<td>R708</td>
</tr>
<tr>
<td>Baker A.</td>
<td>T619</td>
</tr>
<tr>
<td>Baker D. M. H.</td>
<td>T626, R721</td>
</tr>
<tr>
<td>Baker E. M.</td>
<td>F552</td>
</tr>
<tr>
<td>Baker M. B.</td>
<td>M153</td>
</tr>
<tr>
<td>Baland R.-M.</td>
<td>T629</td>
</tr>
<tr>
<td>Balcerski J. A.</td>
<td>W303*</td>
</tr>
<tr>
<td>Baldino T.</td>
<td>T634</td>
</tr>
<tr>
<td>Baldridge A. M.</td>
<td>T637</td>
</tr>
<tr>
<td>Balme M. R.</td>
<td>T624, R729</td>
</tr>
<tr>
<td>Baloga S. M.</td>
<td>T624</td>
</tr>
<tr>
<td>Balta J. B.</td>
<td>F552*, R724</td>
</tr>
<tr>
<td>Bamberg M.</td>
<td>T253*</td>
</tr>
<tr>
<td>Bamford R. A.</td>
<td>R723</td>
</tr>
<tr>
<td>Bamsey M.</td>
<td>T641</td>
</tr>
<tr>
<td>Bandeira L.</td>
<td>R727</td>
</tr>
<tr>
<td>Bandfield J. L.</td>
<td>M103*, M154, R722, R726</td>
</tr>
<tr>
<td>Banerdt W. B.</td>
<td>T612, T640, R741</td>
</tr>
<tr>
<td>Banerjee N. R.</td>
<td>R706</td>
</tr>
<tr>
<td>Banfield D.</td>
<td>T612</td>
</tr>
<tr>
<td>Banks M. E.</td>
<td>W353, T612, T613, T627, R722</td>
</tr>
<tr>
<td>Bao H.</td>
<td>T602, T644</td>
</tr>
<tr>
<td>Bao X.</td>
<td>T641</td>
</tr>
<tr>
<td>Bapst J. R730</td>
<td>R730</td>
</tr>
<tr>
<td>Baratoux D.</td>
<td>R724</td>
</tr>
<tr>
<td>Barber S. J.</td>
<td>T638</td>
</tr>
<tr>
<td>Barbieri L.</td>
<td>W305</td>
</tr>
<tr>
<td>Barcena H. W355*</td>
<td>R734</td>
</tr>
<tr>
<td>Bar-Cohen Y.</td>
<td>T641</td>
</tr>
<tr>
<td>Barge L. M.</td>
<td>R734</td>
</tr>
<tr>
<td>Barger M. W.</td>
<td>T628</td>
</tr>
<tr>
<td>Barker M. K.</td>
<td>T626</td>
</tr>
<tr>
<td>Barlow N. G. T253*, R727, R732</td>
<td></td>
</tr>
<tr>
<td>Barnman T. S.</td>
<td>R730</td>
</tr>
<tr>
<td>Barmatz M.</td>
<td>T628</td>
</tr>
<tr>
<td>Barnes A.</td>
<td>T621</td>
</tr>
<tr>
<td>Barnes D. P.</td>
<td>T641</td>
</tr>
<tr>
<td>Barnes J. F505, T628, T638</td>
<td></td>
</tr>
<tr>
<td>Barnes J. W. M155, T256, T630</td>
<td></td>
</tr>
<tr>
<td>Barnes W. T. R701</td>
<td>R731</td>
</tr>
<tr>
<td>Barnouin O. S. W303, R405, R455, F555, T613, R735</td>
<td></td>
</tr>
<tr>
<td>Baroukh J.</td>
<td>M153, T617</td>
</tr>
<tr>
<td>Barr A. C.</td>
<td>T205, W303</td>
</tr>
<tr>
<td>Barralough B.</td>
<td>M153, T617</td>
</tr>
<tr>
<td>Barralough B. L. T617</td>
<td>R724</td>
</tr>
<tr>
<td>Barrat J. A. R401</td>
<td>R726</td>
</tr>
<tr>
<td>Barrett J. M103, R732</td>
<td>R727</td>
</tr>
<tr>
<td>Barry P. H.</td>
<td>T628</td>
</tr>
<tr>
<td>Barthelmy M.</td>
<td>T638</td>
</tr>
<tr>
<td>Barucci A. F551</td>
<td>R727</td>
</tr>
<tr>
<td>Baryshev S. V.</td>
<td>T601</td>
</tr>
<tr>
<td>Basavaiah N.</td>
<td>T643</td>
</tr>
<tr>
<td>Basilevsky A. T.</td>
<td>R715, R721, R722, R734</td>
</tr>
<tr>
<td>Baskakova M. A.</td>
<td>T605</td>
</tr>
<tr>
<td>Basov D.</td>
<td>F553</td>
</tr>
<tr>
<td>Basov D. N.</td>
<td>T605</td>
</tr>
<tr>
<td>Bassett W.</td>
<td>T629</td>
</tr>
<tr>
<td>Bassim N. D.</td>
<td>R706</td>
</tr>
<tr>
<td>Bastien R.</td>
<td>R703</td>
</tr>
<tr>
<td>Bates D. E.</td>
<td>T641</td>
</tr>
<tr>
<td>Battler M.</td>
<td>T645</td>
</tr>
<tr>
<td>Bauer J. F551</td>
<td>R728</td>
</tr>
<tr>
<td>Baumann P.</td>
<td>R732</td>
</tr>
<tr>
<td>Bazell D. W351</td>
<td>R727</td>
</tr>
<tr>
<td>Baziotis I. P.</td>
<td>T641</td>
</tr>
<tr>
<td>Beach M. J.</td>
<td>R728</td>
</tr>
<tr>
<td>Bean K. M.</td>
<td>T612, T615, R715</td>
</tr>
<tr>
<td>Beard S. P. R454, T604, T628</td>
<td></td>
</tr>
<tr>
<td>Bearzotti A.</td>
<td>T641</td>
</tr>
<tr>
<td>Beatty W. L.</td>
<td>T641</td>
</tr>
<tr>
<td>Beauchamp P. M.</td>
<td>T630</td>
</tr>
<tr>
<td>Beauford R. E.</td>
<td>R707</td>
</tr>
<tr>
<td>Bebout B. M.</td>
<td>T643</td>
</tr>
<tr>
<td>Becerra P.</td>
<td>R727</td>
</tr>
<tr>
<td>Beck A.</td>
<td>W301</td>
</tr>
<tr>
<td>Beck A. W.</td>
<td>T610</td>
</tr>
<tr>
<td>Beck P. R706, R707</td>
<td>T630</td>
</tr>
<tr>
<td>Becker H.</td>
<td>T603</td>
</tr>
<tr>
<td>Becker H.-W.</td>
<td>T203</td>
</tr>
<tr>
<td>Becker K. J. W301, T613, T641, R732</td>
<td></td>
</tr>
<tr>
<td>Becker N. T644</td>
<td>R732</td>
</tr>
<tr>
<td>Becker S. T251*</td>
<td>R732</td>
</tr>
<tr>
<td>Becker T. L. M152, R732</td>
<td></td>
</tr>
<tr>
<td>Beckett J. R.</td>
<td>R704, R705</td>
</tr>
<tr>
<td>Beddingfield C. B.</td>
<td>T612</td>
</tr>
<tr>
<td>Bedini P. D. W303</td>
<td>R732</td>
</tr>
<tr>
<td>Beebe R.</td>
<td>T641</td>
</tr>
<tr>
<td>Beegle L. W. T202, T615, T618, R726</td>
<td></td>
</tr>
<tr>
<td>Beeehr A. R.</td>
<td>R726</td>
</tr>
<tr>
<td>Behar A. M153, T616, T617</td>
<td></td>
</tr>
<tr>
<td>Behr B.</td>
<td>T626</td>
</tr>
<tr>
<td>Bekker D.</td>
<td>T641</td>
</tr>
<tr>
<td>Belhai D.</td>
<td>R720</td>
</tr>
<tr>
<td>Bell A. S. T201, W352, F552, R724</td>
<td></td>
</tr>
<tr>
<td>Bell E. A.</td>
<td>T604</td>
</tr>
<tr>
<td>Bell I. T638</td>
<td>R724</td>
</tr>
<tr>
<td>Bell J. T619</td>
<td>R726</td>
</tr>
<tr>
<td>Bell J. F. III M102, T612, T614, T615, T617, T622, T625, T641, R715, R716, R722, R724, R726</td>
<td></td>
</tr>
<tr>
<td>Bell M. S.</td>
<td>T638, T645</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Bellucci G.</td>
<td>R726</td>
</tr>
<tr>
<td>Bellutta P.</td>
<td>T645</td>
</tr>
<tr>
<td>Belza J.</td>
<td>F506</td>
</tr>
<tr>
<td>Benavente N.</td>
<td>R727</td>
</tr>
<tr>
<td>Bender S.</td>
<td>M153, T617</td>
</tr>
<tr>
<td>Bender S. C.</td>
<td>T617</td>
</tr>
<tr>
<td>Benedix G.</td>
<td>T628</td>
</tr>
<tr>
<td>Benedix G. K.</td>
<td>T638, R718</td>
</tr>
<tr>
<td>Benna M.</td>
<td>W302</td>
</tr>
<tr>
<td>Benner L. A. M.</td>
<td>T252, R729, T638, R740</td>
</tr>
<tr>
<td>Bennett K. A.</td>
<td>M154, T621, R729, R731</td>
</tr>
<tr>
<td>Berard G.</td>
<td>T641</td>
</tr>
<tr>
<td>Berger E. L.</td>
<td>T604</td>
</tr>
<tr>
<td>Berg T.</td>
<td>T607</td>
</tr>
<tr>
<td>Berger G.</td>
<td>T618, T645</td>
</tr>
<tr>
<td>Berger J.</td>
<td>M102, M153, T615, T617</td>
</tr>
<tr>
<td>Berger J. A.</td>
<td>T617, T645</td>
</tr>
<tr>
<td>Berinstein A.</td>
<td>T641</td>
</tr>
<tr>
<td>Berisford D.</td>
<td>T641</td>
</tr>
<tr>
<td>Berlanza G.</td>
<td>R706</td>
</tr>
<tr>
<td>Berlin J.</td>
<td>T607</td>
</tr>
<tr>
<td>Berman D. C.</td>
<td>T621, R729, R731</td>
</tr>
<tr>
<td>Bermingham K.</td>
<td>M101</td>
</tr>
<tr>
<td>Bermingham K. R.</td>
<td>R401, R706</td>
</tr>
<tr>
<td>Bernard S.</td>
<td>T605</td>
</tr>
<tr>
<td>Bernard K. R.</td>
<td>R401, T603</td>
</tr>
<tr>
<td>Bernard K. A.</td>
<td>T615, T617</td>
</tr>
<tr>
<td>Bernatowicz T. J.</td>
<td>T615</td>
</tr>
<tr>
<td>Bernhardt H.</td>
<td>T606</td>
</tr>
<tr>
<td>Bernstein M. P.</td>
<td>T635</td>
</tr>
<tr>
<td>Bertero M.</td>
<td>F551</td>
</tr>
<tr>
<td>Berube P. B.</td>
<td>T641</td>
</tr>
<tr>
<td>Besse S.</td>
<td>R722</td>
</tr>
<tr>
<td>Besserer J.</td>
<td>T255*</td>
</tr>
<tr>
<td>Bevan A.</td>
<td>R401</td>
</tr>
<tr>
<td>Beyer R. A.</td>
<td>T629, R732</td>
</tr>
<tr>
<td>Beyersdorf-Kuis U.</td>
<td>R704</td>
</tr>
<tr>
<td>Bhandari P.</td>
<td>T641</td>
</tr>
<tr>
<td>Bhattacharya S.</td>
<td>F505*, R722, R726</td>
</tr>
<tr>
<td>Bibring J.-P.</td>
<td>R402, R451*, T614, T619, R724, R726, R729, R735</td>
</tr>
<tr>
<td>Biese J.</td>
<td>R735</td>
</tr>
<tr>
<td>Bierhaus E. B.</td>
<td>F501, T614</td>
</tr>
<tr>
<td>Bierhaus M.</td>
<td>R455*</td>
</tr>
<tr>
<td>Bieri S.</td>
<td>T633</td>
</tr>
<tr>
<td>Bierwirth M.</td>
<td>T641</td>
</tr>
<tr>
<td>Bigoski J. N.</td>
<td>F554*, R720</td>
</tr>
<tr>
<td>Bills B. G.</td>
<td>M155*, T638, R732</td>
</tr>
<tr>
<td>Bingham R.</td>
<td>T723</td>
</tr>
<tr>
<td>Binzci R.</td>
<td>T608</td>
</tr>
<tr>
<td>Biondi D.</td>
<td>T641</td>
</tr>
<tr>
<td>Birch S.</td>
<td>R730</td>
</tr>
<tr>
<td>Bischoff A.</td>
<td>T604, R704, R706, R709</td>
</tr>
<tr>
<td>Bish D. L.</td>
<td>T202*, R402, T615, T618, R726</td>
</tr>
<tr>
<td>Bishop J.</td>
<td>R726</td>
</tr>
<tr>
<td>Bishop J. L.</td>
<td>R402*, T642, R726, R729, R734</td>
</tr>
<tr>
<td>Bishop M. C.</td>
<td>T604</td>
</tr>
<tr>
<td>Bistacchi A.</td>
<td>T624</td>
</tr>
<tr>
<td>Bizzarro M.</td>
<td>R705</td>
</tr>
<tr>
<td>Blacksilver J.</td>
<td>T641</td>
</tr>
<tr>
<td>Blair D. M.</td>
<td>T255, W303, T626</td>
</tr>
<tr>
<td>Blake D.</td>
<td>T618, R726</td>
</tr>
<tr>
<td>Blake D. F.</td>
<td>M102, T202*, T615, T618, T646</td>
</tr>
<tr>
<td>Blake G. A.</td>
<td>T254</td>
</tr>
<tr>
<td>Blakolb B.</td>
<td>T618</td>
</tr>
<tr>
<td>Blamey N. J. F.</td>
<td>R724</td>
</tr>
<tr>
<td>Blanchett-Guertin J.-F.</td>
<td>T627</td>
</tr>
<tr>
<td>Blanco A.</td>
<td>T604</td>
</tr>
<tr>
<td>Blanco J. D. R.</td>
<td>W302</td>
</tr>
<tr>
<td>Bland M. T.</td>
<td>M101, T629, R711</td>
</tr>
<tr>
<td>Bland P. A.</td>
<td>M101*, T203, T606, T628</td>
</tr>
<tr>
<td>Blaney D.</td>
<td>M153, T615, T617</td>
</tr>
<tr>
<td>Blaney D. L.</td>
<td>T202, T617</td>
</tr>
<tr>
<td>Blank J.</td>
<td>M153, T617</td>
</tr>
<tr>
<td>Blank J. G.</td>
<td>T617</td>
</tr>
<tr>
<td>Blank S.</td>
<td>R453</td>
</tr>
<tr>
<td>Blankenship D. D.</td>
<td>T205, T638, T642</td>
</tr>
<tr>
<td>Bleacher J. E.</td>
<td>W352, T624, T638, T641, R723, R731</td>
</tr>
<tr>
<td>Bleacher L. V.</td>
<td>T634, T637</td>
</tr>
<tr>
<td>Bleamaster L. F.</td>
<td>T637</td>
</tr>
<tr>
<td>Blewett D. T.</td>
<td>M154, W301, W351, W353, F501*, T611, T613, R711, R723</td>
</tr>
<tr>
<td>Blichert-Toft J.</td>
<td>W352, R710</td>
</tr>
<tr>
<td>Blumers M.</td>
<td>T645</td>
</tr>
<tr>
<td>Bocanegra T.</td>
<td>T638</td>
</tr>
<tr>
<td>Bocaccio P.</td>
<td>F551</td>
</tr>
<tr>
<td>Bocaccini A.</td>
<td>T643</td>
</tr>
<tr>
<td>Bochsler P.</td>
<td>T254*, T601</td>
</tr>
<tr>
<td>Boczekowski D. L.</td>
<td>T611</td>
</tr>
<tr>
<td>Bodanen J.-D.</td>
<td>R704</td>
</tr>
<tr>
<td>Bodnar R. J.</td>
<td>T724</td>
</tr>
<tr>
<td>Boehnke P.</td>
<td>R454</td>
</tr>
<tr>
<td>Boesenberg J. S.</td>
<td>R401*, R706</td>
</tr>
<tr>
<td>Boetcher S.</td>
<td>T616</td>
</tr>
<tr>
<td>Bogard D. D.</td>
<td>T718</td>
</tr>
<tr>
<td>Boggs D. H.</td>
<td>T255, T626</td>
</tr>
<tr>
<td>Böhm E.</td>
<td>T616</td>
</tr>
<tr>
<td>Boivin A.</td>
<td>T641</td>
</tr>
<tr>
<td>Bojazi M. J.</td>
<td>F504</td>
</tr>
<tr>
<td>Bolaños-Sánchez U.</td>
<td>R734</td>
</tr>
<tr>
<td>Boley A. C.</td>
<td>M156</td>
</tr>
<tr>
<td>Bonaccorsi R.</td>
<td>T634</td>
</tr>
<tr>
<td>Bonal L.</td>
<td>R706, R707</td>
</tr>
<tr>
<td>Bondarenko N. V.</td>
<td>W354*, R728</td>
</tr>
<tr>
<td>Bonev B. P.</td>
<td>R714</td>
</tr>
<tr>
<td>Boone C. D.</td>
<td>T641</td>
</tr>
<tr>
<td>Borchardt J. D.</td>
<td>T643</td>
</tr>
<tr>
<td>Borg L.</td>
<td>R404*</td>
</tr>
<tr>
<td>Borg L. E.</td>
<td>T204, W302, R404</td>
</tr>
<tr>
<td>Borisovsky S. Ye.</td>
<td>R710</td>
</tr>
<tr>
<td>Bornstein B.</td>
<td>T641</td>
</tr>
<tr>
<td>Boroson D.</td>
<td>R723</td>
</tr>
<tr>
<td>Borrok D. M.</td>
<td>T642</td>
</tr>
<tr>
<td>Boschi L.</td>
<td>T612</td>
</tr>
<tr>
<td>Bose M. F.</td>
<td>F504*, R701</td>
</tr>
<tr>
<td>Boss A. P.</td>
<td>T254*</td>
</tr>
<tr>
<td>Bost N.</td>
<td>T642, T643, R734</td>
</tr>
<tr>
<td>Böttcher S. I.</td>
<td>T616</td>
</tr>
<tr>
<td>Böttger U.</td>
<td>F501, R708</td>
</tr>
<tr>
<td>Bottke W. F.</td>
<td>M101*, F551, F555, T608, R716</td>
</tr>
<tr>
<td>Bouabdelahah A.</td>
<td>T641</td>
</tr>
<tr>
<td>Bouchet R. A.</td>
<td>R710</td>
</tr>
<tr>
<td>Bouffard M.</td>
<td>T205</td>
</tr>
<tr>
<td>Boukrara A.</td>
<td>T641</td>
</tr>
<tr>
<td>Bourdon B.</td>
<td>R401</td>
</tr>
<tr>
<td>Bourgeois O.</td>
<td>T630</td>
</tr>
<tr>
<td>Bourke M. C.</td>
<td>F502*, R727, R729</td>
</tr>
<tr>
<td>Bouvier A.</td>
<td>W352*</td>
</tr>
<tr>
<td>Bowden R.</td>
<td>W355</td>
</tr>
<tr>
<td>Bower H.</td>
<td>T615, T618</td>
</tr>
<tr>
<td>Bowers M.</td>
<td>T603</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Clark B.</td>
<td>M153, T202, F501, T617</td>
</tr>
<tr>
<td>Clark B. C.</td>
<td>T252, T615, T618</td>
</tr>
<tr>
<td>Clark B. E.</td>
<td>R716</td>
</tr>
<tr>
<td>Clark C. S.</td>
<td>R732</td>
</tr>
<tr>
<td>Clark I. D.</td>
<td>R702</td>
</tr>
<tr>
<td>Clark J. P.</td>
<td>T627, T638, T641, R704, R706</td>
</tr>
<tr>
<td>Clark R. N.</td>
<td>T630</td>
</tr>
<tr>
<td>Clarke J. D. A.</td>
<td>R728</td>
</tr>
<tr>
<td>Clay P. L.</td>
<td>M104</td>
</tr>
<tr>
<td>Claydon J. L.</td>
<td>W351*, T604, T615, R706</td>
</tr>
<tr>
<td>Clayton A. N.</td>
<td>R404, T641, R725</td>
</tr>
<tr>
<td>Clynes A.</td>
<td>T641</td>
</tr>
<tr>
<td>Coates A.</td>
<td>T641</td>
</tr>
<tr>
<td>Coghe A.-M.</td>
<td>T632, T635</td>
</tr>
<tr>
<td>Cobb W. H.</td>
<td>T251, T636</td>
</tr>
<tr>
<td>Cody C. D.</td>
<td>T605</td>
</tr>
<tr>
<td>Cody G. D.</td>
<td>W302, W356</td>
</tr>
<tr>
<td>Coi L.</td>
<td>T634</td>
</tr>
<tr>
<td>Cohen B. A.</td>
<td>T252*, T641</td>
</tr>
<tr>
<td>Cohen J. P.</td>
<td>T634</td>
</tr>
<tr>
<td>Cohen T. E.</td>
<td>T645</td>
</tr>
<tr>
<td>Colaitis A.</td>
<td>R453</td>
</tr>
<tr>
<td>Colaprete A.</td>
<td>T638, R723</td>
</tr>
<tr>
<td>Cole M. J.</td>
<td>R405, F503, F553</td>
</tr>
<tr>
<td>Cole T. E.</td>
<td>T612</td>
</tr>
<tr>
<td>Colin A.</td>
<td>R404, T641</td>
</tr>
<tr>
<td>Colt P.</td>
<td>T202, F503, T615, T618</td>
</tr>
<tr>
<td>Collette A.</td>
<td>R709, R718</td>
</tr>
<tr>
<td>Collier M. R.</td>
<td>T638</td>
</tr>
<tr>
<td>Collin M.</td>
<td>R724</td>
</tr>
<tr>
<td>Collins C. L.</td>
<td>T615</td>
</tr>
<tr>
<td>Collins G.</td>
<td>T629</td>
</tr>
<tr>
<td>Collins G. S.</td>
<td>T255, R455*</td>
</tr>
<tr>
<td>Collins M.</td>
<td>R722</td>
</tr>
<tr>
<td>Collon P.</td>
<td>T603</td>
</tr>
<tr>
<td>Colson R. O.</td>
<td>T609, R724</td>
</tr>
<tr>
<td>Colwell J. E.</td>
<td>T631</td>
</tr>
<tr>
<td>Comeau J.</td>
<td>T617</td>
</tr>
<tr>
<td>Connelly J.</td>
<td>R404</td>
</tr>
<tr>
<td>Connerney J. E. P.</td>
<td>T612</td>
</tr>
<tr>
<td>Connolly H. C. J.</td>
<td>T203, W355, F501, F554, R704, R706</td>
</tr>
<tr>
<td>Connolly J. A. D.</td>
<td>T627</td>
</tr>
<tr>
<td>Conrad A. R.</td>
<td>F551*</td>
</tr>
<tr>
<td>Conrad P.</td>
<td>T202, F503, T615, T618</td>
</tr>
<tr>
<td>Conrad P. G.</td>
<td>M102, T202, F503*, T616</td>
</tr>
<tr>
<td>Conrey R. M.</td>
<td>W303</td>
</tr>
<tr>
<td>Consolmagno G. J. SJ</td>
<td>T641</td>
</tr>
<tr>
<td>Conti A.</td>
<td>T636</td>
</tr>
<tr>
<td>Conway E. M.</td>
<td>T634</td>
</tr>
<tr>
<td>Conway S. A.</td>
<td>T641</td>
</tr>
<tr>
<td>Conway S. J.</td>
<td>W305*, W353*, R451, R725</td>
</tr>
<tr>
<td>Cook C.</td>
<td>M155*</td>
</tr>
<tr>
<td>Cook D.</td>
<td>M152, R732</td>
</tr>
<tr>
<td>Cook D. L.</td>
<td>T603</td>
</tr>
<tr>
<td>Cook M.</td>
<td>T643</td>
</tr>
<tr>
<td>Cooke B.</td>
<td>T638</td>
</tr>
<tr>
<td>Cooke I.</td>
<td>M104, T604</td>
</tr>
<tr>
<td>Cooper B.</td>
<td>T202, T615, T628</td>
</tr>
<tr>
<td>Cooper G.</td>
<td>F503*</td>
</tr>
<tr>
<td>Cooper J. F.</td>
<td>T638</td>
</tr>
<tr>
<td>Cooper M.</td>
<td>T641</td>
</tr>
<tr>
<td>Cooper R. F.</td>
<td>R726</td>
</tr>
<tr>
<td>Coraor R. J.</td>
<td>T204</td>
</tr>
<tr>
<td>Corrier C. A.</td>
<td>T610, R710</td>
</tr>
<tr>
<td>Cordier D.</td>
<td>T630</td>
</tr>
<tr>
<td>Cordine R.</td>
<td>T641</td>
</tr>
<tr>
<td>Cordina W. S.</td>
<td>R720</td>
</tr>
<tr>
<td>Cormac J. H.</td>
<td>T630</td>
</tr>
<tr>
<td>Cornish T.</td>
<td>T641</td>
</tr>
<tr>
<td>Correia C. J.</td>
<td>T615</td>
</tr>
<tr>
<td>Corrigan C. M.</td>
<td>W301, R401, T607</td>
</tr>
<tr>
<td>Corsetti F.</td>
<td>T641</td>
</tr>
<tr>
<td>Corsetti F. A.</td>
<td>T638</td>
</tr>
<tr>
<td>Cuscia D.</td>
<td>T202, T615, T618</td>
</tr>
<tr>
<td>CosmoQuest Build</td>
<td>Team T636</td>
</tr>
<tr>
<td>Costa B.</td>
<td>R720</td>
</tr>
<tr>
<td>Costa M.</td>
<td>T638</td>
</tr>
<tr>
<td>Costard F.</td>
<td>R451</td>
</tr>
<tr>
<td>Cotter R. J.</td>
<td>T641</td>
</tr>
<tr>
<td>Cottin A.</td>
<td>T641, R714, R734</td>
</tr>
<tr>
<td>Cotto-Igualero D.</td>
<td>R712</td>
</tr>
<tr>
<td>Cottrell E.</td>
<td>T609</td>
</tr>
<tr>
<td>Cottrell R. D.</td>
<td>M101</td>
</tr>
<tr>
<td>Coulson I.</td>
<td>R714</td>
</tr>
<tr>
<td>Coulter A. B.</td>
<td>T641</td>
</tr>
<tr>
<td>Couinley J.</td>
<td>T251, T636</td>
</tr>
<tr>
<td>Courea A. W. S.</td>
<td>R720</td>
</tr>
<tr>
<td>Courner E.</td>
<td>W302</td>
</tr>
<tr>
<td>Courteau du Pont S.</td>
<td>T256</td>
</tr>
<tr>
<td>Cousin A.</td>
<td>M102, M153, T615, T617</td>
</tr>
<tr>
<td>Coustenis A.</td>
<td>T630</td>
</tr>
<tr>
<td>Coutrot G. L.</td>
<td>T645</td>
</tr>
<tr>
<td>Cox J.</td>
<td>T638, T641</td>
</tr>
<tr>
<td>Cox R. G.</td>
<td>T627</td>
</tr>
<tr>
<td>Credrick R. A.</td>
<td>W303*, R403*</td>
</tr>
<tr>
<td>Craft J.</td>
<td>T641</td>
</tr>
<tr>
<td>Craft K. L.</td>
<td>T629</td>
</tr>
<tr>
<td>Craig M. A.</td>
<td>R706, T616, R718</td>
</tr>
<tr>
<td>Craparo E. M.</td>
<td>T638</td>
</tr>
<tr>
<td>Crapster-Pregent E. J.</td>
<td>T603, R403*</td>
</tr>
<tr>
<td>Crawford D. A.</td>
<td>W301, R455</td>
</tr>
<tr>
<td>Crawford I. A.</td>
<td>T628, T623</td>
</tr>
<tr>
<td>Cremonese G.</td>
<td>T613, T624, R718</td>
</tr>
<tr>
<td>Cressey G.</td>
<td>T606</td>
</tr>
<tr>
<td>Crichton D. J.</td>
<td>R732</td>
</tr>
<tr>
<td>Crisp D.</td>
<td>R730</td>
</tr>
<tr>
<td>Crisp J.</td>
<td>T630</td>
</tr>
<tr>
<td>Crisp J. A.</td>
<td>T202, T615, T618</td>
</tr>
<tr>
<td>Crites S.</td>
<td>R722</td>
</tr>
<tr>
<td>Crites S. T.</td>
<td>M103*, T628</td>
</tr>
<tr>
<td>Crotch T. K.</td>
<td>F504*, R704, R702</td>
</tr>
<tr>
<td>Croft S. K.</td>
<td>T632</td>
</tr>
<tr>
<td>Cronberger K.</td>
<td>R404*, T628</td>
</tr>
<tr>
<td>Cros A.</td>
<td>M153, T617</td>
</tr>
<tr>
<td>Cross M.</td>
<td>T645</td>
</tr>
<tr>
<td>Crosta A. P.</td>
<td>R720</td>
</tr>
<tr>
<td>Crown D. A.</td>
<td>T621, T624, T637, R729, R731</td>
</tr>
<tr>
<td>Crawther S. A.</td>
<td>M104, W351, F504*, T604, R706, R710</td>
</tr>
<tr>
<td>Crumpeter L. S.</td>
<td>T252*, T624, T634</td>
</tr>
<tr>
<td>Cseh R.</td>
<td>T638</td>
</tr>
<tr>
<td>Cuda J.</td>
<td>R703, R709</td>
</tr>
<tr>
<td>Cudnik B. M.</td>
<td>T251*</td>
</tr>
<tr>
<td>Cui J.</td>
<td>R722</td>
</tr>
<tr>
<td>Culla C.</td>
<td>T629</td>
</tr>
<tr>
<td>Cull S.</td>
<td>R726</td>
</tr>
<tr>
<td>Culver A.</td>
<td>T615</td>
</tr>
<tr>
<td>Cumber J.</td>
<td>T638</td>
</tr>
<tr>
<td>Cuomo D.</td>
<td>T643</td>
</tr>
<tr>
<td>Currie D. G.</td>
<td>T626</td>
</tr>
<tr>
<td>Currie D.</td>
<td>T613</td>
</tr>
</tbody>
</table>
INDEX

Cuvillier P.  T203, T607
Cuzzi J. N.  R706
Czechowski L.  T612, T629, T630
Czechowski L. L.  T630
Dachwald B.  R703
Dahiwal R.  T638
Dahl J. M.  R718
Daisaka H.  T631
Dalba P. A.  W351
D'Alessio P.  F554
Dalton H. A.  T632, T635
Dalton J. B. III  T205*
Daly M.  T641
Daly M. G.  R735
Daly R. T.  T611
D'Amore M.  W353, T613
Dampitz A. L.  R719
Dandonneau P-A.  T641
Danell R. M.  T641
Danielson L.  T609
Danielson L. R.  T201
Dankamich J. W.  T638
Dartois E.  T641
Das A.  R722
Davatzes A.  T637
Dave A.  T641
Davenport J. D.  T204*
D'Aversa E.  R726
Davidson J.  T203*
Davies A. G.  T256*, T625, T629, R734
Davies G.  T641
Davies G. R.  T645
Davies N. S.  R725
Davis A. M.  M104, F504, R701, R705
Davis D. R.  R735
Davis M. W.  R722
Davis P.  T635
Davison T. M.  T608, T611
Dawn Science Team  W351
Day B. H.  T251
Day J. M. D.  T201*, T204, W352, T610, T628, R710
De Angelis S.  T643
Deans M.  R723
Deans M. C.  T645
Dearborn D.  R713
Debaille V.  T612
DeCarli P. S.  R724
Decker M. C.  T625
Deen R.  T617
Deen R. G.  T202, T614, T615
DeFores L.  M153, T616, T617
DeGlacliation Study Steering Group  T642
De Gregorio B.  R702
De Gregorio B. R.  T605
De Gregorio B. T.  W355*
Delaney J.  R454
Delaney J. S.  W352, R703, R724
Dehouck E.  R402*
De Keyser J.  T612
de Kok R.  T630
del la Haye V.  T630
Delanay J.  R545
Delanay J. S.  W352, R703, R724
Delapp D.  M153, T617
Delapp D. M.  T617
de la Torre M.  F503, T616
de la Torre R.  R734
de la Torre Juárez M.  M102, T616, T617, T618
Delbo M.  F551
Delbridge B.  R730
Deldicque D.  T626
Del N'aggio S.  T626
Dell'Arciprete I.  W305
Delle Monache G. O.  T626
Delory G. T.  M103, R723
Deloule E.  R734
Demoule E.  F505
DeMeo F. E.  R714
Demets R.  R734
Demidov N. E.  R722
de Mijolla G. M.  R725
Demura H.  T641
Denevi B. W.  M154*, W301, W303, W353, F501, F555, T610, T611, T613, R732
Deng L.  T201
Denk T.  T629
Denyszn S.  F506
de Pablo M. A.  T616, T617
de Pablo Hernández M. A.  T618
DePaolo D. J.  T628
Depecker C.  T602, T605
deracourt S.  T641
De Rosa D.  M152
Desai A. J.  R729
De Sambur R.  R701
De Sanctis M. C.  W301, W351*, F501, F551, T610, T611, T643
Desch S. J.  M101, M156, T204*, T254*, R711
Des Marais D. J.  T202, T615, T618
DeSouza C. A. G.  T638
DeSouza P.  T252
Deustua S.  T636
Deutsch A.  R405, R718
Devadagoud R.  T609
de Vera J-P.  R734
Devouard B.  T605
de Wet A.  T624
DeWitt R.  T641
Dhaliwal J. K.  T204*, T610
d'Hendecourt L.  T602R703
d'Hendecourt L.  R734
Dhingra D.  W304, R722
Dhrarmendrakar P.  R723
Di K.  T641, R724
Di Achille G.  R726
Diaz E.  T641
Dickson J. L.  W305*
Dietrich J. E.  W351*
Dietrich B.  T614
Dietrich P.  T641
Dietrich W. D.  T642
Dietrich W. E.  M102, M153, T256, T614
DiFrancesco N.  T204
DiFrancesco N. J.  T628
Di Iorio T.  T643
Dikov Yu. P.  T605
Dill J.  R707
Dimitrova L. L.  T612
D'Incecco P.  T613, R733
Ding N.  R719
Ding S. D.  R724
Ding W.  T634
Diniziega S.  T624
Diniziega S. D.  T624
DiNino D.  T205
Direzio S.  T645
Dirk D.  T638
Dirr F.  T641
DiSanti M. A.  R714
Dissly  R.     R709
Ditrói-Puskás Z.     T607
Dixon J. C.     T621, R725, R734
Djouadi Z.     T602, R703
Dobrica E.     F554*
Dobson N.     T202
Doggett T.     R731
Doherty R.     T607
Dohm J. M.     T253, R451, T622
Dohmen R.     T203, R709
Dolliver H. A. S.     R720
Domanik K.     R707
Dombard A. J.     M155, R711, R719
Domingue D. L.     T613
Dominguez G.     F553, T605
Donaldson Hanna K. L.     M154, W304*, T635, T641
Dornan J. W. III     R724
Doubleday J.     T641
Doucet M.     T641
Doué S.     R724
Downs R. T.     T202, T615, T618
Doyle P.     T606
Doyle P. M.     M104*, T604
Drake D.     M153, T617
Drake K.     R709, R718
Drake K. D.     R718
Drapers D. S.     R404, T624
Dresen G.     R718
Dromard G.     T617
Dromart G.     M102, M153, T202, T614, T617
Dropman M.     T643
Drummond J.     F551
Drummond J. R.     T641
Dryer C.     R735
Dube A.     R720
Dubreuil-Laniel G.     T645
Dufek J.     W352, R730
Duke M. J. M.     W302
Dulai S.     T638, R734
Dulova I. A.     R728
Dumas C.     T629
Duncan M.     T201
Dundas C.     R719
Dundas C. M.     M154*
Dunlap D. R.     T607
Dunlop D.     T627
Dun T. L.     F551*
Dunne W. M.     T612
Duprat J.     T601, R703
Duru D. D.     T606, R709, R712, R717
Durham W. B.     R727
d'Uston C.     M153, T617, R722
Dutilleul P.     T603
Dworkin J. P.     T202, W355, F552, T615, R707
Dwyer C. A.     T201*
Dyar D.     T617
Dyar M. D.     M153, F503, T615, T617, T625, R706, R723
Dyar MD.     T617
Dyches P.     T636
Dygert N. J.     W352*, T627
Dyl K. A.     M101, T203*, T628
Dypvik H.     R718
Eakins D.     R718
Ebel D. S.     T203, W303, R403, F554*, R702, R704, R706, R707, R720
Ebert M.     R405*, F506
Ebihara M.     W355, R401, R454, T607, R703, R710
ECAM Team     M102
Eckert J. O.     T607
Economou T.     T252
Edberg S. J.     T634
Edery D. R.     T606
Edgar L.     T614
Edgar L. A.     M102*
Edgett K.     F503
Edgett K. S.     M102, M153, T202*, T251, T615, T616
Edmundson K. L.     M152, R732
Edmunson J. E.     R732
Edwards C. S.     M154*, T619, R726
Eggenberger P.     T254
Eggers G. L.     R733
Ehmann B.     T617
Ehlmann B. L.     M102, M153, R402, T614, T615, T617, R726
Ehrenfreund P.     T645, R734
Ehresmann B.     T616
Eigebrode J. L.     M102, T202, F503, T614, T615, T616, T618
Eignebrode J. L.     T618
Eiler J. M.     F505, R709
Eke V. R.     R726
Elam J. T.     T619
Elam W. T.     T646
Elardo S. M.     T201, R404*, T628
El-Baz F.     R722
Elbeshesauden D.     T611, R718
El-Dasher B.     R718
Elder C. M.     M155*, R455*
El Goreasy A.     W302*, W352, R401
Elkins-Tanton L. T.     M151*, W301, W354, T608, T638
Ellery A.     T641
Elliott B.     M153
Elliott H. M.     R453
Elliott J.     R713
Ellis B. S.     T624
El Maarry M. R.     T253*, T622
Elphic R. C.     T638, T723, R726
Elsaeisser A.     T645, R734
Elsenousy A.     R402*
ElShafie A.     T629
Elisla J.     T641
Elisla J. E.     W355*, F552, R707
Elsner P.     R725
Elsperman M. S.     T638
Emery J. P.     F501, T612, T629, R709, R716
Encrenaz P. J.     T630
Eng P.     T639
Englert P.     T642
Engrand C.     T641, R703, R714
Enke B.     F555
Enns A. C.     T625
Enos M.     R720
Epps A. E.     R732
Erard S.     F551
Erickson T. E.     T609
Erkeling G.     W305*, T640, R726, R728, R729
Ermakov A. I.     W301
Ernst C. M. M154, W303*, W353, T613
Erteza I. R722
Erzinger J. F506
Esccierg S. W302
Escobedo S. R723
Esetim P. T620
Es C. R703
Espinoza C. J. R710
Espinoza C. J. R710
Espinoza C. J. R710
<table>
<thead>
<tr>
<th>Name</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frey H. V.</td>
<td>T253*, F555*, T612, R721</td>
</tr>
<tr>
<td>Friday M. E.</td>
<td>R729</td>
</tr>
<tr>
<td>Friedrich J. M.</td>
<td>R717</td>
</tr>
<tr>
<td>Fries J.</td>
<td>R707</td>
</tr>
<tr>
<td>Fries M.</td>
<td>F501, R707</td>
</tr>
<tr>
<td>Fries M. D. F.</td>
<td>W301, W351*, T610, T611, T643, R727</td>
</tr>
<tr>
<td>Fritz J.</td>
<td>R724, R726</td>
</tr>
<tr>
<td>Fritz J. P.</td>
<td>R710</td>
</tr>
<tr>
<td>Frost D. J.</td>
<td>T201</td>
</tr>
<tr>
<td>Fry C.</td>
<td>R720</td>
</tr>
<tr>
<td>Fu R. R.</td>
<td>W301*, T608</td>
</tr>
<tr>
<td>Fu X. H.</td>
<td>T628</td>
</tr>
<tr>
<td>Fuchs T.</td>
<td>T641</td>
</tr>
<tr>
<td>Fuerst S. I.</td>
<td>T633</td>
</tr>
<tr>
<td>Fueten F.</td>
<td>R451, T620</td>
</tr>
<tr>
<td>Fujibayashi Y.</td>
<td>R722</td>
</tr>
<tr>
<td>Fujikawa T.</td>
<td>T639, R703</td>
</tr>
<tr>
<td>Fujimoto M.</td>
<td>F501, R735</td>
</tr>
<tr>
<td>Fujira Y.</td>
<td>R718</td>
</tr>
<tr>
<td>Fujita Y.</td>
<td>R405</td>
</tr>
<tr>
<td>Fujii Y.</td>
<td>F504*, R705</td>
</tr>
<tr>
<td>Fukami Y.</td>
<td>T603</td>
</tr>
<tr>
<td>Fukuda K.</td>
<td>R705</td>
</tr>
<tr>
<td>Fukuhara T.</td>
<td>T641, T630</td>
</tr>
<tr>
<td>Fulford P.</td>
<td>M153</td>
</tr>
<tr>
<td>Fuller D.</td>
<td>T614</td>
</tr>
<tr>
<td>Funaki M.</td>
<td>R720</td>
</tr>
<tr>
<td>Fuqua H. A.</td>
<td>T635</td>
</tr>
<tr>
<td>Für E.</td>
<td>F505*</td>
</tr>
<tr>
<td>Furuta R.</td>
<td>R722</td>
</tr>
<tr>
<td>Futaguchi M.</td>
<td>R730</td>
</tr>
<tr>
<td>Gaboriaud A.</td>
<td>T615</td>
</tr>
<tr>
<td>Gabsi T.</td>
<td>T641</td>
</tr>
<tr>
<td>Gaddis L. R.</td>
<td>M103*, T625, R722, R726, R732</td>
</tr>
<tr>
<td>Gaffney A. M.</td>
<td>T620</td>
</tr>
<tr>
<td>Gainsforth Z.</td>
<td>F553*, T605, T644, R702</td>
</tr>
<tr>
<td>Gaither T.</td>
<td>T625, R722</td>
</tr>
<tr>
<td>Gaither T. A.</td>
<td>R720</td>
</tr>
<tr>
<td>Gale Mapping</td>
<td>T614</td>
</tr>
<tr>
<td>Team</td>
<td>T614</td>
</tr>
<tr>
<td>Galcic A.</td>
<td>T615, T641</td>
</tr>
<tr>
<td>Gallegos Z. E.</td>
<td>T645</td>
</tr>
<tr>
<td>Gallino R.</td>
<td>F504</td>
</tr>
<tr>
<td>Galub A. G.</td>
<td>T629</td>
</tr>
<tr>
<td>Ganguly J.</td>
<td>T606, T607</td>
</tr>
<tr>
<td>Garber J. M.</td>
<td>T638</td>
</tr>
<tr>
<td>Garcia A.</td>
<td>T256*, R729</td>
</tr>
<tr>
<td>Garcia P. A.</td>
<td>R732</td>
</tr>
<tr>
<td>Garcia R.</td>
<td>T612</td>
</tr>
<tr>
<td>Garcia V.</td>
<td>T619</td>
</tr>
<tr>
<td>Gardner-Vandy K. G.</td>
<td>M101, R401*, R710</td>
</tr>
<tr>
<td>Garenne A.</td>
<td>R706, R707</td>
</tr>
<tr>
<td>Gargate L.</td>
<td>R723</td>
</tr>
<tr>
<td>Garlant A.</td>
<td>T625, R722</td>
</tr>
<tr>
<td>Garvin J.</td>
<td>R722</td>
</tr>
<tr>
<td>Garvin J. B.</td>
<td>T614, R723</td>
</tr>
<tr>
<td>Gasda P. J.</td>
<td>T605</td>
</tr>
<tr>
<td>Gaskell R. W.</td>
<td>W302, R732</td>
</tr>
<tr>
<td>Gasnault O.</td>
<td>M102, T615, T617, R722</td>
</tr>
<tr>
<td>Gattaccceca J.</td>
<td>M101*, W302*, T607, R703</td>
</tr>
<tr>
<td>Gaudin A.</td>
<td>R402</td>
</tr>
<tr>
<td>Gavin P.</td>
<td>W354</td>
</tr>
<tr>
<td>Gay P. L.</td>
<td>T251*, T636</td>
</tr>
<tr>
<td>Gearheart D.</td>
<td>R703</td>
</tr>
<tr>
<td>Geeta V.</td>
<td>M152</td>
</tr>
<tr>
<td>Geiger L.</td>
<td>R719</td>
</tr>
<tr>
<td>Geissler E. P.</td>
<td>F502*, R729</td>
</tr>
<tr>
<td>Geissman J.</td>
<td>W302</td>
</tr>
<tr>
<td>Gellert R.</td>
<td>T617</td>
</tr>
<tr>
<td>Gellar R.</td>
<td>M102, M153*, T202, T252, T615, T618, T645</td>
</tr>
<tr>
<td>Gellissien M.</td>
<td>R704</td>
</tr>
<tr>
<td>Gendreau K.</td>
<td>T641</td>
</tr>
<tr>
<td>Gense M. J.</td>
<td>R724</td>
</tr>
<tr>
<td>Geng H. T.</td>
<td>T640</td>
</tr>
<tr>
<td>Geng H. E.</td>
<td>T614</td>
</tr>
<tr>
<td>Gentry D. M.</td>
<td>T638</td>
</tr>
<tr>
<td>Genzer M.</td>
<td>F503, T615, T616</td>
</tr>
<tr>
<td>Germain M.</td>
<td>T642</td>
</tr>
<tr>
<td>Gernhardt M. L.</td>
<td>T645</td>
</tr>
<tr>
<td>Gerth I.</td>
<td>T638</td>
</tr>
<tr>
<td>Gerya T.</td>
<td>M155</td>
</tr>
<tr>
<td>Gessler N.</td>
<td>W351</td>
</tr>
<tr>
<td>Gesselman M. V.</td>
<td>T605</td>
</tr>
<tr>
<td>Giesler R.</td>
<td>M154</td>
</tr>
<tr>
<td>Ginev G.</td>
<td>T642</td>
</tr>
<tr>
<td>Gipps M.</td>
<td>T613</td>
</tr>
<tr>
<td>Gizzi N.</td>
<td>T627</td>
</tr>
<tr>
<td>Gladstone G. R.</td>
<td>R722, R723</td>
</tr>
<tr>
<td>Glamoclijka M.</td>
<td>W302, F552</td>
</tr>
<tr>
<td>Glaser P.</td>
<td>M152*</td>
</tr>
<tr>
<td>Glass B.</td>
<td>T638</td>
</tr>
<tr>
<td>Glass B. J.</td>
<td>T638, T641</td>
</tr>
<tr>
<td>Glassmeier K.-H.</td>
<td>R735</td>
</tr>
<tr>
<td>Glavron D.</td>
<td>T620, T618</td>
</tr>
<tr>
<td>Glavin D. P.</td>
<td>T252*, W302, W355, F503, F552, T615, T616, T618, R707</td>
</tr>
<tr>
<td>Glazie L. S.</td>
<td>T624, T625, R730</td>
</tr>
<tr>
<td>Gleen C. R.</td>
<td>T256*</td>
</tr>
<tr>
<td>Glines N. H.</td>
<td>R725</td>
</tr>
<tr>
<td>Gloczec Z.</td>
<td>T637</td>
</tr>
<tr>
<td>Godber A.</td>
<td>T617</td>
</tr>
<tr>
<td>Goderis S.</td>
<td>F506*, T612</td>
</tr>
<tr>
<td>Goeussener F.</td>
<td>T618, T641</td>
</tr>
<tr>
<td>Goetz W.</td>
<td>M103, T202*, T615, T616, T617, T618, R734</td>
</tr>
<tr>
<td>Goetz W.</td>
<td>T612</td>
</tr>
<tr>
<td>Goff F.</td>
<td>T642</td>
</tr>
<tr>
<td>Goldberg D.</td>
<td>R718</td>
</tr>
<tr>
<td>Golden D. C.</td>
<td>R402</td>
</tr>
<tr>
<td>Golder J. E.</td>
<td>T613</td>
</tr>
</tbody>
</table>
INDEX

Golder K. B. R725
Goldstein J. I. T203, R401*
Golightly M. T627
Golightly M. J. R722
Golombek M. T612, T640
Golombek M. P. T614
Golovin D. M153, T616, T617
Golovin D. V. T617, R722
Gómez F. F503*, T615, T616
Gómez-Elvira J. M102, F503, T615, T616, T617, T618
Gondet B. M153, T614, T615, T617, T619, R724, R726, R729
Gondo T. R703
Gong X. T627
Gonthier Y. T645
Gonzales A. T638
Gonzalez C. F505
Gonzalez C. P. T601
Gonzalez D. R722
Gonzalez E. T732
González-Medina J. M. R734
González-Sandoval M. R734
Göpel C. W302
Goran D. T607
Gordon S. T617
Gordon S. R. T724
Goreva Y. W302
Goreva Y. S. T601
Gorevan S. T202
Görög M. R703
Goswami J. N. R453*, F505
Goto K. R720
Gou S. R724
Goudge T. A. T613, R725, R726
Gough R. V. R726
Gounelle M. R454*, F555, T628
Gourgeot F. T629
Grady M. M. W304, R722
Gragesh M. A. T628
Grangel S. J. T255, T613, T626
Grange M. L. T640
Grass D. W301
Grass T. R730
Graves S. D. T630
Green A. T625, R729, R731
Green J. T640
Green R. O. R726
Greenbaum J. S. T642
Greenberg M. R702
Greenberger R. T641
Greenberger R. N. T642
Greenhagen B. T. M103*, M154, W304, R722
Greenwood J. P. F505, T628, R724, R726
Greenwood R. C. R401*, T606, R706, R710
Greshake A. R724, R726
Grieve R. A. F. F506, R718, R720
Grieve G. A. R723
Griffiths A. T641
Grigsby B. T633
Grima C. T638
Grimm R. E. W305*, T641
Grindrod P. M. R726
Grocholski B. T609
Groener E. F504
Groopman E. E. F504*
Gross C. R724, R726, R734
Gross J. T203*, F505, F552*, R724
Gross N. T637
Grosse C. R405
Grosse P. T642
Grosshans T. E. W302*
Grossman L. R403, T607, R706
Grott M. T612, T641, R735
Grotzinger J. M153, T202, T614, T618
Grotzinger J. P. M102*, T202, T614, T615, T618
Grove T. L. R404*, T628
Graul A. R723
Gron E. T639, T641, R709, R718
Guallini L. R451*
Guan Y. T254, W352, F505, T601, R705, R709
Guerrini V. T615
Gugliucci N. T251
Guillemin P. M153, T617
Guinness E. T252
Guinness E. A. R732, R733
Guiza B. G. T628
Güldemeister N. R405*
Gulick V. C. T641
Guo J. T616
Guo P. Z. R723
Gupta R. P. W304
Gupta S. M102, T202, W305, T615, T617, T641, R726
Gurenko A. A. F505
Gurman S. J. R708
Gurov E. P. R720
Gusakova E. N. R721
Guseva E. N. R733
Gustafson J. O. M103, R722
Guzzetti F. T621
Gyngard F. F504, T605, R701
Gyllai I. R710
Haa H. R401
Haase I. M152*
Haba M. K. T610
Haberle C. W. R707
Haberle R. T616
Haberle R. M102, F503, T616
Haberle R. M. M102*, T616, T617, T618
Haddad E. T641
Haeencour P. F504*, R701
Hager B. H. W301
Hägermann A. T641
Hagerty J. J. M103, R720, R723
Hagiya K. W356, F501
Hahre M. A. T616
Haigh S. R726
Haines A. J. T612
Haines P. W. F506
Halekas J. S. M103, T612
Hall J. R. T614
Hallet B. R451*, T618
Halligan E. T635
Halls L. J. R402*
Hallock H. R. F506
Haltigin T. T645
Haltigin T. W. R727
Hutzler A.    R703
Hvid S. F.    T202, T611
Hyde T. W.    T643, R701
Hynek B. M.   T641, T642,    R719
Hyodo R.      T602
Hyung E.      T201*
Hyodo R.      T602
Iagnemma K.   T614, T645
IAU Working Group M152
Ibarra Y.      T641
Imae N.       R405, R703
Ibara Y.       T641
Iess L.       M155, R732
Ito K.        R721
Ito S.        R703
Itoh S.       W355, T628, R704
Itose S.       T641
Itiharat D.   T641
Ivanov A. B.  R727
Ivanov A. B.  T611, T614,    R715
Ivanov A. M.  W305, W354*,    T640, R728
Ivanova M. A.  M104, R401,    R403*, T605, R710
Iwai T.       T639
Iwata N.      T602
Iwata T.      T604, T625, T628,
               R721, R723, R735
Izawa M. R. M. R706, R716,    R718, R726, R735
Jacob D.      T607
Jacob S. R.   R724
Jacobsen B.   M104*, R403
Jacobsen R. E. R725
Jacobsen S. B. W304
Jacobsen S. D. W304
Jacobsen S. N. T641
JadHAV M.     F504*, R701
Jaeger F.     T202
Jain N.       R726
Jaiswal B.    R704
Jakobovitz C. V. R722
Jambon A.     T606, R720
James D.      T641
James J. H.   M102*, T202,    F503, F552, T616, T617,
               T618, T636, R724
Jannink E.    T201, T252, T560,
               R401, R455*, T626
Jantzen R.    R722
Janssen M.    R729
Jansens M.    R734
Jaron A. C.   T202, T615
Jaron A. P.   R723
Jaron K.      T624
Jaron M. K.   R705
Jenniskens P. W356, F501,    T604, R707
Jenks E. H.   T202, T615
Jensen J. K.  M102
Jensen J. R.  R722
Jerome M.     T615
Jha K.        T613
Jiala C.      T644
Jin Y. Q.     T627
Jodlowski P.  T624
Jogi P.       R718
Johnstone S.  R729
Johannsen B.  T638
Johnson B.    R720
Johnson B. C. T255*, W301,    R455*, T626
Johnson C.   T612
Johnson C. L. W303*, F555*,    T627, R721
Johnson C. S. T202
Johnson D.    M153, T617
Johnson D. E. T645
Johnson D. R. T252, T614,    T615, T617, R726
Johnson L.   T251
Johnson M. B. R729
Johnson M. S. T202, T615
Johnson N.    W354
Johnson P. V. T629
Johnson T. V. M156*, T256,    T625, T629
Johnston A. K. T634
Johnston R.   T629
Johnston S. J. T629
Johnstone S.  T612
Johnson H. L. T638
Johnson L.    R724
Jones A. J. P. T634, T637
Jones C. E.   T641
Jones C. E.   T641
Jones C. H.   T638
Jones D.      R724
Jones J. H.   M102*, T202,    F503, F552, T616, T617,
               T618, T636, R724
Jones R. H.   T201, T607
Jones S. M.   R734
Jordan A. P.  R723
Jordan C. J.  T624
Jordan C. J.  T624
Jordan M. K.  R705
INDEX

Joseph E. C. S.     T621, T637
Joseph J.       T617
Joshipura K. N.     R730
Joswiak D.     F553
Joswiak D. J.     R703
Jourdan F.     F506, T628, R720
Joy K. H.     R454, T628
Joy S. P.       W301
Joyce C.     R722
Joyce C. J.     T627, R723
Jozwiak L. M.     M154*, T624
Jun I.     R403*, T614, T615, T617, T618
Kabai S.      T638
Kaczmarek M.-A.     T628
Kadlec J.     R720
Kadono T.     R405, T641, R720
Kah L. C.     M102, M153, T202, F503, T614, T615, T617, T618
Kahan D. S.     W303
Kahampää H.     M102, T615, T616
Kahmann-Robinson J. A.     R402
Kahre M. A.     M102
Kairies Beatty C. L.     R720
Kalirai J. S.     T641
Kalisch J.     T610
Kallonen A.     R703
Kaltenbach A.     M104, T604
Kallyn J. D.     F555, R721
Kamata S.     F551, R721
Kambhu D.     R720
Kameda S.     F551, T641
Kamp L. W.     T205
Kamyshenkov D.     T611
Kang R.     T619
Kanik I.     R734
Kantescaria K.     T619
Kapitzke M.     R703
Kaplan M.     R716
Käppel A.     T607
Kaptechen P. F.     R709
Karachevtseva I. P.     R715, R721, R729
Karatekin O.     T612
Karato S.     T627
Karcz J.     T638, R723
Kargel J. S.     W353*, T642
Kargl G.     T612
Karimi M.     M155*
Karner J. M.     T624
Karouyi J.     F501, R722
Karunatilakke S.     F552*, R724
Kashima S.     T628
Kashiv Y.     T603
Kasper J.     R722
Kasper J. C.     T627, R722
Kato C.     T204
Kato H. Y.     R722
Kattenhorn S.     T629
Kattenhorn S. A.     M155, T612, T623, T629
Katz I.     T618
Kaufmann A. J.     T644
Kaufmann D. E.     R722
Kauhanen J.     T616
Kay J.     T638
Kaydash V.     R722
Kearsley A. T.     M156, R405, F553, R702, R724
Kebukawa Y.     W356*, F501
Kedar S.     T641, R718
Kelley D. S.     F503
Kempf S.     T641, R709
Kempf J.     T201
Kemppinen O.     T615, T616
Kendall J. D.     R718
Kendrick M.     T405, F506, R718, R719, R720
Kennedy E.     T623
Kennedy M. R.     M153, T202, T615
Kerber L.     T624, R730
Kereszturi A.     T607, T623, T637, R734
Kerjean L.     T618
Kier L.     R709
Kim K. J.     R722
Kim P. L.     M153, T614, T615, T617, T618, T645
King P. L.     T617
King S. D.     T612
Kinney-Spano E.     T641
Kinser R. M.     R732
Kirby J. P.     R734
Kirchoff M. R.     F555*
Kirienko G. A.     R730
Kirk R.     M103, M155
Kirk R. K.     T256
Kirk R. L.     M152*, T256, T641, R732
Kissel J.     R714
Kita N. T.     M104, R403, T628, R704, R708
Kitajima Y.     T602
Kitazato K.     T641, R735
Kite E. S.     F502*
Klaus K.     T638
Kleine T.     M101, M156, T204, R401, T603, T604, T628, R710
Kleinmans M. G.     W305, R725
Klemme S.     R709
Klesh A. T.     T638
Kletetschka G.     R720
Kleyina J.     R405
Klima R. L.     M103*, W353, F505, T613, T625, R723
Klimczak C.     W303, W355*, T613, T627, R722
Klingelhofer G.     T645
Klingelhofer G.     T252, R720
Kickapoo Lunar Research Team     F555*
Kidd R.     T645
Kiefer W. S.     M103, T255*, W354*
Kierenber R. L.     R729
Kierein-Young K. S.     T642
Kilcoyne A. L. D.     W302, W355, W356
Killen R. M.     W303, T638
Kim K. J.     R722
Kim M.-J.     R716
Kim S.     T642
Kim T.     R732
Kimberley J.     R718
Kimura H.     T639, R709
Kimura J.     T638, T641
Kimura M.     M104, R702, R708
Kinch K. M.     T615, T617
King A. J.     M104*
King D. T. Jr.     T623, R720
King P. L.     M153, T614, T615, T617, T618, T645
King P. L.     T617
King S. D.     T612
Kinney-Spano E.     T641
Kinser R. M.     R732
Kirby J. P.     R734
Kirchoff M. R.     F555*
Kirienko G. A.     R730
Kirk R.     M103, M155
Kirk R. K.     T256
Kirk R. L.     M152*, T256, T641, R732
Kissel J.     R714
Kita N. T.     M104, R403, T628, R704, R708
Kitajima Y.     T602
Kitazato K.     T641, R735
Kite E. S.     F502*
Klaus K.     T638
Kleine T.     M101, M156, T204, R401, T603, T604, T628, R710
Kleinmans M. G.     W305, R725
Klemme S.     R709
Klesh A. T.     T638
Kletetschka G.     R720
Kleyina J.     R405
Klima R. L.     M103*, W353, F505, T613, T625, R723
Klimczak C.     W303, W355*, T613, T627, R722
Klingelhofer G.     T645
Klingelhofer G.     T252, R720

44th LPSC Program  231
INDEX

Klug Boonstra S. L.     T633
Knapmeyer M.     M152
Knappe E.     R730
Kneissl T.     T253, T611, R719, R729
Knoll A. H.     T252
Knollenberg J.     T641
Kobayashi M.     M152
Knappe E.     R730
Kneissl T.     T253, T611, R719, R729
Knoll A. H.     T252
Knollenberg J.     T641
Kobayashi H.     T201
Kobayashi M.     T638, T639, T641, R709, R722
Kobayashi N.     T612, T638
Kobayashi S.     T605, R722
Kocurek G.     T202, R451
Kocurek G. A.     M102
Kodama R.     R405
Koeber S. D.     R722
Koeberl C.     T204, T642, R718, R720
Koehler J.     T616
Koenders R.     T645
Kogure T.     R724
Kohara S.     T602
Kohl E.     R707
Kohler E.     W354*
Köhler J.     T616
Kohlstedt D.     T612
Kohout T.     R703, R709
Koike C.     T602
Koiuzumi E.     R732
Kokhanov A. A.     R715
Komacek T. D.     T608
Komatsu G.     W305, T621, R720, R729
Komatsu M.     W356, F501, R705, R735
Koncz L.     R734
Kondo T.     R720
Kong F. J.     T642
Kong W. G.     T642
Kononkova N. N.     R403, R710
Konopliv A. S.     T255, W301
Konstantinidis K.     T638
Kööp L.     R705
Korn L.     T614
Kornienko Yu. V.     R728
Korochantsev A. V.     T605, R710
Korochantseva E. V.     R710
Korokhin V.     R722
Korotev R. L.     T204, R404, R454, T628
Korteniemi J.     T620, R725
Kortenkamp S. J.     T637
Korth H.     W303
Korvald C.     T641
Korycansky D. G.     R712, R718
Kostama V. -P.     R725
Kostama V.-P.     T620, R725
Kostiuk T.     R730
Koujelev A.     T641, T643, T646
Koutnik M.     R728
Kouyama T.     R723
Kowalski P. M.     T201
Kowitz A.     R405*
Kozakiewicz J.     R729
Kozyrev A. S.     M153, T616, T617
Kral T. A.     R734
Kramer G.     W354, R721, R729
Kratschmer H.     R718
Kring D. A.     R454, R455, F555, T633, T638, R722
Krishna B. G.     R732
Krishtan Sumanth T.     M152
Krohn K.     T611
Kron P.     R722
Kronrod E. V.     T627
Kronrod V. A.     T627
Krot A. N.     M104, T203, R403*, F554, T604, T606, R705
Krot T. V.     T623
Krüger H.     R714
Krüger T.     R719, R722
Kružínský M.     R710
Kružínska G.     T255
Kružínska G. L.     T255
Kružínska M.     T641
Krzesinska A.     T607
Kuan Y. J.     R714
Kuchka C. R.     R724
Kuder J.     R718
Kudo M.     T641
Kuehner S. M.     W303, R710
Kueppers M.     R714
Kuerster M.     F551
Kuga M.     T630
Kuhlmantel C.     T601
Lajtha L.     R402
Lalla E.     T646
Lamb M. P.     F502, T630
Landis R.     T638
Landis R.     T638
Landman N. H.     R720
Lane J. E.     T638
Lan Diego D.     T638
Landa F.     T638
Landis D.     R723
Landis M. E.     R727
Landis B.     T638
Landman N. H.     R720
Landes R.     T638
Landman N. H.     R720
Landes R.     T638
Lang A.     T637
Lang M.     T637
Lang M.     T637
Lang N. P.     R732, R733
Langenhorst F.     R703, R705
INDEX

Langevin Y.     M153, T615, T617, T619, T639, R724, R726, R729
Lanza N. L.     M153, T615, T617, T619, T639, R724, R726, R729
Lanzieri A.     T644
Lapen T. J.     M104, W302, W351, W352*, R404, R454, T604
Larson E.     T638
Larson W.     R723
Lasue J.     M153, T202, T615, T617, T618, R725, R734
Latham D. W.     W305
Laudet P.     T641
Lauer H. V.     T641
Lauer H. V. Jr     T641
Laufer R.     T643
Laura J.     M103, R722, R732
Laurent B.     T602, T605
LaViole S. K.     R732
Law E.     R732
Lawrence D. J.     M103, W301, W303, W351*, T610, T641, R722, R723
Lawrence J. F.     T627
Lawrence S. J.     M103, F555, T628, R722, R732
Le L.     F501, F505, R702, R724
Lebofsky L. A.     T641
Lebreton J. P.     T641
Le Corre L.     W301, W351, F501, T610, T611, R716
Le Deit L.     W305, R451*, R726
Lee C.     T609
Lee C. T.     T201
Lee E.     M155, R732
Lee E. M.     T619, R732
Lee J. I.     T203
Lee M. R.     R402, R726
Lee M. Y. P.     T604, R706
Lee P.     T638, T641, T645
Lees D. S.     T645
LeFavor M.     T615
Lefavor M. C.     T202
Lefebvre C.     T641, T643, T646
Lefevbre C.     T641
Lefèvre A.     T630
Leftwich K. M.     R402*, R726
Le Gall A.     T256, R729
Leger P. C.     T615
Le Guillou C.     T203*, T605
Lehan C.     T251, R722
Lehman K. M.     M103*
Lehner S. W.     T607
Lehto H. J.     R714
Lehto K.     R714
Leinhardt Z. M.     W353
Leinweber H.     R453
Leite E. P.     R720
Leitner J.     F504*
Leliwa-Kopystynski J.     F551*, T612
Le Menn E.     R402, T630
Lemke L.     T638
Lemmon M.     M102, T617
Lemmon M. T.     T615, T617, R715
Lemoine F. G.     T255, T613, T626
Le Mouélic S.     M102, M153, T256, T615, T617, T630
Lenardic A.     M155, T612
Leon P.     R722
Leone G.     M155*
Lepinette A.     F503, T615, T616, T617
Lepiniette A.     T616
Leprince S.     T614
Leprince S.     T614
Leroux H.     T203*, T602, T605, T607
Leshin L. A.     M102, M153, T202, F503, T616, T618
Lettieri R.     R702
Leung C. W. S.     R730
Léveillé R.     M153, T614, T617, T618, T645, T646, R734
Léveillé R. J.     T643
Lezengood S. P.     R735
Leverington D. W.     T624
Levine R. D.     T254
Levison H. F.     T629
Levy C. L.     R727
Lewellen D. C.     F502
Lewin E.     M102, M153, T615, T617
LeWinter A. L.     T624
Lewis D.     T641
Lewis J. A.     T607
Lewis J. B.     R701
Lewis K. W.     M102, M153, T202, F502, T615, R733
Lewis S.     T251
Leya I.     T603, R710
Li C.     T641
Li C. T.     T641
Li C.-L.     R722
Li C. L.     T628, R723
Li D.     T641
Li H.     R722
Li J.-Y.     W301
Li J.-Y.     T631, T610
Li L.     W304
Li L.     R723
Li R.     T634, T641
Li S.     F505*, R726
Li X.     T641
Li Y.     T612, R719
Li Z.     T638, R721
Li Z.-H.     T641
Liang Y.     W352, T627, T628
Liberi F.     R726
Libourel G.     F554
Licht A. A.     R732
Light B.     R726
Likhanskii A. R709
Likhanskii A.     T627
Lillis R. J.     M155*, T612
Lin L.     T641
Lima E. A.     M101
Limaye S. S.     R730
Limonadi D.     M153, T615, T618
Lin J.     T614
Lin J.-F.     R726
Lin T. J.     F503*
Lin Y.     W302*, T625
Lin Y. T.     R401
Lindemann R.     T645
Lindsay F.     W352
Lindsay F. N.     W352, R454, R703, R724
Lindskog A.     R706
Lindley D. H.     T204, T628
Lindval R.     R404
Line M. R.     R730
Lineberger D. H.     T633
Ling V.     R719
Ling Z. C.     R722
Linnen R. L.     F506
Lipkaman L. J.     M153, T202, T615
Lipman M. D.     R717
Lisov D.     M153, T617
Litaker H. L.     T645
LITA Project Science Team     T641
Litvak M.     M153, T616, T617, R722

44th LPSC Program  233
Litvak M. L. T616, T617, R722
Liu D. R723
Liu J. G. T628
Liu J. J. R723
Liu J. Z. R722
Liu M.-C. T254*
Liu M. C. T603
Liu N. F504*, R701
Liu Q. R732
Liu X. Q. T628
Liu Y. W304, T602, T628, R709, R724, R726
Liu Z. Y. C. T612
Livengood T. F505
Livengood T. A. R722, R730
Lizárraga-Mendiola L. R734
Llorca J. R706
Lobenwein M. T637
Lock S. J. R718
Lockwood A. C. T615, T618
Loeffler M. J. T638
Lofgren G. E. T638
Lofstrom D. J. T628
Logan C. T615, T618
Lognionne P. T641
Lognonné P. T612
Loiselle L. T643, R734
Loizeau D. R402, R724
LOLA Science Team T626
Lomov I. T615
Long A. T641
Long N. J. T638
Longobardo A. W351, T610, T611, T641
Longval Y. T639
Loomis B. D. T626
Looper M. D. R722
Lopes R. M. M154
Lopes R. M. C. T256, R732
Macke R. J. SJ T641
Luo W. T603
Luo Y. T625, T643, W305, R721
Lucas A. T256, F502, R732
Lucas M. P. T616
Lucichita B. K. T621
Lucey P. G. M103, W304*, F501, T628, T641, R722
Luceier A. T626
Ludwig H.-G. T601
Lunine J. I. T256, T629, T630, T641, R732
Lunning N. G. W301*, T607
Luntzer A. T638
Lüssing N. R703
Luspay-Kuti A. T256, T630
Lustrement B. T641
Lutz D. R453
Lynch K. L. T642
Lyness E. I. T202
Lyon I. C. T605
Lyon I. R726
Lyon J. R. T254*, T601, T602
Ma C. F505, R704, R705
Määttänen A. T643
Maia G. T611
Magar S. S. T256
Magna T. T603
Magni G. T643, T611
Magri C. T638
Magyar I. T638
Mahaffy P. M. T102, T202, T615, T618
Mahaffy P. M. T503, T615, T616
Mahaffy P. R. T602*, T615, T616, T617, T618, T641, R723
Mahanty P. F555*, T638, R719, R723
Maier A. T638
Mainzer A. K. T638
Makarov A. T641
Maki J. T102, T612, T615, T616
Maki J. N. T102, T202, T615
Malakhov A. M153, T616, T617, R722
Malakhov A. V. T617
Malaret E. T626
Malaret E. R. T626
Malaska M. T626
Malespin C. T616
Malespin C. A. T202
Malhotra S. R732
Maling M. C. T102, T614, T615, T617, T618, R715
Malkova K. T620
Mall U. T626
Manab C. T638
Managan R. T638
Mance D. T641
Mandler B. E. W301*
Mandler K. E. T630, R723
Mandt K. E. T630, R723
Manfredi L. T641
Mangold N. T638
Mango M. M155, T612, T629, T630, R730
Mangi M. T645
Mangold N. M102*, M153, R402, R451, T614, T617, T618
Mann P. T641, T642, T643, R716, R726
Mann P. J. T610
Manning H. M102, T202, T615, T617, T618
Manning H. L. T202
Mann H. L. K. T616
Manoa L. M. T253
Marboeuf U. R714
Nebergall K. T645
Nebut T. T641
Nedrow P. R710
Needham A. W. R403*
Neese C. L. R735
Nefian A. V. R732
Nechish T. R722
Neish C. D. M103, T256*, R719, R722, R732
Nekvasil H. T204*, T628, R704, R726
Nelson D. M. R722
Nelson T. M153, T617
Nemchin A. A. R454, F555*, T628
Nemeth P. T607
Neronzi S. R727
Nervold A. T638, T641
Nesnas I. A. T615, R729
Neville M. R711
Newcombe M. M153
Newman C. M102, T615, T616, R729
Newman C. E. T256, F502
Newman J. D. R720
Newsom H. E. M153, T202, T614, T645, R720, R724, R734
Newson H. E. T617
Newville M. T644
Nguyen A. N. W356, R701
Nicholas J. B. T626
Nicholson P. D. T630
Nihara T. W352, R454*
Nikidorov S. T617
Nikiforov S. M153, T616, T617
Nikitzczuk M. P. C. T642
Niles P. B. M102, T202, R402*, T602, T618, T641
Nimmo F. M155, T201, T205, T255, W353, T612, T629
Nishizumi K. W356*, R454*, T628
Nishijima M. R401
Nishimura Y. R708
Nishizawa S. N. R452
Nittler L. R. W303*, W355, F504*, T605, T613, R701, R706
Nixon B. E. T202, T615
Nixon C. A. T630
Noack L. R455, T612
Noble S. R723
Noble S. K. F501, R709
Noda H. T641
Noda S. N. R452
Noe Dobrea E. Z. T252*, R726
Noel A. J. R726
Nogami K. T639
Noguchi T. M104, T203, W355, F501, R703, R708
Nolan M. R722
Nolan M. C. F551, R712, R735
Nolan T. J. T202
Nordheim T. T638
Norman J. M103
Norman M. D. R454, T628
Norman M. L. F555
Norris M. F551
North S. N. T628
Northway P. R709
Notarnicola C. T630
Nottingham M. M104, R710
Novak R. E. R453
Novakovici T. F552*
Noviicki K. T641
Nuding D. T638
Nuding D. L. R726
Nuego M. T630, R707
Nuhn A. T633
Nuhn A. M. T253*, R720
Nunn M. H. F552*
Nuno R. G. R730
Nuth J. A. III M156*
Nvarro S. T616
Nyquist L. R724
Nyquist L. E. W352, R454*, R706, R724
Oberst J. M152, T613, T641, R715, R718
O'Brien D. P. M156, W351, R401*, T611
Ody A. R724, R729
Oehler D. Z. R451*, R725
Ofer E. O. F551
Ogawa K. T638, T641
Ogawa Y. W304, T641, R722
Ogliore R. C. T604, T605, R702, R706
Ohashi H. T639
Ohashi N. R703
Ohman T. T620, R722
Ohno S. R405, T638, T641, R720
Ohsumi K. W356, F501
Ohtake M. W304, F505, R719, R721, R722, R723, R732, R735
Ohtani E. W302, R401
Ohtsuki K. T602, T631
Ojha L. T627, R725, R726
Okabayashi S. T641
Okada T. F501, T641, R735
Okamoto C. R405*, T641, R703
Okamoto T. R718
Okano O. R706
Okazaki K. W355, R401, W361, R703, R708
Oklay N. R735
Okubo A. W355
Okubo C. H. T620, T642, R719, R729
Oki T. R726
O'leary A. F503
Ollila A. T617
Olinger C. T. R703, R710
Oliver A. R. T619
Ollila A. M102, M153, F503, T617
Ollila A. M. T615, T617, T645
Olsen K. T641
Olsen K. S. T641
Olson T. S. T202, T615, T617
Ong W. J. F553, R701
Onishi M. R730
Onishi M. O. R452
Ono A. T645
Ono T. M103, R722
Oosthoek J. H. P. T612, R732
Opanasenko N. R722
Orenstein N. P. T638
Orgel C. T645
Ori G. W. W305*, R725
Orlando T. M. R723
Ormel J. R718, R720
Orosei R. T624
Ott R. T. T624
Ortega K. T641
Orthsous-Daunay F.-R. T605
Oritz J. L. F551
Orzechowska G. T645
Osawa T. R708
Osetinsky L. R723
Oshigami S. M103, T641, R722
Osmond J.  R724
Ostrach L. R.  R721
O'Sullivan K. M.  R404*
Osuna P.  T638
Otake H.  T638, R722, R732
Otsuki M.  T638
Ott S.  R734
Ott U.  W302, R403, R702, R704, R707
Otto K.  W301, T611
Ouyang Z.  W302
Ouyang Z.-Y.  R722
Owen J. M.  R717, R718
Owen M.  R713
Owen T.  M102, T616, T617
Owens T. L.  T628
Oyama K.  R732
Ozaki N.  R405
Ozawa K.  T254
Ozawa S.  W302
Ozhogin P.  T638
Ott U.  T603
Padovan S.  T638
Pahlevan K.  T204*
Paige D.  R718
Paige D. A.  M103, M154, W304, T627, R712, R722, R730
Palasse L.  T607
Palma R. L.  F553, R702
Palme H.  R403, R704, R705
Palmer E.  W301
Palmer E. E.  R732, R735
Palmer E. M.  T610
Pál-Molnár E.  R710
Palomba E.  W301, W351*, T610, T611, T641, T643
Palucis M. C.  M102*, T614
Pan C.  W352*
Pan L.  T254, R402*
Panda D.  R720
Pandey D.  R723
Pando K.  T201, T609
Pandya S. H.  R730
Paniello R. C.  T203
Panning M.  T612
Pantalei S.  T641
Papanastassiou D. A.  M104, R404, R710
Papake J. J.  T201, W352, R724
Papp A.  T638
Pappalardo R.  T638
Pappalardo R. T.  T205*, T629
Paquette J. A. M156
Parai R.  T604
Paranicas C.  T205
Parente M.  R404, R710
Park J.  W352*, R454*, R724
Park R.  T610
Park R. S.  T255, W301
Parker C. W.  T638
Parker J. Wm.  R722
Parker T.  R451, T614
Parker T. J.  T252, T614
Parkos D.  R720
Parman S. W.  M102, T614, T628
Parmentier E. M.  T627
Parnell J.  R724, R730, R734
Parsons A. M.  T638, T641
Parsons D. P.  R725
Parsons R. A.  R451*, T642
Pasckert J. H.  R722
Pasini D. L. S.  F503*
Patchen A.  W304
Patel A. D.  T610
Patchen A. P.  R710
Patel A.  R730
Parethare A.  R727, R728
Parethare A. V.  R719, R727
Patmore E. B.  R717
Paton M.  T616
Patrick E. L.  R723
Patterson G. W.  M103, T629, R722
Patterson W.  T638
Patterson W. R. III  W304
M103, T629, R722
Patthoff D. A.  T629
Patzer A.  W351*
Paull D. J.  R728
Paufl G.  T641
Pavlovs G. A.  T202
Pavlov A. A.  T623
Pavlov S. G.  R708
Pavlov S.  F501, R708
Pavlov S.  F501, R708
Pawin B.  M153
Payne C. K.  T633
Pease R. E.  T605
Pease S. J.  W303
Pearson D. G.  W302
Pedersen G. B. M.  R451*, T642
Pedrazzi G.  R732
Pedrosa M. M.  T613
Peeters Z.  W355, T605
Peinado V.  T616, T617
Pellin M.  F504
Pellin M. J.  T601, R701
Pendleton M.  T638
Pendleton M. W.  T623
Peng Y.  T644
Peng Z. X.  R401
Pepe M.  R726, R732
Pepin R. O.  M102, T202, R451*, T616, R702
Pepelowski P. N.  W301, W303, W351*, T610, T641, T642
Peralta J.  R453
Pereira M. R.  R713
Perentis R.  T619
Peres R.  M153, T617, T641
Perl S. M.  T638
Perry J. M.  T614
Perry M. E.  W303*
Persson A. H.  R454, F505, F552*
Petrova M. I.  M156, T201, F506*, T607, R705
Persson M.  T603
Peters S. T. M.  T603
Peterson C. A.  M103, R722
Peterson C. M.  T619
Peterson K. M.  T638
Petitgirard S.  R404
PetitJean M.  R451
Peto N. E.  M103, F505*, T638, R722, R723, R731
Petrochilos L. T.  T643
Petruny L. W.  R720
Pewitt M. L.  T607
Philippion C.  T615
Phillips C.  R729
Phillips C. B.  T205, T629
Phillips R. J.  T255, W303, T613, T624, T626
Pien J.  T619
Pietak J. L.  R727
Picsi G.  T643
Pickersgill A. E.  F506*, R720
Pidgeon R. T.  R454, T628
Pierce J.  T619
Pieters C. M.     M103, M154, W304*, W351, F501, F505, T610, R721, R722, R723
Pieters C. P.     T641
Pietrek A.     R719
Pignatari M.     F504
Pike T.     T641
Pike W. T.     T612
Pillinger C. T.     R706
Pillinger J. M.     R706
Piluso E.     R726
Pina P.     R719, R727, R729
Pinet P.     M153, T617
Ping J.     T626
Ping J. S.     T625, R721
Pinnick V. T.     T641
Piquette M.     R709
Pikzaretto S.     W355
Platz T.     W305, T624, R720, R725, R726, R731
Plaut J. J.     T624, T641, R727
Plesk C. S.     R718
Plettemeier D.     T641
Poch O.     T615
Pocks T.     T638
Podosek F.     R701
Poelchau M. H.     R405*, R718
Poinsignon P.     T615
Pokuri J.     T619
Polanskey C. A.     W301
Polkko J.     T616
Pollard W. H.     R727
Pommerol A.     R727
Pommier A.     T627
Pompilio L.     R726, R732
Pondrelli M.     R451, T620, R725
Pont S.     W302
Pontoppidan K. M.     T254
Poole W. D.     T638, T641
Popa C.     R726
Popa D.     T641
Popa R.     T618, R734
Poppe A. R.     M103*, R703
Porco C.     T205*
Porter D. W.     T628
Porter J. N.     T641
Portree D.     R732
Portyankina G.     R727
Posiolova L. V.     T202, T615
Posner A.     T616
Posn E. S.     T607
Post K. E.     T638
Postberg F.     T641
Poston M. J.     R723
Potter A. E.     W303
Potter R. W. K.     R455*, T638
Poulet R.     F402, T614, T619, R729, R769, R740, R724, R726, R729
Povenmire H.     R720
Powell M.     T614, T615
Pozzobon R.     T620, T624
Price M. A.     R729
Price M. C.     M156, R405*, F503, F553, R718, R724
Prissel T.     W304
Prissel T. C.     W304*, T628
Proktor L.     W303, T610
Proktor L. M.     T205, W303*
Proslier T.     T644
Provenio P.     W302, T628
Pryor W. R.     R722
PSA Development Team     T638
PTF Team     F551
Pugetel J. S.     M104, W352, T628
Pullikainen A.     T638
Purohit V.     R720
Purucker M. E.     W303
Pyle D. M.     T625
Qadi A.     T641
Qi H.     R726
Qin C.     T626
Quantin C.     T624, R726
Quantin-Nataf C.     T620
Quinn R.     T645, R734
Quinn R. C.     R726
Quintana S.     F502
Quintana S. N.     R455*
Quirico E.     R706, R707, R714
Raack J.     R725
Raiaen E.     T202, T615, T616
Raaitala J.     T620
Radebaugh J.     M155, T256*, T612, T625, T642, R729, R732
Radhadevi P. V.     M152
Radhakrishnan K.     R453
RAD Team     T616
Rafkin S.     T616
Rafkin S. C. R.     M102, T616
Rahman Z.     W356, F501, F505, R701, R709
Rai B.     T645
Rai N.     R404*
Rainen R.     T615, T618
Raitala J.     R725
Rakoto F. Y.     T615
Rahchenu M.     T641
Reale S.     W303
Rall J. A.     T635
Ramboz C.     T642, T643, R734
Ramesh K. T.     R455*, R718
Ramkisssoon N. K.     R725
Ramos I.     T645
Ramon E.     R404
Ramos M.     T617, T618
Ramos M. A.     T616
Rampe E.     T618
Rampe E. B.     T202, T615, T618
Ramsey M.     T609
Ramsey M. S.     T624, R729
Ramsley K. R.     R718
Raney R. K.     R722
Rao M. N.     R724
Raponi A.     R714
Rapp J. F.     R404*, T628
Raschke U.     F506*, R720
Rask J. C.     T628
Ratejiff J. T.     T626
Rathbun J. A.     M154*
Raulin F.     T202, T615, T618
Ravine M. A.     T202, T614, T615
Ray D.     R720
Rayman M. D.     W301
Raymond C. A.     W301*, W351, F501, T610, T611
Read P. L.     R730
Reagan M. L.     T645
Redding B.     M155, R732
Reddy S. M.     T628
Reddy V.     W301, W351, F501, T610, T611, R716
Redmond L.     T640
Reed J. P.     R720
Reed M. H.     R402
INDEX

Reedy R. C.     W301, T610, R722
Rees S.     R732
Reimold W. U.     R405, F506, R720, R724
Reimuller J.     T638
Reisenfeld D. B.     T254
Reijns D.     W305, F502*, T640, R725, R726, R728, R729
Reitz G.     T616
Remijnan A. J.     R714
Remington B. A.     R718
Rempel A. W.     R451, R727
REMS/MSL Science Teams     M102
REMS Team     T616, F503
Rémusat L.     T203, W355*, T602, T605
Ren X.     R723
Rennó N.     M102, M153, T202, F503, T616, T618, R734
Rennó N. O.     R453, T617
Resnick I.     T637
Retherford K. D.     R722, R723
Reufer A.     T201*
Reuter D. C.     T641
Rey K. A.     T642
Reynard B.     M101
Rhind T.     T641
Rhoden A. R.     M155*
Ricco A.     R734
Rice J.     T641
Rice M.     T614, T617
Rice M. S.     T252, W305, T614, T617
Richardson D. C.     R712
Richardson J. E.     R718
Richardson M. I.     M102, F502, T616, T618
Richardson M. R.     R730
Richie J.     R732
Richmond N. C.     R722
Richter F. M.     R403
Rickman D.     T628
Rickman D. L.     R709, R732
Riebe M.     T605, R706
Rieck K. D.     T601
Rigal J. B.     T615
Rigaudier T.     T630
Righer K.     T201*, T608, T609, R706, R724
Righer M.     M104*, W351, W352, R404, R454
Rilee M. L.     R732
Riner M. A.     T613, R722
Riofrio L. M.     T627
Ristvey J.     T636
Ritter S. M.     T642
Rivera-Hernández F.     R726
Rivera-Valentin E. G.     W303*, T630
Rivers M. L.     R717
Rivkin A.     T629
Rivkin A. S.     M101*, W301, F501*, F551
Rizk B.     T641
Roark S. E.     R709
Roatsch T.     T611
Robbins S.     T621
Robbins S. J.     T612, R719, R721, R722
Robert F.     T203, T605
Robert M.     T641
Robert O.     T641
Roberts J.     R454
Roberts J. H.     W301*, W303, T612, T629
Roberts R. V.     R716
Roberts S. E.     T628
Robertson K. M.     R726
Robertson S.     T627
Robinson J. K.     T632
Robinson K. L.     F505*
Robinson M.     T615
Robinson M. L.     M153, T202, T615
Robinson M. S.     M103, M152, W303, F555, T612, T625, T627, T638, R719, R721, R722, R723, R732
Robinson T. D.     R452*
Rochette P.     M101, W302, T607, R703
Rodriguez M. C.     T601
Rodriguez L.     T645
Rodriguez J. A. P.     R722
Rodriguez M.     T601, R703
Rodriguez M. C.     T601
Rodriguez M. R.     T601
Rodriguez S.     T256, T630
Rodriguez-Ferreira J.     T639
Rodriguez-Manfredi J. A.     M102, F503, T616, T617, T618
Rodriguez J. A.     T616
Rodriguez M. C.     T601
Roe L.     T630
Roe L. A.     T256, T630
Rogalla D.     T203
Rogers A. D.     M154, W352*, R724, R726
Rogers F.     T638
Rogers K. L.     W302, T642
Rohani N.     R726
Roig C. I.     R720
Roland S.     T618
Roling W.     T645
Roll R.     T641
Roques R.     T735
Rosatielli G.     R726
Rose M.     F551
Roschichina I. A.     R710
Rosiek M. R.     M152*
Roskosz M.     T602, T605
Ross D. K.     R403, F505, T601, T625, R724
Rossi A. P.     R451, T612, T620, R718, R729, R732
Rossi C.     T641
Rossman G. R.     T615, T641, R704, R709
Rost D.     R701
Rothery D. A.     W353, T613, T624
Roumeletitis C.     T202, T615
Roush T.     T644
Roush T. L.     R726
Rout S. S.     R709
Rouzaud J.-N.     T605
Rovny J.     R713, R718
Rowe M. C.     T624
Rowland S. K.     M153, T202, T614, T615, T618
Rowlands D. D.     T626
Royer E. M.     T629
Rozell A.     R724
Rubie D. C.     M156
Rubin D.     M102, T202, T618, R734
Rubin M.     T619
Rubin M. E.     M101*
Rudolf M.     R405
 Rudraswami N. G.     R703
Ruesch O.     T610, T611, R725, R726
Ruff S.     R726
Ruff S. W.     T252, T626
Ruffini J. M.     R726
Rull F.     T641, T642, T646
Rumble D. III     T607
Runge K.     T605
Runyon K. D.     R405*
Ruoff N. A.     T202, T615
INDEX

Russell C. T.     W301*, W351, R453, F501, T610, T611, T636, R712
Russell M. J.     R734
Russell P. S.     R727
Russell S. S.     F505, R704, R724
Rutherford M. J.   W304
Ruzicka A.     T203*, T604, T607
Ryan C. G.     T203
Rygalov V. Y.     T643
Saad M. E.     T630
Saal A. E.     W304
Saavedra F.     T641
Sabaka T. J.     T603
Sable J.     T634
Saccoccio M.     M153, T617
Safonova E. N.     T605
Sagdeev R.     F505, R724
Sagdeev R. Z.     R722
Saggin B.     T641
Sahoui R.     R720
Saibaba J.     M152
Saiki K.     R723
Sakaguchi I.     T641
Sakainey A.     R405, R720
Sakamoto N.     W355, T628, R704
Sakamoto Y.     T638
Sakata S.     T641
Sakatani N.     T641
Sakuma F.     R723
Sakamoto Y.     R710
Sakamoto Y.     T612
Sakimoto N.     W304, W351, R453, F501, T610, T611, T636, R712
Sakamoto Y.     T612
Sakatani N.     T641
Sakuma F.     R723
Sakaguchi I.     T641
Sakainey A.     R405, R720
Sakamoto N.     W355, T628, R704
Sakamoto Y.     T638
Sakata S.     T641
Sakatani N.     T641
Sakuma F.     R723
Salama F.     T641
Saleh R.     R723
Saleh R. A.     T641
Salesse F.     W305, R725
Salge T.     F553, T607
Sallantin R.     T638
Salut J. S.     R723
Salvatore M. R.   T642, R726
SAM and MSL Science Teams     T615
Sameer S.     F505
Samson C.     T641, R720
SAM Team     T618
Samu S.     R707
Sánchez F. J.     R734
Sanchez J. A.     R716
Sanchez J. J.     T625
Sanchez P.     F501*, R709
Sánchez-Bayton M.     T623
Sanders G.     R723
Sandford S. A.     R707
Sangha S. S.     T624
Sanin A. B.     M153, F505, T616, T617, R722
Sanjeevi S.     R719
Sano T.     R405
Sano Y.     T604, R705
Sansano A.     T624, T646
Santangelo M.     T621
Santos A. R.     R701
Santos O.     R734
Sapahi M. S.     M104, R403*, T604
Sapers H. M.     R718
Saraiva J.     R727
Saran S.     R722, R723
Saranathan A. M.     R723
Sarantos M.     R720
Sarbadhikari A. B.     R722
Sarid G.     M101*, R714
Saripalli S.     T625
Sarkissian A.     R732
Sarrazin P. C.     T202, T615, T618
Sasaki S.     T203, W304, F501, T639, T641, R705, R722
Sassenschmidt D.     M156
Satake W.     W351*
Sato H.     R723, R723
Sato M.     F552, T638
Satterwhite C. E.     R706
Saunders A.     R710
Sautter V.     M102, M153, T615, T617
Sava P.     T641
Savijärvi H.     T616
Savina M. R.     F504, R701
Sawada H.     R405, T641
Sayanagi K. M.     R730
Sayfi E.     M152
Scanlon K. E.     R451*, R730
Scannapieco E.     T254
Scarciglia F.     R726
Schade U.     F502*, T611, T613, R718
Scheeres D. J.     F501, R709, R716
Scheld L.     T641, R735
Schenk P. M.     R701
Schneider R. J.     T642
Schneidmiller M.     T603, T604
Schönhense G.     R403
Schönhense G.     R403
Schneider E. E.     T204, T603
Schneider T.     T642
Schneweis R.     M153*, T202, T615, T618, T642
Schmitz A.     T616
Schmitz A.     T616
Schneider E. E.     R706
Schmedemann N.     T603, T611, R715
Schmeling M.     T601
Schmerr N. C.     T627
Schmidt B.     T205, T251, T636, T642
Schmidt J.     T641
Schmidt M.     T617
Schmidt M.     T617
Schmidt M. E.     M153*, T202, T615, T618, T642
Schmidt W.     T616
Schmieder M.     F506*, R720
Schmitt B.     R706, R707, R714
Schmitt M.     R701
Schmitt R. T.     R405, F506, R720
Schmitz B.     R706
Schmitz N.     R735
Schmitz S.     R701
Schmoke J.     T643
Schneidmiller M.     T603, T604
Schönbächler M.     T603, T604
Schmitt M.     R733
Schulten M.     M152, T611
Schoenberg T.     T638
Schoenjans T.     R701
Schoerghofer N.     T642
Schrader C. M.     T252
Schrader D. L.     F554*
Schrader C.     T642
Schroder C.     T252
Schroder C.     T252
Schroder S.     T617
Schroder S.     M153
Schroder S. E.     T610
Schroeder D. M.     T638
Schroeder S.     M153, F503, T617
Schroeder S.     M153, F503, T617
Schubert G.     M101, T205
Schutz P. H.     W301, R405*, R455, F502*, T611, T613, R718
Schultz R. A.     T624
Schulz T.     T603
Schulze R.     R722
Schuman S.     T612
Schumann D.     T642
Schutt J. W.     T638
Schwadron N. A.  T627, R722, R723
Schwander D.  R403*, R705
Schwartz C.  T640, R726
Schwartz S.  T638
Schwegman R. D.  R729
Schwenzer S. P.  M102, R402*, T616, T617, R726
Sciamma-O’Brien E.  T630
Sciama-O’Brien E. M.  T205*
Scipioni F.  T205*
Scodary A.  M153
Scorzelli R. B.  W302
Scott A.  T641
Scott E. R. D.  T201, T203*, R401
Scott K.  R706
Scully J. E. C.  T251, W301, T610, T611, T636
Seager S.  R452
Seaman S. J.  T628
Sears D. W. G.  T607, R707
Sears S. K.  T642
Sebastian E.  T615, T617
Sebastián E.  T616
Sebastián-Martínez M. E.  T202, T615
Seddio S. M.  R404*, T628
Sedlmair J.  T605
See T. H.  F501, T601, R724
Seelan S.  T633
Seelos F. P.  W352, T614, R726
Seelos K. D.  T614, R726
Sefton-Nash E.  T630, R722, R729
Seigler M. A.  T627
Seis Team  T641
Selvans M. M.  W303*, T613, T634, R727
Semones E.  T627
Senatore C.  T645
Sengstacken A. J.  T202, T615
Senshu H.  T638, T641, R709, R735
Senske D.  T638, R731
Sephton M.  T645, R734
Seproto L. M.  T642
Serventi G.  R723
Seto Y.  T602
Seybold C. C.  T202, T615
Sgavetti M.  R723
Shaddad M.  T640
Shaffer J. T.  R454
Shah D.  T643, R724
Shahar A.  T201*
Shaner A. J.  T633
Shank E. M.  T625
Shankar B.  T633, R722
Sharma M.  F506, R720
Sharma P.  T638, T642
Sharma R.  T641
Sharma S. K.  T641
Sharp M.  T628
Sharp T. G.  R724
Sharp Z. D.  W302, F552*, T628, R724
Sharpton V. L.  R455*
Shaubs B. J.  R454*
Shaw A.  R735
Shean D.  R731
Shearer C. K.  T201, T204*, T632, W302, W352*, R404, T628, T641, R710, R724
Shearer C. K. Jr.  F552
Shekhunova S. B.  R720
Shepard M. K.  F551*, R735
Shepherd J.  T642
Sheridan S.  T638
Sherrit S.  T641
Shchepchenko V. V.  T625, R721
Shi X.  R715
Shibata H.  T639
Shibazaki Y.  T609
Shibuya T.  R734
Shigemori K.  R405, R720
Shih C.-Y.  W352, R454, R706, T628, R724
Shimada A. S.  F501
Shimaki Y.  T609
Shinaman J.  M152, R709
Shipley T. F.  T637
Ship S. S.  T632, T633, T635
Shirai K.  F501, T641
Shirai N.  R401, R454, T607, R703, R710
Shirbhatte A. A.  T638
Shirley J. H.  T205
Shirley K. A.  T645, R721
Shirley M.  R723
Shiro B. R.  T638
Shizugami M.  T641
Shkolyar S.  T638
Shkuratov Y.  R722
Shock E.  R726
Shock E. L.  T256
Shofner G.  T201
Sholes S. F.  R727
Shotorban B.  R701
Showman A. P.  M155, T631
Shu A.  R709
Shu A. J.  R718
Shupla C.  T633, T635
Shuvalov V.  R718
Shvetsov V. M.  T616, T617
Shyam Prasad M.  R703
Sides S.  R732
Siebach K. L.  T614
Sieglar M. A.  T603, T627, R722
Sierks H.  F551, T611, R716, R735
Siili T.  T616
Silen J.  T614
Siljeström S. S.  W302, F552
Silva E. A.  T613, R729
Silva L.  R723
Silvestro S.  R726, R729
Simmonds J. J.  M153, T202, T615
Simmons S. T.  R404
Simon J. I.  R403*, F552, T625, R706
Simon M. N.  T602
Simon S. B.  R403*, R706
Simoncini E.  R730
Simon-Miller A. A.  T641, R730
Simons F. J.  T733
Simmonson B. M.  R720
Singer K. N.  T205*, T629, R711
Singerling A. S.  R710
Singh S.  T256*, T630
Singh R. A.  R724
Sipiera P. P.  R710
Sipos A.  T637
Sirven J.-B.  M153, T617
Sirven J. B.  T615, T617
Sisodia M. S.  R720
Sizemore H. G.  R451*, R727
Skala R.  T703, R709
Skidmore M.  T642
Skinner J. A. Jr.  T621, T645, R725, R731
Sklute E. C.  R726
Skok J. R.  W352, F552, T624, R724
Skripnik A. Ya.  R710
INDEX

Slavin J. A.     W303
Slavney S.     R733
Sletten R. S.     R451, T614
Slowinski C. M.     R720
Smart K. J.     T621
Smith J.     F506
Smith A.     M152
Smith C.     W302
Smith C. L.     R726
Smith D.     T635
Smith D. E.     M152, T255*, W303, T613, T626, R722
Smith H. D.     T635, T641
Smith I. B.     R729
Smith J. H.     T625
Smith K. E.     F552
Smith M.     T252
Smith M. C.     F555, R731
Smith M. D.     R726
Smith P.     T638, T641
Smith R.     R726
Smith R. J.     T614
Smith R. L.     T254*, R730
Smith S.     T627
Smith S. S.     R722
Smith T.     T645
Smith-Konter B. R.     T629
Smrekar S.     T612, T640
Smrekar S. E.     T624, T627
Smrekar S. S.     T624
Snapje F.     T605, T628
Snyder R.     T633
Soare R. J.     W305, R451*
Sobron P.     T641, T643
Sobron P.     T646
Sobron P. S.     T641
Socci R. A.     T602, T641
Soderblom J. M.     T255, T626
Soderlund K. M.     T205*, T642
Sohus A. M.     T635
Soldani L.     T615
Solomon S. C.     M154, T255, W303, W353, T612, T613, T626
Sommacal S.     T615
Sommer F. D.     R718
Song E.     W304
Sonnenberg G.     R453, R730
Sonobeorn G.     T641
Sonzogni Y.     R724
Sori M. M.     T255*
Sornig M.     R453*, R730
Sosothikul S.     R702
Sotin C.     M101*, T205, T256, T630
Sowe M.     R724, R726, R729, R734
Spaans M.     R734
Spanovich N.     T202, T615, T618
Spanovich N.     T202
Spear J. R.     T642
Spence H. E.     T627, R722, R723
Spencer J. R.     M154, T205
Speyerer E. J.     R719, R732
Spicuzza M. J.     R720
Spiga A.     R453, R729
Spitz A. H.     T251*
Spohr T.     T612, R735
Sprague A. L.     W303, T613
Spratt J.     R704
Spring N.     R708
Spring N. H.     F501, R708
Springmann A.     F551, R712
Sprung P.     T204*, T628, R710
Spudis P. D.     F555*, R722, R731
Squyres S. W.     M153, T202, T252*, T616, T618, R725
Srama R.     T639, T641, R718
Sremecvic M.     T631
Sridhar J.     T628
Srinivasan G.     T254
Srinivasan P.     R706
Sriram S.     R723
Srivastava N.     W304*, R722
Stack K. M.     M102*, T614, T615
Stadermann F. J.     F553, R702
Staid M.     R722
Stamponapi M.     R708
Stangier T.     R453, R730
Stanley S.     T629
Starkey N. A.     F505, F553*, T605, T628, R704
Starr R.     M153, T641
Starr R. D.     T603, F505, R722
Starukhina L. V.     R709
Statella T.     R729
Statler T. S.     R712
Statz C.     T641
Steckloff J. K.     R714
Steel D.     R703
Steele A.     T202, W302*, F503, F552*, T615, T616, T618, T628
Steele R. C. J.     T603
Stefanov W. L.     R732
Stein N.     T614
Stein T. C.     T615
Steiner M. H.     R734
Steinfeld D.     T628
Steinhart W. M.     R718
Steininger H.     T618, T641
Stelling R.     F555
Stelzner T. D.     T635
Stephan K.     T205, T611
Stephan T.     R701, R703
Stephan A.     T203*
Stephens R.     R724
Stephens R.     F551
Stepinski T.     R722
Stern J.     M102, F503, T617, T618
Stern J. C.     M102, T202*, T615, T616, T618
Stern L.     R727
Stern S. A.     R722
Sternberg R.     T615
Stern R. E. II     T613
Sternovsky Z.     T641, R709, R718
Stesky R.     T620
Stevens R. E.     T628
Stevenson D. J.     T204, T628
Stewart N.     T635
Stewart S. T.     M101, M155, W353*, R455*, R718
Stewart W.     R451
Stickel R. A.     W305*, R718
Stiles B.     M155, T256
Stiles B. W.     M155, R732
Stillman D. E.     W305*, T641
Stirling C. H.     M104, T604
St John J.     T613
Stock C. R.     T645
Stockstill-Cahill K. R.     T613
Stockton A. M.     T641, R734
Stockman J.     F553, T644
Stofan E.     T624
Stofan E. R.     T256, R732
Stoker C.     T645
Stolper E. M.     M153*, T202, F505, T615, T618
Stooke P. J.     T640
Stopar J. D.     M103, F555*, R722, R732
Stoper E. M.     T505
Storak M.     T256
Storcksdieck M.     T251*
Stout T.     T203
Strait M. M.     T606, R717
Strangeway R. J.     R453
INDEX

Straniero O. F504
Straub J. T638, T641, R713
Strickland P. R710
Strom R. G. T613, R732
Stromback T. J. R720
Stromberg J. T641, R726
Strong K. T641
Stroud R. M. W355, F504, T605, R701, R706
Stuart F. M. R402, R726
Stubbs T. J. R722, R723
Stucky G. D. R734
Sturkell E. T607
Sturm S. F506*
Su J. J. R723
Su X. T628
Sun C. T628
Sun H. J. R734
Sun P. W303
Sun T. T602, T641
Sun V. Z. R726
Sun X. T613
Sun Y. W304*
Sunshine J. M. W301, F501, T606, R722
Susorney H. S. T613
Sutter B. T202, T601, T618
Sutton S. T203*, T644, R703, R724
Sutton S. R. W352, R706
Suuronen J.-P. R703
Svendsen Å. T645
Svitavska-Svobodova H. R720
Swann J. L. T633
Swayne G. A. W352, R726
Sweet W. J. R405
Swift D. C. R718
Swindle T. D. R454, T604, T628, T641
Swisher C. C. III W352, R454, R724
Sykes M. V. T251*, W351, R732, R735
Sylvest M. R725
Sylvestre M. E. T621
Sylvestre M. R726
Symes S. J. K. W352, R454, R724
Szakolczai P. T638
Szalay J. T635
Szalay J. R. T627, T638
Szalay K. T637
Szilágyi I. T638
Szopa C. T602, T615, T618, T641
Szumila I. T. R729
Szumlas M. T638
Szykiewicz A. T642
Tabares Rodenas P. R720
Tachibana S. W355, R405, T641, R703, R706
Tackley P. J. M155
Tagle R. F506, T607
Taguchi M. T641, R730
Tait K. T. R735
Tajika E. R721
Takahashi J. R716
Takahashi R. T602
Takahashi Y. T638, R730
Takahashi Y. O. T602
Takahashi Y. O. T. R452
Takahata N. T604, R705
Takano Y. T641
Takato N. F551, R735
Takchechi S. T639
Takeda H. W351, R722
Takeda T. T602
Takehiro S. T. R452
Takenouchi A. R724
Takigawa A. R701, R706
Takigawa A. T. F501
Takir D. R706
Takita J. T641
Talbot M. T641
Tan F. W. T202
Tanabe Y. T638
Tanaka H. T641
Tanaka K. L. T621, R725, R731
Tanaka M. R703
Tanaka S. T638, T641
Tancredi G. F551
Tang H. M104*, T201
Tang Z. S. R719
Tangara A. C. R726
Tankosic D. R709
Tao Y. T615
Tappa M. J. R706
Tarduno J. A. M101*
Tarozo R. R707
Tartese R. F505, T628
Tate C. M153, T616, T617
Tate C. G. T616
Taylor A. T641
Taylor G. J. T204, T255*, R402, F505, T605, T628, T641
Taylor J. T612
Taylor L. A. W304, T607, T610, T628, R709, R710, R724
Taylor P. A. F551, R712
Taylor P. T. T641, R732
Taylor S. R703
Tayler S. R. R724*
Tazawa S. T641
Teamby N. A. T612, T630, R729
Tedder R. E. T619
Teinturier S. T202, T615, T618
Teifel V. G. R730
Telus M. M104, T604
Teng F.-Z. R403
Tenner T. J. M104*, R704
Teodoro L. F. A. R726
Teplyakova S. N. R710
Terada K. W355, R703
Terada N. R722
Terborg R. F553
Tewelde Y. T622
Thangiam G. S. T610
Theis K. J. T604
Thiel C. T645
Thiemens M. F553, T605
Thiemens M. H. T254*, F552
Thiessen F. F555
Thirkell L. T641, R714
Thissen R. T641
Thoma K. R405, R718
Thomas A. T629
Thomas E. R703, R709
Thomas I. R. W304, T641
Thomas N. T253, R727
Thomas N. H. R726
Thomas O. M152
Thomas R. J. W353*
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas S.-M.</td>
<td>W304</td>
</tr>
<tr>
<td>Thomas-Keprta K. L.</td>
<td>F505*</td>
</tr>
<tr>
<td>Thompson C.</td>
<td>T641</td>
</tr>
<tr>
<td>Thompson D. R.</td>
<td>M152*, T641</td>
</tr>
<tr>
<td>Thompson F. S.</td>
<td>T638</td>
</tr>
<tr>
<td>Thompson L.</td>
<td>M153</td>
</tr>
<tr>
<td>Thompson L. M.</td>
<td>T615</td>
</tr>
<tr>
<td>Thompson M. S.</td>
<td>R708</td>
</tr>
<tr>
<td>Thompson T. W.</td>
<td>R723</td>
</tr>
<tr>
<td>Thompson Stiegler M.</td>
<td>R720</td>
</tr>
<tr>
<td>Thomson B. J.</td>
<td>T625, R722, R732, R733</td>
</tr>
<tr>
<td>Thorey C.</td>
<td>M154*</td>
</tr>
<tr>
<td>Thorne M. S.</td>
<td>T627</td>
</tr>
<tr>
<td>Thornton A.</td>
<td>R723</td>
</tr>
<tr>
<td>Throop H.</td>
<td>T629, T638</td>
</tr>
<tr>
<td>Tian B. Y.</td>
<td>R730</td>
</tr>
<tr>
<td>Tielke J.</td>
<td>T612</td>
</tr>
<tr>
<td>Tikoo S. M.</td>
<td>T607</td>
</tr>
<tr>
<td>Tillier S.</td>
<td>T641</td>
</tr>
<tr>
<td>Timmes F. X.</td>
<td>T254</td>
</tr>
<tr>
<td>Timms N. E.</td>
<td>R454, R455*, T628</td>
</tr>
<tr>
<td>Tirsch D.</td>
<td>R726, R729</td>
</tr>
<tr>
<td>Tissot F. L. H.</td>
<td>T641</td>
</tr>
<tr>
<td>Titus T. N.</td>
<td>W301*, R727, R729, R732</td>
</tr>
<tr>
<td>Tlustos R.</td>
<td>T638</td>
</tr>
<tr>
<td>Tobie G.</td>
<td>T630, T641</td>
</tr>
<tr>
<td>Toche F.</td>
<td>R707</td>
</tr>
<tr>
<td>Tóczik S.</td>
<td>T638</td>
</tr>
<tr>
<td>Todd N. S.</td>
<td>R732</td>
</tr>
<tr>
<td>Todt M. K.</td>
<td>T624</td>
</tr>
<tr>
<td>Toffolo B.</td>
<td>T615</td>
</tr>
<tr>
<td>Togashi S.</td>
<td>T628</td>
</tr>
<tr>
<td>Toh S.</td>
<td>R703</td>
</tr>
<tr>
<td>Tohver E.</td>
<td>F506, R720</td>
</tr>
<tr>
<td>Tokar R. M153, T617</td>
<td></td>
</tr>
<tr>
<td>Tokar R. L. T615, T617</td>
<td></td>
</tr>
<tr>
<td>Tolbert M. A.</td>
<td>R726</td>
</tr>
<tr>
<td>Tolman H. L. T630</td>
<td></td>
</tr>
<tr>
<td>Tomiya A. T.</td>
<td>T628</td>
</tr>
<tr>
<td>Tomiyama T.</td>
<td>R405</td>
</tr>
<tr>
<td>Tomkinson T. R402*, R726</td>
<td></td>
</tr>
<tr>
<td>Tompkins V. V. T202, T615</td>
<td></td>
</tr>
<tr>
<td>Toner J. D. R726</td>
<td></td>
</tr>
<tr>
<td>Tong S.</td>
<td>T638</td>
</tr>
<tr>
<td>Tonge A. L. R455</td>
<td></td>
</tr>
<tr>
<td>Toon G. C.</td>
<td>T641</td>
</tr>
<tr>
<td>Toplis M. M153, T617</td>
<td></td>
</tr>
<tr>
<td>Toplis M. J. W301, T610, R724</td>
<td></td>
</tr>
<tr>
<td>Toplitz M.</td>
<td>T617</td>
</tr>
<tr>
<td>Torgerson D. T641</td>
<td></td>
</tr>
<tr>
<td>Torres M. H. T255, T613, T626</td>
<td></td>
</tr>
<tr>
<td>Torres J. T616</td>
<td></td>
</tr>
<tr>
<td>Tosi F. T205, W301*, W351, F551, T610</td>
<td></td>
</tr>
<tr>
<td>Tóth N. T638</td>
<td></td>
</tr>
<tr>
<td>Touboul M. M101</td>
<td></td>
</tr>
<tr>
<td>Tovar D. T625</td>
<td></td>
</tr>
<tr>
<td>Townsend L. W. T627, R722</td>
<td></td>
</tr>
<tr>
<td>Toyoda N. R701</td>
<td></td>
</tr>
<tr>
<td>Trainer M. M102, R717</td>
<td></td>
</tr>
<tr>
<td>Trainer M. G. T202, T216</td>
<td></td>
</tr>
<tr>
<td>Trammell H. J. T638</td>
<td></td>
</tr>
<tr>
<td>Tranfield E. M. T628</td>
<td></td>
</tr>
<tr>
<td>Trang D. W304*, T625, R722</td>
<td></td>
</tr>
<tr>
<td>Tranquili A. R726</td>
<td></td>
</tr>
<tr>
<td>Trappitsch R. R701, R706</td>
<td></td>
</tr>
<tr>
<td>Travis B. J. M101, R725</td>
<td></td>
</tr>
<tr>
<td>Teese B. P. T645</td>
<td></td>
</tr>
<tr>
<td>Treiman A. H. M153, T202, T203, F503, F505*, T615, T616, T618, R724, R725</td>
<td></td>
</tr>
<tr>
<td>Trela J. R724</td>
<td></td>
</tr>
<tr>
<td>Tremblay A. T641</td>
<td></td>
</tr>
<tr>
<td>Tremblay M. T641</td>
<td></td>
</tr>
<tr>
<td>Tret'yakov V. I. M153, T616, T617</td>
<td></td>
</tr>
<tr>
<td>Trieloff M. R704</td>
<td></td>
</tr>
<tr>
<td>Trigo-Rodriguez J. M. T606, R706, R726</td>
<td></td>
</tr>
<tr>
<td>Trilling D. T629</td>
<td></td>
</tr>
<tr>
<td>Trilling D. E. R709</td>
<td></td>
</tr>
<tr>
<td>Trines R. M. G. M. R723</td>
<td></td>
</tr>
<tr>
<td>Tripa C. E. R701</td>
<td></td>
</tr>
<tr>
<td>Triqueneaux S. T615</td>
<td></td>
</tr>
<tr>
<td>Tromp J. T612</td>
<td></td>
</tr>
<tr>
<td>Trouw F. R. R710</td>
<td></td>
</tr>
<tr>
<td>Tsang C. C. M154</td>
<td></td>
</tr>
<tr>
<td>Tsang K. T. R722</td>
<td></td>
</tr>
<tr>
<td>Tsuchida S. R723</td>
<td></td>
</tr>
<tr>
<td>Tsuichiyama A. R405, F501*, T602, R701, R718</td>
<td></td>
</tr>
<tr>
<td>Tsuichiyama A. T. F501</td>
<td></td>
</tr>
<tr>
<td>Tsujimoto S. W355, R703</td>
<td></td>
</tr>
<tr>
<td>Tsumura K. R735</td>
<td></td>
</tr>
<tr>
<td>Tu V. R726</td>
<td></td>
</tr>
<tr>
<td>Tubiana C. R716</td>
<td></td>
</tr>
<tr>
<td>Tucek J. R709</td>
<td></td>
</tr>
<tr>
<td>Tucker J. M. R720</td>
<td></td>
</tr>
<tr>
<td>Tullis J. A. R727</td>
<td></td>
</tr>
<tr>
<td>Turner F. S. R722</td>
<td></td>
</tr>
<tr>
<td>Turner G. T604</td>
<td></td>
</tr>
<tr>
<td>Turner K. R742</td>
<td></td>
</tr>
<tr>
<td>Turner N. E. R732</td>
<td></td>
</tr>
<tr>
<td>Turney D. R733</td>
<td></td>
</tr>
<tr>
<td>Turrin B. W352*, R454, R724</td>
<td></td>
</tr>
<tr>
<td>Turrini D. W301</td>
<td></td>
</tr>
<tr>
<td>Turtle E. P. T256, R729</td>
<td></td>
</tr>
<tr>
<td>Tybo J. L. R710</td>
<td></td>
</tr>
<tr>
<td>Tye A. R. R722</td>
<td></td>
</tr>
<tr>
<td>Tyliszcza T. F553, T644</td>
<td></td>
</tr>
<tr>
<td>Uchino K. T641</td>
<td></td>
</tr>
<tr>
<td>Uchôa E. B. R720</td>
<td></td>
</tr>
<tr>
<td>Udry A. R724</td>
<td></td>
</tr>
<tr>
<td>Udvardi M. T638</td>
<td></td>
</tr>
<tr>
<td>Uesugi K. U. F501</td>
<td></td>
</tr>
<tr>
<td>Uesugi M. F501</td>
<td></td>
</tr>
<tr>
<td>Ulamec S. R735</td>
<td></td>
</tr>
<tr>
<td>Ulrich R. T256</td>
<td></td>
</tr>
<tr>
<td>Umland J. T615, T618</td>
<td></td>
</tr>
<tr>
<td>Unger M. T605</td>
<td></td>
</tr>
<tr>
<td>Unnithan V. T612, R732</td>
<td></td>
</tr>
<tr>
<td>Upadhyay R. T603</td>
<td></td>
</tr>
<tr>
<td>Urqui R. T616</td>
<td></td>
</tr>
<tr>
<td>Urqui O'Callahan R. T617</td>
<td></td>
</tr>
<tr>
<td>Ushikubo T. M104, R403, R704, R708, R720</td>
<td></td>
</tr>
<tr>
<td>Ushioda M. F552</td>
<td></td>
</tr>
<tr>
<td>Usikov D. R723</td>
<td></td>
</tr>
<tr>
<td>Ustinov E. A. R723</td>
<td></td>
</tr>
<tr>
<td>Ustunisik G. T204, T628, R704, R706</td>
<td></td>
</tr>
<tr>
<td>Usui T. F552*, R706, R724</td>
<td></td>
</tr>
<tr>
<td>Váczi T. T607</td>
<td></td>
</tr>
<tr>
<td>Vaishnav B. G. R730</td>
<td></td>
</tr>
<tr>
<td>Valdes M. T204</td>
<td></td>
</tr>
<tr>
<td>Valenti M. T205</td>
<td></td>
</tr>
<tr>
<td>Vali H. T642</td>
<td></td>
</tr>
<tr>
<td>Valley J. W. R708, R720</td>
<td></td>
</tr>
<tr>
<td>van Amerom F. H. W. T641</td>
<td></td>
</tr>
<tr>
<td>Van Beek T. L. T202, T615</td>
<td></td>
</tr>
<tr>
<td>VanBommel S. M153</td>
<td></td>
</tr>
<tr>
<td>Vance S. T205*, T629, T638, R726</td>
<td></td>
</tr>
<tr>
<td>Vandaele A. C. T612</td>
<td></td>
</tr>
<tr>
<td>Vander Auwer J. R724</td>
<td></td>
</tr>
<tr>
<td>van der Bogert C. H. M103, F555, R719, R721, R722</td>
<td></td>
</tr>
<tr>
<td>Vander Kaaden K. E. M154*, R724</td>
<td></td>
</tr>
<tr>
<td>Van De Wiel M. R728</td>
<td></td>
</tr>
<tr>
<td>van Gasselt S. R725, R734</td>
<td></td>
</tr>
<tr>
<td>Vanhaecke F. F506, T612</td>
<td></td>
</tr>
<tr>
<td>Van Hoolst T. T612, T629</td>
<td></td>
</tr>
<tr>
<td>Vani K. R719</td>
<td></td>
</tr>
<tr>
<td>Vaniman D. T. M153, T202, T615, T617, T618, T642, T645</td>
<td></td>
</tr>
</tbody>
</table>
INDEX

Van Orman J. A.     R401, T628
van Soest M. C.     F506
van Westrenen W.   T201*, R404
van Woud H.     T645
van Zoest T.     T612
Varela M. E.      R724
Varenikov A.     M153, T616, T617
Varga R. K.     T638
Varga T. N.     T638
Varga T. P.     T638
Vargo K.     R723
Varmuza K.     R714
Vasant A.     T638, T641
Vasavada A. R.   M102*, M103, T616, T617, R715
Vasconcelos M. A. R.   R720
Vaughan W. M.   W353, T613, R722
Vaz D. A.     R729
Vazquez J. L.   T638
Vdovichenko V. D.   R730
Veeder G. J.    T625
Veilleux J. J.   T641
Vekemans B.    R701
Velasco A. A.   R722
Velikodsky Y.    R722
Venkataramanaswamy A.   R713
Ventra D.    T256
Ventura B.     T630
Verchovsky A. B.  W356, R710
Verdasca J.    T616
Veres B.     T638
Veres M.     R710
Versteeg M. H.  R722
Vervack R. J. Jr. W303
Veryovkin I. V.  T601
Veizer J.    R605
Viana A.     T636
Videen G.     R722
Vieira G.     R727
Vijayan S.    R719
Vilas F.     F551*, T613
Vilen C.    T619
Villanueva G.  R714
Villanueva G. L.  R453*
Villemsen B. T606
Vinatier S.    T630
Vincendon M.   T619, R725, R726, R729
Vincent J.-B.  F551*, T611, R716, R735
Vincze L.     R701
Vinegar Z. Z.   T619
Viotti M. A.   T251*
Visscher C.   T204*, R730
Viswanathan A. V.  T619
Viviano C. E.   T610, R726
Vixie G.     T638
Vizi P. G.    T637, T638
Vodniza A. Q.    R713
Voelker M.    R725
Vogel N.     R706
Vokrouhlicky D. F551
Vollmer C.    T203, F504
von Dassow W. A.   R722
Vondrak R. R.  R723
VonZabern K.   T619
Voropaev S. A.  R712
Vosstrukhin A.  M153, T616, T617
Vroon P. Z.   T201
Vye-Brown C. L. T624
Wada K.     R455*, T638, T641, R709
Wada T.     T641
Waddington E.  R728
Wade D. W.   T614
Wadhwa M.    W302, R403, F552
Wagner A.    T256*, T630
Wagner K. H.   T641
Wagner R. J.   T611
Wagner R. V.  R719, R732
Wagstaff K. L.  T641
Wahl D. E.   R722
Wahr J. M.    T626
Waite J. H.   T630
Wakabayashi S. T638
Wakabayashi Y.  T628
Waldschläger U. T607
Walker C. C.  T638, T642
Walker K. A.   T641
Walker M. E.   T629
Wall K. T.    T624
Wall S. D.   T205, T256, R732
Wallace S. W.  R707
Wallace W. T.  T628
Wallgren J.  R732
Walling A.    T619
Walis K. J.   M101, F551*
Walsh L. S.  T612, T613, T627
Walter S.    T611, R726
Walters G. L.  R726
Walton E. L.  R724
Wang A.     W305*, R404, T628, T641, T642, R726
Wang F.        R723
Wang J.     W302, F552, R724, R732, R733
Wang J. R.   R723
Wang K.     T203*
Wang R. C.   R704
Wang W.     R726
Wang X.     T627
Wang X.-Q.   R722
Wang Z.     R729
Warburton D.  R716
Warner B. D.  F551
Warner N.   T640
Warner N. H. W305, R726
Warren P. H.  W351*, R454*, T628
Warren T. J.  T641
Wasem J.     R713
Wasem J. V.  R718
Wasilak F. C.  T630
Wasserburg G. J.  M104, T254*
Wasserburg J.  R404
Wasson J. T.  W301*
Waszczyk A.  F551*
Watanabe S.  R735
Watanabe K.  T606
Watkeys M. K.  T629
Watkins J.   T612
Watkins M. M. T255
Watters T. R.  M154, W303, W353, T612, T613, T627, R722, R727
Watters W. A.  R719
Webb F. H.   T641
Weber I.  F501, R708, R709
Weber P. K.  R403
Weber R.     T612
Weber R. C.  T255
Webster C. R.  M102*, T202, T616, T618
Webster K. D.  T642
Wedemeyer-Bohm S. T601
Wei H. Y.  R712
Weidenschilling S. J.  M156*, R401
Weider S. Z. W303*, T613
Weinstein M.  T628
Weir H.     T637
Weisberg M. K.  M104, T203*, R401, F554, R702, R717
Weiss B. P.  M101, T607, T608, T627, R710
Weiss D. K.  R727
Weiss J. W.  T205*, T252, W305*, R726
Welivitiya W. D. P.  T630
Wellenreuther G.  R701
Weller L.  M103, T619, R732
Weller L. A.  R732
Weller M. B.  M155*, T612, T628, R726
Wellington D. F.  R724
Welsch B.  W352, R724
Welten K. C.  W356, T628
Wendt L.  M103, T612
Wendt L. A.  R732
Wenger M.  T634
Wenger M.  T634
Wenger M. R.  M104, T254, W352, T605, R706, R710
Wenkenk D.  T641
Wenkenk D. S.  T641
Wetzel D. T.  W304*
Whalen D.  T638
Whittaker S.  T641
Whitten J. L.  T638
Whyte L.  T641
Wicht J.  T205
Widemann T.  M153, T612, T626
Wieczorek M. A.  T204, T255*, T612, T626
Wieler R.  M104, T254, W352, T605, R706, R710
Wiens R. C.  M102, M153*, T202, F503, T615, T617, T618, T641, T645, R734
Wilhelm M. B.  R726
Wilkes C. A.  T623
Wilkinson M. J.  R725
Williams A. J.  T642
Williams C. D.  R403*
Williams D.  W301, T611
Williams D. A.  T611, T625, R729, R731
Williams D. R.  R732
Williams J.  T614
Williams J. G.  T255, T626
Williams J. M.  T614
Williams J-P.  T627
Williams J.-P.  M103, R719, R722
Williams J. P.  M103
Williams J. T.  R401*, T604
Williams N. R.  T612, T627, R722
Williams P.  F504, R701
Williams R.  M102, R451, T614
Williams R. M. E.  M102*, M153, T614, T624
Williams S. H.  T634
Williams T.  R703
Williamson H. N.  R730
Williamson M. C.  T642
Williamson T. J.  T619
Willingham D. G.  F504
Willis P. A.  T641, R734
Willner K.  R715
Willson D.  T645
Wilson D.  T645
Wilson J. K.  T627, R722, R732
Wilson L.  M154, R401, R404*, T622, T628
Wilson M. A.  T202, T615
Wilson N. V.  W302
Wilson S. A.  W305, T611, T625, R722
Wittig N.  T603
Wittke J.  R720
Wyatt M. B.  R722
Wyrick D. Y.  W301, T624
Xiao L.  M154, T626
Xiao Y.  R722
Xiao Z.  T613, R721
Xiao Z. Y.  R719
Xie Z.  R720
Xing Z.  T632
Xu L.  W302
Xu Y.  W302
Wise J.  T251*, T636
Wiseman S.  R722
Wiseman S. M.  R726
Wisshard C. A.  T623
Witek P. P.  T630
Witlers A. C.  T608
Witke R.  T251, T636
Wiseman S.  R722
Wiseman S. M.  R726
Wittmann A.  R454*, T628
Wlodarczyk I.  F551
Woerner W.  R726
Wöhler C.  R723
Woffm M.  T252
Wolff M. J.  R402, R726, R732
Wollack E. A.  T201
Wong M.  M102, T616, T618
Wong M. H.  T202, F503, T615, T616, T617, T636
Wong U. Y.  T638
Wood C. A.  T256*, R722, R732
Wood I.  R710
Wood S. E.  T627, R730
Wooden D.  R723
Wooley J.  T612
Wordsworth R.  R730
Worsham E. A.  R401*
Wozniakiewicz P. J.  M156*, R405*, F553*, R718, R724
Wray J.  T202, F503, T618
Wray J. J.  T202, T252, W352*, R402, T618, R725, R726
Wright I. P.  T638, R726
Wright S. P.  W352, T623, T642, R718, R720, T734
Wu F. L.  R723
Wu Z. H.  R722
Wuf G.  F506, R719
Wunemann K.  R720
Wünemann K.  R405, R455, T611, R718
Wurz P.  T641
Wyatt M. B.  R726
Wyrick D. Y.  W301, T624
Xiao L.  M154, T626
Xiao Y.  R722
Xiao Z.  T613, R721
Xiao Z. Y.  R719
Xie Z.  R720
Xing Z.  M152
Xu L.  W302
Xu Y.  W302

INDEX