

Wednesday, July 15, 2009
IMPACT, CRATERING, AND SHOCK
0830 Salon d'Honneur des Universités

Chairs: E. Buchner
F. Kyte

- 0830 Morbidelli A. * [INVITED]
- 0900 Stöffler D. *
Public Outreach of Impact Research: The Ries Event [#5114]
- 0915 Hartmann W. K. * Quantin C. Werner S. C. Popova O.
Using Small Impact Craters to Date Surfaces on Mars: Successful Test and New Opportunities [#5350]
- 0930 Mohr-Westheide T. * Reimold W. U.
Microchemical Analysis of Small-Scale Pseudotachylitic Breccia Zones from the Central Uplift of the Vredefort Impact Structure, South Africa [#5107]
- 0945 Bartosova K. * Hecht L. Czaja P. Libowitzky E. Koeberl C.
Melt in the Impact Breccias from the Eyreville Drill Core, Chesapeake Bay Impact Structure — Microprobe Analyses [#5022]
- 1000 Koeberl C. * Brigham-Grette J. Melles M. Minyuk P.
Drilling into the El'gygytgyn Impact Crater, Arctic Russia: The 2009 ICDP Project [#5014]
- 1015 Amor K. * Hesselbo S. P. Porcelli D. Thackrey S. Parnell J.
Field Observations and Geochemistry of the Stac Fada Member (Torridonian Supergroup, Scotland); A Mesoproterozoic Proximal Impact Ejecta Blanket [#5312]
- 1030 Ferrière L. * Devouard B. Goderis S. Vincent P. Bernon D. Lorillard R. Saul J. M.
Petrographic and Geochemical Study of an Anomalous Melt Rock from the Gilf Kebir Plateau, Close to the Libyan Desert Glass Area, Egypt [#5384]
- 1045 Moynier F. * Koeberl C. Beck P. Jourdan F.
Isotopic Fractionation of Chalcophile Elements in Tektites [#5147]
- 1100 Kyte F. T. * Omura C. Gersonde R.
Fractionation in Eltanin Impact Spherules [#5417]
- 1115 El Goresy A. * Miyahara M. Ohtani E. Nagase T. Nishijima M. Ferroir T. Gillet Ph.
Micro-Surgical FIB-TEM Study of Diverse Liquidus Wadsleyite-Ringwoodite Pairs Fractionally Crystallized from Olivine Melt Enclaves in Shock Melt Veins in L6 Chondrites [#5018]
- 1130 Dubrovinsky L. S. * El Goresy A. Gillet Ph. Wu X. Simionivici A.
A Novel Natural Shock-induced High-Pressure Polymorph of FeTiO₃ with the Li-Niobate Structure from the Ries Crater, Germany [#5094]
- 1145 Gillet Ph. * Ferroir T. Beck P. El Goresy A.
Pressure-Temperature-Time Records of Shock in Meteorites [#5144]
- 1200 Miyahara M. * Ohtani E. Kimura M. El Goresy A. Ozawa S. Nagase T.
Detailed FIB-TEM Study of Ringwoodite Lamellae in Individual Olivine Grains in Shock-Melt Veins of Yamato 791384 L6 Chondrite [#5110]

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Tomioka N. * Kondo H. Kunikata A. Nagai T.

The Plagioclase-Maskelynite Transition in an External Heated Diamond Anvil Cell [#5112]

Wednesday, July 15, 2009
ORGANIC COSMOCHEMISTRY
0830 K12

Chairs: S. Clemett
F. Robert

- 0830 Alexander C. M. O'D. * [INVITED]
The Central Importance of Chondritic Organic Matter to Understanding the Origin of the Solar System and Maybe even Life [#5441]
- 0900 Apai D. * Pascucci I.
Protoplanetary Disks Around Cool Stars: Differences in the Disk Structure, Dust Processing and Organic Chemistry [#5361]
- 0915 Derenne S. * Robert F.
A Molecular Model of Chemical Structure of Insoluble Organic Matter in Carbonaceous Chondrites [#5119]
- 0930 Huang Y. * Wang Y. Alexandre M. R. Brearley A. J. Alexander C. M. O'D.
Relationship Between Soluble Monocarboxylic Acids and Aliphatic Side Chains of IOM in Carbonaceous Chondrites [#5405]
- 0945 Glavin D. P. * Dworkin J. P.
Enrichment in L-Isovaline by Aqueous Alteration on CI and CM Meteorite Parent Bodies [#5009]
- 1000 Clemett S. J. * Nakamura-Messenger K. Messenger S. Thomas-Keprta K. L. Robinson G.-A. McKay D. S.
Molecular Composition of Carbonaceous Globules in the Bells (CM2) Chondrite [#5445]
- 1015 Robert F. * Thomen A. Derenne S.
Hydrogen Isotopic Exchange Rates Between Deuterium-rich Sources and Organic Molecules [#5158]
- 1030 Matsuda J. * Amari S.
Reexamination of the Effect of Pyridine Treatment on Phase Q in Orgueil [#5108]
- 1045 Remusat L. * Guan Y. Eiler J. M.
Chemical and Isotopic Diversity of Organic Particles in Chondrites: Parent Body vs. Nebular Processes [#5433]
- 1100 Flynn G. J. * Wirick S. Keller L. P. Jacobsen C. Sandford S. A.
Organic Rims on Individual Grains in CP IDPs: Constraints on the Origin of Pre-Biotic Organic Matter [#5103]
- 1115 Piani L. * Derenne S. Robert F. Thomen A. Mostefaoui S. Marrocchi Y. Meibom A.
Molecular and Isotopic Study of the Insoluble Organic Matter Isolated from a Primitive Enstatite Chondrite [#5134]
- 1130 Quirico E. * Bourot-Denise M. Bonal L. Orthous-Daunay F.-R. Beck P. Montagnac G.
Structural and Chemical Characterization of the Organic Matter in Metamorphosed CM Carbonaceous Chondrites [#5208]
- 1145 Yabuta H. * Cody G. D. Alexander C. M. O'D.
Organic Molecular Indicators of Aqueous Alteration: Extensive Pyrolysis Survey of CM, CI, CR, and Tagish Lake Chondrites [#5152]

- 1200 Stroud R. M. * Alexander C. M. O'D. Cody G. D. Gregorio B. T. Kilcoyne A. L. D.
Nittler L. R. Zega T. J.
Correlated Microanalysis of Carbonaceous Nanoglobules [#5332]
- 1215 Rouzaud J. N. * Le Guillou C. Bonal L. Derenne S. Quirico E. Remusat L.
IOM Chondrites Nanostructures as seen by HRTEM: Heterogeneity and Metamorphism Effects
[#5088]

Wednesday, July 15, 2009
CHONDRULES AND CHONDRITES
0900 Geny

Chairs: R. Hewins
D. Sears

- 0900 Morris M. A. * Desch S. J. Ciesla F. J.
Thermal Histories of Chondrules in Solar Nebula Shocks [#5423]
- 0915 Kropf A. * Pack A.
Influence of FeO on the Partitioning of Na Between Olivine and Silicate Melt — Implications for the Behavior of Alkalis During Chondrule Formation [#5325]
- 0930 Mathieu R. * Libourel G. Deloule E. Tissandier L.
Effect of Sodium on Phase Relationship: Application to Chondrule Formation [#5204]
- 0945 Sanders I. S. *
Early Planetesimal Splashing: Reconciling Chondrule Formation with Disk Evolution [#5247]
- 1000 Libourel G. * Chaussidon M.
Origin of Mg-rich Olivines in Type I Chondrules [#5201]
- 1015 Hewins R. H. * Zanda B. Bendersky C. Leroux H.
Evolution of Melt Compositions in Semarkona Type II Chondrules [#5279]
- 1030 Wasson J. T. * Rubin A. E.
Formation of Metal Deposits on Chondrules [#5418]
- 1045 Connolly H. C. Jr.* Huss G. R.
CR2 Chondrule Origin: Oxygen Isotopes, Redox, and the Role of Icy Bodies in the Disk [#5013]
- 1100 Sears D. W. G. * Gietzen K. M. Ostrowski D. R. Lacy C. H. S.
S Asteroids: Are some of the Missing Melts UOC? [#5170]
- 1115 Briani G. * Gounelle M. Zolensky M. E.
(Micro)Xenolith Systematics in H Chondrites [#5120]
- 1130 Ahn I. * Choi B.-G. Park C. K. Lee J. I. Wasson J. T.
Bulk Oxygen-Isotope Compositions of Equilibrated Ordinary Chondrite Falls Using CO₂ Laser-BrF₅ Fluorination Technique [#5219]
- 1145 Macke R. J. * Hutson M. L. Britt D. T. Consolmagno G. J.
EH and EL Enstatite Chondrite Physical Properties: No Difference in Iron Content [#5047]
- 1200 Hofmann B. A. * Gnos E. Zurluh F. J. Giscard M. D. Jull A. J. T. Weber P.
Al Busaidi S. H.
Oman Meteorite Search Project 2001–2009: Status and Summary [#5225]
- 1215 Gattacceca J. * Valenzuela E. M. Leclerc M. D. Rochette P. Suavet C. Jull T. Uehara M.
Muayco P. Bourot-Denise M. Scorzelli R. B.
Atacama: The Densest Meteorite Collection Area Among Hot Deserts? [#5083]

Wednesday, July 15, 2009
COMPOSITION OF THE SOLAR NEBULA: GENESIS, STARDUST, IDPS
1330 Geny

Chairs: S. Messenger
A. Westphal

- 1330 Wieler R. * [INVITED]
- 1400 Jurewicz A. J. G. Hervig R. Burnett D. S. * Wiens R. Wadhwa M. Rieck K.
Fractionation of Mg Isotopes Between the Sun's Photosphere and the Solar Wind [#5422]
- 1415 Meshik A. * Hohenberg C. Pravdivtseva O. Frank D. Zolensky M.
Possible Presence of Spallation Neon in the Outer Layer of Particle-free Aerogel Flown on Board of the Stardust Mission [#5285]
- 1430 Lavielle B. * Gilabert E. Marti K.
Solar Wind Isotopic Abundances in 2 mm Surface Layers of Arlington [#5155]
- 1445 Leroux H. * Stodolna J.
Fine Grained Material in Wild 2 in Interaction with the Stardust Aerogel [#5237]
- 1500 Nakamura T. * Noguchi T. Tsuchiyama A. Ushikubo T. Kita N. T. Valley J. W.
Takahata N. Sano Y. Zolensky M. E. Kakazu Y. Uesugi K. Nakano T.
Additional Evidence for the Presence of Chondrules in Comet 81P/Wild 2 [#5304]
- 1515 Palma R. L. * Pepin R. O. Schlutter D.
A Preliminary Light Noble Gas Investigation of Stardust Samples [#5319]
- 1530 Simionovici A. S. * Grosseymy F. Lemelle L. Ferroir T. Gillet Ph. Borg J. Djouadi Z.
Bleuet P. Susini J.
Accurate Chemical Composition of Wild 2 Cometary Grains by SR-XRF [#5398]
- 1545 Bradley J. P. *
Investigating the Provenance of Comet 81P/Wild 2 Grains Using SuperSTEM [#5406]
- 1600 Dobrica E. * Engrand C. Leroux H. Duprat J.
Fine-grained Mineralogy of Cometary Ultracarbonaceous Antarctic Micrometeorites [#5231]
- 1615 Messenger S. * Keller L. P. Nakamura-Messenger K. Nguyen A. N.
Stardust Abundance Variations Among Interplanetary Dust Particles [#5357]
- 1630 Busemann H. * Nittler L. R. Davidson J. Franchi I. A. Messenger S. Nakamura-Messenger K.
Palma R. L. Pepin R. O.
Carbon Raman Spectroscopy of 36 Interplanetary Dust Particles [#5412]
- 1645 Nakamura-Messenger K. * Messenger S. Keller L. P.
Coordinated STEM and NanoSIMS Analysis of Enstatite Whiskers in Interplanetary Dust Particles [#5330]
- 1700 Suavet C. * Alexandre A. Franchi I. A. Gattacceca J. Sonzogni C. Greenwood R. C.
Folco L. Rochette P.
Solving the Parent Bodies of Micrometeorites with High-Precision Oxygen Isotope Ratios [#5031]
- 1715 Maurette M. *
Six Models for the Formation of the Earth's Atmosphere [#5057]

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Michel P. Barucci A. Koschny D. Yoshikawa M. Boenhardt H. Brucato J. Dotto E.
Franchi I. Green S. Josset J. L. Kawagushi J. Muinonen K. Oberst J. Yano H. Binzel R.
Agnolon D. Romstedt J.

*Marco Polo: A Sample Return Mission to a Primitive Near-Earth Object in Assessment Study in the
ESA Program Cosmic Vision 2015—2025* [#5261]

Wednesday, July 15, 2009
ORGANIC COSMOCHEMISTRY (CONTINUED)
1330 K12

Chairs: **S. Clemett**
 F. Robert

- 1330 Thomen A. * Robert F. Mostefaoui S. Piani L. Marrocchi Y. Meibom A.
Spatial Relations Between D/H and N Isotopic Anomalies in Orgueil and Murchison Insoluble Organic Matter: A NanoSIMS Study [#5284]
- 1345 Orthous-Daunay F.-R. * Quirico E. Lemelle L. Beck P. de Andrade V. Simionovici A.
Derenne S. Schmitt B.
Oxidation Degree of Sulfur and Oxygen Organic Function in the IOM of Aqueously Altered Chondrites
[#5211]

Wednesday, July 15, 2009
CARBONACEOUS CHONDRITES
1400 K12

Chairs: D. Ebel
D. C. Hezel

- 1400 Harrison K. P. * Grimm R. E.
Convective Cooling of Carbonaceous Chondrite Parent Bodies During Aqueous Alteration [#5394]
- 1415 Kebukawa Y. * Nakashima S. Zolensky M. E.
Kinetics of Organic Matter Degradation in the Murchison Meteorite for the Evaluation of Chondrite Parent Body Thermal Evolution [#5064]
- 1430 Palmer E. E. * Lauretta D. S.
Kamacite Grains as Aqueous Alteration Indicators in CM Chondrites [#5087]
- 1445 Tsutsui S. * Naraoka H.
Oxygen Isotope Variation at Nanomolar Carbonate in the CM2 Carbonaceous Chondrites [#5266]
- 1500 Bullock E. S. * McKeegan K. D. Gounelle M. Grady M. M. Russell S. S.
Sulfur Isotopic Composition of Fe-Ni Sulfide Grains in CI and CM Chondrites [#5156]
- 1515 Howard K. T. * Benedix G. K. Bland P. A. Cressey G.
PSD-XRD Modal Mineralogy of CM Chondrites Spanning the Complete Petrographic Range [#5125]
- 1530 Brearley A. J. * Burger P. V.
Mechanisms of Aqueous Alteration of Type IIA Chondrule Glass in the CR Chondrite EET 92105: Insights from FIB/TEM Analysis [#5148]
- 1545 Choi B.-G. * Ahn I. Ziegler K. Wasson J. T. Young E. D. Rubin A. E.
Oxygen Isotopic Compositions and Degree of Alteration of CR Chondrites [#5339]
- 1600 Keller L. P. * Nakamura-Messenger K. Messenger S.
Amorphous Silicates in Primitive Meteoritic Materials: Acfer 094 and IDPs [#5371]
- 1615 Bonal L. * Huss G. R. Nagashima K. Krot A. N.
Hydrogen Isotopic Composition of ¹⁵N-rich Clasts in the CB/CH-like Chondrite Isheyevo [#5178]
- 1630 Ebel D. S. * Lu M. Erb I. R. Weisberg M. K.
CAI and Chondrule Sizes and Abundances in the CO3 Chondrites Kainsaz and Colony [#5306]
- 1645 Davidson J. * Schrader D. L. Busemann H. Franchi I. A. Connolly H. C. Jr. Lauretta D. S. Alexander C. M. O'D. Verchovsky A. Gilmour M. A. Greenwood R. C. Grady M. M.
RBT 04133: A New, Unusual Carbonaceous Chondrite [#5141]
- 1700 Abe K. * Sakamoto N. Kojima H. Krot A. N. Yurimoto H.
Variations of Chemical Composition of Matrices of Carbonaceous Chondrites [#5042]
- 1715 Nakato A. * Nakamura T. Noguchi T.
Mineralogical and Chemical Variations Recorded in Dehydrated Carbonaceous Chondrites [#5336]
- 1730 Haack H. * Grau T. Greenwood R. C. Franchi I. A.
A new Carbonaceous Chondrite Fall in Denmark [#5250]

Wednesday, July 15, 2009
MOON, MARS, AND OTHER PLANETS
1330 Salon d'Honneur des Universités

- Chairs:** L. Nyquist
S. Schwenger
- 1330 Melosh H. J. *
An Isotopic Crisis for the Giant Impact Origin of the Moon? [#5104]
- 1345 Lucey P. G. * Taylor G. J.
The Science of the Lunar Poles [#5164]
- 1400 Karouji Y. * Hasebe N. Yamashita N. Kobayashi S. Hareyama M. Shibamura E.
Kobayashi M. Okudaira O. Arai T. Ebihara M. Sugihara T. Takeda H. d'Uston C.
Gasnault O. Diez B. Forni O. Reedy R. C. Kim K. J. Hayatsu K. Nagaoka H. Tsukada K.
Takeda Y. Machida J.
Elemental Distribution in the Lunar Subsurface by the SELENE GRS Observation [#5173]
- 1415 Sakai R. * Kushiro I. Nagahara H. Ozawa K. Tachibana S.
Constraints on Chemical Composition of Lunar Magma Ocean by High Pressure Piston-Cylinder Experiments [#5386]
- 1430 Boyet M. * Carlson R. W. Horan M. Borg L.
146,147Sm-142,143Nd Systematics of Lunar Ferroan Anorthosites [#5415]
- 1445 Nyquist L. E. * Shih C.-Y. Reese Y. D. Irving A. J.
Sm-Nd and Rb-Sr Ages for Northwest Africa 2977, a Young Lunar Gabbro from the PKT [#5347]
- 1500 Jambon A. * Devidal J.-L.
Monazite Dating of Lunar Meteorite NWA 4734 [#5006]
- 1515 Korochantseva E. V. * Trieloff M. Hopp J. Buykin A. I. Korochantsev A. V.
40Ar-39Ar Dating of Solar Gas-rich Lunar Meteorite Dhofar 1436 [#5226]
- 1530 Hallis L. J. * Greenwood R. C. Anand M. Russell S. S. Miller M. F. Franchi I.
Oxygen Isotopic Composition of Mare-Basalts: Magma Ocean Differentiation and Source Heterogeneity [#5314]
- 1545 Hudgins J. A. * Spray J. G.
Lunar Granulitic Breccias: Differences Between Apollo and Meteorite Samples [#5157]
- 1600 Corrigan C. M. * Dombard A. J. Spudis P. D. Bussey D. B. J. McCoy T. J.
Candidate Source Regions for the Lunar Meteorites [#5375]
- 1615 Schwenger S. P. * Kring D. A.
Impact-generated Hydrothermal Alteration on Early Mars in Presence of CO₂ [#5262]
- 1630 Schröder C. * Ashley J. W. Fleischer I. Gellert R. Klingelhöfer G. de Souza P. A. Jr.
Athena Science Team
Meteorites on Mars: Implications from Three Probably Paired Meteorite Candidates at Meridiani Planum [#5246]
- 1645 Malavergne V. * Toplis M. J. Berthet S. Jones J.
Are Bencubbinite or Enstatite Chondrites the Building Blocks of Mercury: Implications for Internal Structure and the Origin of a Magnetic Field [#5193]

- 1700 Fegley B. Jr.* Schaefer L.
Silicate Atmosphere and Clouds of Hot Earth-like Exoplanets [#5032]
- 1715 Delaney J. S. *
Planet, Asteroid, Planetoid: Definitions [#5105]

Wednesday, July 15, 2009
POSTER SESSION
1730 Patio

IMPACT, CRATERING, AND SHOCK

Alexandre P. Cuney M. Duhamel I.

New K-Ar Dating on Impact-generated Melt from the Carswell Astrobleme, Evidence for a Mesoproterozoic Impact Event [#5003]

Shuvalov V. V.

Effect of Internal Friction on the Deformation of Disrupted Meteoroid [#5017]

Buchner E. Schmieder M. Schwarz W. H. Trieloff M. Moilanen J. Öhman T. Stehlik H.

A Proterozoic 40Ar/39Ar Age for the Suvasvesi South Structure (Finland) [#5076]

Schmieder M. Buchner E. Schwarz W. H. Trieloff M. Lambert P.

A Triassic/Jurassic Boundary Age for the Rochechouart Impact Structure (France) [#5138]

Schmieder M. Lambert P. Buchner E.

Did the Rochechouart Impact (France) Trigger an End-Triassic Tsunami? [#5140]

Schmieder M. Buchner E. Schwarz W. H. Trieloff M. Moilanen J. Öhman T.

A Middle Triassic 40Ar/39Ar Age for the Paasselkä Impact Structure (Finland) [#5142]

Sapers H. M. Osinski G. R. Banerjee N. R.

Differential Alteration of Glass Clasts in the Surficial Suevites of the Ries Crater, Germany [#5175]

Brandstätter F. Ponahlo J.

On some Micro-Textural Features of Libyan Desert Glass with Dark Schlieren [#5124]

Tsolmon A. Koeberl C.

Geology and Petrography of Tabun Khara Obo Crater [#5019]

MacDonald W. D. Crosta A. P.

Impact Structures in Serra Geral Basalt, Southern Brazil [#5163]

Lamali A. Abtout A. Merabet N. Maouche S. Rochette P. Boukertbout H. Meziane E. H. Ayache M.

The Maâdna Meteoritic Crater (Talemzane, Algeria): Geophysical and Geological Investigations [#5169]

Valenzuela M. Rochette P. Bourlès D. L. Braucher R. Faestermann T. Finkel R. C. Gattacceca J.

Korschinek G. Merchel S. Morata D. Poutivtsev M. Rugel G. Suavet C.

The Age of the Monturaqui Impact Crater [#5185]

Pati J. K. Reimold W. U. Pati P. Umrao R. K. Ahmad M.

Pseudotachylite Breccia Veins in Basement Granitoids of the Dhala Impact Structure, Bundelkhand Craton, India [#5187]

Deutsch A. Berndt J. Kenkmann T. Domke I.

LA-ICP-MS Analysis of Projectile Material for Experimental Cratering (MEMIN Project) [#5263]

King D. T. Jr. Petruny L. W.

Internal Stratigraphy of the Chicxulub Ejecta Blanket in Belize, Central America [#5308]

Al Barazi S. Riller U. Hecht L.

Geochemistry of Pseudotachylites in Target Rocks of the Sudbury Impact Structure, Ontario, Canada [#5379]

Deenadayalan K. Basavaiah N. Misra S. Newsom H.
Absence of Archean Basement in the Genesis of Lonar Crater, India [#5388]

Misra S. Newsom H.
Fractionation of Impactor Components Within Impact Spherules from Lonar Crater, India [#5389]

Nakamura A. M.
Porosity Change in Parent Bodies due to Impact [#5396]

Arif Md. Misra S. Basavaiah N. Newsom H.
Distribution of Impact-induced Stress Around Lonar Crater, India [#5397]

Marjanac Lj. Marjanac T.
Glass Spherules from Dubci (Croatia) — Possible Evidence of a Lower Pleistocene Impact [#5424]

Schmidt G.
Refractory Element Fractionation (Os/Ir, Rh/Ir, Ru/Os) in Impact Craters: Projectile Identification of Rochechouart, Säcksjärvi, Boltysk, Dellen, Mien, etc. [#5001]

Ferroir T. Miyahara M. Ohtani E. Beck P. Simionovici A. Gillet P. El Goresy A.
P-T Conditions and Mechanisms of Enstatite to Akimotoite Transformations in the Shocked L-6 Chondrite Tenham [#5143]

Singleton A. C. Osinski G. R. Moser D.
Preliminary Comparative Analysis of Shock Metamorphism of Crystalline Basement Clasts in the Haughton Impact Ejecta Layer, Canada [#5383]

Hamers M. F. Drury M. R.
SEM-CL Imaging of Planar Deformation Features and Tectonic Deformation Lamellae in Quartz [#5015]

Bezaeva N. S. Badjukov D. D. Rochette P. Gattacceca J. Trukhin V. I. Kozlov E. A. Uehara M.
Experimental Shock Metamorphism of the L4 Ordinary Chondrite Saratov Induced by Spherical Shock Waves up to 400 GPa [#5065]

ORGANIC COSMOCHEMISTRY

de Bergh C. Barucci M. A. Merlin F. Fornasier S. Doressoundiram A. Brunetto R.
Carbonaceous Compounds at the Surface of Transneptunian Objects and Centaurs [#5102]

CHONDRULES AND CHONDRITES

Dalcher N. Welten K. C. Nishiizumi K. Wieler R. Leya I.
The ⁸¹Kr-Kr Dating Technique for Meteorites [#5044]

Alexeev V. A. Gorin V. D. Kashkarov L. L. Ustinova G. K.
The Main Belt Asteroid 3628 Boznemcova as a Source of the LL6-Chondrites [#5050]

Bartoschewitz R. Appel P. Mader B.
Mineralogy and Petrology of two German H5 Chondrites - Oesede and Wernigerode [#5099]

Bartoschewitz R. Appel P. Mader B. Greshake A. Kurz M.
Königsbrück — Mineralogy and Petrology [#5100]

- Uehara M. Gattacceca J. van der Beek C. J.
Microscopic Magnetic Study of Ordinary Chondrite Using Magneto-Optical Imaging [#5139]
- Avril C. Malavergne V. van Hullebusch E. Brunet F. Guyot F. Labanowski J.
Bioweathering of a Reduced Chondritic Material: Implications for Enstatite Chondrites [#5192]
- Yokoyama T. Misawa K.
K-rich Fragments in Yamato-74442 and Bhola LL-Chondritic Breccias [#5236]
- Fitoussi C. Bourdon B. Kleine T. Oberli F. Reynolds B.
Silicon Isotope Composition of Meteorites and Peridotites: Si in the Earth's Core, Influence of Nebular Processes and Terrestrial Magmatic Processes [#5249]
- Xu L. Zhang G. Zuo W. Zhang Z. Liu J. Li C.
Determination of the Chemical Composition of Metal Phase of Chondrites by ICP-MS and the Distribution of Siderophile Elements [#5252]
- Caillet Komorowski C. Boudouma O. El Goresy A. Miyahara M. Özel M. E.
Sub-Micrometric Study of Cu- and Hg-bearing Opaque Assemblages in Unshocked Primitive H Chondrites: Origin and First Occurrence of Native Hg in a Meteorite [#5294]
- Strait M. M. Consolmagno G. J.
Variations in Porosity Among Multiple Samples of a Single Meteorite [#5348]
- Weirich J. R. Isachsen C. Swindle T. D. Kring D. A.
Ar-Ar Impact Ages of Shocked LL Chondrites [#5368]
- Wittmann A. Swindle T. D. Kring D. A.
Clast-rich H-Chondrite Impact Melts [#5403]
- Moggi-Cecchi V. Pratesi G. Franchi I. A. Greenwood R. C.
Acfer 370: An Anomalous Chondrite Related to the Cumberland Falls Breccia [#5421]
- Bell A. Lee M. R.
Weathering of Glenrothes Meteorite (H5), the First Scottish find [#5427]
- Munayco P. de Aviliez R. R. Brant de Campos J. Dos Santos E. Valenzuela M. Scorzelli R. B.
Weathering of Ordinary Chondrites from the Atacama Desert, Chile, by Synchrotron X-Ray Diffraction and Mössbauer Spectroscopy [#5040]
- Manzari P. Melone N.
Comparative Chemical Investigations Among E3 Chondrules Mesostasis [#5077]
- Uesugi M. Oka M. Saiki K. Tsuchiyama A.
Observation of Ejection Process of Iron Globules from Melted Chondrules [#5111]
- Matsuda S. Nakashima D. Nagao K.
Laser Microprobe Noble Gas Analysis of Chondrules in the Moorabie L3.8 Chondrite [#5214]
- Sano Y. Takahata N. Sugiura N. Fujiya W.
Al-Mg Dating of a Chondrule in Efremovka by Using NanoSIMS [#5216]
- Wick M. J. Jones R. H.
Primary Plagioclase in Type I Chondrules in Kainsaz: Evidence for High Solid Densities During Chondrule Formation [#5315]

Das J. P. Kehm K. Goswami J. N. Pravdivtseva O. V. Meshik A. P. Hohenberg C. M.
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Herd C. D. K. Alexander C. M. O'D.

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Pearson V. K. Haack H. Gilmour I.

Preliminary Organic Analysis of a new Danish Carbonaceous Chondrite [#5323]

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Friedrich J. M. Wolf S. F. Halabi R. Ebel D. S.

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Spatial Distribution of Organic Matter in the Bells Meteorite Using Near-Field Infrared Micro-Spectroscopy
[#5066]

MOON, MARS, AND OTHER PLANETS

Dukes C. Christoffersen R. Keller L. Loeffler M. J. Baragiola R.
Effect of Space Radiation Processing on Lunar Soil Surface Chemistry: X-Ray Photoelectron Spectroscopy Studies
[#5411]

Yakovlev O. I. Gerasimov M. V. Dikov Yu. P.
Formation of HASP and GASP Particles: Evaluation of Temperature and Mass Loss [#5213]

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Hidaka Y. Yamaguchi A. Ebihara M.
Geochemistry and Petrology of Lunar Meteorite Dhofar 1428 [#5329]

Edmunson J. Cohen B. A.
Characterizing the Effect of Shock on Isotopic Ages II: Mg-Suite Troctolite Major Elements [#5300]

Liu Y. Zhang A. Taylor L. A.
Fragments of Asteroids in Lunar Rocks [#5434]

CHRONOLOGY OF EARLY SOLAR SYSTEM

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Evidence for Post-Impact Plume Origin of Porphyritic Chondrules in Isheyevo (CH/CB) and CH Carbonaceous Chondrites [#5184]

Fujiya W. Ichimura K. Takahata N. Sugiura N. Sano Y.
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Itoh S. Simon S. B. Grossman L. Yurimoto H.
Al-Mg Isochron Study Combined with Oxygen Isotope Analysis of the Allende Type B CAI, Golfball [#5307]

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A Preliminary Study on ⁵⁵Mn/⁵²Cr Relative Sensitivity for a Synthetic Calcite: Implications [#5316]

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**SPECIAL SESSION: IMPACT CRATERING AND SHOCK METAMORPHISM –
A TRIBUTE TO DIETER STÖFFLER**

Tagle R. Lambert P.

Tracing and Mapping the Extraterrestrial Contamination in Impactites with Portable μ -XRF Instruments: Potentials and Real Time Field Testing at Rochechouart [#5062]

Schmieder M. Buchner E.

Fe-Ni-Co Sulfides from the Steinheim Basin, SW Germany: Possible Impactor Traces [#5073]

Buchner E. Schmieder M.

Steinheim Basin Impact Spherules [#5075]

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Feather Textures — A Possible Shock Feature in Quartz Diagnostic of Low Shock Pressures [#5127]

Ferrière L. Osinski G. R.

Characterization of Shock-Metamorphic Effects in Quartz from Sandstones at the Haughton Impact Structure, Canada [#5377]

Wright S. P.

Basaltic Impactites from Lonar Crater, India: Analogs for Shergottites and Impact Melts yet to be Found on Mars [#5387]

Thursday, July 16, 2009
CHRONOLOGY OF EARLY SOLAR SYSTEM
0830 K12

Chairs: **A. Bouvier**
 K. Marhas

- 0830 Allegre C. * [INVITED]
- 0900 Wadhwa M. * Janney P. E. Krot A. N.
Al-Mg Isotope Systematics in the Efremovka E60 CAI: Evidence of Re-Equilibration [#5431]
- 0915 Bouvier A. * Wadhwa M.
26Al-26Mg Internal Isochrons for two CAIs from Leoville CV3 Chondrite [#5408]
- 0930 Mishra R. K. * Goswami J. N.
60Fe and 26Al Records in UOC Chondrules: Evidence for Their Contemporaneous Injection into Early Solar System [#5190]
- 0945 Villeneuve J. * Chaussidon M. Libourel G.
Evidence for 26Al Homogeneous Distribution in the Early Solar System from Chondrules Mg Isotopic Composition [#5205]
- 1000 Turner G. * Crowther S. A. Burgess R. Wasserburg G. J. Kelley S. P. Gilmour J. D.
Pink Angel: Argon and Xenon Diffusion, I-Xe Chronology and the 36Cl Problem [#5255]
- 1015 Lin Y. * Gyngard F. Zinner E.
Search for Extinct Chlorine-36 in Enstatite Chondrites: New Constraints on the Distribution of Short-lived Nuclides in the Solar Nebula [#5179]
- 1030 Cook D. * Herzog G. F. Leya I. Huber L.
36Cl and 10Be in Pallasite Metal [#5331]
- 1045 Marhas K. K. * Goswami J. N. Singh A.
Li-Be-B Isotope Systematics in CV3 Meteorites [#5271]
- 1100 Petitat M. * Gounelle M. McKeegan K. D. Mostefaoui S. Marrocchi Y. Meibom A. Zolensky M. E.
53Mn-53Cr Systematics of Kaidun Dolomites [#5425]
- 1115 Brennecka G. A. * Weyer S. Wadhwa M. Janney P. E. Anbar A. D. Zipfel J.
238U/235U Variations in Meteoritic Materials: Evidence for Curium-247 in the Early Solar System and Implications for Pb-Pb Dating [#5303]
- 1130 Sanborn M. E. * Carlson R. Wadhwa M.
87Rb-87Sr and 147,146Sm-143,142Nd Systematics in the Angrite Northwest Africa 2999 [#5399]
- 1145 Spivak-Birndorf L. J. * Wadhwa M.
26Al-26Mg Chronology of the Unique Basaltic Achondrite Northwest Africa 2976 [#5390]
- 1200 Quitté G. *
182Hf-182W Ages of Metal-rich Chondrites and the Timing of Early Metal Formation in the Solar System [#5419]
- 1215 Pravdivtseva O. V. * Meshik A. P. Hohenberg C. M. Kurat G.

New I-Xe Ages of Campo del Cielo Silicates [#5432]

Thursday, July 16, 2009
SPECIAL SESSION: IMPACT CRATERING AND SHOCK METAMORPHISM –
A TRIBUTE TO DIETER STÖFFLER
0830 Geny

Chairs: W. U. Reimold
L. Hecht

- 0830 Thoma K. * Hornemann U. Schäfer F.
The Physics of Shock Waves and Experimental Shock Metamorphism: Dieter Stöffler and the Ernst-Mach-Institut [#5301]
- 0845 Langenhorst F. *
Shock Deformation and Transformation of Minerals — Advances by Transmission Electron Microscopy [#5360]
- 0900 Scott E. R. D. *
Shock Metamorphism, Brecciation, and Impact Melting in Meteorites [#5416]
- 0915 Wittmann A. * Kenkmann T.
Fluidization of the Ries Crater's Ejecta Blanket [#5392]
- 0930 Lambert P. * Reimold W. U.
Rochechouart Impactoclastites [#5223]
- 0945 Buchner E. * Schmieder M.
The Steinheim Suevite [#5072]
- 1000 Collins G. S. * Wünnemann K.
Numerical Modeling of Impact Ejection Processes in Porous Geologic Materials [#5245]
- 1015 Artemieva N. A. *
Shock Metamorphism in Numerical Modeling: Tektites, Suevites, and more [#5049]
- 1030 Spray J. G. * Boonsue S.
Quartz-Coesite-Stishovite Relations and Genesis in Shocked Metaquartzites from the Vredefort Impact Structure [#5289]
- 1045 Newsom H. E. * Nelson M. J. Spilde M. N.
Evidence for at Least two Source Melt Compositions for the Lower Yaxcopoil-1 Impact-Melt Breccias [#5345]
- 1100 Osinski G. R. * Grieve R. A. F.
Classification of Impact Melt-bearing Impactites: A Discussion [#5335]
- 1115 Chapman C. R. * Harris A. W.
Near-Earth Asteroid/Meteoroid Impacts: Prospects for Linking Telescopic Observations with Recovered Meteorites [#5041]
- 1130 Bläß U. W. * Langenhorst F.
Shock-induced Phase Transformations of SiO₂ Polymorphs in Martian Meteorites [#5352]
- 1145 Schmitz B. * Alwmark C. Cronholm A. Tassinari M.
The Breakup of the L-Chondrite Parent Body and its Signature in Ordovician Sediments — An Update [#5153]

- 1200 Rochette P. * Folco L. d'Orazio M. Suavet C. Gattacceca J.
Large Iron Spherules from the Transantarctic Mountains: Where is the Nickel? [#5097]
- 1215 Hamacher D. W. *
Meteorite Falls and Cosmic Impacts in Australian Aboriginal Mythology [#5005]

Thursday, July 16, 2009
AWARD CEREMONY AND PLENARY LECTURES
1400 K12

- 1400 **Welcome**
Hiroko Nagahara and Ed Scott
- Meteoritical Society Award Presentation**
- 1405 Leonard Medal
Citation: M. Humaun
Acceptance: L. Grossman
- 1420 Barringer Award
Citation: C. Koeberl
Acceptance: U. Reimold
- 1435 Nier Prize
Citation:
Acceptance: G. Osinski
- 1450 Meteoritical Society's Service Award
Citation:
Acceptance: D. Sears
- 1505 **Leonard Medal Lecture**
Grossman L. *
Vapor-Condensed Phase Processes in the Early Solar System [#5161]
- 1550 **Barringer Medal Lecture**
Reimold U. *
Vredefort et al: 25 Years of Impact Studies in Developing Countries
- 1635 **Barringer Lecture**
Cavé J. *
She Called Me "My Martian"

Friday, July 17, 2009
ISOTOPIC ANOMALIES
0830 K12

Chairs: J. Lyons
S. Desch

- 0830 Clayton R. N. * [INVITED]
Photochemical Isotope Effects in the Early Solar System [#5084]
- 0900 Meyer B. S. *
Oxygen Isotope Evolution in Interstellar Dust [#5340]
- 0915 Ellinger C. I. Young P. A. Desch S. J. *
Solar System Shifts in Oxygen Isotopes Associated with Supernova Injection of Aluminum 26 [#5385]
- 0930 Nuth J. A. III*
A Simple Mechanism for Fractionating Oxygen Isotopes in the Solar Nebula [#5086]
- 0945 Ozima M. * Yamada A. Abe O. Nanbu S. Kasai Y.
Revisiting the CAI Oxygen Isotope Anomaly [#5098]
- 1000 Abe O. * Ozima M. Yamada A.
Mass Independent Isotope Fractionation of Molecular Oxygen During Electron Ionization [#5181]
- 1015 Yamada A. * Nanbu S. Kasai Y. Ozima M.
Mass-Independent Oxygen Isotope Fractionation in Earth Wind: First Principle Calculation [#5196]
- 1030 Lyons J. R. *
N₂ Self-shielding in the Solar Nebula [#5437]
- 1045 Qin L. * Alexander C. M. O'D. Nittler L. R. Wang J. Carlson R. W.
Looking for the Carrier Phase of ⁵⁴Cr in the Carbonaceous Chondrite Orgueil [#5286]
- 1100 Luu T. H. * Petitat M. Birck J.-L. Gounelle M.
⁵⁴Cr Isotopic Anomalies in the Tagish Lake and Orgueil Carbonaceous Chondrites [#5288]
- 1115 Göpel C. * Birck J. L. Manhès G.
U/Pb and Cr Isotope Study of the Tafassasset Meteorite [#5267]
- 1130 Paniello R. C. * Moynier F. Podosek F. A. Beck P.
Zinc Isotopic Composition of Achondrites [#5251]
- 1145 Steele R. C. J. * Elliott T. Coath C. D. Regelous M.
Correlated ⁶⁴Ni and ⁶²Ni in Bulk Meteorite Analyses [#5256]
- 1200 Akram W. M. * Schönbachler M. Williams H. M. Halliday A. N.
Zirconium Isotope Heterogeneities in the Solar System [#5363]
- 1215 Davis A. M. * Gallino R. Cristallo S. Straniero O.
Asymptotic Giant Branch Stars and Their Influence on the Isotopic Compositions of the Transition Elements [#5402]

Friday, July 17, 2009
VESTA
0830 Geny

Chairs: J.-A. Barrat
T. Mikouchi

- 0830 McSween H. Y. * [INVITED]
The Dawn Mission at Vesta [#5007]
- 0900 Usui T. * McSween H. Y. Jr. Mittlefehldt D. W. Prettyman T. H.
Chemical Mixing Model and K-Th-Ti Systematics of HED Meteorites for the Dawn Mission [#5131]
- 0915 Greenwood R. C. * Franchi I. A. Scott E. R. D. Barrat J.-A. Norman M.
Oxygen Isotope Variation in the HEDs: How Homogeneous is Vesta? [#5436]
- 0930 Ghosh A. * Day R.
Thermal Simulation of a Magma Ocean on Asteroid 4 Vesta [#5240]
- 0945 Yamaguchi A. * Barrat J. A. Greenwood R. C. Ebihara M. Franchi I. A.
Crustal Partial Melting on Vesta: Evidence from Stannern Trend and Residual Eucrites [#5199]
- 1000 Warren P. H. * Choe W.
Ultra-Fine Grained Eucrite NWA 999, and the Paradox of Thorough Equilibration, Without much Textural Maturation, in Typical Noncumulate Eucrites [#5442]
- 1015 Barrat J. A. * Yamaguchi A. Greenwood R. C. Bollinger C. Bohn M. Cotten J. Franchi I. A.
Geochemistry of HED Cumulates: A Synthesis [#5151]
- 1030 Beck A. W. * McSween H. Y.
Olivine in Diogenites: Evidence for Multiple Diagenitic Lithologies on Vesta [#5313]
- 1045 Buchanan P. C. * Zolensky M. E. Greenwood R. C. Franchi I. A.
Foreign Materials in Polymict Breccias from Vesta [#5180]
- 1100 Bunch T. E. Irving A. J. * Rumble D. III Korotev R. L. Wittke J. H. Sipiera P. P.
Northwest Africa 2824: Another Eucrite-like Sample from the Ibitira Parent Body? [#5367]

Friday, July 17, 2009
DIFFERENTIATED METEORITES
1115 Geny

Chairs: J.-A. Barrat
T. Mikouchi

- 1115 Roszjar J. * Geisler T. Scherer E. E. Bischoff A.
The Thermal History of Zircon from the NWA 5073 Eucrite as Revealed by Raman Spectroscopy
[#5203]
- 1130 Wee B. S. * Yamaguchi A. Ebihara M.
Geochemical Study of some Howardites and Polymict Eucrites [#5334]
- 1145 Nakashima D. * Nagao K. Irving A. J.
Noble Gas Retention Ages of Angrites NWA 1296, NWA 2999/4931, NWA 4590 and NWA 4801
[#5349]
- 1200 Downes H. * Beard A. D. Howard K.
Petrology of a Granitic Clast in Polymict Ureilite EET 83309 [#5036]
- 1215 Rubin A. E. Warren P. H. *
Porous, Impact-smelted Ureilites: Exceptions that Prove the Rule [#5407]

Friday, July 17, 2009
PRESOLAR MATERIALS
1330 K12

Chairs: U. Ott
P. Heck

- 1330 Hoppe P. * Gail H.-P. Zhukovska S. V. Trieloff M.
The Stellar Sources of Presolar Grains: Isotopic Evidence vs. Model Predictions for the Origin of Stardust in the ISM [#5128]
- 1345 Hynes K. M. * Gyngard F. Zinner E. Nittler L. R.
Iron and Nickel Isotopic Compositions of Silicon Carbide Z Grains [#5168]
- 1400 Daulton T. L. * Stadermann F. J. Bernatowicz T. J. Amari S. Lewis R. S.
Coordinated TEM/NanoSIMS Microanalysis of Structurally or Isotopically Rare Presolar Silicon Carbides [#5381]
- 1415 Heck P. R. * Stephan T. Hoppe P. Davis A. M.
Origin of Two AB Type SiC Grains from Murchison [#5401]
- 1430 King A. * Henkel T. Chapman S. Rost D. Lyon I.
A TOFSIMS Study of Pristine Presolar Graphite [#5257]
- 1445 Croat T. K. * Jadhav M. Lebsack E. Bernatowicz T. J.
Refractory Metal Nuggets Within Presolar Graphite [#5299]
- 1500 Amari S. * Zinner E. Gallino R. Lewis R. S.
Presolar Graphite from the Murchison Meteorite [#5322]
- 1515 Liu M.-C. * Nittler L. R. Alexander C. M. Gyngard F.
An Automated NanoSIMS Search for Presolar Oxide Grains [#5172]
- 1530 Gyngard F. * Zinner E.
A Presolar Spinel Grain of Probable Nova Origin [#5166]
- 1545 Bose M. * Floss C. Stadermann F. J.
Presolar Silicate and Oxide Dust in ALH A77307 [#5341]
- 1600 Nguyen A. N. * Messenger S.
Identification of an Extremely 18O-rich Presolar Silicate Grain in Acfer 094 [#5376]
- 1615 Leitner J. * Hoppe P. Zipfel J.
NanoSIMS Investigation of Presolar Material in Chondrites of the CR Clan: C-, N-, and O-Isotopic Studies [#5290]
- 1630 Ott U. * Kratz K.-L. Farouqi K.
On Ways for Making Xenon-HL [#5121]
- 1645 Ebata S. * Yurimoto H.
Presolar Grains in Primitive Enstatite Chondrites [#5012]

Friday, July 17, 2009
DIFFERENTIATED METEORITES (CONTINUED)
1330 Geny

Chairs: H. Downes
R. Jones

- 1330 Zolensky M. E. * Herrin J. Jenniskens P. Friedrich J. M. Rumble D. Steele A. Sandford S. A. Shaddad M. H. Le L. Robinson G. A. Morris R. V.
Mineralogy of the Almahata Sitta Ureilite [#5183]
- 1345 Ross A. J. * Downes H. Smith C. L. Jones A. P.
Highly Reduced Metals and Sulphides in Ureilites: Remnants of the UPB Core? [#5269]
- 1400 Ando K. * Nakamura T. Noguchi T. Okazaki R. Nakashima D. Kakazu Y. Kitajima F.
No Meaningful Correlation Between Mineralogy and Noble Gas Compositions of Carbonaceous Materials in Shisr 007 Ureilite [#5209]
- 1415 Mayne R. G. * McCoy T. J. Ash R. D. McDonough W. M.
Do Redox Reactions Play a Role in the Formation History of the Mesosiderites? [#5253]
- 1430 Huber L. * Herzog G. F. Cook D. L. Leya I.
Noble Gas Measurements in Metal from Pallasites [#5220]
- 1445 Yang J. Goldstein J. I. * Scott E. R. D. Yu H. Zhu M.
Cooling Rates and Origin of Main Group Pallasites [#5295]
- 1500 Luais B. * Toplis M. J. Tissandier L. Roskosz M.
Metal-Silicate Segregation and Fractionation of Ge Isotopes: Comparison of Experimental Data and Meteorite [#5326]
- 1515 Chabot N. L. * Saslow S. A. McDonough W. F.
Examination of Trace Element Partitioning Behavior in the Fe-Ni System [#5069]

Friday, July 17, 2009
PARENT BODY PROCESSES
1530 Geny

Chairs: H. Downes
R. Jones

- 1530 Hill E. * Domanik K. Huss G. R. Drake M. J.
Silicon Mantle/Core Fractionation and the Origin of Pallasites [#5089]
- 1545 Alard O. * Gounelle M.
Metal and Sulfides in Eucrites and Diogenites [#5051]
- 1600 Roskosz M. * Alexander C. M. O'D. Wang J. Dauphas N. Mysen B. O.
Diffusion-driven Fractionation of Iron Isotopes in Oxidized and Reduced Silicate Melts [#5227]
- 1615 Jones R. H. * Kovach H. A.
Plagioclase in Type 4–6 Ordinary Chondrites: An Indicator of Metamorphic Processes [#5298]
- 1630 Dyl K. A. * Bischoff A. Ziegler K. Wimmer K. Young E. D.
Evidence for Aqueous Alteration in Ordinary Chondrites from Compositional and Oxygen Isotopic Trends in an Exotic Fragment [#5162]
- 1645 Hidaka H. * Yoneda S.
Cosmic-Ray Exposure Histories of Gas-rich Brecciated Meteorites [#5113]
- 1700 Ciesla F. J. * Davison T. M. Collins G. S.
Cooling of Porous Planetesimals After Impacts: Implications for the Thermal Evolution of Primitive Bodies [#5048]
- 1715 Krause M. * Blum J. Trieloff M. Skorov Y. V.
Thermal Conductivity Measurements of Planetesimal Dust Analogs [#5221]

Friday, July 17, 2009
POSTER SESSION
1730 Patio

ISOTOPIC ANOMALIES POSTERS

Lyons J. R. Stark G.

Simulation of the Massive Fractionation Observed in CO Photodissociation Experiments [#5443]

VESTA, DAWN MISSION

Trigo-Rodríguez J. M. Llorca J. Madiedo J. M. Jambon A. Chennaoui Aoudjehane H.

The Puerto Lápice Eucrite. Free Sample Delivery from Vesta: Trajectory, Orbital Solutions, and Shock History from Cathodoluminescence [#5035]

Barrat J. A. Yamaguchi A. Greenwood R. C. Bollinger C. Bohn M. Jambon A. Boudouma O. Franchi I. A.

High-K Glasses and "KREEPy" Clasts in Howardites: Evidence for K-rich Terrane(s) on 4-Vesta [#5149]

DIFFERENTIATED METEORITES

Karczewska A. Jakubowski T. Kozanecki M.

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