84TH ANNUAL MEETING OF THE METEORITICAL SOCIETY

August 15–21, 2021
Chicago, Illinois

Program

Monday, August 16, 2021

8:30 a.m.	Waldorf	Welcome and Introduction
9:00 a.m.	Waldorf	Moon
9:00 a.m.	Williford AB	Chondrules
12:00 p.m.	Waldorf	Townhall: OSIRIS-REx Sample Analysis
1:30 p.m.	Williford AB	Achondrites I
1:30 p.m.	Waldorf	CAIs
6:00 p.m.	Waldorf	Barringer Lecture

Tuesday, August 17, 2021

8:30 a.m.	Williford AB	Missions
8:30 a.m.	Waldorf	Impacts
12:00 p.m.	Waldorf	Townhall: Status of the Mars Sample Return Campaign
1:30 p.m.	Williford AB	Mars
1:30 p.m.	Waldorf	Presolar Grains
5:30 p.m.	Williford C	Poster Session

- Achondrites
- Carbonaceous Chondrites
- Curation and Education
- Enstatite and Ordinary Chondrites
- Early Solar System: Disk Conditions and Processes
- Space Weathering
- Impacts
- Mars and Moon
- Missions
- Micrometeorites
- Chondrules and CAIs
- Experiments
- Small Bodies

Wednesday, August 18, 2021

8:30 a.m.	Waldorf	Meteoritical Society Award Ceremony 2020 and 2021

Thursday, August 19, 2021

8:30 a.m.	Williford AB	Carbonaceous Chondrites
8:30 a.m.	Waldorf	Achondrites II
12:00 p.m.	Waldorf	Meteoritical Society Business Meeting
1:30 p.m.	Williford AB	Disk Conditions and Processes
1:30 p.m.	Waldorf	Fireballs and Sources

Friday, August 20, 2021

8:30 a.m.	Williford ABC	Chondrites
8:30 a.m.	Waldorf	Organics and Ices
1:30 p.m.	Williford ABC	Parent Body Processes
1:30 p.m.	Waldorf	Potpourri

Saturday, August 21, 2021

8:30 a.m.	Field Museum of Natural History, Founders Room	Workshop on Meteorite Ownership and Legal Issues

E-Posters
Virtual Poster Session A
Virtual Poster Session B

Monday, August 16, 2021
MOON
8:30 a.m. Waldorf
Chairs: Ryan Zeigler and Amanda Stadermann

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
8:30 a.m.	Heck, P. R. *	*Welcome Remarks*
8:45 a.m.	Ciesla, F. J. *	*Welcome Remarks*
9:00 a.m.	Fegley B. Jr. * Lodders K.	*Condensation Chemistry of Dry Bulk Silicate Earth Material* **[#6131]** We give condensation calculations for dry bulk silicate Earth material at 1e-6 to 1e+2 bars and T up to 6000 K with thermal ionization and non-ideal molten oxide solution. Our work constrains lunar formation and molten silicate evaporation with fO_2.
9:15 a.m.	Dauphas N. * Nie N. X. Blanchard M. Zhang Z. J. Zeng H. Hu J. Y. Meheut M. Visscher C. Canup R. Hopp T.	*Are K and Rb Uniformly Depleted in Lunar Rocks?* **[#6226]** Variations in K/U and Rb/Ba ratios in lunar rocks have a magmatic origin. We present two approaches to see through these magmatic processes and estimate the composition of the Moon.
9:30 a.m.	Stadermann A. C. * Barnes J. J. Erickson T. M. Zega T. J.	*Apollo Sample 64455: Petrologic and Geochemical Characterization of a Glass-Coated Impact Melt Rock* **[#6261]** Metamorphism / On contact with impact melt / In Apollo rock.
9:45 a.m.	Greer J. * Zhang B. Isheim D. Seidman D. N. Bouvier A. Heck P. R.	*Atom Probe Tomography of 4.45 Ga Lunar Zircon from the Apollo 17 Civet Cat Norite Clast* **[#6134]** APT analysis of zircon from the Civet Cat norite clast of Apollo 17 impact melt breccia 72255 reveals Pb distribution at the nanoscale, important for interpreting NanoSIMS U-Pb and Pb-Pb ages.
10:00 a.m.	Treiman A. H. * Semprich J. J.	*Lunar Feldspathic Breccia Northwest Africa (NWA) 11421: Clasts in the Corners* **[#6065]** Fragments of weird rock / Dispersed in lunar matrix / On old X-ray maps.
10:15 a.m.	Zeigler R. A. * Gross J. Eckley S. Vander Kaaden K. E.	*Petrology, Geochemistry, and Pairing of Lunar Meteorites from the Dominion Range* **[#6141]** Initial results of electron microprobe and X-ray computed tomography (XCT) studies of the seven new DOM lunar meteorites and a look at the details of their petrography and mineral chemistry, as well as investigate possible pairing relation-hips.
PRE-RECORDED PRESENTATION		
10:30 a.m.	Morino P. * Schönbächler M. Maden C. Busemann H.	*A Combined Study of Cr Isotope and Noble Gas Composition of 18 Apollo Samples* **[#6150]** This study aims to combine high precision Cr isotope and noble gas measurements of Apollo samples to first determine the Cr isotope composition of the Moon and then tighten the constraints on the origin and composition of Theia.

10:40 a.m.		*Q&A*

Monday, August 16, 2021
CHONDRULES
9:00 a.m.   Williford AB
Chairs: Alexander Ruzicka and Marina Gemma

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
9:00 a.m.	Ruzicka A. M. * Hugo R. C.	*Probing the Thermal and Deformation Histories of Chondrules in a Cluster Chondrite Lithology of Northwest Africa 5205 with Electron Backscatter Diffraction (EBSD) Techniques* **[#6109]** Most chondrules in a cluster lithology of NWA 5205 (LL3.2) accreted while warm, but some chondrules were cool, and some were deformed and reheated prior to agglomeration.
9:15 a.m.	Zhang M. * Fukuda K. Siron G. Kita N. T. Ushikubo T.	*Primitive Chondrule Minerals (PCM) Line-A Mix of Two Trends?* **[#6036]** We reanalyzed Acfer 094 chondrite chondrules and prove that the PCM line could be a mix of two trends, the one below is represented by typical CC chondrules and the one above is represented by those chondrules mixed with OC chondrule-like materials.
9:30 a.m.	Shimizu K. * Alexander C. M. O'D. Hauri E. H. Sarafian A. R. Nittler L. R. Wang J. Jacobsen S. D. Mendybaev R. A.	*Highly Volatile Element (H, C, F, Cl, S) Abundances and H Isotopic Composition in Chondrules from Carbonaceous and Ordinary Chondrites* **[#6283]** Most of the highly volatile elements or HVEs (H, C, F, Cl, S) in chondrules were likely introduced during parent body processes. However, the small but measurable amount of HVEs in melt inclusions in chondrule phenocrysts may be primary HVEs.
9:45 a.m.	Fukuda K. * Tenner T. J. Kimura M. Tomioka N. Siron G. Ushikubo T. Chaumard N. Hertwig A. T. Kita N. T.	*A Temporal Shift of Chondrule Generation from the Inner to Outer Solar System* **[#6030]** The Al-Mg ages of chondrules from pristine CM and CO chondrites are systematically younger than those of the majority of ordinary chondrite chondrules, suggesting a delayed chondrule formation in the outer Solar System.
10:00 a.m.	Gemma M. E. * Gonzales J. C. Ebel D. S.	*Trace Element Diversity of Chondrule Mesostasis in CV and CR Chondrites* **[#6232]** We present trace element analyses of chondrule mesostasis in CV and CR chondrites. This statistically significant dataset complements existing major element and isotopic datasets and addresses formation theories of chondrites and their constituents.
PRE-RECORDED PRESENTATION		
10:15 a.m.	Kadlag Y. * Leya I. Mezger K. Bouvier A.-S. Haberthür D. Hlushchuk R.	*Timing and Environment of Chondrule Formation* **[#6060]** Combining temporal information (from Al-Mg relative ages) with environment (from isotope ratios of He, Ne and Ar) of chondrules to understand early solar system processes and chondrule formation conditions.
10:25 a.m.		*Q&A*

Monday, August 16, 2021
ACHONDRITES I
1:30 p.m. Williford ABC
Chairs: Zoltan Vaci and Paul Warren

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
1:30 p.m.	Warren P. H. * Rubin A. E.	*Northwest Africa 12969: Diamonds and Siderophile-Element Evidence Suggest Kinship, or at Least Petrogenetic Analogy, with Extreme-Magnesian Ureilites* **[#6285]** The NWA 12969 harzburgitic, ultra-magnesian achondrite contains diamonds in clumps up to 70 microns long, and has a ureilite-like pattern of siderophile element depletions, although bulk Zn is low, and Ni/Au ratio is high, by ureilite standards.
1:45 p.m.	Rubin A. E. * Zhang B.	*The Nordheim Trio: IAB-an Irons that Experienced Devolatilization and Silicate Vaporization* **[#6011]** The Nordheim Trio comprises three IAB-an ataxites [Nordheim, ALH 77255, Babb's Mill (Blake's Iron)] that experienced impact-devolatilization, silicate vaporization and quenching. A silica glass spherule in ALH 77255 formed by fractional condensation.
2:00 p.m.	Zhang B. * Chabot N. L. Rubin A. E.	*Fractional Crystallization Modeling of Carbonaceous-Type Iron Meteorites* **[#6122]** We present comprehensive fractional-crystallization modeling of the CC-type groups (IIC, IID, IIF, IIIF, IVB) and the South Byron Trio to reconstruct their crystallization processes and initial compositions and to compare CC-type asteroidal cores.
2:15 p.m.	Vaci Z. * Yin Q.-Z. Dey S. Miller A. Ziegler K. Day J. M. D. Agee C. B. Pack A.	*Chromium and Oxygen Isotopic Compositions of Ultramafic Achondrites: Implications for the Missing Mantle Problem in the Asteroid Belt* **[#6067]** New oxygen and chromium isotopic analyses show that olivine-rich cumulate achondrites are associated with at least two unique parent bodies and potentially the "anomalous" HED meteorites.
PRE-RECORDED PRESENTATIONS		
2:30 p.m.	Neumann W. * Ma N. Neri A. Schwarz W. H. Ludwig T. Trieloff M. Klahr H. Bouvier A.	*Thermal History and Structure of the Tafassite Parent Body* **[#6153]** We identified a first group of carbonaceous primitive achondrites and proposed to name them Tafassites. We studied their Pb-Pb SIMS chronological records and constrained the accretion and thermal evolution of their parent body by numerical modeling.
2:40 p.m.	Hamann C. Collinet M. * Schwinger S. Kaufmann F. E. D. Bonato E. Greshake A. Maturilli A. Helbert J. Hecht L.	*Petrography of Fine-Grained Domains in Ungrouped Achondrite Erg Chech 002: Evidence for Different Cooling Histories?* **[#6236]** Here we describe the petrography of previously unknown, fine-grained magmatic domains in ungrouped achondrite Erg Chech 002 and discuss the implications for a multistage cooling and crystallization history.

2:50 p.m.	Hahn T. M. Jr * Bose M.	*Primitive Achondrite Parent Bodies are Volatile-Rich Compared to Differentiated Achondrites* **[#6227]** Water contents and D/H ratios were measured in nominally anhydrous minerals in two Ureilites (LAP 03587 and CMS 04048) and two Brachinites (EET 99402 and GRA 06129). Primitive achondrites are volatile-rich compared to differentiated achondrites.
3:00 p.m.	Davies F. * Daly L. Hallis L. Lee M.	*Deformation and Mineral Relationship of Achondrite Meteorites to Reconstruct the Geological History of Their Protoplanets* **[#6171]** This project is investing achrondrite meteorites ureilite: Havero, Nova 001, Reid 016; Aubrite: Cumberland Falls; and an anomoulous achondrite: MIL 090356, studying the deformation and mineral relationship of these meteorites using SEM-EDS and EBSD.
3:10 p.m.	Khan H. * Leya I.	*Re-Establish the Potassium Dating System for Iron Meteorites* **[#6145]** The work presented is a follow-up on the oral presentation I had the opportunity to give at MetSoc2019. I am extremely excited to present this new development as there has not been anything done like this in the last 30 years.
3:20 p.m.	Barbaro A. * Domeneghetti M. C. Litasov K. D. Ferrière L. Pittarello L. Christ O. Lorenzon S. Alvaro M. Nestola F.	*Carletonmooreite (Ni3Si) in Shocked Diamond Bearing Kenna Ureilite* **[#6066]** Our results on Kenna show that the association of nano-, micro-diamonds and nanographite found in ureilites was produced by impacts at peak pressures at least of ~15 GPa and the presence of Ni3Si highlights the role of Fe-Ni phases in diamond growth.
3:30 p.m.	Danoix F. * Cadel E. Cuvilly F. Danoix R. Gounelle M. Kern L. Roskosz M.	*Nanostructure and Nanochemistry of Selected Iron Meteorites Obsserved at the Nanometric Scale* **[#6207]** We report the observation and chemical analysis by atom probe tomography of selected iron meteorites at the nanometer scale, and aim at illustrating how nano structural/chemical features bear information related to their thermo-mechanical history.
3:40 p.m.		*Q&A*

Monday, August 16, 2021
CAIs
1:30 p.m. Waldorf
Chairs: Prajkta Mane and Emilie Dunham

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
1:30 p.m.	Mane P. * Ross D. K. Simon J. I.	*A Population Study of the Refractory Inclusions in Miller Range (MIL) 090019 CO3 Carbonaceous Chondrite* **[#6275]** We present a particle size distribution study of CAIs from MIL 090019 CO3 chondrite that provides insights into the accretionary processes.
1:45 p.m.	Torrano Z. A. * Desch S. J. Dunham E. T. Williams C. D. Mane P.	*A Reassessment of the Titanium Isotopic Compositions of FUN CAIs* **[#6262]** In FUN CAIs / Titanium is a clue / For late formation.

2:00 p.m.	Dunham E. T. * Liu M.-C. Matsuda N. McKeegan K. D.	*CAIs in Ordinary and Enstatite Chondrites* **[#6133]** NC CAIs / Very small and rare, unlike / CC CAIs.
2:15 p.m.	Ramprasad T. * Seifert L. B. Zega T. J.	*A Microstructural Examination of a Refractory-Siderophile Nugget from the Northwest Africa 8323 CV3 Chondrite* **[#6123]** We investigate the structure and chemical composition of a polyphasic refractory-siderophile nugget from a CV3 chondrite, using electron microscopy techniques to gain insight into its origin.
2:30 p.m.	Matsuda N. * Liu M.-C. McKeegan K. D.	*Petrography, Oxygen, and Magnesium Isotopic Compositions of Hercynite-Rich CAIs from CO3 Chondrites* **[#6110]** We present the results of petrological characterizations, oxygen, and magnesium isotopic compositions of hercynite-rich inclusions in order to better understand the effects of secondary processing.
PRE-RECORDED PRESENTATION		
2:45 p.m.	Han J. * Liu M.-C. Matsuda N. Park C. Keller L. P.	*Mineralogical and Al-Mg Isotopic Study of Fine-Grained Ca-Al-Rich Inclusions* **[#6267]** We present high-precision Al-Mg isotopic data of fine-grained CAIs from reduced CV3 chondrites, coordinated with FIB/TEM analyses, to elucidate their formation conditions and timescales in comparison with coarse-grained CAIs.
2:55 p.m.	Liu M.-C. * Matsuda N. Dunham E. T. McKeegan K. D.	*The Discovery of HIDALGO, a New Hibonite Inclusion with FUN Characteristics, in Dar Al Gani 027 (CO3)* **[#6084]** What is HIDALGO? / It has fractionated oxygen isotopes and low ^{26}Al / It is probably a FUN inclusion!
3:05 p.m.	Martin P. M. C. * Lee M. R.	*The Conspicuous Compound Chondrule-CAI Conundrum: A Case Study Within the Brecciated CM2.2 Lithology of the Carbonaceous Breccia Aguas Zarcas* **[#6190]** Discovery of a new Compound Chondrule-CAI (CCCAI) within the brecciated CM2.2 lithology of the carbonaceous breccia Aguas Zarcas. Little cockerel / Why do you carry a ball? / Tell me your secrets.
3:15 p.m.	Krot A. N. * Nagashima K. MacPherson G. J.	*On the Nature of Oxygen Isotope Heterogeneity of Igneous Calcium-Aluminum-Rich Inclusions in CV (Vigarano-Type) Carbonaceous Chondrites* **[#6136]** Melilite, anorthite, Ti-rich fassaite, perovskite, and davisite in the Allende igneous CAIs experienced postcrystallization mineralogically controlled O-isotope exchange with the external ^{16O}-poor reservoir ($\Delta^{17}O \sim -3‰$), most likely aqueous fluid.
3:25 p.m.	Manga V. R. * Zanetta P. M. Thakur A. Muralidharan K. Zega T. J.	*Thermodynamic Modeling of Equilibrium Solubilities of Ti in Minerals of Calcium-and-Aluminum-Rich Inclusions Under Nebular Conditions* **[#6293]** The crystal chemistries of pristine minerals that are found within CAIs when analyzed in conjunction with thermodynamic calculation of condensation, reveal the thermochemical landscape of the high temperature region of the early solar nebula.

3:35 p.m.		*Q&A*

Monday, August 16, 2021
Barringer Lecture
6:00 p.m.   Waldorf

Barringer Lecture: Prof. Leslie Rogers, The University of Chicago: Glimpsing the Exoplanet Composition Distribution

Tuesday, August 17, 2021
MISSIONS
8:30 a.m.   Williford ABC
Chairs: Pierre Haenecour and Nancy Chabot

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
8:30 a.m.	Chabot N. L. * Rivkin A. S. Cheng A. F. Adams E. Y. Reynolds E. L. DART Team	*DART – The Double Asteroid Redirection Test Mission* **[#6074]** DART, the Double Asteroid Redirection Test, is NASA's first mission that is dedicated to demonstrating a planetary defense mitigation technology. DART is planned to launch in November 2021 and to impact the asteroid Dimorphos in Fall of 2022.
8:45 a.m.	Parker E. T. * Chan Q. H. S. Glavin D. P. Dworkin J. P.	*Extraterrestrial Non-Protein Amino Acids Identified in Carbon-Rich Particles Returned from Asteroid Itokawa* **[#6101]** The results of this study mark the first evidence of extraterrestrial amino acids in asteroid material collected during a sample-return mission and returned to Earth.
9:00 a.m.	Ishimaru K. * Lauretta D. S.	*Modeling of Sediment Deposition on asteroid Bennu's Parent Body* **[#6080]** We analyzed clast size distribution and thickness of layered structures on Bennu's boulders using OSIRIS-REx data. The observed parameters were used to model the hydrothermal flow in the parent body.
9:15 a.m.	Chaves L. C. * Thompson M. S.	*Sulfur and Nickel Depletion in Space Weathered Sulfides from Asteroid Itokawa* **[#6234]** Despite the relevance of sulfides in airless body regoliths, their response under space weathering conditions is still poorly understood. Here, we report S and Ni depletion as result of space weathering on sulfides from asteroid Itokawa.
9:30 a.m.	Ryan A. J. * Craddock Z. A. Cherian S. K. Gibson M. N. McCommon A. T. Ochoa A. D. Ouyang J. Siegler M. Lauretta D. S.	*Thermal Conductivity Measurement Plan for Samples Returned by OSIRIS-REx* **[#6237]** Plans are presented for a nondestructive, noncontact method to measure sample thermal conductivity.
9:45 a.m.	Haenecour P. * Bennett C. A. Crombie M. K. Fitzgibbon M. Ferro A. Hammond D. McDonough E. Westermann M. M. Barnes J. J. Connolly H. C. Jr. Lauretta D. S.	*The OSIRIS-REx Sample Analysis Micro Information System (SAMIS)* **[#6083]** The OSIRIS-REx mission is developing the Sample Analysis Micro Information System (SAMIS) with the goals of facilitating sample analysis by mission scientists, as well as fostering data stewardship practices.

PRE-RECORDED PRESENTATION		
10:00 a.m.	Van Ginneken M. * Wozniakiewicz P. J.	*Impact Experiments of Chondrule Fragments on Stardust Analogue Foils: Clues to the Nature of Chondrule-Like Material in Wild 2* **[#6167]** We present an experimental study of craters and residues resulting from the impact of fragments of chondrules on Stardust analogue foils. Comparison with Stardust data will allow drawing comprehensive picture of the chondrule population in Wild 2.
10:10 a.m.	Daly L. * Lee M. R. Darling J. R. McCarrol I. Yang L. Cairney J. Forman L. V. Bland P. A. Benedix G. K. Fougerouse D. Rickard W. D. A. Saxey D. W. Reddy S. M. Bagot P. A. J.	*Ice Ice Baby: Improving Water Quantification of Hydrous Minerals by Cryo-Focussed Ion Beam and Cryo Vaccum Transfer to Atom Probe* **[#6032]** Phyllosilicates are key targets for upcoming sample return missions, we outline a new cryo-FIB to atom probe approach that detects novel nanophases and provides accurate quantification of the water abundance of phyllosilicates.
10:20 a.m.	Westphal A. J. * Pister K. S. J. Alvara A.	*Rapid Multi-Comet Sample Return Using Swarms of Tiny Interplanetary Spacecraft* **[#6174]** Spectacular advances in the last decade in microelectronics and MEMS technology enable the development of tiny (~10g), inexpensive, autonomous spacecraft that could be used for rapid sample return from dozens of comets.
10:30 a.m.	Bibring J. P. * Pilorget C. Okada T. Hamm V. Brunetto R. Yada T. Loizeau D. Riu L. Usui T. Moussi-Soffys A. Hatakeda K. Nakato A. Yogata K. Abe M. Aléon-Toppani A. Carter J. Chaigneau M. Crane B. Gondet B. Kumagai K. Langevin Y. Lantz C. Le Pivert-Jolivet T. Lequertier G. Lourit L. Miyazaki A. Nishimura M. Poulet F. Arakawa M. Hirata N. Kitazato K. Nakazawa S. Namiki N. Saiki T. Sugita S. Tachibana S. Tanaka S. Yoshikawa M. Tsuda Y. Watanabe S.	*First NIR Hyper-Spectral Imaging of Hayabusa2 Returned Samples by the MicrOmega Microscope within the ISAS Curation Facility* **[#6276]** We present the preliminary outcomes of the analyses performed with MicrOmega (a hyperspectral NIR microscope) on asteroid Ryugu samples collected and returned by the Hayabusa2 mission.
10:40 a.m.	Yada T. * Abe M. Nakato A. Yogata K. Miyazaki A. Kumagai K. Hatakeda K. Okada T. Nishimura M. Furuya S. Yoshitake M. Iwamae A. Soejima H. Hitomi Y. Riu L. Lourit L. Pilorget C. Hamm V. Brunetto R. Bibring J.-P. Cho Y. Yumoto K. Yabe Y. Sugita S. Tachibana S. Sawada H. Sakamoto K. Hayashi T. Yamamoto D. Fukai R. Sugahara H. Yurimoto H. Usui T. Watanabe S. Tsuda Y.	*Initial Descriptions of Asteroid Ryugu Samples Returned by Hayabusa2* **[#6186]** C-type asteroid Ryugu samples returned by Hayabusa2 experienced initial descriptions conducted by JAXA. They are described with an optical microscope, a balance, a visible spectrometer, an FT-IR, and a MicrOmega.
10:50 a.m.		*Q&A*

Tuesday, August 17, 2021
IMPACTS
8:30 a.m.   Waldorf
Chairs: Christian Koeberl and George Flynn

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
8:30 a.m.	Flynn G. J. * Durda D. D. Strait M. M. Macke R. J.	*Limits on Asteroid Kinetic Impact Deflection from Hypervelocity Cratering* **[#6037]** Hypervelocity impact experiments show the maximum momentum change without disruption for a carbonaceous meteorite is ~10x less than for an ordinary chondrite, and deflection of carbonaceous asteroids may require multiple successive impacts.
8:45 a.m.	Knicely J. J. C. * Herrick R. R. Daly T. Barnouin O.	*A Reexamination of Low-Velocity Oblique Cratering with New Techniques* **[#6290]** We reexamine low-velocity oblique cratering with new techniques. These experiments are a prelude to high-velocity experiments, but may have relevance to secondary cratering on terrestrial bodies.
9:00 a.m.	Alexander A. M. * Marchi S. Chocron S. Walker J.	*Modeling Impact-Induced Porosity and Fracturing on Fe-Ni Bodies* **[#6200]** In this work, we use CTH and iSALE shock physics codes to explore impact-induced porosity and fracturing in materials relevant to Asteroid (16) Psyche (Fe-Ni alloys and iron meteorites) and compare with previous in situ impact experiments.
9:15 a.m.	Feignon J.-G. Schulz T. Ferrière L. Goderis S. de Graaff S. J. Kaskes P. Déhais T. Claeys P. Koeberl C. *	*Examining the (Potential) Presence of a Preserved Impactor Signature in the Impact Melt Rocks of the Chicxulub Impact Structure Peak Ring* **[#6238]** Here are presented results related to the search for the presence of a possible meteoritic component within the Chicxulub impact structure peak ring impact melt rocks, using detailed highly siderophile element and Re-Os isotopic investigations.
9:30 a.m.	Huber M. S. Kovaleva E. Mautle F. Hainsworth J. Koeberl C. *	*First Discovery of Proximal Vredefort Impact Ejecta in South Africa* **[#6240]** We report on the first discovery of possible proximal ejecta from the Vredefort impact event.
9:45 a.m.	Koeberl C. * Mojzsis S. J.	*The Needle in the Haystack Problem: Search for Meteoritic Contamination and Identification of Projectile Type in Terrestrial Impact Events* **[#6194]** It is very difficult to distinguish some meteorite types in terms of meteoritic contamination in impact melt rocks and ejecta, but this is of particular importance for the early Archean impact record.

PRE-RECORDED PRESENTATION		
10:00 a.m.	Ciocco M. * Roskosz M. Gounelle M. Fiquet G. Leroux H.	*Self-Consistent Determination of Impact Timescales by Growth and Diffusion Kinetics of Olivine and Pyroxene Polymorphs in 3 Highly Shocked L Chondrites* **[#6132]** Microstructures and chemical partitions of high pressure polymorphs are characterized by nanoSIMS and STEM in 3 shocked L chondrites. Insights on the transformation mechanisms and associated elemental diffusion provide new shock timescales.
10:10 a.m.	Schmalen A. * Luther R. Artemieva N.	*Campo del Cielo Strewn Field: Modeling and Comparison with Observations* **[#6044]** Reconstruction of the Campo del Cielo impact event, i.e., to estimate the minimal pre-atmospheric mass and velocity of the meteoroid, its fragmentation during the atmospheric entry and to compare the resulting strewn field with the observed one.
10:20 a.m.	Riches L. J. * Pickersgill A. E. Daly L.	*Shock Metamorphism in Feldspar from the Chicxulub Impact Structure* **[#6158]** This project investigates shock deformation features in both plagioclase and alkali feldspar from the Chicxulub impact structure. Samples have been mapped using SEM-EDS and will be studied further using EBSD.
10:30 a.m.	Kurosawa K. * Ono H. Niihara T. Mikouchi T. Sakaiya T. Kondo T. Tomioka N. Genda H. Tada T. Tada R. Kayama M. Koike M. Sano Y. Matsuzaki T. Murayama M. Satake W. Okamoto T. Matsui T.	*Shock Recovery of Macro Blocks of Rocky Materials with Decaying Shock Waves* **[#6163]** We have developed an experimental technique for shock recovery with decaying compressive pulses. The method allows as to collect a shocked sample experienced a variety of peak pressure depending on the initial location only at a single shot.
10:40 a.m.	Bender Koch C. *	*Sampling of Impact Plume Components from Wabar Impact Craters* **[#6220]** It is suggested to use information from analysis of the material inside plume-trapping vesicles as a proxy for the conditions in the impact plume.
10:50 a.m.	Gritsevich M. * Moilanen J. Visuri J. Heinlein D. Schweidler F. Flohrer J. Oberst J.	*Reanalysis of the 24 November 1970 Fireball* **[#6216]** We demonstrate that the EN_241170 fireball was the fall of the Ischgl meteorite.
11:00 a.m.		*Q&A*

Tuesday, August 17, 2021
MARS
1:30 p.m. Williford ABC
Chairs: Amanda Ostwald and Arya Udry

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
1:30 p.m.	Ostwald A. M. * Udry A. Gross J. Day J. M. D.	*Nakhlite and Chassignite Parental Melt Compositions Compared* **[#6209]** We present and compare major, minor, and trace element abundances present in nakhlite and chassignite parental melt compositions determined from melt inclusion analysis.

1:45 p.m.	Humayun M. * Yang S. Irving A. J. Righter K.	*An Ancient Martian Ocean Inferred from Sulfide Immiscibility in Meteorites* **[#6243]** Elemental abundances in two Amazonian-age meteorites indicate that the depleted shergottites formed in a large volcanic pile, the basal flows of which were sulfidized in an ancient martian ocean.
PRE-RECORDED PRESENTATION		
2:00 p.m.	Christou E. V. * Hallis L. J. Daly L. Hayward C. L. Lee M. R.	*Northwest Africa 8159 Apatite Versus Lafayette Apatite: Effects of Terrestrial Weathering Versus Martian Alteration* **[#6297]** We have analyzed NWA 8159 and Lafayette apatite via correlative SEM, EPMA, TEM and APT to acquire an insight into their origin and the geochemical reaction pathways of the primary and secondary alteration processes that affected these Martian rocks.
2:10 p.m.	Piercy J. D. Bridges J. C. * Hicks L. J.	*Odinite and Saponite Replacement of Carbonate in the Lafayette Nakhlite: Part of the CO_2-CH_4 Cycle on Mars* **[#6159]** Textural and chemical analysis of Lafayette carbonate dissolution illustrate a process of subsurface dissolution to explain the low abundance of detected carbonate on Mars and a source of martian methane.
2:20 p.m.	Griffin S. * Keller T. Daly L. Lee M. R. Cohen B. E. Forman L. V. Piazolo S. Trimby P. W. Baumgartner R. Benedix G. K.	*Nakhlite Emplacement Mechanisms from Electron Backscatter Diffraction* **[#6185]** Volcano on Mars / Emplaced nakhlites now on Earth / How did they all form?
2:30 p.m.	Malarewicz V. * Beyssac O. Zanda B. Hewins R. Pont S. Bouley S.	*Investigating Main and Accessory Minerals in the Martian Regolith Breccia Northwest Africa 7533 by Raman and Luminescence Spectroscopy* **[#6128]** As a martian breccia, Northwest Africa 7533 provides insights on the history and evolution of the primitiv crust. In this study, we used Raman and luminescence spectroscopy to investigate the structure and REE content of main and accessory minerals.
2:40 p.m.		*Q&A*
3:40 p.m.		*Q&A continued*

Tuesday, August 17, 2021
PRESOLAR GRAINS
1:30 p.m. Waldorf
Chairs: Nan Liu and Reto Trappitsch

Times	Authors (*Denotes Presenter)	Abstract Title and Summary
1:30 p.m.	Liu N. * Ogliore R. C.	*NanoSIMS Isotopic Investigation of the CO3 Chondrite Dominion Range 14359* **[#6069]** We report our NanoSIMS H, C, and O isotopic imaging results for the CO3 chondrite DOM 14359. We compare DOM 14359 with DOM 08006 for their inventories of presolar and interstellar grains to discuss their different degrees of secondary processing.

1:45 p.m.	Liu N. * Dauphas N. Cristallo S. Ogliore R. C.	*Oxygen and Magnesium-Aluminum Isotopic Systematics of Presolar Nanospinel Grains from CI Chondrite Orgueil* **[#6215]** We report NanoSIMS O isotope data for 109 new presolar oxides and Al-Mg isotope data for 24 of the grains (23 spinel grains and one Al-rich oxide), including four Group 2 and 20 Group 1 grains.
2:00 p.m.	Seifert L. B. * Haenecour P. Ramprasad T. Zega T. J.	*Transmission Electron Microscopy Study of a Presolar Silicate Grain from the Uniquely Altered Miller Range 07687 Chondrite* **[#6124]** We report the structure and chemistry of a presolar silicate grain from the Miller Range 07687 carbonaceous chondrite.
2:15 p.m.	Stephan T. * Bloom H. E. Davis A. M. Hoppe P. Korsmeyer J. M. Pellin M. J. Regula A. Sheu S.	*Correlated Molybdenum and Ruthenium Isotopes in Presolar Silicon Carbide* **[#6270]** Mo and Ru isotopes analyzed with high precision in presolar SiC grains using CHILI show a clear correlation between s-process signatures in Mo and Ru. Contributions by the s-process to the various Ru isotopes were determined for the first time.
2:30 p.m.	Barosch J. * Nittler L. R. Dobrică E. Brearley A. J. Hezel D. C. Alexander C. M. O'D.	*Presolar O- and C-Anomalous Grains in Pristine Ordinary Chondrite Matrices* **[#6137]** We used the NanoSIMS to investigate the abundances, compositions and characteristics of presolar O- and C-anomalous grains in pristine matrices of unequilibrated ordinary chondrites.
2:45 p.m.	Trappitsch R. * Ong W.-J. Dory C. J. Shulaker D. Z. Lugaro M. Savina M. R. Weber P. K. Isselhardt B. H. Amari S.	*Simultaneous Analyses of Titanium and Molybdenum Isotopic Compositions in Presolar SiC Grains* **[#6239]** Simultaneous analyses of titanium and molybdenum in presolar SiC mainstream grains allow us to correlate galactic chemical evolution and s-process nucleosynthesis.
3:00 p.m.	Meyer B. S. * Bermingham K. R.	*Titanium-46 Production in Exploding White Dwarf Stars* **[#6274]** Correlated ^{46Ti} and ^{50Ti} anomalies in Solar System objects are thought to arise from selective thermal processing of distinct carriers. We speculate they could also arise from dust from rare thermonuclear supernovae that carries both isotopes.
PRE-RECORDED PRESENTATION		
3:15 p.m.	Hoppe P. * Leitner J.	*The Imprint of Supernova Dust in the Solar Nebula* **[#6148]** We review abundances of presolar supernova grains in primitive meteorites and discuss implications for the inventory of interstellar dust in the solar nebula.
3:25 p.m.	Bodénan J.-D. * Hutchison M. Mayer L. Schönbächler M.	*Nucleosynthetic Variations Generated by Size and Density Driven Sorting of Dust in Protoplanetary Disk* **[#6180]** We use smoothed particle hydrodynamics simulations to study the density and mass sorting of dust, especially presolar grains in a protoplanetary disk to assess its effects on their distribution and nucleosynthetic variations in solar system material.

3:35 p.m.	Shaw K. M. M. * Coath C. D. Elliott T.	*Evidence for Presolar Titanium in Silicate Stardust* **[#6102]** Using in situ techniques, we have identified highly anomalous material in the ungrouped carbonaceous chondrite Acfer 094 that possesses a high Si-O and low C bulk composition. Possible evidence for presolar Ti in silicate phases.
3:45 p.m.	Singerling S. A. * Nittler L. R. Barosch J. Dobrică E. Brearley A. J. Stroud R. M.	*Transmission Electron Microscopy of an AOA-Like Presolar Grain from Semarkona* **[#6029]** We detail TEM microstructural and chemical observations of an unusual AOA-like presolar grain from Semarkona with implications for circumstellar conditions around its progenitor AGB star as well as secondary processes on its asteroidal parent body.
3:55 p.m.		*Q&A*

Tuesday, August 17, 2021
POSTER SESSION: ACHONDRITES
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Kouvatsis I. Cartwright J. A.	*Investigating the Impact Flux of the Early Solar System Through the Analysis of HEDs and Mesosiderites* **[#6208]** Mesosiderites / Eucrites to investigate / Solar system flux.
Regula A. Bloom H. E. Dauphas N. Davis A. M. Korsmeyer J. M. Krawczynski M. J. Pellin M. J. Sheu S. Stephan T.	*Toward Trace Element Concentrations with CHILI* **[#6287]** CHILI, a RIMS instrument at the University of Chicago, offers yet untapped capabilities for trace element ratio measurements on the micrometer scale. Toward this goal, we present Ru/Mo measurements from several well-characterized iron meteorites.
Valdes M. C. Blättler C. L. Razionale D. Heck P. R.	*A Reevaluation of the Petrogenetic Relationships Among HED Meteorites with Calcium Isotopes* **[#6268]** To shed light on Vesta's magmatic history and investigate the nature of HED relationships, we aim to quantify the effects of differentiation processes such as partial melting and fractional crystallization on Ca isotopes.

Tuesday, August 17, 2021
POSTER SESSION: CARBONACEOUS CHONDRITES
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Aravena-Gonzalez C. S. Moncada D. Martínes de Los Ríos R.	*A Detail Petrographic of Two CO3 Chondrites from Atacama Desert, Chile* **[#6138]** Petrological, chemical and mineralogical study of Melt Inclusions Assemblages (MIAs) found mainly in olivine crystals present in El Médano 389 and El Médano 397, CO3 Chondrites. Using Raman spectroscopy, IR and Laser Ablation ICP-MS.
Kerraouch I. Bischoff A. Zolensky M. E. Hellmann J. L. Wölfer E. King A. J. Patzek M. Marrocchi Y. Pack A. Ludwig T. Trieloff M.	*The Metal-Rich Lithology Within the Aguas Zarcas Breccia: Characterization, Origin, and Evolution* **[#6201]** We investigated the petrography, mineralogy, chemistry, and isotopic composition of an unusual 'metal-rich lithology' (termed Met-1) from the CM chondrite Aguas Zarcas in order to better understand its characteristics, affinities, origin, and formation history.

Tuesday, August 17, 2021
POSTER SESSION: CURATION AND EDUCATION
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Heck P. R. Holstein J.	*A Brief History of the Meteorite Collection at the Field Museum* **[#6222]** The Field Museum started with a meteorite collection in 1894, the year it was established. It currently houses the largest meteorite collection at a private scientific research institution. We will present the collection's history and current status.
Chennaoui Aoudjehane H. Berrada O. Aoudjehane M. Arif S. Jadid F. Z. Boukhris S. Zennouri L. Ould Mohamed Naviee E. C. El Hachemi E. Shisseh T. Haissen F. Makhoukhi S.	*Attarik Foundation: Two Years of Meteoritics and Planetary Science Dissemination* **[#6265]** ATTARIK Foundation is an autonomous and non profit NGO dedicated to the promotion of meteoritics and planetary sciences, a summary of two years of rich activities will be presented.
Anghel S. Chirita D. Cretu M. Mihalcea I. Moldovan R. Naiman M. Soare A. Stancu C. Stoica A.	*Astrojunior: An Educational Project for Interactive Teaching of Planetary Science* **[#6028]** The full implementation of an online planetary science interactive workshop for children all ages.

Tuesday, August 17, 2021
POSTER SESSION: ENSTATITE AND ORDINARY CHONDRITES
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Dobrică E. Ohtaki K. K. Breadley J.	*TEM/EELS Detection of Water in Extremely Dry Phosphates from Ordinary Chondrites* **[#6081]** This study suggests that electron energy-loss spectroscopy is a useful tool for detecting tens of ppm-level water on a scale of a few microns.
Downes H. Goodrich C. A. Greenwood R. C. Abernethy F. J.	*Origin of Enstatite Chondrite Fragments in Almahata Sitta: Implications for the Enstatite Chondrite Parent Body* **[#6089]** Almahata Sitta contains as wide a range of enstatite chondrite fragments as found in meteorite collections on Earth. Is the parent body for enstatite chondrites a mega-breccia containing all known enstatite chondrite types?
Ivanova M. A. Zinovieva N. G. Franchi I. A. Lorenz C. A. Teplyakova S. N.	*Ungrouped Chondrite Chug-Chug 086* **[#6108]** A new ungrouped chondrite Chug-Chug 086 has affinities with reduced chondrites EM 301, NWA 7135 and Acfer 370, although, in general, its oxygen isotopic composition, average chondrule size and Co content in kamacite are in the range of H chondrites.
Ostrowski D. R.	*Compression Strength of Ordinary Chondrites* **[#6126]** The compression strength for Tamdakht and other ordinary chondrites is measured. Compression test elastic modulus is compared to the moduli determined from acoustic velocity.
Chennaoui Aoudjehane H. Agee C. B. Jadid F. Z.	*Wad Lahteyba H5 Moroccan Fall of June 27th,2019* **[#6245]** Wad Lahteyba is an H5 eye witnessed Moroccan fall that we will be describing in the presentation.
Chennaoui Aoudjehane H. Agee C. B. Bouragaa A. Jadid F. Z.	*Al Farciya LL6 Moroccan Fall of August 20th, 2019* **[#6249]** Al Farciya is an LL6 fall that occurred in the south of Morocco on August 2019, we will be presenting the fall circumstances and the classification of the meteorite.

Tuesday, August 17, 2021
POSTER SESSION: EARLY SOLAR SYSTEM: DISK CONDITIONS AND PROCESSES
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Desch S. J. Mane P. Dunham E. T. Williams C. D.	*Oxygen Isotope Reservoirs in the Solar Nebula* **[#6244]** Our astrophysical model combining magnetic forces on dust during star formation and pebble flux in the disk, reproduces the oxygen isotopic compositions and oxygen fugacities of CAIs, explaining why the Sun is at $D^{17}O$=–29 but CAIs at $D^{17}O$=–23.
Burbine T. H. Greenwood R. C.	*Investigating the Origin of Oxygen Isotopic Variations in Meteorites* **[#6210]** We are currently undertaking modeling to investigate how the oxygen isotopic variations seen in meteorites can be related to mixtures of simple end-member nebula components.

Tuesday, August 17, 2021
POSTER SESSION: SPACE WEATHERING
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Thompson M. S. Dukes C. A. Loeffler M. J. Morris R. V. Glotch T. G. Keller L. P.	*Revealing the Combined Effects of Simulated Solar Wind Irradiation and Micrometeoroid Bombardment of a Carbonaceous Chondrite* **[#6289]** We perform coordinated analysis of a carbonaceous chondrite that has been subjected to laboratory experiments simulating micrometeoroid bombardment and solar wind irradiation.
Chaves L. C. Thompson M. S. Prince B. Loeffler M. J.	*Simulating Micrometeoroid Impacts on Magnetite: Implications for Remote Sensing Observations and Returned Sample Analysis* **[#6298]** Here we present the results of pulsed laser irradiation experiments on magnetite pressed pellets .

Tuesday, August 17, 2021
POSTER SESSION: IMPACTS
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Anghel S. Nedelcu D. A. Birlan M. Boaca I. Colas F. Malgoyre A. MOROI and FRIPON Teams	*Phase Two of MOROI Network: Connection with FRIPON and Pipeline Development for Studying Meteoroids* **[#6027]** The current capability of the MOROI network, its expansion, and the gradual integration with the FRIPON international database. Moving towards a complete pipeline to track the atmospheric impacts, from source origin, to strewn field computation.
Clarke J. C. Cartwright J. A. Stowell H. H. Tobin T. S.	*Exploration of the K-Pg Impactor Through a Study of Tektites from the Gulf Coastal Plain* **[#6277]** The Chicxulub impactor is believed to be the impactor responsible for the end of the Cretaceous period and extinction of non-avian dinosaurs. The purpose of this study is to conclude the parent body of the impactor using neodymium analysis.

Tuesday, August 17, 2021
POSTER SESSION: MARS AND MOON
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Bechtold A. Schulz T. Wegner W. Mader D. Patterer C. Koeberl C.	*Geochemistry of Lunar Regolith Breccia Northwest Africa 11962 and Its Potential Source Region/Crater in the Procellarum KREEP Terrane* **[#6250]** We describe a possible source region on the Moon for lunar meteorite NWA 11962 from geochemical data.
Bhanot K. K. Downes H.	*Multiple Origins of Spinel Symplectite Textures in Lunar Dunites 72415 and 72417* **[#6090]** CT scanning of lunar dunites reveals four different types of spinel symplectite. Each type has a different origin, with spinel-pyroxene clusters being formed after mantle garnet, and others formed by interaction with melts at different depths.

Tuesday, August 17, 2021
POSTER SESSION: MISSIONS
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Keller L. P. Berger E. L.	*Solar Energetic Particle Tracks in Itokawa Samples: Implications for Regolith Development on Near-Earth Asteroids and Space Weathering* **[#6111]** We use solar energetic particle tracks in Itokawa grains to infer surface exposure ages, space weathering rates, and regolith dynamics.
Yokochi R. Mueller P. Heck P. R. Campbell A.	*Development of Stepwise Heating Gas Extraction System for the Analyses of Noble Gases in Mission-Returned Samples* **[#6196]** Aiming at better resolving different noble gas components in mission-returned samples, a laser-based stepwise heating gas extraction system was developed. The temperature stability and accuracy of the heating system will be reported at the meeting.

Tuesday, August 17, 2021
POSTER SESSION: MICROMETEORITES
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Boyd M. R. Cartwright J. A. Singh J. Bagot P. A. J. Moody M. P.	*Nanoscale Chemical Heterogeneity in an Antarctic Micrometeorite Revealed by Atom Probe Tomography* **[#6278]** We analysed a micrometeorite using atom probe tomography, spatially resolving geochemical trends on the nanometre-scale. We identify heterogeneous elemental distributions that may represent atmospheric entry processing.

Tuesday, August 17, 2021
POSTER SESSION: CHONDRULES AND CAIS
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Hutson M. H. Ruzicka A. M. Pugh R. N.	*Harold (a) and Harold (b): Two New Meteorites from Ness County, Kansas* **[#6064]** Classification of two new L6 chondrites from Ness County Kansas demonstrates lack of literature data needed for pairing, and suggests that more than the roughly three dozen currently catalogued stones were picked up in the late 1800s.
Dunham E. T. Desch S. J. Torrano Z. A. Mane P. Williams C. D.	*A Reassessment of Aluminum-26 in FUN CAIs* **[#6273]** The FUN CAIs / 26-Aluminum / Uniform or not?

Tuesday, August 17, 2021
POSTER SESSION: EXPERIMENTS
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Liu C. X. Heard A. W. Yokochi R. Dauphas N.	*MERLIN — An Innovative Experimental Leaching System for Mars and Beyond* **[#6260]** We introduce MERLIN, an instrument designed to carry out experimental leaching to simulate aqueous alteration under controlled atmosphere on planetary bodies, using the production of clay on early Mars as an example.
Ouzillou M. Herd C. D. K.	*Does Meteoritic Metal Change with Forging? An Experimental Study* **[#6187]** A study to determine the bulk elemental changes that occur in the meteorite Gebel Kamil during subsequent stages of forging, and the implications in linking artifacts, such as Tutankhamun's dagger, created from meteoritic iron to a known meteorite.

Thursday, August 19, 2021
POSTER SESSION: SMALL BODIES
5:30 p.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Vodniza A. Q.	*The Asteroid Apophis* **[#6007]** I took part in the international research team "99942 Apophis 2021 Observing Campaign." I captured several images and videos of the asteroid Apophis, and I calculated the orbital elements and physical parameters.

Thursday, August 19, 2021
CARBONACEOUS CHONDRITES
8:30 a.m. Williford ABC
Chairs: Romy Hanna and Kaitlyn McCain

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
8:30 a.m.	Yang X. * Hanna R. D. Davis A. M. Neander A. I. Heck P. R.	*A Possible Record of an Active Asteroid: Discovery of a Compact Lithology in the Aguas Zarcas CM Chondrite* **[#6075]** We found a previously unreported lithology of compact fragments in the Aguas Zarcas chondrite, which would advance our understanding of the regolith evolution of carbonaceous chondrites and the potential prevalence of active asteroids.
8:45 a.m.	Hanna R. D. * Ketcham R. A. Edey D.	*3D Porosity of Fine-Grained Rims in CM Murchison via XCT Imaging with Xe Gas* **[#6219]** We examine microporosity within CM Murchison in 3D using X-ray CT imaging while the sample is infiltrated with the noble gas Xe, which is highly attenuating to X-rays.
9:00 a.m.	Nie N. X. * Chen X.-Y. Hopp T. Hu J. Y. Zhang Z. J. Teng F.-Z. Shahar A. Dauphas N.	*A Condensation Origin of Potassium and Rubidium Isotopic Variations in Carbonaceous Chondrites* **[#6217]** Rubidium and potassium isotopes suggest evaporation and partial condensation of them into chondrules is the main cause of Rb and K depletion and isotopic variation in carbonaceous chondrites.
9:15 a.m.	Zega T. J. * Schrader D. L.	*Microstructural Analysis of a Sulfide Grain in the Matrix of the Sutter's Mill CM-Like Carbonaceous Chondrite* **[#6280]** We report on the microstructure of a sulfide grain the Sutter's Mill CM-like carbonaceous chondrite. In situ alteration, presumably on the parent body, altered and oxidized its microstructure, leading to the formation of magnetite.
9:30 a.m.	McCain K. A. * Liu M-C. Brearley A. J. McKeegan K. D.	*Matrix-Matched ^{53}Mn-^{53}Cr Ages of Dolomite and Calcite in CM and CI Chondrites* **[#6263]** We present measurements of the ^{53}Mn-^{53}Cr ages of carbonates in the CM and CI chondrites Boriskino, ALH 84034, and Alais made using matrix-matched dolomite standards.
9:45 a.m.	Chennaoui Aoudjehane H. * Agee C. B. Ziegler K. Garvie L. A. J. Irving A. Sheikh D. Carpenter P. K. Zolensky M. Schmitt-Kopplin P. Trif L.	*Tarda an Unusual Carbonaceous Chondrite Meteorite Fall from Morocco* **[#6303]** Tarda is an C2-Ungrouped new carbonaceous chondrite fall in Morocco, analysis supporting the specificity and unicity of this meteorite will be given in the presentation. Tarda is a perfect analog material for the space missions to the C-type meteorites.
PRE-RECORDED PRESENTATION		
10:00 a.m.	Ogliore R. C. * Carpenter P. Wang A. Krawczynski M. Vacher L.	*Iron-Titanium Sulfide and Phosphide Spherules in Acfer 182 (CH_3)* **[#6143]** An iron-titanium sulfide object and phosphide spherules in Acfer 182 provide evidence that CH chondrites accreted impact-liberated debris from reduced parent bodies.

10:10 a.m.	Leitner J. * Vollmer C. Kodolányi J. Hoppe P.	*Investigation of the Silicon Nitride Inventory of Carbonaceous Chondrites* **[#6183]** N-isotopic compositions of Silicon nitride from three carbonaceous chondrites indicate formation at larger heliocentric distances than Si3N4 from E-chondrites (ECs), while Isheyevo-Si3N4 is isotopically light and occurs in EC-like assemblages.
10:20 a.m.	Arribard Y. * Baklouti D. Lantz C. Aléon-Toppani A. Borondics F. Djouadi Z. Doisneau B. Nakamura T. Sandt C. Brunetto R.	*Variations of Mineralogy, Hydration and Organic Content Within CM Chondrites Determined by MIR Hyperspectral Imaging* **[#6149]** MIR reflectance hyperspectral imaging measurements and data process including k-means clustering allow us to characterize and colocalize at the micrometric scale the mineralogy, hydration and organic content on millimetric surfaces of chondrites.
10:30 a.m.	Dionnet Z. * Aléon-Toppani A. Rubino S. Suttle M. D. Lantz C. Grieco F. Baklouti D. Djouadi Z. Rotundi A. Scheel M. Borondics F. Heripre E. Avdellidou C. Brunetto R.	*FTIR Spectroscopy and X-CT Characterization of the New CM Aguas Zarcas* **[#6099]** We report the result of X-CT and FTIR spectroscopy measurements on fragments from the new CM Aguas Zarcas (AZ). We discuss the porosity, the role of hydrated minerals in the evolution of organic matter and compare AZ with other CM chondrites.
10:40 a.m.	Bose M. * Hahn T. M. Jr. Jin Z.	*Silicate Minerals in CM Carbonaceous Chondrites Murchison and Aguas Zarcas* **[#6078]** Silicate minerals in Aguas Zarcas has elevated hydrogen isotopic ratios compared to Murchison. Isolated olivines in the Murchison matrix have higher D/H ratios but similar water contents relative to Murchison chondrules.
10:50 a.m.	Ciceri F. * Hildebrand A. R. Hanton L. T. J.	*Shear Strength and Seismic Velocities of the Murchison Meteorite* **[#6286]** Shear strength and seismic velocities have been measured for a Murchison meteorite individual although slightly complicated by Murchison's brecciation. Dynamic elastic constants have also been calculated for this carbonaceous chondrite lithology.
11:00 a.m.		*Q&A*

Thursday, August 19, 2021
ACHONDRITES II
8:30 a.m. Waldorf
Chairs: Maria Valdes and Jennifer Gorce

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
8:30 a.m.	Valdes M. C. * Heck P. R.	*Northwest Africa (NWA) 13993: A Newly Classified Brecciated Eucrite* **[#6266]** We have conducted detailed petrographic and geochemical analyses to classify an achondritic meteorite specimen acquired by the Field Museum in 2020 as a brecciated eucrite.

8:45 a.m.	Kiefer W. S. * Mittlefehldt D. W.	*Thermal Evolution on Asteroid 4 Vesta in the Magma Ocean Regime* **[#6079]** The eucrite parent body (likely 4 Vesta) had a magma ocean in its early history, implying that convective heat transport dominated its thermal evolution. Models are consistent with geochemical constraints if it begins with ~50% of canonical ^{26}Al.
9:00 a.m.	Gorce J. S. * Mittlefehldt D. W. Simon J. I.	*Assessing Domains of Equilibrium in Highly Metamorphosed Eucrites* **[#6112]** Highly metamorphosed eucrites such as Elephant Moraine 90020 preserve evidence for localized equilibrium. Here, we assess whether textural or chemical observations provide the best constraints for identifying metamorphically equilibrated areas.
PRE-RECORDED PRESENTATION		
9:15 a.m.	Datta C. * Amelin Y. Krestianinov E.	*Geochronological Evaluation of the Cooling Rate of the Diabasic Angrite Northwest Africa 12320* **[#6142]** In this study, we calculate a model cooling rate for the diabasic angrite meteorite Northwest Africa 12320, using absolute Pb-Pb ages for acid soluble and acid insoluble minerals within it, and their respective closure temperatures.
9:25 a.m.	Ono H. * Takenouchi A. Mikouchi T. Yamaguchi A. Sugiura N.	*Silica Minerals in Northwest Africa 1878 Mesosiderite* **[#6140]** We studied a mesosiderite NWA 1878 to estimate the transformation conditions of silica minerals. Pyroxene in NWA 1878 and our previous experiments indicate that cristobalite and quartz form in a cooling rate faster than 0.003-0.01 C/day at >850 C.
9:35 a.m.	Rider-Stokes B. G. * Greenwood R. C. Anand M. Franchi I. A. White L. F.	*Revising the Angrite Fractionation Line: New Insights from High-Precision Oxygen Isotope Studies* **[#6071]** Here we present new oxygen isotope data for angrite meteorites, including those which have not been previously investigated, the only known shocked angrite NWA 7203, and the intermediate angrite NWA 10463. We provide a new angrite fractionation line.
9:45 a.m.	Caves L. Mayne R. G. * McCoy T. J. Ash R. D. McDonough W. F.	*Redox and Fractional Crystallization of Mesosiderite Metal* **[#6213]** We examine the evidence within mesosiderite metal for redox during the metal silicate mixing phase of mesosiderite formation and explore the possibility that the metal experienced some fractional crystallization.
9:55 a.m.	Reger P. M. * Zhang B. Gannoun A. M. Regelous M. Agee C. B. Bouvier A.	*Chronology of the Unique Angrite Northwest Africa 10463* **[#6235]** Using the Pb-Pb and Al-Mg chronometers, we determined that the unique angrite Northwest Africa 10463 formed at 4560.25 ± 0.18 Ma, belonging to a group of angrites with intermediate ages, distinct from the quenched and coarse-grained angrites.

10:05 a.m.	Mittlefehldt D. W. *	*Mesosiderite Silicates vs. HED Polymict Breccias* **[#6251]** Mesosiderite silicates are broadly similar to howardites, but the similarities disappear upon closer examination. Petrologic and compositional data indicate that mesosiderites and howardites are derived from different asteroids.
10:15 a.m.	Krestianinov E. * Datta C. Amelin Y.	*Uranium Isotopic Composition of Volcanic Angrites Northwest Africa 12320, Northwest Africa 12004, and Northwest Africa 12774 and Ungrouped Achondrite Erg Chech 002* **[#6059]** We present the uranium isotopic composition ($^{238}U/^{235}U$) of three volcanic angrites (Northwest Africa 12320, Northwest Africa 12004, and Northwest Africa 12774) and ungrouped achondrite Erg Chech 002.
10:25 a.m.	Ferrière L. * Pittarello L. Chernonozhkin S. M. Vanhaecke F. Goderis S.	*The Anomalous Diogenite Northwest Africa 12973* **[#6282]** The origin of the vesicular lithology in the anomalous diogenite NWA 12973 is discussed based on observations using a multi-method approach. LA-ICP-MS and geothermobarometric works are used to further constraints the suggested formation scenario.
10:35 a.m.		*Q&A*

Thursday, August 19, 2021
DISK CONDITIONS AND PROCESSES
1:30 p.m. Williford ABC
Chairs: Rachel Smith and Timo Hopp

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
1:30 p.m.	Hopp T. * Dauphas N. Spitzer F. Burkhardt C. Kleine T.	*Fe Isotopic Dichotomy in Iron Meteorites and the Stellar Origin of Nucleosynthetic Fe Isotope Anomalies* **[#6225]** Nucleosynthetic Fe isotope anomalies in iron meteorites display a NC-CC dichotomy. These anomalies predominantly reflect variations in Iron-54 that are caused by admixture of material produced by nuclear statistical equilibrium in supernovae.
1:45 p.m.	Van Camp E. R. * Bergner J. B. Bosman A. Bergin E. Ciesla F. J.	*A Unified Model of Pebble Growth, Diffusion, and Chemistry in Protoplanetary Disks* **[#6211]** We present the results of a new unified protoplanetary disk model including pebble growth, diffusion, and chemistry. Our model allows us to track time evolving photochemistry and ice compositions in a self-consistent manner with gas phase chemistry.
2:00 p.m.	Liszewska K. M. * Rundhaug C. J. Hunt A. C. Schönbächler M.	*Iron Isotopic Heterogeneity in the Protoplanetary Disk* **[#6175]** We present high-precision data for mass-independent Fe isotope variations in eucrites, chondrites, and iron meteorites, including for $\varepsilon^{58}Fe$, to investigate the causes of Fe isotope variations in early solar system materials.

2:15 p.m.	Herbst A. K. * Desch S. J. Williams C. D. Dunham E. T. Mane P.	*Radial Distribution of Ca-Rich, Al-Rich Inclusions in the Solar Nebula* **[#6272]** We model the launching of CAIs by magnetocentrifugal outflows (disk winds) from the inner disk. We find only very small CAIs (<1 micron) can be lofted in the disk, launched by the wind, and achieve sufficient velocity to reach the outer disk.
2:30 p.m.	Zanetta P.-M. * Manga V. Chang Y.-J. Ramprasad T. Zega T. J.	*Multistage Non-Equilibrium Processes Recorded by a Hibonite Grain in the Northwest Africa 5028 CR2 Chondrite* **[#6177]** Hibonite in CAIs can incorporate Ti3+ and Ti4+. Our multiscale study reveal composition and oxidation state variations along the grain. Quantification of such variations provide information on the thermodynamic conditions of the early solar system.
2:45 p.m.	Lodders K. * Fegley B.	*The Effects of Metallicity and Total Pressure on Condensation Temperatures* **[#6135]** We describe some effects of metallicity and total pressure on the condensation temperatures of the elements.
3:00 p.m.	Smith R. L. * Boogert A. C. A. Blake G. A. Pontoppidan K. M.	*Variability in Gas-Phase CO Reservoirs in Massive Young Stellar Cores and Binaries* **[#6301]** We present new results of CO variability for massive YSO cores and binaries. Thus far we find the most pronounced variation in ^{13}CO, with our results suggesting that isotopic heterogeneity could be significant in evolving protoplanetary systems.
3:15 p.m.	Desch S. J. * Dunlap D. R. Williams C. D. Torrano Z. A.	*Statistical Chronometry: Anchors Away!* **[#6231]** We fit 4 parameters (CAI Pb-Pb ages; solar system initial ^{53}Mn/^{55}Mn, ^{182}Hf/^{180}Hf; ^{53}Mn half-life) and make concordant 30 ages (Al-Mg, Mn-Cr, Hf-W, Pb-Pb) across 10 achondrites. CAIs formed 4568.61 ± 0.26 Myr ago, D'Orbigny 5.05 ± 0.03 Myr later.
3:30 p.m.	Render J. * Brennecka G. A. Burkhardt C. Kleine T.	*Zirconium Isotopic Constraints on Early Solar System Evolution and Planetary Building Blocks* **[#6233]** We present new Zirconium isotope data on a broad set of meteoritic and planetary samples to shed light on early solar system evolution and terrestrial planet accretion.
PRE-RECORDED PRESENTATION		
3:45 p.m.	Kodolányi J. * Hoppe P. Vollmer C.	*No In Situ Evidence for ^{60Fe} Decay in Primitive Meteorites* **[#6125]** New in situ isotope data on primitive chondrite components do not support high initial ^{60}Fe/^{56}Fe ratios in the early solar system, unlike previous in situ data, but are consistent with initial ^{60Fe}/56Fe ratios estimated from bulk samples.
3:55 p.m.	Hu J. Y. * Dauphas N. Tissot F. L. H. Davis A. M. Ciesla F. Yokochi R. Ireland T. J. Zhang Z. Davis A. M. Ciesla F. J. Grossman L. Charlier B. L. A. Roskosz M. Alp E. E. Hu M. Y. Zhao J.	*Heating Events in the Nascent Solar System Recorded by Rare Earth Element Isotopic Fractionation In Refractory Inclusions* **[#6284]** We measured the isotopic compositions of Ce, Nd, Sm, Eu, Gd, Dy, Er, and Yb in group II CAIs and found light isotope enrichment for the most refractory REEs, suggesting the CAIs formed by fast evaporation followed by near-equilibrium recondensation.

4:05 p.m.		*Q&A*

Thursday, August 19, 2021
FIREBALLS AND SOURCES
1:30 p.m. Waldorf
Chairs: James Karner and Peter Jenniskens

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
1:30 p.m.	Karner J. M. * Harvey R. P. Schutt J. S. Rougeux B.	*Meteorite Search and Recovery at Davis Nunataks - Mt. Ward, Antarctica* **[#6295]** Over 3000 meteorites have been recovered from the Davis Nunataks - Mt. Ward icefields in Antarctica.
1:45 p.m.	Dermott S. F. * Li D. Christou A. A.	*Root Sources of the Meteorites Originating from the Inner Asteroid Belt* **[#6204]** Observational evidence is presented that the root sources of the meteorites originating from the inner asteroid belt were about 20 large asteroids.
2:00 p.m.	Hewins R. H. * Zanetta P.-M. Zanda-Hewins B. Le Guiillou C. Leroux H. Brunetto R. Maupin R. Djouadi Z. Gattacceca J. Sognzoni C. Pont S. Piani L. Rigaudier T. Bernard S. Deldicque D. Malarewicz V. Dionnet Z. Aléon-Toppani A. King A. Borondics F.	*Magnetite-Rich C2-ung Chondrites and Their Asteroidal Parent Bodies* **[#6041]** C2-ung1 chondrites are more $\delta^{18}O$-rich and magnetite-rich than CM2 chondrites. NWA 12563 magnetite cannot be detected in the IR making a connection to asteroids difficult. However, it resembles WIS 91600, and could be from the same parent body.
2:15 p.m.	Jenniskens P. * Gabadirwe M. Yin Q.-Z. 2018 LA Meteorite Consortium	*The Impact and Recovery of Asteroid 2018* **[#6306]** On June 2, 2018, asteroid 2018 LA was detected in space and impacted over Botswana’s Central Kalahari Game Reserve 8 hours later. This was only the second time that an asteroid was spotted in space before impacting over land.
PRE-RECORDED PRESENTATION		
2:30 p.m.	Schmitz B. * Heck P. R.	*Meteorite and Asteroid Fluxes to Earth the Past 500 Ma as Reconstructed from Sediment-Dispersed Chrome Spinel, Fossil Meteorites and Impact-Crater Ages* **[#6092]** We have performed the first reconstruction of the flux of meteorites to Earth through the Phanerozoic Eon. Ordinary chondrites have dominated the flux and most impact craters have likely formed from ordinary chondritic projectiles during this time.
2:40 p.m.	Hill P. J. A. * Tunney L. D. Herd C. D. K. Weber M.	*Application of Drone-Captured Thermal Imagery in Aiding in the Recovery of Meteorites Within a Snow-Covered Strewn Field* **[#6118]** This study examines the application and feasibility of utilizing drone-based thermal imagery to aid in the finding and recovery of meteorites that may have fallen in snow-covered terrain.

2:50 p.m.	Valenzuela M. * Oliveros V. Menzies A. Pinto G. Alvarez S. Beltran T. Corgne A. Echaverria R. Revillard A. Salazar N. Soto K.	*QEMSCAN® as a New Tool for Classification: First Results in Ordinary Chondrites from Atacama Desert, Chile* **[#6281]** Using a new classification technique -QEMSCAN- it was possible to reproduce the Fe^0/Fe tot and Fe^0/SiO_2 values for 5 ordinary chondrites, enabling a fast classification for numerous samples, as is the case of Chilean meteorites from Atacama desert.
3:00 p.m.	Sansom E. K. * Gritsevich M. Devillepoix H. A. R. Towner M. C.	*An Interactive Quick-Look Tool for Fireballs and Their Initial Velocities* **[#6199]** We present an interactive tool for quickly determining if a meteorite survives atmospheric entry, including determining a best fit initial velocity for orbital modelling. Code for this tool on github can also be run online (see links in abstract).
3:10 p.m.	Moilanen J. * Gritsevich M.	*A Spatial Heat Map for the 7 November 2020 Iron Meteorite Fall* **[#6252]** On the difference between density and mass distribution per surface area heat maps made from dark flight Monte Carlo (DFMC) simulations. Using simulations for a recent, but still unclassified, iron meteorite fall in Sweden as an example.
3:20 p.m.		*Q&A*

Friday, August 20, 2021
CHONDRITES
8:30 a.m. Williford ABC
Chairs: Tasha Dunn and Michael Weisberg

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
8:30 a.m.	Dunn T. L. * Carpenter P. K.	*Equilibration of Low-Ca Pyroxene in Petrologic Type 3 CK Chondrites* **[#6107]** Here we report compositions of high- and low-Ca pyroxene in seven petrologic type 3 CK chondrites and one CK chondrite to examine the extent of chemical equilibration during thermal metamorphism.
8:45 a.m.	Alpert S. P. * Daly L. Ebel D. S. Weisberg M. K. Stroud R. M.	*Electron Backscatter Diffraction Study of Magnetite in Ordinary Chondrite Opaque Assemblages* **[#6179]** Magnetite grains grow / EBSD tells of space / Condensation is the key.
9:00 a.m.	Gray M. L. * Weisberg M. K. Ebel D. S. Alexander C. M. O'D. Foustoukos D. I. Howard K. T.	*H, N, and C Isotopes in Enstatite Chondrites and Accretion of the Earth* **[#6255]** In search of the solar system materials that potentially contributed to Earth's accretion, we evaluated H, N, and C isotopic compositions of E, C, and O chondrite groups and compared the values to Earth.

9:15 a.m.	Hugo R. C. * Ruzicka A. M.	*Untangling the History of a Chondrule in Northwest Africa 5205 (LL3.2) with Electron Backscatter Diffraction and Transmission Electron Microscopy* **[#6258]** EBSD and TEM analysis of a chondrule in the cluster chondrite NWA 5205 reveals admixtures of cool and warm deformation signatures and overprinted recovery features. These may represent two distinct events which may have affected overall lithification.
9:30 a.m.	Kerraouch I. * Bischoff A. Zolensky M. E. Pack A. Patzek M. Trieloff M.	*A Unique Chondrite Clast in the Northwest Africa 13262 (L3 Breccia) Bearing Similarities to Carbonaceous and Ordinary Chondrites* **[#6197]** We report here a unique chondritic clast found in the Northwest Africa 13262 (L3 breccia) that is different from material sampled by individual meteorites. The clast bears similarities to carbonaceous and ordinary chondrites.
9:45 a.m.	Weisberg M. K. * Zolensky M. E. Kimura M. Howard K. T. Ebel D. S. Alexander C. M. O'D.	*Magnetite in Matrix of Anomalous EL3 Chondrite Northwest Africa (NWA) 8785* **[#6198]** NWA 8785 is an anomalous EL3 with a high abundance of matrix rich in magnetite. The matrix may have been the carrier of ices, resulting in parent body alteration to form the magnetite or the magnetite formed prior to accretion and/or is primary.
PRE-RECORDED PRESENTATION		
10:00 a.m.	Pratesi G. * Moggi Cecchi V. Greenwood R. C. Franchi I. A. Hammond S. Di Martino M. Barghini D. Taricco C. Carbognani A. Gardiol D.	*Mineralogy, Petrography and Geochemistry of Cavezzo, a "Double-Faced" Chondrite* **[#6271]** The mineralogy, petrography and geochemistry of Cavezzo, fallen on January 1st 2020 and representing the first italian meteorite detected and recovered by the Italian PRISMA Fireball Network, is provided.
10:10 a.m.	Baziotis I. * Xydous S. Papoutsa A. Hu J. Ma C. Ferrière L. Klemme S. Berndt J. Asimow P. D.	*Discovery of High-Pressure Polymorphs in the Recent Fall of Viñales (L6 Ordinary Chondrite): Implications for Collisions on its Parent Body* **[#6115]** Viñales, a L6 ordinary chondrite, is a February 2019 fall, presents a unique opportunity to recreate the shock metamorphic history of this meteorite based upon the presence of high-pressure polymorphs occurring in melt veins.
10:20 a.m.	Walton C. R. * Shorttle O. Černok A. Baziotis I. Asimow P. Ferrière L. Anand M.	*Phosphorus-Olivine-Assemblages (POAs): A Paragenetic Model for P-Bearing Phases in Primitive Meteorites* **[#6022]** P-bearing minerals are emerging as crucial tools in the study of asteroids. However, P pathways in chondrites are poorly understood. We present observations in support of a key role for olivine in the paragenesis of P-bearing phases in chondrites.
10:30 a.m.	Moreau J. * Jõeleht A. Hamann C. Stojic A. N. Plado J. Hietala S.	*Synthesized Troilite Melt Migration into Ultramafic Rocks: A Study for Ordinary Chondrite Darkening by Iron Sulfide Shock Melting* **[#6026]** We induce the migration of synthesized troilite melt into a dunite rock to reproduce optical darkening. Such experiment allow us to study more about shock darkening of ordinary chondrites from iron sulfide melt vein migration into silicate cracks.

10:40 a.m.	Ma C. * Rubin A. E.	*Discovery of Zolenskyite ($FeCr_2S_4$), a New Sulfide Mineral in the Indarch Enstatite Chondrite* **[#6047]** New mineral zolenskyite (IMA 2020-070; monoclinic FeCr2S4) occurs only in the Indarch matrix, likely formed from daubréelite on the EH parent body at high shock pressures during collisional events.
10:50 a.m.	Dugushkina K. A. * Berzin S. V. Pankrushina E. A. Pastukhovich A. Iu. Grokhovsky V. I. Chebykin N. S. Demberel S.	*SiO_2-Rich Components in Ordinary Chondrite Shinejinst (H4)* **[#6094]** Four SiO_2-rich components from the Shinejinst meteorite were studied. SiO_2-phase is associated with low-Ca pyroxene. The FeO content of low-Ca pyroxene varies from 2.1 wt% to 21.5 wt%. Mesostasis between Px and SiO_2 is represented by glass (K2O>4 wt%).
11:00 a.m.		*Q&A*

Friday, August 20, 2021
ORGANICS AND ICES
8:30 a.m. Waldorf
Chairs: Rhonda Stroud and Jennifer Bergner

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
8:30 a.m.	Stroud R. M. * De Gregorio B. T. Alexander C. M. O'D.	*Ex Situ Analyses of Chemical Heterogeneity in Insoluble Organic Matter from Primitive Chondrites* **[#6269]** Variations in the elemental and functional chemistry of meteoritic organic matter at scales too small for XANES is revealed by STEM-EELS-EDS. Electron beam damage is not prohibitive at 60 kV operating voltage, though H groups are preferentially lost.
8:45 a.m.	Nittler L. R. * Alexander C. M. O'D. Verdier-Paoletti M. J.	*Microscale H, C, and N Isotopic Distributions in Three Pristine CM Chondrites* **[#6063]** In 3 CM rocks / H, C, and N isotopes / Huge diversity.
9:00 a.m.	Bergner J. B. * Ciesla F. J.	*Ice Inheritance in Dynamical Disk Models* **[#6173]** We will present a model to explore the prospects for interstellar icy material to survive passage through the proto-Solar disk and incorporation into icy bodies.
PRE-RECORDED PRESENTATION		
9:15 a.m.	Lecasble M. * Remusat L. Viennet J.-C. Laurent B. Bernard S.	*PAH Content of CM Chondrites: Influence of Aqueous Alteration on the Parent Body?* **[#6205]** We extracted PAHs from Munkundpura, Agua Zarcas, Kolang and Tarda. PAH concentration and alkylation degree are driven by the extent of aqueous alteration. PAH isotope signature will shed light on PAH formation mechanisms.
9:25 a.m.	Furukawa Y. * Iwasa Y. Chikaraishi Y.	*Synthesis of ^{13}C-Enriched Amino Acids with ^{13C}-Depleted IOM in a Formose-Type Reaction* **[#6127]** ^{13}C-enrichment is one of the representative characteristics of meteorite's small organic compounds such as amino acids, nucleobases, and sugars. This presentation introduces an experimental demonstration of this enrichment.

9:35 a.m.	Tunney L. D. * Hill P. J. A. Herd C. D. K. Hilts R. W. Holt M. C.	*Organic Compounds in the Tarda C2 Ungrouped Carbonaceous Chondrite: MTBSTFA as a One-Pot Extraction Technique* **[#6116]** In our study we employed MTBSTFA to identify organic compounds in the Tarda C2 ungrouped carbonaceous chondrite and characterize the performance of this derivatization technique relative to other common extraction methods.
9:45 a.m.	Laurent B. Holin M. Beyssac O. Brunetto R. Brunelle A. Bouvier C. Remusat L. *	*Experimental Alteration of Insoluble Organic Matter of the Paris Meteorite* **[#6202]** The Paris IOM was subjected to aqueous alteration at 150°C. Molecular evolution consistent with observations in natural objects, but no significant H and N isotope evolution. Aqueous alteration cannot solely explain differences between IOM in CCs.
9:55 a.m.	Rojas J. * Duprat J. Dartois E. Wu T-D. Engrand C. Augé B. Boduch Ph. Rothard H. Chabot M. Guérin B. Mathurin J.	*Ion-Irradiation Induced Organic Refractory Residues from Nitrogen-Rich Ices: Clues on the Isotopic Composition of the Organic Matter in UCAMMs* **[#6193]** Ultra Carbonaceous MicroMeteorites contain high amounts of N-rich organic matter with extreme D/H enrichments. Laboratory experiments modelling the GCR on the surface of icy bodies are made to constrain the formation of the organic matter in UCAMMs.
10:05 a.m.	Burgess K. D. * Stroud R. M. Nittler L. R. Trigo-Rodriguez J. M.	*Mineralogical Record of Alteration by Heavy Ices in a Cometary Clast in a Primitive Meteorite* **[#6182]** We preformed analyses of a hypothesized cometary micro-xenolith identified in the Renazzo-like (CR) carbonaceous chondrite LaPaz Icefield 02342 that contains ^{16}O-poor Na-sulfates in regions with minor aqueous alteration.
10:15 a.m.	De Gregorio B. T. * Stroud R. M.	*In Situ Analysis of Chemical Variations in Meteoritic Organic Matter for Constraining Alteration Histories* **[#6254]** S-rich insoluble organic matter in a CM chondrite contains nanoscale variations in N and O correlated with C=O and C=N functional chemistry. These observations can help unravel the complex processing history of IOM in asteroid return samples.
10:25 a.m.	Yesiltas M. * Glotch T. D. Sava B.	*Nanoscale Infrared Investigation of Organics in Carbonaceous Chondrites* **[#6097]** We demonstrate the identification and petrographic context of organic molecules in carbonaceous chondrites using near-field infrared spectroscopy with ~20 nm spatial resolution.
10:35 a.m.		*Q&A*

Friday, August 20, 2021
PARENT BODY PROCESSES
1:30 p.m. Williford ABC
Chairs: Michael Zolensky and Dara Laczniak

Times	Authors (*Denotes Presenter)	*Abstract Title and Summary*
1:30 p.m.	Laczniak D. L. * Thompson M. S. Christoffersen R. Dukes C. A. Clemett S. J. Morris R. V. Keller L. P.	*Investigating Space Weathering of Carbonaceous Asteroids Through Low-Flux and High-Flux H+ and He+ Irradiation of the Murchison Meteorite* **[#6086]** We perform low-flux and high-flux H+ and He+ irradiations on the Murchison meteorite to investigate the effect of ion flux on olivine amorphization and better understand the microstructural, chemical, and optical effects induced by solar wind.
1:45 p.m.	Zolensky M. E. * Bodnar R. J. Dolocan A. Tsuchiyama A.	*Analysis of Fluid Inclusions in Astromaterials: Why, Where and How* **[#6034]** Current situation of astromaterial fluid inclusions.
PRE-RECORDED PRESENTATION		
2:00 p.m.	Hicks L. J. * Bridges J. C.	*Alteration of Carbonate in the Aguas Zarcas and Tarda Carbonaceous Chondrites* **[#6157]** In this study of Aguas Zarcas and Tarda carbonaceous chondrites, we aim to constrain the history of carbonate mineralisation and the evolution of the parent body fluids between bicarbonate-rich and siliceous.
2:10 p.m.	Jenkins L. E. * Lee M. Daly L. King A. J. Chung P.	*Post-Brecciation Chondrule Flattening and Petrofabric Formation in CM Chondrite Kolang* **[#6165]** Petrofabrics and / Flattened chondrules shared among / The clasts of Kolang.
2:20 p.m.	Eschrig J. * Bonal L. Gattacceca J. Beck P.	*The Hydration History of Unequilibrated Ordinary Chondrites* **[#6095]** An indepth study of the hydration of UOCs is performed to investigate if UOCs are hydrated or not, and if the extent of hydration is controlled by the thermal metamorphism as it is observed in CV chondrites. UOCs show clear signs of hydration.
2:30 p.m.	Mertens C. A. K. Busemann H. * Krietsch D. Riebe M. E. I. Maden C. Righter K. Alexander C. M. O'D.	*Parent Body Processing in CO Chondrites Recorded by Noble Gases* **[#6169]** We further examine the idea that trapped noble gases can be used to assess parent body processing in meteorites. Following aqueous alteration effects in CMs and CRs, we now show that thermal alteration is well monitored by noble gases in COs.
2:40 p.m.	MacPherson G. J. * Nagashima K. Krot A. N. Irving A. J. Pitt D. Mallozzi L.	*CV4 Metamorphism: Oxygen Isotopes in the Northwest Africa 8418 Chondrite* **[#6104]** Oxygen isotope data confirm that NWA 8418, although related to CV3 chondrites, is more highly metamorphosed and should be considered as CV4. CAI data plot along CCAM, chondrule data plot along PCM.
2:50 p.m.	Baliyan S. * Ray D.	*Phyllosilicate Rich Rims in Mukundpura Meteorite: Implications for Parent Body Aqueous Alteration* **[#6247]** This study focuses on the origin and alteration of fine-grained rims in Mukundpura meteorite (CM2).

3:00 p.m.	Krämer Ruggiu L. * Devouard B. Gattacceca J. Bonal L. Leroux H. Eschrig J. Borschneck D. King A. Beck P. Marrocchi Y. Debaille V. Hanna R. D.	*Detection of Incipient Aqueous Alteration in Carbonaceous Chondrites* **[#6164]** We studied four ungrouped carbonaceous chondrites showing minimal aqueous alteration and thermal metamorphism by several techniques. We discuss the performances of those techniques to detect incipient aqueous alteration.
3:10 p.m.	Azevedo-Vannson S. * Remusat L. Piani L. Pont S. Roskosz M.	*Origin of Hydrogen Content in Chondrules of CM Chondrites* **[#6151]** Ion probe reveals high H content in NAMs of Paris, Aguas Zarcas and Mukundpura chondrules. D/H, H and FeO concentrations appear correlated. This may relate to preaccretionnary formation processes or aqueous alteration on the parent body.
3:20 p.m.		*Q&A*

Friday, August 20, 2021
POTPOURRI
1:30 p.m. Waldorf
Chairs: Elena Dobrică and Thomas Zega

Times	**Authors (*Denotes Presenter)**	***Abstract Title and Summary***
1:30 p.m.	Zhang Z. J. * Nie N. X. Mendybaev R. A. Liu M-C. Hu J. Y. Hopp T. Alp E. E. Lavina B. Bullock E. S. McKeegan K. D. Dauphas N.	*Loss and Isotopic Fractionation of Alkali Elements During Diffusion-Limited Evaporation from Molten Silicate* **[#6257]** We carried out the vacuum evaporation experiments from a basaltic melt at 1200 and 1400°C in this study, and we found chemical and isotopic zoning profile of residues from 1400°C runs, which is attributed to diffusion-limited transport within the molten droplet.
1:45 p.m.	Dobrică E. * Ohtaki K. K. Engrand C.	*The Occurrence of Complex Microstructures and Zonations in Carbonates from a Hydrated Fine-Grained Antarctic Micrometeorite* **[#6076]** Our TEM study of carbonates from a hydrated fine-grained Antarctic micrometeorite shows that these phases could result from rapid growth occurring from isolated reservoirs of fluid with a highly variable composition.
2:00 p.m.	Patzer A. Bullock E. S. Alexander C. M. O'D. *	*The Non-Complementary Compositions of Chondrules and Matrices in CO, CM and CR Chondrites* **[#6025]** Our results are inconsistent with chondrule-matrix complementarity but in line with the four-component model of Alexander (2019) combined with the addition or loss of individual components like forsterite, refractory inclusions and FeS or FeNiS.
PRE-RECORDED PRESENTATION		
2:15 p.m.	Bekaert D. V. * Auro M. Shollenberger Q. R. Liu M-C. Marschall H. Burton K. Jacobsen B. Brennecka G. A. McPherson G. J. vonMutius R. Sarafian A. Nielsen S. G.	*Vanadium Isotope Constraints on the Solar Irradiation History of CV CAIs* **[#6259]** CAIs record the history of our solar system before any of the planets formed. Here, we use V and Sr isotopic data for six CAIs from Allende chondrite to suggest that CAI formation took place further away from the protoSun than previously thought.

2:25 p.m.	Leya I. * Hirtz J. David J.-C.	*The Next Generation of Model Calculations for Cosmogenic Production Rates in Planetary Objects* **[#6051]** We present a new version of model calculations for cosmogenic production rates in planetary objects. The model is based on the latest improvements in terms of nuclear physics modelling and fully considers recent changes and adjustments of AMS standards and half-lives.
2:35 p.m.	Floyd C. J. * Lee M. R.	*Chondrule Size Variation Within CM Chondrite Lithologies* **[#6091]** We find significant chondrule size variations between four CM carbonaceous chondrites and the clasts within using BSE/EDS mosaics and XCT analysis.
2:45 p.m.	Van Maldeghem F. * Soens B. Kaufmann F. E. D. Van Ginneken M. Hecht L. Claeys Ph. Goderis S.	*Oxygen Isotope Variability Among Unmelted Micrometeorites from the Sør Rondane Mountains, East Antarctica* **[#6168]** Triple-oxygen isotope data from 55 unmelted micrometeorites from the Sør Rondane Mountains is used to identify the parent bodies of extraterrestrial material and suggests these particles are more susceptible for alteration than previously thought.
2:55 p.m.	Nguyen A. N. * Nakamura-Messenger K. Keller L. P. Klock W.	*Bulk Oxygen Isotopic Compositions of Anhydrous Interplanetary Dust Particles: Indication of an ^{16}O-Poor Reservoir in the Outer Solar System* **[#6304]** We report an unusually ^{16}O-poor bulk composition in an anhydrous IDP, and two IDPs with bulk ^{17}6049-rich compositions that are offset from the CCAM line.
3:05 p.m.		*Q&A*

Workshop on "Meteorite Ownership and Legal Issues"
Saturday morning, August 21, 2021, ~8:30–12:00, Field Museum of Natural History, Founders Room.

E-POSTERS AND ABSTRACTS

Authors (*Denotes Presenter)	Abstract Title and Summary
Mitchell J. T. Stephen N. R. Tomkins A. G.	*Sampling an Impact Melt Sheet with Unusual Diogenite Northwest Africa 5480* **[#6008]** EBSD analysis of NWA 5480 reveals a distinct lack of preferred orientation and an unusual poikilitic texture, likely produced through mineral settling and mixing processes in a thick impact melt sheet.
Liao S. Y. Tang C. P. Wang Y. Jiang Y. Li Y. Chen J. Y.	*Genesis of Quartz and Tridymite in Eucrites* **[#6039]** We studied the petrography and mineral chemistry of quartz and tridymite, the two major polymorphs of silica in basaltic eucrites, aiming to investigate the effect of shock reheating on the formation of quartz and tridymite.
Cloutis E. A. Connell S. A.	*Spectral Reflectance Properties of Mesosiderites* **[#6048]** Reflectance spectroscopy of mesosiderites can be used to identify possible asetroidal parent bodies. Their reflectance spectra are strongly affected by physical properties but mafic silicate absorption bands are pervasive.

Li Y. Hsu W. Wu Y.	*Carbon Isotopic Composition of Haxonite in Aletai (IIIE-an Iron)* **[#6049]** $\delta^{13}C$ value of Aletai haxonite (-15.2 ± 1.2‰) is significantly lighter than that in IIIE Colonia Obrera. This suggests that Aletai either experienced a different differentiation process or had a unique origin other than that of the other IIIE irons.
Jiang Y. Li Y. Liu J. Wang Q. Qin L. Liao S. Hsu W.	*Incipient Melting and Differentiation of the CR Chondrite Parent Body* **[#6062]** Based on mineralogical, petrological and geochemical observations in our work, a close affinity among North West Africa (NWA) 12869, 3250, 11112 and Tafassasset can be established, and are probably closely related to CR carbonaceous chondrites.
Teplyakova S. N. Lorenz C. A. Ivanova M. A. Kononkova N. N.	*Fine-Grained Metal in Sierra Gorda 054 (L4 Chondrite)* **[#6073]** Three types of fine-grained metal were found in Sierra Gorda 054 (L4). Some of them contain tetrataenite-taenite-kamacite melt pockets with cellular texture and rare grains of metal copper of (1–0.5 µm) are unusually enriched in Au, Pd and Sn.
Mei A. Wang Y. Hsu W. Liao S.	*Chronology and Petrogenesis of the Northwest Africa 11005 Mesosiderite* **[#6139]** To unravel the formation history of mesosiderites, we carried out in situ U-Pb dating on zircon and Ca-phosphate grains in Northwest Africa 11005. Here we present chronological results and discuss the implications for the petrogenesis of it.
Mikouchi T. Takenouchi A. Abe D. Yamaguchi A. Irving A. J.	*Olivine Petrofabrics of Ungrouped Olivine-Rich Achondrites Northwest Africa 6077, Northwest Africa 6962 and Northwest Africa 13446* **[#6147]** We studied olivine petrofabrics of three ungrouped olivine-rich achondrites (NWA 6077, NWA 6962 and NWA 13446) using EBSD and found NWA 6077 olivine showed b axis concentration possibly caused by deformation in the parent body.
Takenouchi A. Sumino H. Yamaguchi A. Barrat J. A.	*Noble Gas Chronology of Erg Chech 002 Ungrouped Achondrite* **[#6162]** We conducted Ar-Ar analyses of recently found andesitic achondrite Erg Chech 002. The Ar-Ar age of Erg Chech 002 is 4.51 ± 0.04 Ga, which is consistent with its rapid cooling texture and silica occurrences.
Irving A. J. Carpenter P. K. Ziegler K.	*Ungrouped Ultramafic Achondrites Northwest Africa 13921 and Northwest Africa 13955: Olivine-Bearing Igneous Rocks Unlike Eucrites or Diogenites Derived from Unknown Differentiated Parent Bodies* **[#6221]** Two new ungrouped igneous achondrites from Northwest Africa differ from typical eucrites and diogenites in mineralogy and oxygen isotopic composition.
Brusnitsyna E. V. Muftakhetdinova R. F. Yakovlev G. A. Zvonarev S. V.	*The Heating Influence on the Cloudy Zone Structure in the Seymchan Meteorite (PMG)* **[#6223]** We studied the heating influence on the cloudy zone structure in the Seymchan meteorite (PMG).

Carpenter P. K. Irving A. J. Ziegler K.	*Chromite and Plagioclase Exsolution from Pigeonite in Anomalous Pyroxene-Phyric Eucrite Northwest Africa 13355: Implications for High Temperature/Pressure Crystallization on One of the Many Eucrite Parent Bodies* **[#6228]** Ungrouped unbrecciated eucrite NWA 13355 contains exsolved pyroxene phenocrysts (or cognate xenocrysts) of possible high temperature and pressure origin, and may be a sample from a unique parent body.
Pravdivtseva O. Meshik A.	*Xenon Isotopic Composition in Pyroxene from the Steinbach IVA-an Meteorite* **[#6246]** Xenon isotopic systematics in Steinbach pyroxene separates supports complex crystallization history of the IVA parent body.
Sawicki J. A. Ebrahimi C.	*Depth Profiling of Iron Species in Sooke #1 Meteorite with Mössbauer Spectroscopy* **[#6305]** Mössbauer spectra of samples from various depths in Sooke #1 were measured, see also #6005 abstract. Observed changes in magnetite and silicates are discussed in view of aerodynamic heating during entry.
AL Omran N. Mardon A. A. Johnson P. A. Johnson J.	*Detection of the Biohazards of Living Martian Organisms* **[#6012]** We analyzed the approach taken to detect the biohazards of potential living martian organisms returned from Mars. The draft protocol for detecting biohazards in martian samples was evaluated, and recommendations were made for an updated protocol.
Goryunov M. V. Oshtrakh M. I.	*Re-Examination of the Isheyevo Mössbauer Spectra* **[#6070]** Verification of previously measured Mössbauer spectra of Isheyevo CH/CBb external and internal parts was carried out and revealed new results concerning the phase composition of meteorite.
Patzek M. Bischoff A. Ludwig T. Whitehouse M. Trieloff M. Visser R. John T.	*O-Isotope Signatures of Olivine and Pyroxene Grains in C1 and CM-Like Clasts* **[#6096]** The olivine and pyroxene grains in C1 clasts seem to span a wider range than the mineralogically similar CI chondrites. O-isotope data of grains in CM-like clasts overlap with those of AMMs possibly indicating a common heritage.
Yesiltas M. Kebukawa Y. Zolensky M. E. Fries M. Glotch T. D.	*Spectroscopic Investigation of Ungrouped Carbonaceous Chondrites* **[#6098]** We present detailed spectroscopic and imaging data on multiple C2-ung chondrites and compare them with various members of well-established C chondrite groups.
Dutta A. Raychaudhuri D. Mishra M. Ram R. Bhattacharya A.	*Geochemical Characterization of Mukundpura Carbonaceous Chondrite (CM2): Insights into Planetary Processes* **[#6106]** Partitioning of different trace elements and REEs among the various silicate phases, in particular olivine and its mesostasis component, matrices may be very sensitive to nebular processes.
Imai Y. Fagan T. J.	*Deformation in CV Chondrites: Ductile in Leoville, Brittle in Vigarano* **[#6166]** A clastic zone in Vigarano is a fault breccia that resulted from brittle deformation, contrasting with ductile chondrule flattening in Leoville. A setting near the parent body surface is inferred for Vigarano and an interior setting for Leoville.

Righter K. Alexander C. Foustoukos D. Mertens C. A. K. Busemann H. Schutt J.	*Pairing Relations Within CO3 Chondrites Recovered at the Dominion Range and Miller Range, Transantarctic Mountains* **[#6191]** We present new data that allow a better understanding of pairing relations in two large CO3 chondrite groups from Antarctica.
Lunning N. G. Harrington R. Satterwhite C. Righter K. Corrigan C.	*Mass Consumed Associated with Carbonaceous Chondrite Thin Section Making: Experience from the U.S. Antarctic Meteorite Collection* **[#6195]** We identified Antarctic CM, CO, CR, and CV chondrite chips (subsplits) that have been fully subdivided to make thin/thick sections, and calculated the average mass of material consumed to make sections of these carbonaceous chondrites.
Irving A. J. Garvie L. A. J. Carpenter P. K. Ziegler K.	*Newly Recognized Classes of Type 3 Carbonaceous Chondrites with Extreme Oxygen Isotopic Compositions Beyond the CCAM Trend* **[#6218]** Three new types of ungrouped carbonaceous chondrite from Northwest Africa have oxygen isotopic compositions which plot below the CCAM trend, and therefore must derive from previously unrecognized parent bodies.
Efimov A. V. Murtazov A. K. Zhabin V. S.	*Visual Spectrum of Ordinary Chondrite H5 Sierra Gorda 008* **[#6002]** The meteorite Sierra Gorda 008 was found in the Chile's Atacama Desert, Antofagasta province in 2018. It was classified as an ordinary chondrite H5. We measured the scattering visual spectrum of the Sierra Gorda 008.
Szurgot M. A.	*Mean Atomic Weight, Grain Density, and Porosity of Flensburg Unique Carbonaceous Condrite* **[#6006]** Mean atomic weight (Amean), grain density (dgr) and porosity of Flensburg unique carbonaceous chondrite were determined. It was shown that Flensburg Amean and dgr values are comparable with those established for Murchison CM2 chondrite.
Szurgot M. A.	*Mean Atomic Weight, Grain Density, and Porosity of Cavezzo Chondrite* **[#6009]** Mean atomic weight (Amean), grain density (dgr), and porosity (P) of anomaleous Cavezzo L5 chondrite were predicted. It was shown that Cavezzo whole rock Amean, dgr, and P values are smaller than those established for other L chondrites falls.
Voropaev S. A. Eliseev A. A. Dushenko N. V. Fedulov V. S.	*Experimental Study of L3 Aba Panu Meteorite's Degassing* **[#6031]** Experimental L3 Aba Panu degassing is explored by heating. Time dynamics of the main active volatiles (H_2O, CO_2, H_2 etc.) is analysed by the gas chromatography. Metosomatism of meteorites minerals is checked by means of the Raman spectroscopy.
Maksimova A. A. Petrova E. V. Chukin A. V. Felner I. Oshtrakh M. I.	*The Fusion Crust from Ozerki L6 and Kemer L4 Studied by X-Ray Diffraction, Magnetization Measurements and Mössbauer Spectroscopy* **[#6068]** Here we compare results of fusion crust taken from Ozerki L6 and Kemer L4 ordinary chondrites obtained by X-ray diffraction, magnetization measurements and Mössbauer spectroscopy.

Goryunov M. V. Petrova E. V. Oshtrakh M. I.	*Tsarev L5: Re-Fitting of the Extracted Metal Grains Mössbauer Spectrum* **[#6072]** New examination of the previously measured Mössbauer spectrum of the metal grains from Tsarev L5 have been done with better quality and revealed new results.
Panda D. K. Shukla A. D.	*Raman Spectroscopy of Freshy Fallen Mahadeva (H5/6) Chondrite* **[#6156]** Study of a new chondrite meteorites always shades some insights on the understanding of the records of physical and chemical processes during the early phases of the formation of the Solar System.
Devillepoix H. A. R. Anderson S. Sansom E. K. Lagain A. Towner M. C. Bland P. A. Howie R. M. Cupak M. Benedix G. K. Forman L. V. Shober P. Hartig B. A. D.	*Madura Cave: A New Meteorite Fall Delivered from an Aten Orbit* **[#6189]** This work presents initial insights from the Madura Cave meteorite, the latest recovery from the Desert Fireball Network.
Towner M. C. Sansom E. K. Devillepoix H. A. R. Cupak M. Bland P. A. Anderson S. L. Shober P. M.	*Arpu Kuilpu, an Ordinary Chondrite on a Jupiter Family Cometary Orbit* **[#6206]** We describe the recovery and classification of Arpu Kuilpu, and H5 chondrite recently seen to fall by the Desert Fireball Network in Southern Australia. Of note is that this chondrite had an orbit that would be classed as a Jupiter family comet.
Kuehner S. M. Irving A. J. Buckland N. H. Bandli M. Mani P. C.	*Analysis and Imaging of Original Thin Sections Made Around 1878 by Otto Hahn Establish Knyahinya to be an L4 Chondrite* **[#6224]** Analyses of 19th Century thin sections of the ordinary chondrite fall Knyahinya support revision of its classification.
Sukhanova K. Skublov S. Li Q.-L. Li X.-H.	*Oxygen Isotopes Ratios in Olivine of Porphyritic Chondrules from EOC* **[#6292]** Oxygen isotope ratios in olivine from Saratov L4, Elenovka L5 and Buschhof L6 meteorites were measured with a SIMS method. All three studied meteorites show a very different distribution of the oxygen three-isotope ratios.
Shornikov S. I. Yakovlev O. I.	*Experimental and Theoretical Investigations of Evaporation of Chondrule Melts of the Saratov Chondrite* **[#6077]** We compared the results of an experimental study of evaporation of alkalis from the pyroxene chondrules of the Saratov chondrite with those calculated for the case of evaporation of the K2O–Na2O–SiO_2 melts.
Salazar N. A. Valenzuela M. Oliveros V. Menzies A.	*Characterization of Five Ordinary Chondrites of the Atacama Desert Using QEMSCAN® and Other Techniques* **[#6299]** The petrological and chemical classification of five ordinary chondrites (OC) from the Atacama desert was obtained using automated mineralogy (Qemscan) along with classical techniques. Qemscan would provide accurate and fast classification of OCs.
Johnson J. C. Johnson P. A. Mardon A. A.	*Was the Red Planet once Blue? Meteoritic Evidence for Historical Biosignatures* **[#6003]** Signatures of life on historical Mars are putative speculations of the chondritic meteorites Allan Hills 77005 (ALH77005) and 84001 (ALH84001) martian meteorites discovered in Antarctica. Here, we try to chronicle this evidence ore elegantly.

Konovalova K. A. Plechov P. Yu. Litasov K. D. Shcherbakov V. D.	*Ruthenium-Dominated Phases in the Heterogeneous Refractory Metal Nuggets in Calcium-Aluminium Inclusions in the CV3R Chondrite Northwest Africa 12590* **[#6152]** The abstract presents the results of studying crystal structures by EBSD and chemical composition by SEM for refractory metal nuggets in Ca-A-inclusions in CV3R Northwest Africa 12590.
Meshik A. Pravdivtseva O.	*Xenon Isotopes in Solar Wind, Comet 67P/C-G, and Jupiter: A Step Toward the Understanding of Their Relationship* **[#6279]** Renormalized xenon composition of Jovian atmosphere and comet 67P/C-G suggests the presence of fission xenon in the Sun and Jupiter.
Martínez M. J. Marco F. J.	*A 10th Century Ball of Fire over Spain* **[#6055]** A 10th century fireball seen in several Spanish villages caused damages and it was recorded in several chronicles. Although different interpretations exist, the description of the phenomenon may correspond to a bolid whose path can be reconstructed.
Kalabanov S. A. Korotishkin D. V. Ishmuratov R. A. Valiullin F. Sherstykov O. N.	*New Software and Hardware Platform for Meteor Radar Observation in Kazan (Russia)* **[#6017]** The Kazan Meteor Radar (KMR) is a new generation system deployed on the scientific research area of Kazan Federal University, Tatarstan, Russia (55 N) in March 2015. KMR transmits 15kW power in pulse and uses single antenna all sky configuration.
Patzek M. Ruesch O.	*Simulating the Effects of Thermal Fatigue on the Formation of Regolith in a Thermal Vacuum Chamber* **[#6146]** We setup an experimental chamber to simulate the effect of diurnal temperatures excursions on the surface of planetary bodies under vacuum conditions to study the crack formation and location within a range of different meteorite types.
Morlok A. Reitze M. P. Weber I. Stojic A. N. Bauch K. E. Wohlfarth K. Wöhler C. Hiesinger H. Helbert J.	*FTIR Studies of Planetary Materials: The Impact of Temperature and Vacuum on Spectral Features* **[#6184]** We present results of mid-infrared reflectance spectroscopy forsterite, enstatite, labradorite, heated under vacuum to temperatures up to 400°C. The results are for the comparison with spectra from planetary surfaces (e.g. Moon, Mercury.).
Muftakhetdinova R. F. Yakovlev G. A. Brusnitsyna E. V. Grokhovsky V. I.	*The Cloudy Zone Structure as an Indicator of Shock and Thermal Effects* **[#6192]** The formation of cloudy zone resulted from the unique space conditions. In the presence or absence of this structure, one can draw conclusions about the reaching of certain temperatures. The cloudy zone could serve as an indicator of shock and heat.
Muftakhetdinova R. F. Grokhovsky V. I. Minin M. G.	*Structural Features of Se?mchan Pallasite After Shock-Wave Loading* **[#6203]** This paper presents the results of a study of the structural features of the pallasite part of the Seymchan meteor-ite after experimental impacts by spherically converging shock waves. The results of nanoindentation of kamacite are also given.

Begunova A. S. Kamalov R. V. Yakovlev G. A. Grokhovsky V. I.	*Synchesis of Carbon Nanotubes on the Chinga Meteorite* **[#6248]** We synthesized carbon nanotibes (CNTs) using the duplex plessite part of the Chinga ataxite. The method of the synthesis was a catalytic pyrolisis of ethanol. Temperature of synthesis was 600 °C.
Schmidt G.	*Iron Meteoritic Platinum Group Element Abundance Pattern in Chicxulub Impact Crater Sediments from a Drill Core on the Yucatán Peninsula in Mexico* **[#6004]** The non-chondritic PGE abundance pattern in sediments recovered on the Chicxulub peak ring is consistent with an Mundrabilla like iron projectile and is distinctly different from the near-chondritic PGE ratios determined in European K-Pg sites.
Vondrak D. Kavkova R. Chattova B. Golias V. Takac M. Svecova E. Storc R. Kletetschka G.	*Effect of the Tunguska Event on the Lake Ecosystems: A Case Study of Suzdalevo Lake* **[#6023]** Here we present new data on the Tunguska impact in 1908. The event caused not only a destructive forest damage (2,000 km2) and severe fires, but it also affected lake ecosystems. We documented these impact-related changes using lake sediments.
Sahoui R. Belhai D.	*Two Shock Stages at the 6 km Diameter Tin Bider Impact Crater, Algeria* **[#6035]** Two shock stages are detected at Tin Bider impact carter: a high shock stage identified on the albian sandstones of the central pick while the low shock stage is identified on Breccias 1.
Echaurren J. C.	*Jezero Crater, Mars: Estimating the Impact Conditions* **[#6082]** In this work, the conditions of the Jezero impact crater are estimated, providing numerical results.
Ucar H. Kletetschka G. Mizera J.	*Investigation of the Glassy Objects from ODP Leg 175, Hole 1082C* **[#6120]** The formation of the Australasian tektites corresponds to prior to the M/B transition. Here we investigated the glassy objects found in a previous study in the marine sediment from the South Atlantic that is outside of the Australasian strewnfield.
Vinnikov V. V. Gritsevich M. I. Pshehotskaya E. A.	*A Pre-Entry Shape Estimation for Puerto Lápice and Villalbeto de la Peña Meteorites via Statistical Distribution of Fragment Masses* **[#6230]** We present the meteorite shape estimation approach based on the statistical mass distributions of the recovered fragments. The power law with exponential cutoff is fitted to the empirical fragment distribution function to obtain the scaling index.
Unsalan O. Kruglikov N. A. Yesilyaprak C. Pastuhovich A. Y. Unsalan C. A. Goodall J. Yakovlev G. A. Satir O. Grokhovsky V. I. Uysal I. Erdogan I. Y. Cakmak I. Cubuk A. Sengun M. T. Mickaelian A. M.	*Analysis of the Bright Fireball Over Turkey on May 27, 2020* **[#6264]** A bright fireball observed in Turkey was analyzed and meteorites were searched. Videos from Turkish universities helped determination of the strewnfield. Bad terrain led to four unsuccessful campaigns. A recent dam prevents a further campaigns.
Kletetschka G. Klokočník J. Kostelecký J. Bezděk A.	*Gravity Aspects Suggest that Isidis Basin is Buried Volcano* **[#6020]** While Isidis is a topographical low; it displays the gravity signature consistent with a volcanic structure.

Kletetschka G. Klokočník J. Kostelecký J. Bezděk A.	*Gravity Aspect Reveals more Differentiated Southern Hemisphere that Northern Hemisphere of Mars* **[#6021]** Larger density contrast is consistent with the northern hemisphere being less differentiated, with contrasting densities, than the southern hemisphere with more uniform densities.
Wu Y. Xiao Z. Hsu W.	*Composition of Phosphates in the Martian Shergottite Northwest Africa 13581* **[#6050]** Apatite and merrillite in the shergottite Northwest Africa 13581 often coexist with uneven boundaries. Apatite are relatively F-rich and exclusively OH-poor. The parent melt may have exsolved Cl-rich melts that are subsequently migrating outward.
Glukhov M. S. Chetverikov Yu. O. Ivankova E. M. Yakubovich O. V. Goryunova A. A.	*Morphology and Composition of Magnetic Microspherules from the Snows of Antarctica* **[#6105]** Magnetic microspherules sampled from the Antarctic snows at Vostok station are type I micrometeorites. All of them have a spherical shape, dendrite and mosaic microtexture of the surface of magnetite and chromite composition.
Kochemasov G. G.	*Lunar Degassing and Basalt Effusions* **[#6015]** Some lunatics consider basalts effusions and impacts as main source of volatiles in the lunar crust. However, slow warping Moon in course of its movement in elliptical with alternating accelerations obit is a main reason of volatile involvement.
Kochemasov G. G.	*Regular Lunar Tectonics* **[#6016]** Most lunatics consider giant lunar craters as impacts. However, their regular distribution, in geomorphologic lines shows that a wave process participates in their origin. In the map there are such lines with alternating ups and downs in relief.
Demidova S. I. Tetroeva S. A. Ryazantsev K. M.	*Thermal History of the Evolved Rock Clast from Luna-24 Soil Samples as Recorded in Silica Polymorphs* **[#6294]** Recently found clast of evolved rock in impact melt breccia fragment of Luna-24 samples contains two silica polymorphs. Their identification along with study of their textural characteristics clarify thermal history of the rock fragment.
Lehnert K. A. Hezel D. Ji P. Mays J. Profeta L. Song L. Morrison S. Figueroa J. D. Johansson A.	*Open and Reusable Data for Astromaterials Samples* **[#6291]** This presentation provides an overview and update of the Astromaterials Data System that offers a comprehensive suite of systems and services for open and reusable laboratory analytical data of samples returned from space missions and for meteorites.
Peltoniemi J. Gritsevich M. Moilanen J. Mitev V. Roulet J.-C. Millinger M.	*In-Orbit Coincident Lasersheet Particle Monitor* **[#6188]** We propose a new concept for in situ detection of interplanetary dust particles, meteoroids, and space debris by combining the laser sheet technique with an additional fast single-pixel photodetector to precisely monitor the timestamp of each event.
Malbeuf J. T. Kabir-Bahk C. Ali S. Mardon A. A.	*Meteoric Jewelry in Egypt Shedding Light on the Sophistication of Prehistoric Mankind* **[#6302]** The only metal known to prehistoric Eqyptians was the iron that could be found in meteorites, which they used for jewelry and ceremonial purposes.
Vidmachenko A. P. Zhilyaev B. E. Steklov A. F. Petukhov V. N. Reshetnyk V. N. Verlyuk I. A. Pokhvala S. M.	*The Physics of Space Intrusions. Colorimetry of Meteors* **[#6038]** For colorimetric analysis an image of Leonid-6230 meteor was used, obtained by Mike Hankey in 2012. It allows to determine ??? temperature, chemical composition and other characteristics.

Ohtaki K. K. Ishii H. A. Bradley J. P. Davis J. J. G. Ciston J. Bustillo K. Walroth R. Ruiz R. C. Kroll T. Sokaras D.	*Iron Oxidation State Distributions in Space-Weathered Pyroxene and Olivine* **[#6117]** Laser irradiated pyroxene and olivine crystals were analyzed by EDS and EELS. EELS maps show a variation of Fe oxidation states in the irradiated amorphous layer.
Willcocks F. Grimes S. T. Stephen N. R.	*Comparative Planetology of the Inner Solar System; Using Flood Basalts on the Moon (Lunar Maria), Mars (Tharsis and Elysium) and Earth to Investigate the Magmatic Evolution of Our Solar System* **[#6061]** A new study focusing on the geochemical and petrological observations of meteorites on the Moon and Mars, and their comparison to terrestrial analogs, such as basalts from Hawaii, New Mexico, Northern Ireland and terrestrial flood basalts provinces.
Visuri J. J. Gritsevich M. I.	*Introducing the FireOwl — Data Processing Software of the Finnish Fireball Network* **[#6093]** We introduce the new FireOwl software developed and used by the Finnish Fireball Network. It includes kernels for image calibration, fireball measurements, visible flight triangulations, dark flight trajectory, and solar system orbit calculation.
Bonato E. Schwinger S. Maturilli A. Helbert J.	*A New Facility for the Planetary Science Community: The Planetary Sample Analysis Laboratory (SAL) at DLR* **[#6103]** The Planetarey Sample Analysis Laboratory (SAL) is a new facility being set up within the Institute of Planetary Research at DLR Berlin. SAL is being developed in preparation to receive samples from sample return missions for microanalysis.
Anderson S. L. Towner M. C. Bland P. A.	*Search and Recover: An Update of Semi-Automated Meteorite Recovery with Drones and Machine Learning* **[#6155]** We provide an update for our machine learning and drone-based meteorite recovery framework.
Moilanen J. Gritsevich M.	*From Atmospheric Entry to Termination or a Strewn Field: Modelling Fireball Events as a Suite of Individual Trajectories* **[#6288]** The dark flight Monte Carlo model (DFMC) provides an adequate representation of the processes occurring during the luminous trajectory coupled together with dark flight. This model has already assisted in several meteorite recoveries.

Wednesday, August 11, 2021
VIRTUAL POSTER SESSION A
8:30 a.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Ipatov S. I.	*Delivery of Bodies to the Earth and the Moon from the Zone of the Outer Asteroid Belt* **[#6040]** The probability of a collision with the Earth of a body with semi-major axis between 3 and 4 AU could be greater than that for greater semi-major axes. The zone of the outer asteroid belt could be one of the sources of the late heavy bombardment.

Ipatov S. I.	*Delivery of Icy Planetesimals to Inner Planets in the Proxima Centauri System* **[#6042]** A lot of icy material (more than to the Earth) could be delivered to the inner exoplanets b and in the Proxima Centauri planetary system. A cometary cloud similar to the Oort cloud can exist in this system.
Johnson P. A. Johnson J. C. Mardon A.	*Near-Earth Objects Impact Hazard Assessment Scales* **[#6001]** We describe the strengths and limitations of the Torino Scale and Palermo Technical Impact Hazard Scale for impact hazard assessment and future avenues for impact hazard modelling.
Kuznetsov E. D.	*Orbital Evolution of Phaethon Cluster* **[#6100]** The age of the pair (3200) Phaethon – (155140) 2005 UD is more than 1 Myr. The age of the pair (3200) Phaethon – (225416) 1999 YC exceeds 100 kyr. The age of the pair (155140) 2005 UD – (225416) 1999 YC may be 50 kyr or more.
Kuznetsov E. D. Vasileva M. A. Rosaev A. E. Plavalova E.	*Some Examples of Close Asteroid pairs Interactions with Resonances* **[#6170]** Encounters with Mars have the strongest effect on the orbital evolution of pairs (9068) 1993 OD – (455327) 2002 OP28 and (88666) 2001 RP79 – (501710) 2014 UY23, moving in the vicinity of the 10–7S–3J three-body resonance with Saturn and Jupiter.
Ohnishi I. Kadoi M. Shibata M.	*Preparation of TEM Specimens for Olivine with Specific Crystal Orientations from the Matrix in Allende CV3 Chondrite Using FIB-SEM and EBSD* **[#6053]** We prepared the TEM specimens from the randomly oriented olivine grains in the Allende matrix by a method combined with FIB (Focused Ion Beam) and EBSD (Electron Back Scattered Diffraction). Here, we report de-tails of the procedure and its results.
Bruno A.	*An Archival and Oral History of the Tunguska Explosion* **[#6178]** This poster presentation will describe the research and results of a book project by a professional historian on the history of investigations into the Tunguska explosion of 1908 in Siberia.
Kling A. M. Benner M. C. Thompson M. S. Greer J. Diaz R. E. Heck P. R.	*The Search for Water in Lunar Soils Through Coordinated Analysis of Space Weathering Characteristics in an Apollo 17 Sample* **[#6241]** Hollow nanophase iron particles were identified in a vesicle-rich region of the space weathered rim in a mature lunar mare grain. Coordinated analyses may shed light on the relationship between vesicles, water, and the hollow nanoparticles.
Krämer Ruggiu L. Beck P. Gattacceca J. Eschrig J.	*Visible-Infrared Spectroscopy of Ungrouped and Rare Meteorites Brings Further Constraints on Meteorite-Asteroid Connections* **[#6160]** We studied 25 ungrouped chondrites and rare meteorite groups using VIS-NIR reflectance spectroscopy and compared their spectra to end-members spectra of asteroids taxonomy to find potential link of ungrouped meteorites to their parent bodies.

Kampf C. E. Hamann C. Schäffer S. Heunoske D. Hasse T. Hecht L. Greshake A. Osterholz J.	*Laser-Irradiation of an Ordinary Chondrite: Simulation of Atmospheric Entry of Chondritic Materials and Links to the Formation of Micrometeorites* **[#6256]** Here we compare petrography and microchemistry of quenched melts produced from an ordinary chondrite in a 1-bar laser-irradiation experiment to recently described urban micrometeorites and fusion crusts developed around ordinary chondrites.
Hill P. J. A. Chevalier M. Herd C. D. K. Hilts R. W.	*Advancing the Curation of Aldehydes and Ketones for Applications to Carbonaceous Chondrite Curation and Cometary Nucleus Sample Return* **[#6119]** The aim of this study is to examine the reactivity of carbonyl compounds under a variety of conditions to provide insight into the curation and handling requirements of organic-rich astromaterials.
Nissinen M. Gritsevich M. Oksanen A. Suomela J.	*Modeling of Cometary Dust Trails* **[#6010]** We present the 'Dust Trail kit' model describing the evolution of cometary dust trails. As a case study, we demonstrate our analysis of the physical and spatial characteristics of the dust trail produced by the 2007 explosion of comet 17P/Holmes.
MSPG2 Team Beaty D. W. Carrier B. L. Kminek G. Meyer M. A. Haltigin T. Hays L. E. Agee C. B. Busemann H. Cavalazzi B. Cockell C. S. Debaille V. Glavin D. P. Grady M. M. Hauber E. Hutzler A. Marty B. McCubbin F. M. Pratt L. M. Regberg A. B. Smith A. L. Smith C. L. Summons R. E. Swindle T. D. Tait K. T. Tosca N. J. Udry A. Usui T. Velbel M. A. Wadhwa M. Westall F. Zorzano M.-P.	*Summary of Mars Sample Return (MSR) Science Planning Group 2: Planning for the Arrival and Analysis of MSR Samples at Earth* **[#6242]** MSPG2's overarching aims were to build upon previous efforts in defining an end-to-end MSR Science Program, and addressing important issues that will influence the design and implementation of the Sample Receiving Facility.
Safronova V. S. Kuznetsov E. D.	*Estimation of the Age of Two Young Pairs of Asteroids* **[#6144]** The age of the pair (87887) 2000 SS286 – (415992) 2002 AT49 ranges from 7.58 ± 0.035 to 8.8 ± 0.043 kyr; for the pair (320025) 2007 DT76 – (489464) 2007 DP16 one ranges from 15.4 ± 0.96 to 29.5 ± 0.04 kyr depends on the semimajor axis Yarkovsky drift.
Ovcharenko A. V. Schapov V. A. Muravyev L. A.	*Geophysical Search of the Sterlitamak Meteorite* **[#6046]** We describe the results of our geophysical studies (magnetic survey) on the territory of the crater formed after the fall of the sterlitamak meteorite. On our opinion, a significant mass of the meteorite may still be in the crater.
Christ O. Barbaro A. Brenker F. E. Domeneghetti M. C. Nestola F.	*Shock Temperature Records in Graphite from the Northwest Africa 6871 Ureilite* **[#6052]** Northwest Africa 6871 was studied by XRD and μ-Raman. It contains aggregates of nanographite and micro/nanodiamond. A graphite-geothermometer revealed a temperature of 1412 °C, which we ascribed to the shock event which destroyed the parent body.

Andreev A. O. Nefedyev Y. A.	*Analysis of Broadband Color Characteristics and Spectral Distribution of Asteroids with Small Perihelion Distances* **[#6057]** The purpose of this study is to analyze the genetic relationships of asteroids with small perihelion distances with meteor showers by broadband color characteristics based on modern optical observations with various color filters.
Andreev A. O. Nefedyev Y. A.	*Creation of an Imitation Model of Near-Sun Asteroids with Small Perihelion Distances* **[#6058]** The work is focused on creating a simulation model of near-Sun asteroids (NSAs) with small perihelion distances. The model includes astrophysical parameters of these objects, size distribution and their dynamic behavior in space.
Churkin K. O. Nefedyev Y. A. De La Morena C. Andreev A. O. Ahmedshina E. N.	*Analysis of Digital Model of Titan Using Fractal Geometry and Automated Complex for Studies* **[#6113]** This work aims at considering the issues of regression modeling of the surface of Saturn's moon, Titan and at studying the produced model by means of fractal geometry. Based on data collected by NASA Cassini the Titan surface model was created.
Churkin K. O. Andreev A. O. Nefedyev Y. A.	*Creation of a Unified Selenocentric System Using Quantum Optical Systems* **[#6114]** The work is devoted to the development of a method for creating a unified selenocentric system for a space satellite in a circumlunar orbit (SSCLO) and reference objects on the lunar surface using quantum optical devices.
Nefedyev Y. A. Sergienko M. V. Andreev A. O.	*Analysis of Orbital Elements of Near Earth Objects over a Long-Term Period* **[#6087]** The aim of this work is to analyze the changes in orbital elements of near earth objects (NEO) and to identify them with the meteor shower Delta Cancrids (MSDC). For MSDC connections with asteroids were investigated.
Nefedyev Y. A. Sergienko M. V. Andreev A. O.	*The Coordinate Ranging of the Delta Cancrids Meteor Shower* **[#6088]** The aim of this work is to refine the radiants distribution of the meteor shower Delta Cancrids (MSDC) branches and their drift motion and to study features of radiants distribution and orbit elements for MSDC using television observations.

Wednesday, August 11, 2021
VIRTUAL POSTER SESSION B
8:30 a.m.

Authors (*Denotes Presenter)	Abstract Title and Summary
Johnson P. A. Johnson J. C. Mardon A. A.	*Utilization of Nano-Vibration for Microbial Life Sensing* **[#6085]** Almost 50 years ago, we first detected bio-signatures and evidence of microorganisms in meteorites. We propose the utilization of nanoscale vibration technology for its use in meteorite sampling and detection of these bio-signatures in meteorites.

Morin S. M. Barnes J. J. Wilbur Z. E. Stadermann A. C. Domanik K. McCubbin F. M.	*Assessing the Volatile Inventory of Basaltic Fragments in Luna Soils* **[#6229]** We investigate the mineralogy, chemistry, and volatile systematics of basalt fragments in Luna 16 and 24 soils. The overall goal is to better understand the origin(s) of chlorine isotope fractionation on the Moon.
Lee M. R. Martin P. M. C. Floyd C. J. Jenkins L.	*A Xenolith from an Early Formed Parent Body in the CM Carbonaceous Chondrite LaPaz Icefield 02239* **[#6176]** Why do so few xenoliths in CM carbonaceous chondrites have a fine-grained rim? What does that tell us about the transport of lithic fragments through the disk?
Jenkins L. E. Lee M. Daly L. King A. J. Chung P.	*Identification of Clasts in CM Chondrite Fall Kolang with S and Ca* **[#6161]** Clasts experienced / Alteration with fluids / Of varied makeups.
Pickersgill A. E. Lee M. R. Lindgren P. Daly L. Whitehouse M. J. Griffin S. Hallis L.	*Seeking Evidence of Life in Sulphides from the Boltysh Impact Structure* **[#6181]** Boltysh, was there life? / Did it eat tasty sulphur? / Isotopes will tell.
Lowe H. Daly L. Lee M. R.	*Evidence of Micro-Faulting Within Ureilite Miller Range (MIL) 090980* **[#6045]** This abstract presents new EDS data from the ureilite sample Miller Range (MIL) 090980. Found within the data sets is evidence of micro-faulting throughout the sample affecting carbon and iron-rich veins.
Sheikh D.	*Petrology and Geochemistry of Errachidia 004, a Polymict Winonaite Composed of Distinct High and Low Metal Lithologies* **[#6253]** Errachidia 004 is a recently recovered polymict winonaite from Morocco in 2020 that exhibits two distinct lithologies with varying metal abundances: 1) a metal-depleted ultramafic melt residue and 2) a silicate-rich IAB of basaltic composition.
Wilbur Z. E. Barnes J. J. Eckley S. A. Zeigler R. A.	*Investigating the Petrogenesis and Eruption Histories of Apollo 15 and Apollo 17 Basalts* **[#6130]** Apollo basalts/Contain vesicles and vugs/How were they emplaced?
Mouti X. Davidson J. Schrader D. L. Bullock E. S.	*Fine-Grained Rims in Mighei-Like Carbonaceous Chondrites: Support for a Nebular Origin* **[#6129]** Fine-grained chondrule rims were analyzed in six CM chondrites and their abundances and sizes were determined. Results indicate rims formed in the nebula.
Barnes J. J. Wilbur Z. E. Domanik K.	*Phosphate Chemistry in Brachinites and Brachinite Like Meteorites* **[#6300]** In this work, we investigate the textural occurrence of phosphates and their chemistry in brachinite and brachinite-like meteorites.
Koch T. E. Spahr D. Tkalcec B. J. Christ O. Genzel P.-T. Merges D. Wilde F. Winkler B. Brenker F. E.	*Formation of Fused Aggregates Aboard the ISS with Implications for Early Solar System Particle Aggregattion* **[#6043]** We carried out an experiment under long-term microgravity conditions aboard the ISS to fuse particles in order to study early solar system particle aggregation.

Di Y. Sapah M. S. Amelin Y.	*Complex Pb Isotopic Contamination in CAIs from Northwest Africa 4502* **[#6033]** Pb isotopic systems of CAIs from NWA 4502 CV chondrite show strong and complex terrestrial contamination signatures. The Pb contamination in CAIs is difficult to completely remove by acid leaching, and requires a more effective cleaning procedure.
Pittarello L. Chernonozhkin S. M. Goderis S. Vanhaecke F. Downes H.	*A Puzzling Fragment from the Dyalpur Ureilite: Anomalous Components, Microstructures, and Geochemistry* **[#6024]** The investigated fragment presents the following unusual features for ureilites: presence of amphibole clasts in an olivine-rich matrix, unusual high Co content in sulfides, uncommon Mn and Cr content in olivine.
Anand A. Pape J. Mezger K. Hofmann B.	*Cr and O Isotopes Link IVA Irons and LL Chondrites* **[#6154]** Investigation of the association between IVA irons and L/LL ordinary chondrites within ε^{54Cr} vs. Δ^{17O} space based on ε^{54Cr} values obtained from chromite ($FeCr_2O_4$) or daubréelite ($FeCr_2S_4$) inclusions in IVA iron meteorites.
Hwang S. L. Shen P. Varela M. E. Saavedra M. Yui T. F. Chu H. T.	*Electron Microscopic Study of Graphite in the Vaca Muerta Mesosiderite* **[#6019]** Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) studies coupled with energy dispersive X-ray (EDX) analysis in the Vaca Muerta mesosiderite give some hints about graphite formation.
Hwang S. L. Saavedra M. Shen P. Varela M. E. Chu H. T. Yui T. F.	*A Transmission Electron Microscopy Study of the Olivine Coronas in the Vaca Muerta Mesosiderite* **[#6018]** A transmission electron microscopy (TEM) coupled with energy dispersive X-ray (EDX) analysis was performed to shed light on the main process under which the Vaca Muerta coronas were formed.
Demina N. Y. Nefedyev Y. A. Andreev A. O.	*Analysis of the Unified Digital Database of Observations of Modern Satellite Lunar Missions* **[#6054]** The aim of this work is to analyze the unified digital database of optical observations obtained during the satellite lunar missions. A transformation method was created for the coordinate systems and mega-relief of the Moon.
Demina N. Y. Andreev A. O. Nefedyev Y. A.	*Modeling the Lunar Physical Parameters Using Complex Systems Methods* **[#6056]** The aim of this work is analysis of stochastic and dynamical features of time series describing the satellite measurements of gravitational fields and parameters of lunar physical libration (LPL).
Zagidullin A. A. Andreev A. O. Nefedyev Y. A.	*Automated Stochastic Analytical Complex for the Analysis of Satellite Observations of the Gravitational Field and Physical Libration of the Moon* **[#6212]** The work is focused to the development of a software for two-parameter cross-correlation dependence construction in order to describe stochastic similarity in time series of satellite observations of gravity field and lunar physical libration.

Zagidullin A. A. Nefedyev Y. A. Andreev A. O.	*The Simulation System for Determining the Positions of Lunar Objects on the Basis of Satellite Observations in the Selenocentric System* **[#6214]** The work is focused to the creation of the software simulation system for determining the positions of lunar objects on the basis of satellite observations in the selenocentric system using the lunar space missions data.

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