

Samuel D. Crossley

Department of Planetary Sciences and Lunar and Planetary Laboratory
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Education

Ph.D. Geology, University of Maryland, College Park, 2021
Thesis: *"Petrologic, Geochemical, and Remote Spectral Characteristics of Oxidized Planetary Differentiation"*
Thesis Advisors: Prof. Jessica Sunshine and Dr. Richard Ash

M.S. Geology, Texas Christian University, 2016
Masters Thesis: *"Experimental Insights into Stannern-trend eucrite petrogenesis"*
Thesis Advisor: Prof. Rhiannon Mayne

B.S. Geology, Hardin-Simmons University, 2010
Senior Thesis: *"Calcareous Nanoplankton of the Late Cretaceous."*
Thesis Advisors: Prof. Steven Rosscoe and Prof. Mark Ouimette

Appointments

Staff Research Scientist, Lunar and Planetary Laboratory, University of Arizona, 2024 – present

Gordon A. McKay Postdoctoral Fellow, Lunar and Planetary Institute (LPI), USRA-Houston
Astromaterials Research and Exploration Science division, NASA Johnson Space Center, 2021–2023
Research focus: Experimental Investigations into the Core Formation Pathways and Trace Element Systematics of Oxidized Asteroids.
Additional responsibilities: Co-manager, LPI SEM Facility; Co-organizer, LPI Seminar Series.

Fellowships and Awards

Meteoritical Society Travel Award: Perth, Australia, July 2025

University of Arizona Technology and Research Initiative Fund – "Multiphoton Microscopy Applications to Astromaterials." Principal Investigator, 2024 – present.

NASA PSEF – "LPI SEM Facility." Co-Investigator, 2023.

LPI/NASA Gordon McKay Postdoctoral Fellowship in Petrology and Geochemistry Nov 2021-present

USRA/LPI Career Development Registration Award: LPSC 52, March 2021

Ann G. Wylie Semester Dissertation Fellowship, University of Maryland, Spring 2021

Dept. of Geology PhD Post-Candidacy Talk Award, University of Maryland, January 2019

DoGood Mini-Grant (for STEM educational outreach), University of Maryland, November 2019

NASA Doctoral Fellowship Award, Harriet J. Jenkins Fellowship, August 2017-2020

Planetary Science Foundation Travel Award: Meeting of Meteoritical Society 82, July 2019

Goldhaber Travel Award, University of Maryland, July 2019

ISSC Travel Award, University of Maryland, July 2019

CMNS Dean's Fellowship, University of Maryland, 2018-2019

ESSIC Travel Award, University of Maryland, March 2019

USRA/LPI Early Career Development Award: Building Worlds II, May 2018

USRA Travel Award: Meeting of Meteoritical Society 80, July 2017

Graduate Student Travel Award, Texas Christian University, August 2016

Extended Research Visits

NASA Johnson Space Center, March 2024. NASA Facilities for Astromaterials Research. Visiting Science Collaborator. Meteorite Vapor Deposition Experiments

NASA Johnson Space Center, 2017-2019. Visiting Graduate Student Researcher. Mineralogic analyses

Smithsonian Institution Washington, D.C. 2015-2021. Visiting Student Researcher. Experimental petrology, mineralogic analyses

Publications

Journal publications

Magnus J.H., Nguyen L.T., Alevy E.G., Sawyer T.W., **Crossley S.D.**, Kieu K., 2025, [Fifth-harmonic and five-photon excitation fluorescence multiphoton microscopy](#). *Optics Letters*, 50, 3931-3934.

Crossley S.D., Setera J.B., Anzures B.A., Iacovino K., Buckley W.P., Eckley S.A., O'Neal E.W., Maisano J.A., Simon J.I., Righter K., 2025, [Percolative sulfide core formation in oxidized planetary bodies](#). *Nature Communications* 16, 3233.

Crossley S.D., Donner C.L., Magnus J., Nguyen L., Kieu K., 2024, [Fluorescent emission and nondestructive 3D textural imaging in geologic materials by multiphoton microscopy](#). *Optics Express* 32, 41404-41416.

Moran S.E., Marley M.S., **Crossley S.D.**, 2024, [Neglected Silicon Dioxide Polymorphs as Clouds in Substellar Atmospheres](#). *Astrophysical Journal Letters*, 973.

Crossley S.D., Ash R.D., Sunshine J.S., Corrigan C.M., McCoy T.J., 2023, [Parent body histories recorded in Rumuruti chondrite sulfides: Implications for the onset of oxidized, sulfur-rich core formation](#). *Meteoritics and Planetary Science*, 58, 3, 383-404.

Crossley S.D., Ash R. D., Sunshine J. M., Corrigan C. M., McCoy T. J., Mittlefehldt D.W., and Puchtel I.S., 2020, [Sulfide-dominated partial melting pathways in brachinites](#). *Meteoritics and Planetary Science*, 55, 9, 2021-2043.

Crossley S.D., Lunning N.G., Mayne R.G., McCoy T.J., Greenwood R.C., Franchi I.A., Humayun M., Ash R.D., Sunshine J.M., Yang S., 2018, [Experimental insights into Stannern-trend eucrite petrogenesis](#). *Meteoritics and Planetary Science*, 53, 10, 2122-2137.

Balta J.B., Sanborn M.E., Mayne R.G., Wadhwa M., **Crossley S.D.**, and McSween H.Y., 2016, [Northwest Africa 5790: A surprising sample from the upper part of the Nakhilite pile](#). *Meteoritics and Planetary Science*, 52, 1, 36-59.

Teaching Experience

Teaching/Research Assistant, University of Maryland, 2016–2017

Fall 2016 - Evolution of Life and Environment on Planet Earth

Spring 2017 - Introduction to Environmental Sciences

Teaching Assistant, Texas Christian University, 2014 –2016

Fall 2014 - Introduction to Geology Lab

Spring 2015 - Introduction to Geology Lab

Fall 2015 - Earth Materials Lab

Spring 2016 - Monnig Meteorite Gallery

Science & Maths Teacher, Kamakwie Wesleyan Secondary School, Sierra Leone
U.S. Peace Corps, 2011–2013

Integrated Sciences, Applied Mathematics

Additional projects: science curriculum development, school science laboratory founder/manager, teaching workshop organizer, scholarship fund organizer, local cartography, public health outreach

Mentoring Experience

Elana Alevy, University of Arizona, Research Technician, 2024 – present, *“Multiphoton microscopy applications to astromaterials.”*

Colby Donner, University of Arizona, Undergraduate Student Researcher, 2023 – present, *“Fluorescent emission and nondestructive 3D textural imaging in geologic materials by multiphoton microscopy.”*

Daniel Burgin

University of Otago, New Zealand, LPI Summer Intern, 2022, *“Opaque mineralogy of the CK chondrites at the onset of partial melting.”*

Curtin University, Perth Australia, PhD Student, 2024 – present. *“Ni-rich iron meteorites as products of sulfide core formation.”*

Kathryn Gansler, University of Maryland, Senior Thesis Project, 2020, *“Untangling the effects of terrestrial weathering on the reflectance spectra of olivine-rich meteorites.”*

Research Presentations

Invited Talks

“Percolative Sulfide Core Formation in Oxidized Planetary Bodies.” Geological Society of America, San Antonio, TX, October 2025.

“Percolative Sulfide Core Formation in Oxidized Planetary Bodies.” Lunar and Planetary Laboratory Conference, August 2025.

“Percolative Sulfide Core Formation in Oxidized Planetary Bodies.” Smithsonian NMNH, Dept of Mineral Sciences Seminar, August 2025.

“Percolative Sulfide Core Formation in Oxidized Planetary Bodies.” Curtin University, Dept of Geosciences Colloquium, August 2025.

“Percolative Sulfide Core Formation in Oxidized Planetary Bodies.” Forrest Research Symposium, Perth, WA, Australia, July 2025.

“Evidence for Oxidized, Sulfur-rich Core Formation in Meteorites and Asteroids.” Smithsonian Institution National Museum of Natural History, Department of Mineral Sciences, Washington, D.C., 2022.

“Experimental and Geochemical Investigation of Oxidized, Sulfur-rich Core Formation.” Joint Session between Lunar and Planetary Institute, NASA Johnson Space Center, Houston, TX, 2021.

“Understanding Oxidized Differentiation through the Brachinites and Implications for Oxidized Bodies in the Solar System.” Lunar and Planetary Institute, USRA, Houston, TX, 2019.

Contributed Talks and Departmental Seminars

"Percolative Sulfide Core Formation in Oxidized Planetary Bodies." 87th Annual Meeting of the Meteoritical Society, July 2025.

"Multiphoton Microscopy as a Novel Tool for Astromaterials Analysis." Lunar and Planetary Laboratory Conference, 2024.

"Oxidized Planetary Differentiation." Lunar and Planetary Laboratory Colloquium, University of Arizona, Tucson, AZ, April 2024.

"Percolative Sulfide Core Formation in Oxidized Meteorite Parent Bodies." Lunar and Planetary Science Conference, 2024.

"The Onset of Oxidized Differentiation: Sulfide Melting Experiments." 84th Annual Meeting of the Meteoritical Society, 2022.

"Parent Body Histories Recorded in Oxidized Chondrite Sulfides: Implications for Core Formation." Lunar and Planetary Science Conference, 2021.

"Evolution of Platinum-Group Element Phases in R Chondrites." 82nd Annual Meeting of the Meteoritical Society, 2019.

"R Chondrites to Brachinites: Insights from Discrete Platinum Group Phases and Sulfides." Lunar and Planetary Science Conference, 2018.

"Oxidized Primitive Achondrites Sample Distinct Parent Bodies." Differentiation: Building the Internal Architecture of Planets, 2018.

"Olivine-Dominated Achondrites Record Multiple Trends of Differentiation." Lunar and Planetary Science Conference, 2018.

"Stannern-trend Eucrite Petrogenesis: An Assessment of Partial Melt Contamination Models via Experimental Petrology." Annual Meeting of the Meteoritical Society, 2016.

Posters

"Percolative Sulfide Core Formation in Oxidized Bodies." Lunar and Planetary Laboratory Conference, 2024.

"Percolative Sulfide Core Formation." Buseck Meteorite Symposium, 2023.

"Refractory Inclusions in the Eaton Brass Pseudometeorite." 84th Annual Meeting of the Meteoritical Society, 2022.

"Compositional and Petrologic Interpretations of Olivine-Dominated Asteroids." Lunar and Planetary Science Conference, 2022.

"Is Brachina an Impact Melt?" Lunar and Planetary Science Conference, 2020.

"A New Angrite Oxybarometer: Olivine-Melt Vanadium Distribution in D'Orbigny." Annual Meeting of the Meteoritical Society, 2017.

"Experimental Insights into Stannern-group Eucrite Petrogenesis." Lunar and Planetary Science Conference, 2017.

"Stannern-trend eucrite petrogenesis: An assessment of partial melt contamination models via experimental petrology." Lunar and Planetary Science Conference, 2016.

"Analyzing Unclassified Meteorites." Lunar and Planetary Science Conference, 2015.

Service, Outreach, and Diversity Initiatives

LPSC Dwornik Award Judge, 2024

LPSC Early Career Award Judge, 2023

LPI Seminar Series Co-organizer, 2022-present

LPI SEM Facility Co-manager, 2022-present

MetSoc Session Chair: Small Bodies, 2022

MetSoc McKay Student Award Judge, 2022

Kids Excelling in Math and Science (KEMS) Middle School Outreach Program, Weekly Mentor/Tutor at Hyattsville Middle School, 2019

Technical Logistics Volunteer, Meeting of Meteoritical Society 82, Sapporo, Japan, July 2019

UMD Geology Department's Inclusivity, Diversity, Equity, and Awareness (IDEA) Committee; Founding Member and Graduate Student Representative, 2018-2019

Maryland Day, Geology Department Volunteer Educator 2017-19

CosmoMeet, Astronomy-Geology Department Discussion Forum Organizer 2017-2019

Planetary Science-Palooza, Conference Volunteer, The Woodlands, TX, 2017

Social Science, Perot Museum of Natural History, Volunteer Educator April 2016

Judge for Undergraduate Research Presentations, Texas Christian University, May 2016

Monnig Meteorite Gallery Tour Guide 2014-2016

Monnig Meteorite Collection Student Curatorial Assistant 2014-2016

U.S. Peace Corps Volunteer, Sierra Leone, 2011-2013