

Matthew C. Brennan

mcbrennan@lanl.gov

(505) 665-3971

mcbrennan.github.io

Education

Harvard University

2022 Ph.D. in Earth & Planetary Sciences

2020 M.A. in Earth & Planetary Sciences

University of Chicago

2017 B.S. with Honors in Geophysical Sciences / B.S. in Environmental Sciences

Research Positions

Sep 2022 **Harold Agnew National Security Postdoctoral Fellow**

– now (formerly Glenn T. Seaborg Institute Fellow, Postdoctoral Research Associate)
Static High Pressure Team, Los Alamos National Laboratory
Project: “Equations of State and Material Synthesis using High-Pressure Experimental Techniques”

Aug. 2017 **Graduate Research Assistant**

– June 2022 Laboratory for Mineral Physics, Harvard University
Dissertation: “Investigating Planetary Core Formation with Geophysical Modeling and High-Pressure Mineralogy”

2016 – now **Synchrotron X-ray user**

HPCAT & GSECARS, Advanced Photon Source, Argonne National Laboratory
Beamline 12.2.2, Advanced Light Source, Berkeley National Laboratory

Nov. 2015 **Laboratory Technician**

– June 2017 Laboratory for Mineral Physics, University of Chicago
Thesis: “Molten Iron – Solid Silicate Interactions in Earth's Deep Interior”

June 2016 **Department of Energy SULI Program Researcher**

– Aug. 2016 Energy Systems Division, Argonne National Laboratory
Project: “Water Use for Power Generation in the United States”

Publications

Submitted **“Nonlinearity of the Post-Spinel Transition and its Expression in Slabs and Plumes Worldwide”** J. Dong, R. A. Fischer, L. P. Stixrude, M. C. Brennan, K. Daviau, T. Suer, K. M. Turner, Y. Meng, V. B. Prakapenka

Submitted **“Investigating E-MORB and OIB Petrogenesis using Machine Learning”** Z. T. Eriksen, S. B. Jacobsen, C. H. Langmuir, J. Dong, M. C. Brennan, J. T. Gu

- 2024 **“Phase Comparison and Equation of State for Ta₂O₅”** M. C. Brennan, D. A. Rehn, L. Q. Huston, B. T. Sturtevant (2024). *Journal of Physics: Condensed Matter* 36, 275401.
- 2023 **“Thermal Equation of State of U₆Fe from Experiments and Calculations”** M. C. Brennan, J. D. Coe, S. C. Hernandez, S. Crockett, L. Q. Huston, S. M. Thomas, B. T. Sturtevant, E. D. Bauer (2023). *Physical Review B* 108, 064108.
- 2023 **“Comparisons of the Core and Mantle Compositions of Earth Analogs from Different Terrestrial Planet Formation Scenarios”** J. Gu, R. A. Fischer, M. C. Brennan, M. Clement, S. A. Jacobsen, N. A. Kaib, D. P. O’Brien, S. N. Raymond (2023). *Icarus* 394, 115425.
- 2022 **“Water Storage Capacity of the Martian Mantle Through Time”** J. Dong, R. A. Fischer, L. Stixrude, C. Lithgow-Bertelloni, Z. T. Eriksen, M. C. Brennan (2022) *Icarus* 385, 115113.
- 2022 **“Timing of Martian Core Formation from Models of Hf–W Evolution Coupled with N-body Simulations.”** M. C. Brennan, R. A. Fischer, F. Nimmo, D. P. O’Brien (2022) *Geochimica et Cosmochimica Acta* 316, 295–308.
- 2021 **“High-Pressure Deformation of Iron–Nickel–Silicon Alloys and Implications for Earth’s Inner Core.”** M.C. Brennan, R. A. Fischer, S. Couper., L. Miyagi, D. Antonangeli, G. Morard (2021). *Journal of Geophysical Research: Solid Earth* 126, e2020JB021077.
- 2020 **“Equation of State of TiN at High Pressures and Temperatures: A Possible Host for Nitrogen in Planetary Mantles.”** K. Daviau, R. A. Fischer, M. C. Brennan, J. Dong, T. Suer, S. Couper, Y. Meng, V. B. Prakapenka, (2020). *Journal of Geophysical Research: Solid Earth* 126, e2020JB020074.
- 2020 **“Core Formation and Geophysical Properties of Mars.”** M. C. Brennan, R. A. Fischer, J. C. Irving (2020). *Earth and Planetary Science Letters* 530, 115923.

Presentations

- 2024 **“Synthesis and Characterization of Metastable Tetragonal UTe₂ at Ambient Conditions”**, Poster Presentation (Gordon Research Conference)
- 2024 **“High-Pressure Investigations of U-bearing Intermetallics”**
Invited Talk (Energy and Natural Resources Security Group, LANL)
- 2023 **“Thermal Equation of State of U₆Fe”**, Oral Presentation (APS Shock Compression of Condensed Matter Meeting)
- 2023 **“The First Thermal Equation of State for U₆Fe”**, Invited Talk (Dynamic Material Properties Meeting, LANL)

- 2023 **“Update on the U₆Fe Equation of State”**
Oral Presentation (Production Science Chemistry L2 Review, DOE)
- 2022 **“High-Pressure Deformation of Iron–Nickel–Silicon Alloys and Implications for Earth’s Inner Core”**, Invited Talk (Materials at Extreme Conditions Group, Stony Brook University)
- 2022 **“Static Deformation of Iron–Nickel–Silicon Alloys at High Pressures”**, Invited Talk (Shock & Detonation Physics Group, LANL)
- 2022 **“A Mineral Physics Perspective on the Martian Core”**, Invited Talk (Planetary Geophysics Group, ETH Zürich)
- 2021 **“A Mechanically Strong Inner Core Implied by Deformation of Silicon-bearing Alloys”**, Poster Presentation (AGU Fall Meeting)
- 2021 **“Deep Mars”**, Invited Talk (Harvard EPS Colloquium)
- 2020 **“High-Pressure Deformation and Texturing of Fe–Ni–Si alloys”**, Oral Presentation (COMPRES Annual Meeting)
- 2019 **“Martian Core Formation: Implications from the Hf–W System”**, Poster Presentation (Goldschmidt Conference)
- 2019 **“Using Core Formation and Geophysical Modelling to Predict the Core Radius and Seismic Properties of Mars”**, Oral Presentation (Lunar and Planetary Science Conference)
- 2018 **“A Core Formation Model with Implications for the Properties of the Martian Interior”**, Oral Presentation (AGU Fall Meeting)
- 2018 **“The Composition and Seismic Properties of the Martian Interior”**, Oral Presentation (Goldschmidt Conference)
- 2017 **“Deep-Earth Partitioning between Molten Iron Alloys and Solid Silicates”**, Poster Presentation (AGU Fall Meeting)

Teaching & Mentoring

- Summer 2024 **Graduate Research Assistant Mentor** (LANL)
- Fall 2021 **Head Teaching Fellow**, A Brief History of the Earth (Harvard EPS 10)
- Spring 2021 **Teaching Fellow**, Stellar and Planetary Astronomy (Harvard ASTRON 16)
- Fall 2020 **Teaching Fellow**, A Brief History of the Earth (Harvard EPS 10)
- Fall 2019 **Teaching Fellow**, Mineralogy (Harvard EPS 142)

Service & Outreach

- 2023 – 2025 **Users' Executive Committee member** (Advanced Photon Source)
- 2023 **Session Chair**, “Interiors of Small Rocky Bodies” (AGU Fall Meeting)
- 2023 **Guest speaker**, “The Mysteries of the Deep Earth” (Pajarito Environmental Education Center)
- 2023 – now **Proposal reviewer** (ANR Appel à Projets Générique, NASA Emerging Worlds, APS User Meeting, SSAA Centers of Excellence)
- 2022 **Featured speaker**, “From Blue to Red: How Mars Got and Lost its Water” (Science in the News Public Seminar Series)
- 2022 **Curatorial assistant**, Mineral Type Specimens (Harvard Mineralogical & Geological Museum)
- 2021 **Guest speaker** (Cambridge Rindge and Latin School Astronomy Club)
- 2021 **Program leader**, Summer Short-Term Student Program (Harvard Earth & Planetary Sciences)
- 2020 – now **Peer reviewer** (*Physics of the Earth & Planetary Interiors*, *Nature Communications*, *Nature Reviews: Earth & Environment*, *Physics & Chemistry of Minerals*)
- 2020 **Early career panelist** (COMPRES Annual Meeting)
- 2020 **Science Education Partner** (Harvard Museum of Natural History)
- 2018 – 2020 **Museum volunteer trainer** (Harvard Museum of Natural History)
- 2018 – 2019 **Graduate Outreach Chair** (Harvard Earth & Planetary Sciences)
- 2018 **Tutor**, Cambridge School Volunteers (Cambridge Public Schools)
- 2017 – 2022 **Laboratory Safety Officer**, Department of Environmental Health & Safety (Harvard University)

Honors & Awards

- 2023 **Harold Agnew National Security Postdoctoral Fellowship** (LANL)
- 2022 **Glenn T. Seaborg Nuclear Science Fellowship** (LANL)
- 2021 **Derek Bok Center Teaching Certificate** (Harvard University)
- 2019 **National Science Foundation Graduate Research Fellowship**
- 2017 **Departmental Honors in Geophysical Sciences** (University of Chicago)
- 2014 – 2017 **Dean's List** (University of Chicago)