# Matthew C. Brennan

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## 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

2024 – now **Scientist**
Static High Pressure Team, Los Alamos National Laboratory

2022 – 2024 **Harold Agnew National Security Postdoctoral Fellow**
(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"

2017 – 2022 **Graduate Research Assistant**
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

2015 – 2017 **Laboratory Technician**
Laboratory for Mineral Physics, University of Chicago
Thesis: "Molten Iron – Solid Silicate Interactions in Earth's Deep Interior"

2016 **Department of Energy SULI Program Researcher**
Energy Systems Division, Argonne National Laboratory
Project: "Water Use for Power Generation in the United States"

## Publications

In Press "**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 (2024). *Nature Communications.*

2024 "**Phase Comparison and Equation of State for $Ta_2O_5$**" 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 $U_6Fe$ 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 $UTe_2$ at Ambient Conditions**", Poster (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 $U_6Fe$**", Talk (APS SCCM Meeting)

2023 "**The First Thermal Equation of State for $U_6Fe$**", Talk (Dynamic Material Properties Meeting, LANL)

2023 "**Update on the $U_6Fe$ Equation of State**", Invited Talk (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 (AGU Fall Meeting)

2021 "**Deep Mars**", Invited Talk (Harvard EPS Colloquium)

2020 "**High-Pressure Deformation and Texturing of Fe–Ni–Si alloys**", Talk (COMPRES Annual Meeting)

2019 "**Martian Core Formation: Implications from the Hf–W System**", Poster (Goldschmidt Conference)

2019 "**Using Core Formation and Geophysical Modelling to Predict the Core Radius and Seismic Properties of Mars**", Talk (Lunar and Planetary Science Conference)

2018 "**A Core Formation Model with Implications for the Properties of the Martian Interior**", Talk (AGU Fall Meeting)

2018 "**The Composition and Seismic Properties of the Martian Interior**", Talk (Goldschmidt Conference)

2017 "**Deep-Earth Partitioning between Molten Iron Alloys and Solid Silicates**", Poster (AGU Fall Meeting)

## Teaching & Mentoring

2024 **Graduate Research Assistant Mentor** (LANL)

2021 **Head Teaching Fellow**, A Brief History of the Earth (Harvard EPS 10)

2021 **Teaching Fellow**, Stellar and Planetary Astronomy (Harvard ASTRON 16)

2020 **Teaching Fellow**, A Brief History of the Earth (Harvard EPS 10)

2019 **Teaching Fellow**, Mineralogy (Harvard EPS 142)

## Honors & Awards

2024 **APS Student and Dissertation Award** (American Physical Society GCCM)

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)

## Service & Outreach

2025 – 2027 **Executive Committee Member (**American Physical Society Topical Group on Compression of Condensed Matter)

2024 **Student Research Symposium Judge** (LANL)

2023 – 2025 **Executive Committee Member** (Advanced Photon Source)

2023 **Guest speaker** (Pajarito Environmental Education Center)

2023 – now **Proposal reviewer** (ANR Appel à Projets Générique, NASA Emerging Worlds, Advanced Photon Source User Meeting, SSAA Centers of Excellence)

2022 **Featured speaker** (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** (*Planetary Science Journal*, *Physics Letters, Physics & Chemistry of Minerals*, *Nature Reviews: Earth & Environment*, *Nature Communications*, *Physics of the Earth & Planetary Interiors*)

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)