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

Sep 2022 – now **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"

Aug. 2017 – June 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**
HP-CAT & GSECARS, Advanced Photon Source, Argonne National Laboratory
Beamline 12.2.2, Advanced Light Source, Berkeley National Laboratory

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

June 2016 – Aug. 2016 **Department of Energy SULI Program Researcher**
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 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

2023 "**Thermal Equation of State of U_6Fe**"
Oral Presentation (APS Shock Compression of Condensed Matter Meeting)

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

2023 "**Update on the U_6Fe 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

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 and 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 and 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)