

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

Harold Agnew National Security Postdoctoral Fellow

June 2023 – now Static High Pressure Team, Los Alamos National Laboratory

Project: “Material Characterization and Synthesis with High Pressure Static Compression”

Glenn T. Seaborg Institute Postdoctoral Fellow

Jan. 2023 – May 2023 Static High Pressure Team, Los Alamos National Laboratory

Project: “High Pressure–Temperature Synthesis and Characterization of Uranium Intermetallics”

Postdoctoral Research Associate

Sep. 2022 – Dec. 2022 Static High Pressure Team, Los Alamos National Laboratory

Project: “Equations of State and Material Synthesis using High-Pressure Experimental Techniques”

Graduate Research Assistant

Aug. 2017 – June 2022 Laboratory for Mineral Physics, Harvard University

Dissertation: “Investigating Planetary Core Formation with Geophysical Modeling and High-Pressure Mineralogy”

Synchrotron X-ray user

2016 – now GSECARS & HP-CAT, Advanced Photon Source, Argonne National Laboratory
Beamline 12.2.2, Advanced Light Source, Berkeley National Laboratory

Laboratory Technician

Nov. 2015 – June 2017 Laboratory for Mineral Physics, University of Chicago

Thesis: “Molten Iron – Solid Silicate Interactions in Earth's Deep Interior”

Department of Energy SULI Program Researcher

June 2016 – Aug. 2016 Energy Systems Division, Argonne National Laboratory

Project: “Water Use for Power Generation in the United States”

Publications

- In press **“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.
- In review **“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
- In review **“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
- 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, Los Alamos National Laboratory)

- 2023 **“Update on the U₆Fe Equation of State”**, Oral Presentation (Production Science Chemistry L2 Review, Department of Energy)
- 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, Los Alamos National Laboratory)
- 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	Guest speaker , “The Mysteries of the Deep Earth” (Pajarito Environmental Education Center)
2023	Proposal reviewer , Centers of Excellence for Characterization of Materials Properties under Extreme Conditions (Stewardship Science Academic Alliance)
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 (<i>Nature Communications</i> , <i>Nature Reviews: Earth & Environment</i> , <i>Physics and Chemistry of Minerals</i>)
2020	Panelist , “Conducting research and managing your career in the time of pandemic” (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 – 2025	Harold Agnew National Security Postdoctoral Fellowship
2022 – 2024	Glenn T. Seaborg Nuclear Science Fellowship
2021	Derek Bok Center Teaching Certificate
2019 – 2022	National Science Foundation Graduate Research Fellowship
2019 – 2020	Associate Member of Sigma Xi Honor Society
2017	Departmental Honors in Geophysical Sciences (University of Chicago)
2014 – 2017	Dean's List (University of Chicago)