Matthew C. Brennan

mcbrennan@g.harvard.edu (914) 346–0291 mcbrennan.github.io

Education

	Harvard University
May 2022	(expected) Ph.D. in Mineral Physics
March 2020	M.A. in Earth & Planetary Sciences
	University of Chicago
June 2017	B.S. with Honors in Geophysical Sciences / B.S. in Environmental Sciences

Research Positions

2017 – now	**Graduate student** Laboratory for Mineral Physics, Harvard University Advisor: Dr. Rebecca A. Fischer Dissertation: "Investigating Planetary Core Formation with Geophysical Modeling and High Pressure Mineralogy"
2016 – now	**Synchrotron user** GSECARS & HP-CAT, Advanced Photon Source, Argonne National Laboratory Beamline 12.2.2, Advanced Light Source, Berkley National Laboratory
2015 – 2017	**Laboratory technician** Laboratory for Mineral Physics, University of Chicago Advisor: Dr. Andrew J. Campbell Thesis: "Molten Iron – Solid Silicate Interactions in Earth's Deep Interior"
2016	**Department of Energy SULI Program Researcher** Energy Systems Division, Argonne National Laboratory Supervisor: Dr. May Wu Project: "Water Use for Power Generation in the United States"

Publications

In review	"**Temperature-dependent Clapeyron slope of the post-spinel transition in Mg_2SiO_4"** 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
In review	**"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
2021	**"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 (2021) *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

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: EPS 10 (A Brief History of the Earth)**

Spring 2021 **Teaching Fellow: ASTRON 16 (Stellar and Planetary Astronomy)**

Fall 2020 **Teaching Fellow: EPS 10 (A Brief History of the Earth)**

Fall 2019 **Teaching Fellow: EPS 142 (Mineralogy)**

Successful Proposals

2021 **"Strength and texturing of iron alloys at high pressures and temperatures"**
Synchrotron Proposal (Beamline 12.2.2, Advanced Light Source)

2019 **"Physical properties of iron alloys with implications for inner core anisotropy"**
Fellowship Proposal (NSF Graduate Research Fellowship)

2018 **"Mantle Melting Temperatures of the Earth and Mars"**
Synchrotron Proposal (GSECARS, Advanced Photon Source)

Service and Outreach

2021 **Guest speaker**
Cambridge Rindge and Latin School Astronomy Club

2021 **Program leader**
EPS Summer Short-Term Student Program

2020 – now **Peer reviewer**
Nature Communications, *Nature Reviews: Earth & Environment*, *Physics and Chemistry of Minerals*

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**
Department of Earth & Planetary Sciences, Harvard University

2018 **Volunteer tutor**
Cambridge School Volunteers, Cambridge Public Schools

2017 – now **Laboratory Safety Officer**
Department of Environmental Health & Safety, Harvard University

2017 – 2018 **Gallery guide**
Harvard Museum of Natural History

Honors and Awards

2021 **Derek Bok Center Teaching Certificate**

2019 – now **National Science Foundation Graduate Research Fellow**

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

Skills

Experiment	**Diamond anvil cell** assembly, loading, laser optics, Raman spectroscopy **X–ray diffraction** synchrotron and conventional sources, diffraction analysis **Scanning electron microscopy** sample preparation, FIB, EBSD, EDS **Rock preparation** field work, lapidary tools, epoxy mounting, polishing **Piston-cylinder press** assembly, hydraulics, electronics, thermocouples **Optical telescope** celestial coordinates, image acquisition, image analysis
Computation	**Programming** Python (Keras/Tensorflow), MATLAB, Mathematica, LaTeX, HTML, SQL **X-ray diffraction** DIOPTAS, MAUD, BEARTEX, FIT2D, APEX3, Olex^2 **Other** Adobe Illustrator, ImageJ, MS Office, GIS