Rebecca A. Fischer

CONTACT INFORMATION

Harvard University
Department of Earth and Planetary Sciences
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EDUCATION

University of Chicago Ph.D. in Geophysical Sciences, August 2015

Northwestern University B.A. in Integrated Science and Earth and Planetary Sciences, June 2009

POSITIONS HELD

2017–present Clare Boothe Luce Assistant Professor of Earth and Planetary Sciences, Harvard University

2015–2017 NSF Postdoctoral Fellow, Smithsonian National Museum of Natural History and the University of California Santa Cruz

2015–2017 Visiting Assistant Professor of Earth and Planetary Sciences, Harvard University

2010–2015 Graduate research assistant, University of Chicago, Laboratory for Mineral Physics

2009–2010 Graduate research assistant, University of Maryland, Laboratory for Mineral Physics

SELECT HONORS AND AWARDS

2017–present Clare Boothe Luce professorship, Henry Luce Foundation, Harvard University

2015–2017 Postdoctoral Fellowship, National Science Foundation

2014 Graduate Research Award, Mineral and Rock Physics, American Geophysical Union

2014–2015 American Dissertation Fellowship, American Association of University Women

2014 Takken Award, Association of Women Geoscientists

2013–2014 Plotnick Fellowship, University of Chicago

2013–2014 Ludo Frevel Crystallography Scholarship, International Centre for Diffraction Data

2013 Career Development Award, Lunar and Planetary Institute

2012–2013 Graduate Research Fellowship, Illinois Space Grant Consortium

2009–2012 Graduate Research Fellowship, National Science Foundation

2009–2010 Flagship Fellowship, University of Maryland

BOOKS EDITED

Terasaki H., Fischer R.A., editors (2016) *Deep Earth: Physics and Chemistry of the Lower Mantle and Core*. AGU Geophysical Monograph Series, American Geophysical Union/John Wiley & Sons.

PUBLICATIONS

**Asterisk indicates my students*

*Brennan M.C., Fischer R.A., Irving J.C.E. (submitted) Core formation and geophysical properties of Mars.

Fischer R.A., Nimmo F. (2018) Effects of core formation on the Hf–W isotopic composition of the Earth and dating of the Moon-forming impact. *Earth and Planetary Science Letters* (499), 257–265.

Wordsworth R.D., Schaefer L., Fischer R.A. (2018) Redox evolution via gravitational differentiation on low mass planets: Implications for biosignatures, water loss, and habitability. *The Astronomical Journal* (155), 195.

Fischer R.A., Campbell A.J., Chidester B.A., Reaman D.M., Thompson E.C., Pigott J.S., Prakapenka V.B., Smith J.S. (2018) Equations of state and phase boundary for stishovite and $CaCl_2$-type SiO_2. *American Mineralogist* (103), 792–802.

Chidester B.A., Pardo O.S., Fischer R.A., Thompson E.C., Heinz D.L., Prescher C., Prakapenka V.B., Campbell A.J. (2018) High-pressure phase behavior and equations of state of ThO_2 polymorphs. *American Mineralogist* (103), 749–756.

Fischer R.A., Nimmo F., O'Brien D.P. (2018) Radial mixing and Ru–Mo isotope systematics under different accretion scenarios. *Earth and Planetary Science Letters* (482), 105–114.

Fischer R.A., Campbell A.J., Ciesla F.J. (2017) Sensitivities of Earth's core and mantle compositions to accretion and differentiation processes. *Earth and Planetary Science Letters* (458), 252–262.

Thompson E.C., Chidester B.A., Fischer R.A., Myers G.I., Heinz D.L., Prakapenka V.B., Campbell A.J. (2016) Equation of state of pyrite to 85 GPa and 2400 K. *American Mineralogist* (101), 1046–1051.

Fischer R.A. (2016) Melting of Fe-alloys and the thermal structure of the core. In: *Deep Earth: Physics and Chemistry of the Lower Mantle and Core*, edited by H. Terasaki and R.A. Fischer, AGU Geophysical Monograph Series, AGU/Wiley.

Shofner G.A., Campbell A.J., Danielson L.R., Righter K., Fischer R.A., Wang Y., Prakapenka V.B. (2016) The W–WO_2 oxygen fugacity buffer (WWO) at high pressure and temperature: Implications for fO_2 buffering and metal–silicate partitioning. *American Mineralogist* (101), 211–221.

Pigott J.S., Ditmer D.A., Fischer R.A., Reaman D.M., Hrubiak R., Meng Y., Davis R.J., Panero W.R. (2015) High-pressure, high-temperature equations of state using nanofabricated controlled-geometry Ni/SiO_2/Ni double hot-plate samples. *Geophysical Research Letters* (42), 10239–10247.

Fischer R.A., Campbell A.J. (2015) The axial ratio of hcp Fe and Fe–Ni–Si alloys to the conditions of Earth's inner core. *American Mineralogist* (100), 2718–2724.

Fischer R.A., Nakajima Y., Campbell A.J., Frost D.J., Harries D., Langenhorst F., Miyajima N., Pollok K., Rubie D.C. (2015) High pressure metal–silicate partitioning of Ni, Co, V, Cr, Si, and O. *Geochimica et Cosmochimica Acta* (167), 177–194.

Salamat A., Fischer R.A., Briggs R., McMahon M., Petitgirard S. (2014) *In situ* synchrotron X-ray diffraction in the laser-heated diamond anvil cell: melting phenomena and synthesis of new materials. *Coordination Chemistry Reviews* (277–278), 15–30.

Fischer R.A., Campbell A.J., Caracas R., Reaman D.M., Heinz D.L., Dera P., Prakapenka V.B. (2014) Equations of state in the Fe–FeSi system at high pressures and temperatures. *Journal of Geophysical Research: Solid Earth* (119), 2810–2827.

Fischer R.A., Ciesla F.J. (2014) Dynamics of the terrestrial planets from a large number of N-body simulations. *Earth and Planetary Science Letters* (392), 28–38.

Fischer R.A., Campbell A.J., Reaman D.M., Miller N.A., Heinz D.L., Dera P., Prakapenka V.B. (2013) Phase relations in the Fe–FeSi system at high pressures and temperatures. *Earth and Planetary Science Letters* (373), 54–64.

Fischer R.A., Campbell A.J., Caracas R., Reaman D.M., Dera P., Prakapenka V.B. (2012) Equation of state and phase diagram of Fe–16Si alloy as a candidate component of Earth's core. *Earth and Planetary Science Letters* (357–358), 268–276.

Fischer R.A., Campbell A.J., Lord O.T., Shofner G.A., Dera P., Prakapenka V.B. (2011) Phase transition and metallization of FeO at high pressures and temperatures. *Geophysical Research Letters* (38), L24301.

Fischer R.A., Campbell A.J., Shofner G.A., Lord O.T., Dera P., Prakapenka V.B. (2011) Equation of state and phase diagram of FeO. *Earth and Planetary Science Letters* (304), 496–502.

Fischer R.A., Campbell A.J. (2010) High pressure melting of wüstite. *American Mineralogist* (95), 1473–1477.

Cottrell E., Kelley K.A., Lanzirotti A.T., Fischer R.A. (2009) High-precision determination of iron oxidation state in silicate glasses using XANES. *Chemical Geology* (268), 167–179.

Lin J.F., Scott H.P., Fischer R.A., Chang Y.Y., Kantor I., Prakapenka V.B. (2009) Phase relations of Fe–Si alloy in Earth's core. *Geophysical Research Letters* (36), L06306.

Jacobsen S.D., Holl C.M., Adams K.A., Fischer R.A., Martin E.S., Bina C.R., Lin J.F., Prakapenka V.B., Kubo A., Dera P. (2008) Compression of single-crystal magnesium oxide to 118 GPa and a ruby pressure gauge for helium pressure media. *American Mineralogist* (93), 1823–1828.

Invited Departmental Colloquia

Stanford University, Department of Geological Sciences, 2019.

Princeton University, Department of Geosciences, Solid Earth Seminar, 2018.

Massachusetts Institute of Technology, Chemical Oceanography, Geology, Geochemistry, and Geobiology group, 2018.

Yale University, Department of Geology and Geophysics, 2016.

Geological Society of Washington, 2016.

University of Maryland, Department of Geology, 2016.

Smithsonian National Museum of Natural History, Department of Mineral Sciences, 2016.

Columbia University, Lamont-Doherty Earth Observatory, Geodynamics Seminar, 2016.

Argonne National Laboratory, Advanced Photon Source, High Pressure Interest Group, 2015.

Eidgenössische Technische Hochschule (ETH) Zürich, Department of Earth Sciences, 2015.

Northwestern University, Department of Earth and Planetary Sciences, 2015.

University of California Santa Cruz, Department of Earth & Planetary Sciences, 2015.

California Institute of Technology, Seismological Laboratory, 2015.

Massachusetts Institute of Technology, Department of Earth, Atmospheric and Planetary Sciences, 2015.

Harvard University, Department of Earth and Planetary Sciences, 2015.

University of Southern California, Department of Earth Sciences, 2015.

University of Chicago, Department of the Geophysical Sciences, 2015.

Washington University in St. Louis, Department of Earth and Planetary Sciences, 2014.

University of California Berkeley, Department of Earth and Planetary Science, 2014.

Harvard University, Department of Earth and Planetary Sciences, 2014.

Carnegie Institution of Washington, Geophysical Laboratory, 2014.

Invited Conference Presentations

AGU Fall Meeting, 2018. Metal–silicate partitioning of carbon to 59 GPa and >5000 K with implications for Earth's core formation.

NASA Differentiation: Building the Internal Architecture of Planets Meeting, 2018. What can the Hf–W system tell us about the mechanism and timing of Earth's core formation?

AGU Fall Meeting, 2017. Radial mixing and Ru–Mo isotope systematics under different accretion scenarios.

Magma Oceanology Workshop, 2016. Effects of core formation on the Hf–W system on Earth.

Goldschmidt Conference, 2016, Keynote talk. Sensitivities of Earth's core and mantle compositions to accretion and differentiation processes.

European Geophysical Union General Assembly, 2016. The composition of Earth's core from equations of state, metal–silicate partitioning, and core formation modeling.

Carbon at Extreme Conditions Workshop, Centre Européen de Calcul Atomique et Moléculaire (CECAM), 2015. Metal–silicate partitioning of Ni, Co, V, Cr, Si, and O in the presence of carbon to 100 GPa and 5700 K with application to Earth's core formation.

Goldschmidt Conference, 2014, Keynote talk. Experimental constraints on the core's Si and O contents from equations of state and metal–silicate partitioning.

Geological Society of America Annual Meeting, 2013. Phase diagrams of FeO and Fe–Si alloys.

Goldschmidt Conference, 2013. Phase diagrams of FeO and Fe–Si alloys.

Contributed Conference Presentations

AGU Fall Meeting, 2018. Equations of state of stishovite and $CaCl_2$-type SiO_2 to lower mantle conditions.

Goldschmidt Conference, 2018. Equations of state and phase diagram of SiO_2 to lower mantle conditions.

Lunar and Planetary Science Conference, 2018. The origin of the Moon's Earth-like ^{182}W isotopic composition.

Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting, 2017. Sensitivities of Earth's core and mantle compositions to accretion and differentiation processes.

Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting, 2017. Effects of core formation on the Hf–W system.

AGU Fall Meeting, 2016. Effects of core formation on the Hf–W system.

Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting, 2016. Radial mixing and Ru–Mo isotope systematics under different accretion scenarios.

Lunar and Planetary Science Conference, 2016. Radial mixing under different accretion scenarios: Observational constraints.

AGU Fall Meeting, 2015. The axial ratio of hcp Fe and Fe–Ni–Si alloys to the conditions of Earth's inner core.

Deep Carbon Observatory Early Career Scientist Workshop, 2015. Metal–silicate reactions in the presence of carbon with application to Earth's core formation.

Deep Carbon Observatory Early Career Scientist Workshop, 2015. Metal–silicate partitioning of Ni, Co, V, Cr, Si, and O in the presence of carbon to 100 GPa and 5500 K.

COMPRES Annual Meeting, 2015. The axial ratio of hcp Fe and Fe–Ni–Si alloys to the conditions of Earth's inner core.

AGU Fall Meeting, 2014. Combining N-body accretion simulations with partitioning experiments in a statistical model of terrestrial planet accretion and core formation.

HPCAT Workshop, 2014. High pressure phase transition in (Mg,Mn)O.

COMPRES Annual Meeting, 2014. High pressure phase transition in (Mg,Mn)O.

Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting, 2014. Metal–silicate partitioning of Co, Ni, V, Cr, Si, and O up to 100 GPa and 5500 K.

Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting, 2014. Quantitative chemical analysis of carbon and oxygen in molten Fe-rich alloy by analytical transmission electron microscopy.

AGU Fall Meeting, 2013. Metal–silicate partitioning of Co, Ni, V, Cr, Si, and O up to 100 GPa and 5500 K: Implications for core formation.

Gordon Research Conference: Origins of Solar Systems, 2013. Dynamics and chemical evolution of the terrestrial planets from a large number of N-body simulations.

COMPRES Annual Meeting, 2013. High pressure metal–silicate partitioning of Co, Ni, Si, V, Cr, and O.

Lunar and Planetary Science Conference, 2013. Dynamics and chemical evolution of the terrestrial planets from a large number of N-body simulations.

Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting, 2013. Metal–silicate experiments in the laser-heated diamond anvil cell.

AGU Fall Meeting, 2012. High pressure melting, phase diagrams, and equations of state in the Fe–FeSi system with applications to Earth's core.

COMPRES Annual Meeting, 2012. Equations of state and phase diagrams of iron–silicon alloys.

AGU Fall Meeting, 2011. Phase diagram and equation of state of Fe–Si alloy.

COMPRES Annual Meeting, 2011. The phase diagram of FeO.

COMPRES Annual Meeting, 2011. The phase diagram of FeO.

AGU Fall Meeting, 2010. Equation of state of FeO.

HPCAT/CDAC Short Course, 2010. Equation of state and B1/B8 phase transition in FeO.

International Mineralogical Association Meeting, 2010. Equation of state and B1/B8 phase transition in FeO.

COMPRES Annual Meeting, 2010. Equation of state and B1/B8 phase transition in FeO.

AGU Fall Meeting, 2008. Phase diagram of wüstite at high pressures and temperatures.

AGU Fall Meeting, 2007. Micro-XANES determination of Fe speciation in natural basalts at mantle-relevant fO_2.

TEACHING EXPERIENCE

Fall 2018 Professor for EPS 248 (Topics in Mineral Physics and Chemistry, Harvard University

Fall 2017, Spring 2019 Professor for EPS 142 (Mineralogy, Harvard University)

Spring 2013, 2014 Teaching assistant for GEOS 21200/31200 (Physics of the Earth, University of Chicago)

Fall 2013 Teaching assistant for GEOS 21000 (Introduction to Mineralogy, University of Chicago)

Fall 2011 Teaching assistant for PHSC 13500 (Chemistry and the Atmosphere, University of Chicago)

STUDENT MENTORING

As Ph.D. supervisor:

Matthew Brennan, 2017–present

Junjie Dong, 2017–present

As committee member:

Sophie Coulson

James Muller

SELECT PRESS COVERAGE

"Solar System Simulation Reveals Planetary Mystery." *NASA Astrobiology Magazine*, 8 September 2014. By E. Howell.

"Mystery at the Center of the Earth." *Inquiry: News from the University of Chicago Physical Sciences Division*. Fall/Winter 2012 (cover article). By B. Recchie.

"Iron Oxide in Earth's Outer Core." *APS Science 2011: Research and Engineering Highlights from the Advanced Photon Source at Argonne National Laboratory*, May 2012. By D. Desonie.

"Journey to the Center of the Earth." *Optics and Photonics Focus*, 7 March 2012, Vol. 16, Story 9. By G. Volpe.

"In a Squeeze." *Science News*, 14 January 2012, Vol. 181 (1), p. 2. By A. Witze.

SCIENTIFIC AND UNIVERSITY SERVICE

Journal reviewer: American Mineralogist, Calphad, Comptes Rendus Geoscience, Earth and Planetary Science Letters, Geochemical Perspectives Letters, Geochimica et Cosmochimica Acta, Geophysical Research Letters, High Temperatures-High Pressures, Icarus, Journal of Alloys and Compounds, Journal of Geophysical Research: Planets, Journal of Geophysical Research: Solid Earth, Nature, Nature Astronomy, Nature Communications, Physics and Chemistry of Minerals, Physics of the Earth and Planetary Interiors, Powder Metallurgy, Progress in Earth and Planetary Science, Review of Scientific Instruments, Science, Science Advances

2018–present Search Committee member, Department of Earth and Planetary Sciences, Harvard University

2018–present Museum Committee member, Department of Earth and Planetary Sciences, Harvard University

2017–present Graduate Studies Committee member, Department of Earth and Planetary Sciences, Harvard University

2013–present Executive Committee member, Mineral and Rock Physics, American Geophysical Union

Meetings Committee member, 2015–2017

Student representative, 2013–2015

2018 Session organizer and chair, American Geophysics Union Fall Meeting: *Composition and Material Properties of the Core*

2017–2018 Department colloquium organizer, Department of Earth and Planetary Sciences, Harvard University

2017 Session organizer and chair, American Geophysical Union Fall Meeting: *Liquids and Melting in Earth and Planetary Interiors*; *Petrology, Partitioning, and Phase Diagrams at Extreme Conditions*; and *Rock-Fluid Interactions and Their Influence on Multiphase Flow in Petroleum Reservoirs*

2017 Nominations Committee member, COMPRES

2016–2017 Theme chair, Earth's Mantle and Core, 2017 Goldschmidt Conference

2016 Session organizer and chair, American Geophysical Union Fall Meeting: *Elasticity, Plasticity, and Microstructures in Planetary Interiors*

2015 Session organizer and chair, American Geophysical Union Fall Meeting: *Elasticity of Earth Materials: From Mantle to Core*, and *General Contributions to Mineral and Rock Physics*

2015 Panelist, COMPRES Annual Meeting, student and postdoc panel discussion: *Interviewing for a job*

2014 Session chair, Goldschmidt Conference: *Collisional evolution of terrestrial planets: Accretion and post-accretion bombardment*

2014 Session chair, Accretion and Early Differentiation of the Earth and Terrestrial Planets Meeting: *Earth composition*

2013 Session organizer and chair, American Geophysical Union Fall Meeting: *Chemistry and physics of Earth's lower mantle and core*

2013 Program Committee member and session chair, COMPRES Meeting

2012 Disciplinary Review Committee member, University of Chicago

2012–2013 Representative to the Dean's Student Advisory Board, University of Chicago

2011–2013 Student and Postdoc Committee member, COMPRES

Chair, 2012–2013

OUTREACH

2017–present Mentor for Harvard Graduate Women in Science and Engineering, Harvard University

2018 Panelist, Harvard Origins of Life Initiative symposium

2018 Student presentation judge, Dwornik Award, Lunar and Planetary Science Conference

2018 Interviewed for:

The Harvard Crimson (http://www.thecrimson.com/article/2018/3/8/eps-new-junior-faculty/)

Popular Science (https://www.popsci.com/diamonds-meteorites-long-lost-planet)

2017, 2018 Student presentation judge, COMPRES Meeting

2016–2018 Student presentation judge, Outstanding Student Paper Award, Mineral and Rock Physics, AGU Fall Meeting

2017 Interviewed for:

The Harvard Crimson

Popular Science (https://www.popsci.com/neutron-star-gold)

2016 CRAM career mentor, AGU Fall Meeting

2016 Volunteer educator, Halloween "Air and Scare" Event, Smithsonian National Air and Space Museum

2016 Panelist, "Science Speed Dating" program for high school interns, Smithsonian National Museum of Natural History, Washington, DC

2016 Science fair judge:

DC elementary school STEM Fair, Washington, DC

DC middle and high school STEM Fair, Washington, DC

2016 Interviewed for:

GeoSpace, American Geophysical Union Blogosphere (http://blogs.agu.org/geospace/2016/06/15/new-study-questions-source-rare-earth-metals-provide-clues-lifes-origins)

EARTH Magazine

Live Science (http://www.livescience.com/53431-magnesium-powers-earth-magnetic-field.html)

2015 "Scientist is In" program, Smithsonian National Museum of Natural History, Washington, DC

2015 Speaker, volunteer education event, Smithsonian National Museum of Natural History, Washington, DC

2015 Interviewed for Smithsonian.com (http://www.smithsonianmag.com/science-nature/weird-new-type-carbon-harder-brighter-than-diamond-180957433)

2014 Science fair judge, St. Thomas Elementary School, Chicago, IL

2014 Speaker, American Association of University Women, Chicago branch

2012, 2013 Speaker, Undergraduate geology club, University of Chicago

2012 Essay judge, New Frontiers in Astronomy and Cosmology

2012 Science mentor, St. Thomas Elementary School, Chicago, IL

2010–2011 Math club volunteer, William H. Ray Elementary School, Chicago, IL

2010 Maryland Day volunteer, University of Maryland, College Park, MD

2009 Science club leader, Dr. Bessie Rhodes Magnet School, Skokie, IL