

SUSANNAH M. DORFMAN

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EDUCATION

Princeton University, Princeton, NJ

Ph.D., Department of Geosciences

M.S., Department of Geosciences

Dissertation: "Effects of Iron Enrichment on Chemistry and Physical Properties of Deep Lower Mantle Silicates"

Advisor: Thomas Duffy

January 2012

June 2008

Massachusetts Institute of Technology, Cambridge, MA

S.B., Department of Earth, Atmospheric and Planetary Sciences

Undergraduate Advisor: Timothy Grove

Senior Thesis: "Permeability Modifying Processes: Thermal Cracking and Crack Healing"

Thesis Advisor: J. Brian Evans

June 2005

RESEARCH EXPERIENCE

Scientist, École polytechnique fédérale de Lausanne, Department of Physics, Earth and Planetary Science Laboratory

2011-present

Initiated laser-heated diamond anvil cell research program at EPFL; used electron microscopy to characterize chemistry and texture of samples recovered from lower mantle pressures and temperatures.

Assistant in Research, Princeton University, Department of Geosciences, Mineral Physics Group

2006-2011

Used synchrotron x-ray techniques in the laser-heated diamond anvil cell to explore lower mantle mineralogy and physical properties of materials at extreme pressures and temperatures.

Undergraduate researcher, MIT Undergraduate Research Opportunities Program, Department of Earth, Atmospheric and Planetary Sciences, Rock Mechanics Laboratory

2004-2005

Performed permeability measurements and analyzed recovered samples to determine effects of temperature, pressure, fluid flow, and mineralogy on cracking and crack healing.

Undergraduate researcher, MIT Undergraduate Research Opportunities Program, Department of Materials Science, Center for Materials Research in Archaeology and Ethnology

2002-2003

Analyzed the composition and manufacture of a Mexican artifact; characterized pottery sherds in Mexico; collected ore samples in Ecuador.

HONORS AND AWARDS

Marie Heim-Vögtlin Postdoctoral Fellowship, Swiss National Science Foundation, 2014.

Arnold Guyot Teaching Award, Princeton University Department of Geosciences, 2009.

Honorable Mention, NSF Graduate Research Fellowship Program, 2006.

Goetze Prize for Undergraduate Research, MIT Department of Earth, Atmospheric and Planetary Sciences, 2005.

Scholarships: Newark Star Ledger Scholar and Robert C. Byrd Scholar, 2001-2005.

TEACHING EXPERIENCE

Teaching Assistant, École polytechnique fédérale de Lausanne

MATH 206 “Analysis IV” for Physicists: Led problem solving sessions in complex analysis.

Spring 2012

Assistant in Instruction, Princeton University, Department of Geosciences

GEO 372 “Earth Materials”: Developed and taught laboratory mineralogy and petrology exercises, led field trips in New Jersey and New Mexico, and graded assignments.

Fall 2010

GEO 207 “A Guided Tour of the Solar System”: Taught precepts, guest-taught lectures, and graded assignments.

Fall 2008, Fall 2007

Teacher, MIT China Educational Technology Initiative

Summer 2006

Developed and taught short courses on geoscience to college and high school students in Kunming, Hangzhou, and Xi'an.

Teaching Assistant, MIT Experimental Study Group

18.01A-18.02A “Accelerated Calculus I-II”: Led problem solving sessions in freshman calculus and graded assignments.

Fall 2005, Fall 2002

8.01S “Physics I – Sports”: Developed and taught a new physics curriculum utilizing examples from sports.

Fall 2003

OTHER EXPERIENCE

Department Liaison (Earth, Atmospheric and Planetary Sciences), MIT OpenCourseWare (June 2005 -June 2006): Prepared course materials for web publication, designed course websites, and mediated between EAPS faculty and OpenCourseWare staff.

MIT Experimental Study Group: Freshman Mentor Program: Chair 2003-2004, Mentor 2002-2005
2004 Fiekowsky Award for service to ESG community

ACADEMIC SERVICE

Organizer, Lausanne Earth and Space Symposium (2014): scheduled and managed one-day meeting for local researchers.

Judge, Outstanding Student Paper Award, AGU Fall Meeting (2011, 2013), Mineral and Rock Physics section: evaluated student research presentations.

COMPRES Annual Meeting 2011 Program Committee member (2010-2011), Consortium for Materials Properties Research in Earth Sciences (COMPRES): represented graduate students and postdocs in setting meeting agenda and selecting speakers.

Student and Postdoc Committee member (2010-2011), COMPRES: liaised between students and COMPRES executive committee; organized events to promote student research.

Princeton Geosciences Graduate Student Committee: chair 2008-2009, member 2007-2011. Solicited and reported graduate student input on department issues; created and managed GeoGradWiki website; organized department social events including Annual GEO/AOS Edible Symposia.

Peer Referee: American Mineralogist, Applied Physics Letters, Earth and Planetary Science Letters, Geophysical Journal International, Geophysical Research Letters, Physica B, Physical Review Letters, Physics and Chemistry of Minerals.

Rocks and Minerals event coordinator, NJ Science Olympiad, Princeton, NJ (2007-2009): Wrote and administered Olympiad exam for middle and high school students.

Undergraduate representative (2004-2005), MIT Student Advisory Board: collaborated on a report to incoming President Susan Hockfield on student life and issues.

Volunteer teacher, Splash, MIT Educational Studies Program (2005): Developed and taught hour-long introductions to crystallography to Boston-area middle school students.

PUBLICATIONS

- Dorfman, S. M.**, S. R. Shieh and T. S. Duffy, "Strength and texture of Pt compressed to 63 GPa," submitted to *Journal of Applied Physics*.
- Dorfman, S. M.**, J. Badro, J.-P. Rueff, P. Chow, Y. Xiao and P. Gillet, "Composition dependence of spin transition in (Mg,Fe)SiO₃ bridgmanite," submitted to *American Mineralogist*.
- Dorfman, S. M.** "Phase Diagrams and Thermodynamics of Lower Mantle Materials," in *Deep Earth: Physics and Chemistry of the Lower Mantle and Core*, ed. H. Terasaki and R. Fischer, AGU Geophysical Monograph Series, invited manuscript (submitted).
- Dong, H., **S. M. Dorfman**, J. Wang, D. He and T. S. Duffy, "The Strength of Ruby from X-ray Diffraction under Nonhydrostatic Compression to 68 GPa," *Physics and Chemistry of Minerals* 41, no. 7 (July 2014), pgs. 527-535.
- Dorfman, S. M.** and T. S. Duffy, "Effect of Fe-enrichment on seismic properties of perovskite and post-perovskite in the deep lower mantle," *Geophysical Journal International* 197, no. 2 (1 May 2014), pgs. 910-919.
- Dong, H., **S. M. Dorfman**, C. Holl, Y. Meng, P. Dera, D. He and T. S. Duffy, "Compression of Lithium Fluoride to 92 GPa," *High Pressure Research* 34, no. 1 (2014), pgs. 39-48.
- Dorfman, S. M.**, Y. Meng, V. B. Prakapenka and T. S. Duffy, "Effects of Fe-Enrichment on the Equation of State and Stability of (Mg,Fe)SiO₃ Perovskite," *Earth and Planetary Science Letters* 361 (1 January 2013), pgs. 249-257.
- Dorfman, S. M.**, S. R. Shieh, Y. Meng, V. B. Prakapenka, and T. S. Duffy. "Synthesis and equation of state of perovskites in the (Mg,Fe)₃Al₂Si₃O₁₂ system to 177 GPa." *Earth and Planetary Science Letters* 357-358 (1 December 2012), pgs. 194-202.
- Dorfman, S. M.**, V. B. Prakapenka, Y. Meng and T. S. Duffy, "Intercomparison of pressure standards (Au, Pt, NaCl, MgO, and Ne) to 2.5 Mbar," *Journal of Geophysical Research* 117, no. B8 (30 August 2012), B08210.
- Dong, H., **S. M. Dorfman**, Y. Chen, H. Wang, J. Wang, J. Qin, D. He and T. S. Duffy, "Compressibility and Strength of Nanocrystalline Tungsten Boride under Compression to 60 GPa," *Journal of Applied Physics* 111, no. 12 (15 June 2012), 123514.
- Shieh, S. R., **S. M. Dorfman**, A. Kubo, V. B. Prakapenka and T. S. Duffy, "Synthesis and Equation of State of Post-Perovskites in the (Mg,Fe)₃Al₂Si₃O₁₂ system," *Earth and Planetary Science Letters* 312, no. 3-4 (15 December 2011), pgs. 422-428.
- Mao, Z., **S. M. Dorfman**, S. R. Shieh, J. F. Lin, V. B. Prakapenka, Y. Meng, and T. S. Duffy. "Equation of state of a high-pressure phase of Gd₃Ga₅O₁₂." *Physical Review B* 83, no. 5 (24 February 2011): 054114.
- Dorfman, S. M.**, F. Jiang, Z. Mao, A. Kubo, Y. Meng, V. B. Prakapenka, and T. S. Duffy. "Phase transitions and equations of state of alkaline earth fluorides CaF₂, SrF₂, and BaF₂ to Mbar pressures." *Physical Review B* 81, no. 17 (27 May 2010): 174121.

PRESENTATIONS

- "3D Imaging of Chemical Distribution from Melting in the Laser-Heated Diamond Anvil Cell," *52nd European High Pressure Research Group International Meeting*, Lyon, France, September 2014.
- "The Mineral Physics Test Kitchen: Finding the Recipe for Lower Mantle Heterogeneities," Harvard University, Cambridge, MA; University of Maryland, College Park, MD; May 2014.
- "Experimental Lower Mantle Petrology: Microrocks, Nanominerals and Iron Partitioning," *Special Seminars: Experimental Geochemistry and Mineral Physics*, Swiss Federal Institute of Technology – Zurich, March 2014.
- "Composition and Pressure Effects on Partitioning of Iron in the Lower Mantle," *American Geophysical Union Fall Meeting*, San Francisco, CA, December 2013.
- "Effects of Iron on the Deep Lower Mantle," *Geophysical Fluid Dynamics seminar*, Swiss Federal Institute of Technology – Zurich, November 2013.

- “Composition and Pressure Effects on Partitioning of Iron Between Perovskite, Post-perovskite and Magnesiowüstite,” *50th European High Pressure Research Group Meeting*, Thessaloniki, Greece, September 2012.
- “Experimental Constraints on Iron Content of Lower Mantle Heterogeneities,” *Table Ronde seminar*, University of Lausanne, May 2012.
- “Iron-Rich Perovskite and Post-Perovskite in the Deep Lower Mantle,” Bayerisches Geoinstitut, Bayreuth, Germany; GFZ German Research Centre for Geosciences, Potsdam, Germany; February-March 2012.
- “Iron-Rich Perovskite and Post-Perovskite: Implications for Lower Mantle Heterogeneities,” *American Geophysical Union Fall Meeting*, San Francisco, CA, December 2011.
- “Compression of Au, Pt, Mo, MgO and NaCl to 258 GPa,” *COMPRES Annual Meeting*, Williamsburg, VA, June 2011.
- “New Constraints on Fe-Enrichment in Deep Lower Mantle Heterogeneities,” The University of Chicago, Chicago, IL; Lamont-Doherty Earth Observatory, Palisades, NY; Carnegie Geophysical Laboratory, Washington, DC; Mineral Physics Institute, Stony Brook University, Stony Brook, NY; January-March 2011.
- “Equation of State and Stability of (Mg_{0.25}Fe_{0.70}Ca_{0.05})SiO₃ Perovskite and Post-Perovskite to 122 GPa,” *Consortium for Materials Properties Research in Earth Sciences Annual Meeting*, Skamania, WA, June 2010.
- “Super-Earths and Super-Hard Materials,” *Princeton Geosciences Solid Earth Brown Bag Seminar*, Princeton, NJ, May 2009.
- “Static Compression to Multimegabar Pressures Under Quasi-Hydrostatic Conditions: Platinum and Magnesium Oxide to 226 GPa in a Helium Medium,” *Carnegie-DOE Alliance Center Winter Workshop*, Argonne, IL, February 2009.
- “Synthesis and Equation of State of Perovskites in the Mg₃Al₂Si₃O₁₂-Fe₃Al₂Si₃O₁₂ system,” *American Geophysical Union Fall Meeting*, San Francisco, CA, December 2008.

WORKSHOPS ATTENDED

- Cooperative Institute for Dynamic Earth Research, “Dynamics of Planetary Interiors”, Santa Barbara, CA, July 2014.
- Deep Carbon Observatory Extreme Physics and Chemistry Workshop, Palo Alto, CA, December 2013.
- High Pressure Studies using Synchrotron Radiation: Present and Future, Saint-Aubin, France, January 2012.
- HPCAT/CDAC Short Course on High Pressure Synchrotron Techniques, Argonne, IL, September 2010.
- Exploring Giant Planets on the National Ignition Facility, Livermore, CA, December 2009.
- Laser Heating the Diamond Anvil Cell: Where we are and where we are going, Berkeley, CA, December 2009.
- International School of Crystallography, 41st course “High pressure crystallography: From novel experimental approaches to applications in cutting-edge technologies”, Erice, Sicily, Italy, June 2009.
- High Pressure Synchrotron Science Workshop, Argonne, IL, April 2009.
- Carnegie-DOE Alliance Center Winter Workshop, Argonne, IL, February 2009.
- Exploring Physics & Chemistry of Giant Planets on the National Ignition Facility, Livermore, CA, December 2008.
- Canadian Powder Diffraction Workshop, Edmonton, Alberta, Canada, May 2008.
- Workshop on Current Status and Prospects for Establishing Precise and Accurate Pressure Scales at High Temperatures, Washington, DC, January 2007.

SKILLS

Scientific equipment and techniques: synchrotron x-ray diffraction, synchrotron Mössbauer spectroscopy, synchrotron x-ray spectroscopy, laser-heated diamond anvil cell, x-ray diffractometer, Raman spectroscopy, focused ion beam, scanning electron microscope, transmission electron microscope, and Paterson rig (permeability measurement).

Computer skills including: Microsoft Office, LaTeX, ArcGIS, Adobe Illustrator, and IgorPro; programming in C++ and Scheme.

Proficiency in Mandarin Chinese, French and Latin.

MEMBERSHIPS

American Geophysical Union, 2006-present

Mineralogical Society of America, 2010-present