

Sang-Heon Dan Shim

Curriculum Vitae

School of Earth and Space Exploration
Arizona State University
Tempe, AZ 85287

Tel: 480-727-2876
Email: SHDShim@asu.edu
Website: <http://www.public.asu.edu/~sshim5>

Degrees

- 2001 Ph.D. Geosciences, Princeton University, Princeton, New Jersey, USA
Thesis Adviser: Dr. Thomas S. Duffy
- 1994 M.S. Geological Sciences, Seoul National University, Seoul, Korea
Thesis Adviser: Drs Soo Jin Kim and Jung Ho Ahn
- 1992 B.S. Geological Sciences, Seoul National University, Seoul, Korea

Employment

- 2012– Associate Professor, School of Earth and Space Exploration, Arizona State University, USA
- 2014 Visiting Professor, Institut de Physique du Globe de Paris (IPGP), Paris, France
- 2008–2011 Associate Professor of Experimental Geophysics, Massachusetts Institute of Technology, USA
- 2003–2008 Assistant Professor of Experimental Geophysics, Massachusetts Institute of Technology, USA
- 2001–2003 Miller Research Fellow, University of California at Berkeley, USA
- 1994–1996 Exploration Scientist, Army, Korea
- 1993–1994 Research Intern, Korea Ocean Research and Development Institute, Korea

Honors

- 2010 Doornbos Memorial Prize, Studies of the Earth's Deep Interior, International Union of Geodesy and Geophysics (IUGG)
- 2004 Jephtha H. and Emily V. Wade Award, Massachusetts Institute of Technology
- 2001–2003 Miller Research Fellowship, University of California, Berkeley
- 2001 Graduate Research Award, Mineral and Rock Physics Section, American Geophysical Union (AGU)
- 2000 Outstanding Student Paper Award, Tectonophysics Section, American Geophysical Union (AGU)
- 2000–2001 Charlotte Elizabeth Procter Fellowship, Princeton University

1999–2000	Research Board Tuition Award, Princeton University
1999	Travel Grant, Association of Princeton Graduate Alumni, Princeton University
1996	Hess Fellowship, Department of Geosciences, Princeton University
1992	Top-Honors Graduate, College of Natural Sciences, Seoul National University

Undergraduate Students Supervised

Alison Piasecki	2007–2009, MIT
Scott Berdahl	2007–2008, MIT
Aron Walker	2007–2008, MIT
Jenna Berkowitz	2007, MIT

Undergraduate Research Program Students

Elizabeth George	Undergraduate Research Opportunities Program, MIT, 2009 (now master's candidate at Electrical/Electronic Manufacturing, MIT)
Michael DeMeo	Leslie C. Patron Undergraduate Research Opportunity Program, MIT, 2008 (now junior application engineer at Exa Corporation)
Deidre LaBounty	Undergraduate Research Opportunities Program, MIT, 2008
Rachel Zucker	Leslie C. Patron Undergraduate Research Opportunity Program, MIT, 2007–2008 (now Ph.D. candidate at Department of Earth and Planetary Sciences, Harvard University, MA, USA)
Sarah Slotznick	Leslie C. Patron Undergraduate Research Opportunity Program, MIT, 2006 (now Ph.D. candidate at Division of Geological and Planetary Sciences, California Institute of Technology, CA, USA)
Nicholas Leiby	Undergraduate Research Opportunities Program, MIT, 2004–2005 (now Ph.D. candidate at Harvard University)

B.S. Students Thesis

Caitlin Murphy	2006–2007, MIT (now a postdoctoral fellow at Geophysical Laboratory, Carnegie Institute of Washington, DC, USA)
----------------	---

Ph.D. Students

Byeongkwan Ko	2014–present, ASU
Huawei Chen	2014–present, ASU
Qian Zhang	2012–2013, Visiting graduate student from Peking University (China) to ASU
Chen Gu	2010–2012, MIT

Krystle Catalli Department of Energy / National Nuclear Security Administration
Stewardship Science Graduate Fellow, 2005–2011, MIT (received 2010
Mineral and Rock Physics Graduate Student Research Award, AGU, now
reliability engineer at Apple, Inc)

Graduate Students

Xuefeng Shang 2008–present, Second generals research project, supervisor: Robert van
der Hilst, MIT
Nathaniel Dixon 2008–present, Second generals research project, supervisor: William
Durham, MIT
Qin Cao 2008–2011, Collaboration with Robert van der Hilst, MIT
Ping Wang 2006–2007, Collaboration with Robert van der Hilst, MIT
Rosalee Lamm 2004–2006, Second generals research project, supervisor: Robert van der
Hilst, MIT
Scott Lundin 2004–2005, MIT (now staff scientist at Engineering and Environment
Solutions Group, Inc., RI)

Postdoctoral Researchers

Carole Nisir 2012–present, ASU
Yu Ye 2012–2014, ASU (now associate professor at Wuhan University, China)
Antonio Buono 2011, MIT (now research scientist at ExxonMobil)
Brent Grocholski 2008–2011, MIT (now associate editor in journal *Science*)
Justin Hustoft 2006–2007, MIT (now assistant professor at Simpson University, CA)
Javier Santillán 2004–2006, MIT, Ford Postdoctoral Fellow (now applications engineer at
Apple, CA)
Sandeep Rekhi 2003–2005, MIT (now research scientist at Apple, CA)

Service

2013–present Graduate student recruiting committee, ASU
2012–2013 Geophysics Faculty Search Chair, ASU
2012 Award Committee, ASU
2009–2010 Graduate Admissions Committee, MIT
2008–2009 Graduate Committee, MIT
2006–2007 Independent Activities Period Educational Program Committee, MIT
2006 Theoretical Geophysics Faculty Search Committee, MIT
2003–2006 Graduate Admissions Committee, MIT

Ph.D. Thesis Committees

2014–present	Jeffrey Lockridge and Rebecca Smith, ASU
2014	Mingming Li and Michael Pagano, ASU
2011	Krystle Catalli, Michael Krawczynski, and Qin Cao, MIT
2010	Jay Barr, MIT
2007	Emily Van Ark, Guangping Xu, and Ping Wang, MIT
2006	Shichun Huang, MIT

Master Thesis Committees

2011	Stephanie Brown, MIT
------	----------------------

Generals Committees

2014	Luke Probst, Ruirui Han, Julie Mitchell, Jinping Hu (Committee Chair), and Christopher Haberle, ASU
2013	Jeffrey Lockridge and Jinping Hu, ASU
2012	Chen Gu, MIT
2009	Qin Cao (Committee Chair), Nathan Dixon, and Xuefeng Shang, MIT
2007	Krystle Catalli, MIT
2006	Jay Barr and Noah McLean, MIT

Teaching

2014 Fall	GLG591. Archean Geophysics (co-teach with A. Anbar), ASU
2014 Fall	GLG494/598. Advanced Mineralogy: Crystallography and Spectroscopy, ASU
2014 Spring	GLG305. Dynamic Earth, ASU (co-teach with D. DeVecchio)
2014 Spring	GLG591. Chemical Processes in Earth's Interior, ASU
2013 Fall	GLG598. Planetary Materials, ASU
2013 Spring	GLG101. Introduction to Geology I (Physical), ASU
2011 Spring	12.591. Hydrogen: from Planetary to Energy Sciences, MIT
2010 Fall	12.591. Volatiles in the Earth and Planetary Interiors, MIT
2010 Spring	12.108. Structure of Earth Materials, MIT
2009 Fall	12.591. The Core-Mantle Boundary, MIT
2009 Spring	12.108. Structure of Earth Materials, MIT
2008 Fall	12.575. Introduction to Mineral Physics, MIT
2008 Spring	12.108. Structure of Earth Materials, MIT
2007 Spring	12.080. EAPS Undergraduate Seminar, MIT

2007 Spring	12.108. Structure of Earth Materials, MIT
2006 Fall	12.080. EAPS Undergraduate Seminar, MIT
2006 Spring	12.080. EAPS Undergraduate Seminar, MIT
2005 Fall	12.571. Deep Water - Geophysical Prospective, MIT
2005 Spring	12.581. Phase Transitions in the Earth's Interior, MIT
2004 Fall	12.580. Introduction to Mineral Physics, MIT
2004 Spring	12.570. Structure and Dynamics of the Core-Mantle Boundary Region, MIT

External Service

Editor	Geophysical Journal International, 2013–present
Panel Member	Advanced Photon Source Proposal Review Panel, High Pressure, 2013–present
Vice chair	Subcommission for Spectroscopy, diffraction, and new instrumentations in mineral physics, Commission of Physics of Minerals, International Mineralogical Association, 2010–2014
Member	Executive Committee, Mineral and Rock Physics Focus Group, American Geophysical Union, 2010–2013
Member	Infrastructure Development Committee, Consortium for Materials Properties Research in Earth Sciences (COMPRES), 2004–2010
Member	International Organizing Committee, 4th Asian Conference in High Pressure Research, Seoul, Korea, 2008
Associate editor	American Mineralogist, 2004–2006
Consulting editor	Odyssey - Adventures in Science, Science magazine for middle schoolers, "That Rocks!" issue, 2010
Convener	Union, Study of Earth's Deep Interior, Planetary Sciences, and Mineral Physics sessions, American Geophysical Union Meetings, 2008–2010
Peer referee	Nature, Science, Geophysical Research letters, Proceedings of the National Academy of Sciences, Journal of Geophysical Research, American Mineralogist, Earth and Planetary Science Letters, Physics of the Earth and Planetary Interiors, Physical Review, Journal of Solid State Chemistry, NSF Geophysics, NSF Geochemistry and Petrology, NSF Earth Sciences: Instrumentation and Facilities, NSF Materials Research, European Science Foundation EuroMinSc

Invited Lectures for the Past 3 Years

2014	MR23D-01, American Geophysical Union Fall Meeting, San Francisco, CA
2014	Department of Geology and Geophysics, University of Utah, Salt Lake City, UT
2014	Deep Earth Processes: Windows on the Working of a Planet, London, UK

2014	PURE-4 meeting (IPGP–UCL), Paris, France
2014	ppv@10: a meeting for the 10th anniversary of the discovery of post-perovskite, University of Bristol, UK
2014	Umgrove Lectures, Department of Geosciences, Universiteit Utrecht, Nederland
2014	Institut de Physique du Globe de Paris (IPGP), Paris, France
2013	Center for the Origin, Dynamics and Evolution of Planets (CODEP), University of California, Santa Cruz, CA
2013	Interior of the Earth, Gordon Research Conference, South Hadley, MA
2013	Stellar Stoichiometry Workshop, Tempe, AZ
2012	Structure and Dynamics of the Earth's Deep Mantle, Collège de France, Paris, France
2012	Institut de Physique du Globe de Paris (IPGP), Paris, France
2011	School of Environmental Science and Engineering, Pohang University of Science and Technology, Pohang, Korea
2011	School of Earth and Environmental Science, Seoul National University, Seoul, Korea
2011	Korea Astronomy and Space Science Institute, Daejeon, Korea
2011	Keynote lecture, Goldschmidt meeting, Prague, Czech Republic
2011	School of Earth and Space Exploration, Arizona State University, Tempe, AZ
2011	Department of Geology, University of Maryland, College Park, MD

Funded Grants

NSF-EAR1401270	CSEDI Collaborative Research: Deep Mantle Cycling of Oceanic Crust, 9/1/2014–8/31/2016 (PI: Edward Garnero), \$818,541 (33% recognition to Shim)
NSF-FESD-Type I	The Dynamics of Earth System Oxygenation, 9/1/2013–8/31/2018 (PI: A. Anbar), \$3,080,000 (5% recognition to Shim)
NSF-EAR1321976	Hydration of Dense Polymorphs of Silica in Subducting Slabs, 8/1/2013–7/31/2016 (PI: K. Leinenweber), \$312,839 (33% recognition to Shim)
NSF-EAR1301813	The Perovskite to Post-Perovskite Phase Boundary in Mantle Rocks, 1/1/2011–12/31/2015 (PI: S.-H. Shim), \$398,149 (\$229,068 transferred to ASU)
NSF-EAR1316022	CSEDI Collaborative Research: Valence state of iron in the lower mantle (co-PI: Morgan), 9/1/2010–8/31/2015 (PI: S.-H. Shim), \$330,922 for Shim (\$69,447 transferred to ASU)
NSF-EAR1316007	Understanding the Complexity near the 660-km Seismic Discontinuity, 12/15/2009–11/30/2014 (PI: S.-H. Shim), \$360,281 (\$58,468 transferred to ASU)

NSF-EAR0757871	CSEDI Collaborative Research: Multi-scale Analysis of Mantle Discontinuities using Inverse Scattering of SS Waves and Experimental Mineral Physics (PI: van der Hilst), 07/01/2008–06/30/2011, \$299,999
NSF-DMR0819762	CMSE-Initiative 3, as a co-PI, 06/01/2010–05/30/2011, \$26,500 for Shim
NSF-EAR0738655	Equation of State and Phase Boundary of Post-Perovskite, 01/01/2008–12/31/2010
NSF-EAR0337005	In situ Raman Spectroscopy Study for Phase Diagrams of Mantle Minerals at High Pressure and Temperature, 07/01/2004–06/30/2008
NSF-EAR0337156	Acquisition of a Combined Micro-Raman Spectroscopy and Laser Heating System for in situ High Pressure and High Temperature Studies, 03/10/2004–03/09/2006
Wade Award	Acquisition of a Double Monochromator for Raman Spectroscopy Measurements at High Pressure and Temperature, 2004

Membership

American Geophysical Union
Geochemical Society

Recent Collaborations

ASU	E. Garnero and A. McNamara (Structure of the mantle), R. Hervig (SIMS measurements on high pressure samples), K. Leinenweber (hydrous stishovite), T. Sharp (Application of the TEM techniques for high pressure materials), P. Young (Element abundance of star systems)
MIT	S. A. Bowring (Radiation damages on zircon crystals), T. L. Grove (Water in volcanic glasses), Y. S. Lee (Physics, CMSE; Spin structures at high pressures), G. R. Ricker Jr and P. G. Ford (Kavli Institute for Astrophysics and Space Research; Portable X-ray instrument for planetary geology exploration), R. D. van der Hilst (Mantle discontinuities and phase transitions)
US	E. Alp (Advanced Photon Source), R. Cooper (Brown Univ.), M. de Hoop (Purdue; Mantle discontinuities and phase transitions), W. Evans (Livermore National Lab.; Spin state of iron in Earth's interior), K. C. Gendreau (Goddard Space Flight Center; Portable X-ray instrument for planetary geology exploration), M. Kunz (Advanced Light Source), D. Morgan (Univ. Wisc.; Spin state of iron in oxides), V. B. Prakapenka (GSECARS, Univ. of Chicago), G. Shen (HPCAT, Argonne National Lab)
International	S. Speziale (GeoForschungsZentrum Potsdam, Germany), S. K. Lee (Seoul National Univ., Korea), Y. J. Lee (Yonsei Univ., Korea)

Technical Skills

Laser heated diamond anvil cell

Powder X-ray diffraction, Crystal structure refinement using the Rietveld method

Dispersive- and gated-Raman spectroscopy

Synchrotron X-ray diffraction and spectroscopy: Advanced Photon Source (Argonne National Laboratory), Advanced Light Source (Lawrence Berkeley National Laboratory), National Synchrotron Light Source (Brookhaven National Laboratory), Cornell High Energy Synchrotron Source (Cornell University), Stanford Synchrotron Radiation Laboratory (Stanford University)

Computer programming with Python, FORTRAN, IDL, and C languages in UNIX, Windows, and Mac OS X systems

Publications

* Undergraduate student author, † Graduate student author, ‡ Postdoc author in the Shim group

Articles (non peer-reviewed)

1. **S.-H. Shim** and T. Lay. Deep Earth: Post-perovskite at ten. *Nature Geoscience*, 7, 621–623, 2014

Papers in Press

1. K. Viella, **S.-H. Shim**, C. G. Farnetani, and J. Badro. Spin state transition and partitioning of iron: effects on mantle dynamics. *Earth and Planetary Science Letters*, 2015

Papers in Peer-Reviewed Journals

50. S. Xu, **S.-H. Shim**, and D. Morgan. Origin of Fe³⁺ in Fe-containing, Al-free mantle silicate perovskite. *Earth Planetary Science Letters*, 409, 319–328, 2015.
49. Y. Ye[‡], C. Gu[†], **S.-H. Shim**, Y. Meng, and Y. Prakapenka. The postspinel boundary in pyrolitic compositions determined in the laser-heated diamond anvil cell. *Geophysical Research Letters*, 41, 3833–3841, 2014.
48. X. Shang, **S.-H. Shim**, M. V. de Hoop, and R. D. van der Hilst. Multiple seismic reflectors in Earth's lowermost mantle. *Proceedings of the National Academy of Sciences*, 111, 2442–2446, 2014.
47. P. A. Young, S. J. Desch, A. D. Anbar, R. Barnes, N. R. Hinkel, R. Kopparapu, N. Madhusudhan, N. Monga, M. D. Pagano, M. A. Riner, E. Scannapieco, **S.-H. Shim**, and A. Truitt. Astrobiological stoichiometry. *Astrobiology* 14, 603–626, 2014.
46. B. Grocholski[‡], **S.-H. Shim**, E. Cottrell, and V. B. Prakapenka. Crystal structure and compressibility of lead dioxide up to 140 GPa. *American Mineralogists*, 99, 170–177, 2014.
45. B. Grocholski[‡], **S.-H. Shim**, V. Prakapenka. Stability, metastability, and elastic properties of a dense silica polymorph, seifertite. *Journal of Geophysical Research*, 118, B50360, 2013.
44. C. Gu[†], K. Catalli[†], B. Grocholski[‡], L. Gao, E. Alp, P. Chow, Y. Xiao, H. Cynn, W. J. Evans, and **S.-H. Shim**. Electronic structure of iron in magnesium silicate glasses at high pressure. *Geophysical Research Letters*, 39, L24304, 2012.
43. B. Grocholski[‡], K. Catalli[†], **S.-H. Shim**, and V. B. Prakapenka. Mineralogical effects on the detectability of the post-perovskite boundary. *Proceedings of the National Academy of Sciences*, 109, 2275–2279, 2012.

42. K. Catalli[†], **S.-H. Shim**, P. Dera, V. B. Prakapenka, J. Zhao, W. Sturhahn, Y. Xiao, P. Chow, H. Cynn, and W. Evans. Effects of the Fe³⁺ spin transition on the properties of aluminous perovskite – New insights for lower-mantle seismic heterogeneities. *Earth and Planetary Science Letters*, 310, 293-302, 2011.
41. **S.-H. Shim**, D. LaBounty*, and T. S. Duffy. Raman spectra of bixbyite, Mn₂O₃, up to 40 GPa. *Physics and Chemistry of Minerals*, 38, 685–691, 2011.
40. C. Qin, R. D. van der Hilst, M. V. de Hoop, and **S.-H. Shim**. Seismic imaging of transition zone discontinuities suggests hot mantle west of Hawaii. *Science*, 332, 1068–1071, 2011.
39. B. Grocholski[‡], **S.-H. Shim**, and V. B. Prakapenka. Stability of the MgSiO₃ analog NaMgF₃ and its implication for mantle structure in super-Earths. *Geophysical Research Letters*, 37, L14204, 2010.
38. K. Catalli[†], **S.-H. Shim**, V. B. Prakapenka, J. Zhao, W. Sturhahn, P. Chow, Y. Xiao, H. Liu, H. Cynn, and W. J. Evans. Spin state of ferric iron in MgSiO₃ perovskite and its effect on elastic properties. *Earth and Planetary Science Letters*, 289, 68–75, 2010.
37. Q. Cao, P. Wang, R. D. van der Hilst, M. V. de Hoop, and **S.-H. Shim**. Imaging the upper mantle transition zone with a generalized Radon transform of SS precursors. *Physics of the Earth and Planetary Interiors*, 180, 80–91, 2010.
36. K. Catalli[†], **S.-H. Shim**, V. B. Prakapenka, J. Zhao, and W. Sturhahn. X-ray diffraction and Mössbauer spectroscopy of Fe³⁺-bearing Mg-silicate post-perovskite at 128–138 GPa. *American Mineralogist*, 95, 418–421, 2010.
35. R. F. Cooper, R. L. A. Everman, J. Hustoft[‡], and **S.-H. Shim**. Mechanism and kinetics of reduction of a FeO–Fe₂O₃–CaO–MgO aluminosilicate melt in a high-CO activity environment. *American Mineralogist*, 95, 810–824, 2010.
34. K. Catalli[†], **S.-H. Shim**, and V. B. Prakapenka. Thickness and Clapeyron slope of the post-perovskite boundary. *Nature*, 462, 782–785, 2009.
33. B. Grocholski[‡], **S.-H. Shim**, W. Sturhahn, J. Zhao, Y. Xiao, and P. C. Chow. Spin and valence states of iron in (Mg_{0.8}Fe_{0.2})SiO₃ perovskite. *Geophysical Research Letters*, 36, L24303, 2009.
32. **S.-H. Shim** and K. Catalli[†]. Compositional dependence of structural transition pressures in amorphous phases with mantle-related compositions. *Earth and Planetary Science Letters*, 283, 174–180, 2009.
31. **S.-H. Shim**, A. Bengtson, D. Morgan, W. Sturhahn, K. Catalli[†], J. Zhao, M. Lerche, and V. B. Prakapenka. Electronic and magnetic structures of the postperovskite-type Fe₂O₃ and implications for planetary magnetic records and deep interiors. *Proceedings of the National Academy of Sciences*, 106, 5508–5512, 2009.
30. R. Zucker* and **S.-H. Shim**. In situ Raman spectroscopy of MgSiO₃ enstatite up to 1550 K. *American Mineralogist*, 94, 1638–1646, 2009.

29. **S.-H. Shim**, K. Catalli[†], J. Hustoft[‡], A. Kubo, V. B. Prakapenka, W. A. Caldwell, and M. Kunz. Crystal structure and thermoelastic properties of $(\text{Mg}_{0.91}\text{Fe}_{0.09})\text{SiO}_3$ postperovskite up to 135 GPa and 2700 K. *Proceedings of the National Academy of Sciences*, 105, 7382–7386, 2008.
28. J. Hustoft[‡], K. Catalli[†], **S.-H. Shim**, A. Kubo, V. B. Prakapenka, and M. Kunz. Equation of state of NaMgF_3 postperovskite - implications for the seismic velocity changes in the D'' region. *Geophysical Research Letters*, 35, L10309, 2008.
27. S. Lundin[†], K. Catalli[†], J. Santillán[‡], **S.-H. Shim**, V. B. Prakapenka, M. Kunz, and Y. Meng. Effect of Fe on the equation of state of mantle silicate perovskite over 1 Mbar. *Physics of the Earth and Planetary Interiors*, 168, 97–102, 2008.
26. J. Hustoft[‡], **S.-H. Shim**, A. Kubo, and N. Nishiyama. Raman spectroscopy of CaIrO_3 postperovskite up to 30 GPa. *American Mineralogist*, 93, 1654–1658, 2008.
25. K. Catalli[†], **S.-H. Shim**, and V. B. Prakapenka. A crystalline-to-crystalline phase transition in $\text{Ca}(\text{OH})_2$ at 8 GPa and room temperature. *Geophysical Research Letters*, 35, L05312, 2008.
24. **S.-H. Shim**. The postperovskite transition. *Annual Reviews in Earth and Planetary Sciences*, 36, 569–599, 2008.
23. A. Kubo, B. Kiefer, **S.-H. Shim**, G. Shen, V. B. Prakapenka, R. J. Cava, and T. S. Duffy. Rietveld structure refinement of MgGeO_3 post perovskite phase to 1 Mbar. *American Mineralogist*, 93, 965–976, 2008.
22. S. P. Slotznick* and **S.-H. Shim**. In situ Raman spectroscopy measurements of MgAl_2O_4 spinel up to 1400°C. *American Mineralogist*, 93, 470–476, 2008.
21. R. D. van der Hilst, M. V. de Hoop, P. Wang, **S.-H. Shim**, P. Ma, and L. Tenorio. Seismostratigraphy and thermal structure of Earth's core-mantle boundary region. *Science*, 315, 1813–1817, 2007.
20. **S.-H. Shim**, A. Kubo, and T. S. Duffy. Raman spectroscopy of perovskite and post-perovskite phases of MgGeO_3 to 123 GPa. *Earth and Planetary Science Letters*, 260, 166–178, 2007.
19. J. Santillán[‡], **S.-H. Shim**, G. Shen, and V. B. Prakapenka. High-pressure phase transition in Mn_2O_3 - application for the crystal structure and preferred orientation of the CaIrO_3 type. *Geophysical Research Letters*, 33, L15307, 2006.
18. **S.-H. Shim**, S. Rekhii[‡], M. C. Martin, and R. Jeanloz. Vibrational spectroscopy and X-ray diffraction of $\text{Cd}(\text{OH})_2$ to 23 GPa at 300 K. *Physical Review B*, 74, 024107, 2006.
17. **S.-H. Shim**. Stability of MgSiO_3 perovskite in the lower mantle. In *Earth's Deep Mantle: Structure, Composition, and Evolution*, edited by R. D. van der Hilst, J. Bass, J. Matas, and J. Trampert, volume 160 of *Geophysical Monograph Series*, 261–282. American Geophysical Union, 2005.
16. T. Lay, D. Heinz, M. Ishii, **S.-H. Shim**, J. Tsuchiya, T. Tsuchiya, R. Wentzcovitch, and D. Yuen. Multidisciplinary impact of the deep mantle phase transition in perovskite structure. *Eos Transactions*, 86, 1–4, 2005.

15. **S.-H. Shim**, T. S. Duffy, R. Jeanloz, and G. Shen. Stability and crystal structure of MgSiO_3 perovskite to the core-mantle boundary. *Geophysical Research Letters*, 31, L10603, 2004.
14. **S.-H. Shim**, T. S. Duffy, R. Jeanloz, C.-S. Yoo, and V. Iota. Raman spectroscopy and x-ray diffraction of phase transitions in Cr_2O_3 to 61 GPa. *Physical Review B*, 69, 144107, 2004.
13. K. K. M. Lee, B. O'Neil, W. R. Panero, **S.-H. Shim**, L. R. Benedetti, and R. Jeanloz. Equations of state of the high-pressure phases of a natural peridotite and implications for the earth's lower mantle. *Earth and Planetary Science Letters*, 223, 381–393, 2004.
12. C. S. Zha, W. A. Bassett, and **S.-H. Shim**. Rhenium, an in situ pressure calibrant for internally heated diamond anvil cells. *Reviews of Scientific Instruments*, 75, 2409–2418, 2004.
11. **S.-H. Shim**, R. Jeanloz, and T. S. Duffy. Tetragonal structure of CaSiO_3 perovskite above 20 GPa. *Geophysical Research Letters*, 29, 2166, 2002.
10. **S.-H. Shim**, T. S. Duffy, and K. Takemura. Equation of state of gold and its application to the phase boundaries near the 660-km depth in the mantle. *Earth and Planetary Science Letters*, 203, 729–739, 2002.
9. **S.-H. Shim** and T. S. Duffy. Raman spectra of Fe_2O_3 to 62 GPa: Implications for thermodynamics and phase transformation. *American Mineralogist*, 87, 318–326, 2002.
8. **S.-H. Shim**, T. S. Duffy, and G. Shen. Stability and structure of MgSiO_3 perovskite to 2300-km depth conditions. *Science*, 293, 2437–2440, 2001.
7. **S.-H. Shim**, T. S. Duffy, and G. Shen. The post-spinel transformation in Mg_2SiO_4 and its relation to the 660-km seismic discontinuity. *Nature*, 411, 571–574, 2001.
6. **S.-H. Shim**, T. S. Duffy, and G. Shen. The stability and P–V–T equation of state for CaSiO_3 perovskite in the earth's lower mantle. *Journal of Geophysical Research*, 105, 25955–25968, 2000.
5. **S.-H. Shim**, T. S. Duffy, and G. Shen. The equation of state of CaSiO_3 perovskite to 108 GPa at 300 K. *Physics of the Earth and Planetary Interiors*, 120, 327–338, 2000.
4. **S.-H. Shim** and T. S. Duffy. Constraints on the P–V–T equation of state of MgSiO_3 perovskite. *American Mineralogist*, 85, 354–363, 2000.
3. **S.-H. Shim**, A. Navrotsky, T. R. Gaffney, and J. E. MacDougall. Chabazite: energetics of hydration, enthalpy of formation, and effect of cations on stability. *American Mineralogist*, 84, 1870–1882, 1999.
2. **S.-H. Shim**, S. J. Kim, and J. H. Ahn. Quantitative analysis of alkali feldspar minerals using Rietveld refinement of X-ray diffraction data. *American Mineralogist*, 81, 1133–1140, 1996.
1. **S.-H. Shim**, J. H. Ahn, and S. J. Kim. Quantitative analysis of feldspar mixture samples using the Rietveld refinement method. *Journal of the Mineralogical Society of Korea*, 7, 62–79, 1994.

Media Highlights

10. News and Views. S. J. Desch, P. A. Young, A. D. Anbar, N. Hinkel, M. Pagano, A. Truitt, M. Turnbull, *Astrobiology*, 14, 271–276, 2014.
9. J. Miller. Calculations clarify the role of minerals' electron spins in Earth's mantle. *Physics Today* 64, 12–13, 2011.
8. APS Science 2010. Electronic and magnetic structures of hematite post-perovskite under deep planetary conditions. 2010.
7. Editors' Highlight. New measurement of electronic spin state of iron in perovskite. *Geophysical Research Letters*, 2009.
6. K. K. M. Lee. The enigma of D''. *Nature* 462, 731–732, 2009.
5. In This Issue. Protean magnetic properties of iron oxide. *Proceedings of the National Academy of Sciences* 106, 5451, 2009.
4. Advanced Photon Source Science Highlights. New look at deep mantle discontinuity. 2009.
3. What lies at the Earth's core-mantle boundary? *Advanced Photon Source Science*, 111–112, 2005.
2. Advanced Photon Source Forefront. Probing the nature of seismic discontinuities in the Earth's mantle with synchrotron X-ray beams. 2001.
1. C. R. Bina. Earth science: Mantle cookbook calibration. *Nature* 411, 536–537, 2001.

Abstracts for the Past 3 Years

16. C. Nisr[‡], **S.-H. Shim**, K. D. Leinenweber, R. L. Hervig, V. Prakapenka, and Y. Meng. Water in Al-free stishovite up to 65 GPa and 2000 K. Abstract MR21A-4302, presented at 2014 Fall Meeting, AGU.
15. Y. Ye[‡], C. Gu[†], **S.-H. Shim**, V. Prakapenka, and Y. Meng. In situ measurements of the post-spinel and post-garnet phase boundaries in pyrolite at 17–32 GPa and 1500–2400 K. Abstract DI41B-4331, presented at 2014 Fall Meeting, AGU.
14. H. Chen[†], **S.-H. Shim**, K. Leinenweber, Y. Meng, and V. Prakapenka. Crystal structure of calcium silicate perovskite synthesized under water saturated conditions at mantle related pressure–temperature. Abstract MR21A-4301, presented at 2014 Fall Meeting, AGU.
13. **S.-H. Shim**, Y. Ye[‡], B. Grocholski[‡], S. Xu, D. Morgan, J. Zhao, and E. Alp. The post-perovskite transition and mineralogical changes in the chemically heterogeneous lower mantle. Abstract MR23D-01, presented at 2014 Fall Meeting, AGU.
12. **S.-H. Shim**. Un-Earth-like interiors of Earth-like exoplanets. Search for Life Beyond the Solar System. Tucson, AZ, March 16–21, 2014.

11. C. Nisr[‡] and **S.-H. Shim**. Thermal expansion of SiC in the deep interiors of carbide exoplanets. Search for Life Beyond the Solar System. Tucson, AZ, March 16–21, 2014.
10. **S.-H. Shim**, Y. Ye[‡], V. Prakapenka, and Y. Meng. Effects of iron and aluminum on phase boundaries at 600–800 km depths. Abstract EGU2014-8674, presented at 2014 European Geophysical Union Meeting, Vienna, Austria.
9. C. Nisr[‡], **S.-H. Shim**, K. Leinenweber, and V. Prakapenka. Effect of water on the compressional behaviors of SiO₂ stishovite up to 30 GPa. Abstract MR21A–2328, presented at 2013 Fall Meeting, AGU.
8. Y. Ye[‡], **S.-H. Shim**, A. MacDowell, and V. Prakapenka. Phase transitions and Al partitioning in a pyrolytic MgO–Al₂O₃–SiO₂ composition at 16–31 GPa and 1500–2300 K. Abstract DI14A–02, presented at 2013 Fall Meeting, AGU.
7. Q. Zhang[†], **S.-H. Shim**, Y. Meng, V. Prakapenka, and E. Alp. Iron oxidation state and compressional behaviors of Al,Fe-rich mantle silicate perovskite up to 90 GPa. Abstract DI41A–2327, presented at 2013 Fall Meeting, AGU.
6. **S.-H. Shim**, Y. Ye[‡], Y. Meng, and V. Prakapenka. Discrepancy among the Au, Pt, and MgO pressure scales at 20–30 GPa and 1700–2100 K in the laser-heated diamond-anvil cell. Abstract MR31A–2259, presented at 2013 Fall Meeting, AGU.
5. K. Vilella, **S.-H. Shim**, C. Farnetani, and J. Badro. Effects of spin transition and partitioning of iron on mantle dynamics. Abstract DI42A–02, presented at 2013 Fall Meeting, AGU.
4. **S.-H. Shim**, C. Gu[†], K. Catalli[†], B. Grocholski[‡], L. Gao, E. Alp, P. Chow, Y. Xiao, H. Cynn, and W. J. Evans. Spin transition of iron in amorphous Mg-silicates at mantle-related pressures. Goldschmidt Conference. The Geochemical Society, 2013.
3. B. Grocholski[‡], **S.-H. Shim**, V. Prakapenka. Stability and Compressibility of Seifertite from 1 bar to 140 GPa. Abstract MR54A–08, presented at 2012 Fall Meeting, AGU.
2. **S.-H. Shim**, R. D. van der Hilst, B. Grocholski[‡], K. Catalli[†], Q. Cao, and X. Shang. Nature of mantle heterogeneities. Goldschmidt Conference. The Geochemical Society, 2011.
1. **S.-H. Shim**, Q. Cao, R. D. van der Hilst, and M. V. De Hoop. Structure and petrology of the mantle beneath Hawaii constrained by seismic discontinuity imaging and mineral phase relations. Goldschmidt Conference. The Geochemical Society, 2011.

January, 2015

