

Philip A. Skemer

Department of Earth and Planetary Sciences
Washington University in Saint Louis
Campus Box 1169
1 Brookings Dr.
Saint Louis, MO 63130-4862

Phone (314) 935-3584
Email pskemer@wustl.edu
Web espm.wustl.edu
Google Scholar goo.gl/HBttQs
ORCID ID orcid.org/0000-0002-6702-1098

EDUCATION

Ph.D., Yale University, Geology and Geophysics, 2007
M.Phil., Yale University, Geology and Geophysics, 2003
B.A., Pomona College, Geology, 2000

APPOINTMENTS

07/2016 - present *Associate Professor*
Department of Earth and Planetary Sciences
Washington University in St. Louis
07/2016 - present *Associate Director*
Institute of Materials Science and Engineering
Washington University in St. Louis
07/2009 - 06/2016 *Assistant Professor*
Department of Earth and Planetary Sciences
Washington University in St. Louis
09/2007 - 07/2009 *Postdoctoral Research Associate*
Department of Geological Sciences
Brown University
09/2001 - 09/2007 *Graduate Research Assistant*
Department of Geology and Geophysics
Yale University

PROFESSIONAL SERVICE AND ACTIVITIES

Steering Committee, Research Coordination Network: In situ Studies of Rock Deformation (ISRDR) (Sep 2019 – present)
Organizing Committee, GeoPRISMS Synthesis and Integration, Technical and Experimental Institute (Feb 27 – Mar 1, 2019, San Antonio, TX)

Organizing Committee, Workshop on Data Standards and Vocabulary for Structural Geology, Microstructures, and Experimental Deformation (Dec 9, 2018, Washington DC)

Organizing Committee (chair), Conference on Experimental Studies of Subduction Zone Processes (July 4-6, 2018, St Louis, MO)

Lecturer, CIDER Summer Program (June-July 2017)

Organizing Committee, Subduction Zone Observatories Workshop (September 28-30, 2016, Boise, ID)

President-elect (2013-14); President (2015-16); Past President (2017-18) Mineral and Rock Physics Focus Group, American Geophysical Union (AGU)

American Geophysical Union Council member, (2013-2016)

Executive Committee, Mineral and Rock Physics Focus Group, AGU (2010 – 2018; *chair* 2015-2016)

Organizing Committee, Workshop on Advancing Experimental Rock Deformation Research: Scientific and Technical Needs (August 16-19, 2012, Cambridge, MA)

Guest Instructor, TTT Short Course (Texture Topics in Tromsø), University of Tromsø, Norway (2011)

Steering Committee, Physical Properties of Earth Materials (Subcommittee of AGU Mineral and Rock Physics Focus Group) (2010-2012)

Washington University Elector, COMPRES consortium for high-pressure research (2010 - present)

AGU Fall Meeting Session Organizer:

- 2017 – Recent Advances in Understanding Deformation Microstructures
- 2017 – Small Samples Yield Big Insights
- 2016 – G, LAB, and MLDs: What are they anyway? Lithospheric boundary structures within and beneath the oceans and continents
- 2014 – Town Hall Meeting: Developing a Digital Data System for Microstructural and Related Spatially Linked Data
- 2013 – Seismic Anisotropy: Predictions, Observations, and Interpretations
- 2011 – Deformation Processes: Microstructure, Rheology, and the Effects of Fluids
- 2009 – Rock Deformation from Grain Boundaries to Plate Boundaries
- 2007 – Shear Localization from Experimentation, Modeling, and Observation

Ad hoc Peer Reviewer: NSF (Geophysics; Tectonics; CSEDI; Instrumentation/Facilities; MG&G; CAREER); Physics of Earth and Planetary Interiors; Earth and Planetary Science Letters; Journal of Geophysical Research; Geophysical Research Letters; Journal of Petrology; G-cubed; Geophysical Journal International; Geology; PNAS

WASHINGTON UNIVERSITY SERVICE AND ACTIVITIES

EPS – Department of Earth and Planetary Sciences; A&S – School of Arts and Sciences; IMSE – Institute of Materials Science and Engineering

Director of Fossett Laboratory for Virtual Planetary Exploration, EPS (2016-present)

Associate Director, IMSE (2016-present)

Director of Undergraduate Studies, EPS (2012-present)

Goldwater scholarship selection committee, A&S (2019)

Website Committee, EPS (2016-present)

Facilities Committee (*chair*), IMSE (2016-present)

Institutional iLab Management Committee (2018-2019)

Faculty Search Committees, EPS (2010, 2013 –*co-chair*, 2017 – *chair*); MEMS (2014); Physics (2019)
Course Evals Committee, A&S (2016)
Mentee in STEM Teaching (MiST) Program, A&S (2015-2016)
Ampersand Week Faculty Committee A&S (2014)
Undergraduate Curriculum Committee (*chair*), EPS (2013-present)
Institute of Materials Science and Engineering, Core Faculty (2013-2016)
Faculty Associate, Danforth College (2012-2014)
Curriculum Development Committee, EPS (2012-2013)
Institute of Materials Science and Engineering PhD Program Organizing Committee (2012)
Undergrad Recruiting Committee (*chair*), EPS (2011-2013)
Fossett Postdoctoral Fellowship Selection Committee, EPS (2011-present)
Compton Scholarship Selection Committee (2010-2012)
Center for Materials Innovation Internal Advisory Group (2010-2011)
Panelist, Grad Student Senate forum on "The Academy and The Economy" (2010)
Undergrad Brochure Committee, EPS (2009)
TA Award Committee, EPS (2009, 2012)
Graduate Admissions Committee, EPS (2009-2012)

WASHINGTON UNIVERSITY AFFILIATIONS

McDonnell Center for the Space Sciences (MCSS)
Institute of Materials Science and Engineering (IMSE)
Environmental Studies Program

OUTREACH

Outreach with 6th grade science classes at Wydown Middle School (February, 2019)
Invited speaker for Science in St. Louis seminar series (May, 2018)
Outreach with 5th grade science classes at The Wilson School (November 2015-present)
Invited speaker for WU Science On Tap (September, 2015)
Outreach with curatorial staff at the Saint Louis Art Museum (2011-present)
Outreach with Flynn Park Elementary School Lego League (April, 2014)
On-call Geologist Calvin Hill Kindergarten, New Haven, CT (2003-2006)

TEACHING EXPERIENCE

<i>Washington University Course Number</i>	<i>Title</i>	<i>Last Taught</i>
EPS L19 104	Geology in the Field (Freshman Seminar)	Fall, 2019
EPS L19 131	Natural Disasters	Spring, 2011
EPS L19 201	Earth and the Environment	Fall, 2018
EPS L19 361/460	Introduction to Structural Geology	Fall, 2019
EPS L19 496	Undergraduate Field Geology	Spring, 2020
EPS L19 580	Deformation of Planetary Materials	Fall, 2013

HONORS

2014: NSF CAREER award
2012: Cornerstone Faculty Mentor Award (Washington University)
2012: Sony Junior Faculty Equipment Prize (Washington University)
2012: Washington University nominee for Packard Fellowship
2005: William E. Ford Prize for excellence in Mineralogy
2004: Outstanding Student Paper, Tectonophysics Section, AGU Fall Meeting
2002-03: Frederick C. Stanley Fellowship in Mineralogy
2002: Honorable Mention, Outstanding Student Paper, Tectonophysics Section, AGU Fall Meeting
2001-02: Henry Gardiner Ferguson Fellowship in Geology

INVITED AND KEYNOTE TALKS

University of New Mexico, Earth and Planetary Sciences Colloquium, October 2019
COMPRES Annual Meeting, August 2019
Gordon Research Seminar (Interior of the Earth), June 2019
Carnegie Habitability Project Workshop, February 2019
Michigan State University, Department of Earth and Environmental Sciences Distinguished Speaker Series, January 2019
Gordon Research Conference on Rock Deformation, August 2018
Cooperative Institute for Dynamic Earth Research (CIDER), June 2017
University of Illinois, Chicago, Department of Earth and Environmental Sciences Seminar, April 2017
Yale University, Department of Geology and Geophysics Colloquium, February 2017
Anisotropy and Dynamics of the Lithosphere-Asthenosphere Boundary, May 2016
American Geophysical Union Fall Meeting (Physical Properties of Earth Materials: Deformation Mechanisms from Crystals to Plates), December 2015
American Geophysical Union Fall Meeting (Crustal and Mantle Deformation: Microstructure, Rheology and the Effects of Fluids), December 2015

University of Rochester, Department of Earth and Environmental Sciences Seminar,
October 2015

Southern California Earthquake Center, Community Rheology Model Workshop,
September, 2015

Lamont-Doherty Earth Observatory Earth Science Colloquium, February 2015

University of Pennsylvania, Department of Earth and Environmental Science Colloquium,
February 2015

Structural Geology and Tectonics 3rd Biennial Forum, June 2014

American Geophysical Union Fall Meeting (Geophysical Observations and Models of
Subduction), December 2013

American Geophysical Union Fall Meeting (Deformation Processes, Rheology, and the
Effects of Fluids), December 2013

EarthCube End-user Domain Workshop for DEFORM and COMPRES, November 2013

Missouri University of Science and Technology, Department of Geological Sciences and
Engineering Department Seminar, November 2013

Caltech, Seismological Laboratory Brown Bag, January 2013

Ruhr-Universität Bochum, Institut für Geologie, Mineralogie und Geophysik, Department
Seminar, October 2011

Stanford University, Department of Geophysics Seminar, April 2011

European Geophysical Union, General Assembly, (Deformation processes: microstructures,
textures, rheology, and fluid migration) April 2011

Gordon Research Conference on Rock Deformation, August 2010

Saint Louis University, Department of Earth and Atmospheric Sciences Seminar, April 2010

Southern Illinois University, Department of Geology Seminar Series, March 2010

University of Missouri, Department of Geological Sciences Colloquium, January 2010

Woods Hole Oceanographic Institute, Geochemistry & Geophysics Seminar, March 2009

Washington University in St. Louis, Departmental Colloquium, February 2009

University of Minnesota, Hard Rock Lunch, January 2009

Washington & Lee University, Departmental Seminar, January 2009

Lamont-Doherty Earth Observatory Seismology, Geology, and Tectonophysics Division
Seminar Series, November 2006

Woods Hole Oceanographic Institute, Geophysics Seminar, November 2006

PUBLICATIONS (PEER-REVIEWED)

**denotes student or postdoc author under direct research supervision*

- *Sly, M., Thind, A., Mishra, R., Flores, K.M., Skemer, P. (2019) Low temperature rheology of calcite, *Geophysical Journal International*, doi: 10.1093/gji/ggz577
- *Cross, A.J., Skemer, P. (2019) Rates of dynamic recrystallization in geologic materials, *Journal of Geophysical Research*, 124, doi: 10.1029/2018JB016201
- Xiong, W., *Wells, R.K., Horner, J.A., Schaef, H.T., Skemer, P., Giammar, D.E. (2018) CO₂ Mineral Sequestration in Naturally Porous Basalt, *Environmental Science and Technology Letters*, 5(3) 142-147, doi: 10.1021/acs.estlett.8b00047
- Xiong, W., *Wells, R.K., Menefee, A.H., Skemer, P., Ellis, B.R., Giammar, D.E. (2017) CO₂ mineral trapping in fractured basalt, *International Journal of Greenhouse Gas Control*, 66:204-217, doi:10.1016/j.ijggc.2017.10.003
- *Wells, R.K., Xiong, W., Giammar, D., Skemer, P. (2017) Dissolution and surface roughening of Columbia River Flood Basalt at geologic carbon sequestration conditions, *Chemical Geology*, 467:100-109, doi:10.1016/j.chemgeo.2017.07.028
- *Boneh, Y., Wallis, D., Hansen, L.N., Krawczynski, M.J., Skemer, P. (2017) Oriented grain growth and modification of ‘frozen anisotropy’ in the lithospheric mantle, *Earth and Planetary Science Letters*, 474:368-374, doi:10.1016/j.epsl.2017.06.050
- Adeoye, J.T., Menefee, A.H., Xiong, W., *Wells, R.K., Skemer, P., Giammar, D.E., Ellis, B.R. (2017) Effect of transport limitations and fluid properties on reaction products in fractures of unaltered and serpentinized basalt exposed to high P_{CO2} fluids, *International Journal of Greenhouse Gas Control*, 63:310-320, doi:10.1016/j.ijggc.2017.06.003
- Bercovici, D.B., Skemer, P., (2017) Grain damage, mixing, and plate boundary formation, *Journal of Geodynamics*, 104:40-55 doi:10.1016/j.jog.2017.05.002
- Skemer, P., *Chaney, M.M., *Emmerich, A.L., Miller, K.J., Zhu, W., (2017) Network topology of olivine – basalt partial melts, *Geophysical Journal International*, 210:284-290 doi:10.1093/gji/ggx160
- *Cross, A. J., Skemer, P. (2017), Ultramylonite generation via phase mixing in high strain experiments, *J. Geophys. Res. Solid Earth*, 122, doi:10.1002/2016JB013801
- *Wells, R.K., Xiong W., Sesti, E., Cui, J., Giammar, D., Skemer, P., Hayes, S.E., and Conradi, M.S., (2017) Spatially-variable carbonation reactions in polycrystalline olivine, *Geochimica et Cosmochimica Acta*, 252-266, doi:10.1016/j.gca.2017.02.003
- Hansen, L.N., Conrad, C.P., *Boneh, Y., Skemer, P., Warren, J.M., Kohlstedt, D.L. (2016) Viscous anisotropy of textured olivine aggregates, Part 2: Micromechanical model, *Journal of Geophysical Research* doi:10.1002/2016JB013240

- Rahl, J.M., Skemer, P., (2016) Microstructural evolution and rheology of quartz in a mid-crustal shear zone, *Tectonophysics*, 680:129-139, doi:10.1016/j.tecto.2016.05.022
- *Kranjc, K., Rouse, Z., Flores, K.M., Skemer, P. (2016) Low temperature plastic rheology of olivine determined by nanoindentation, *Geophysical Research Letters*, 43:176-184, doi:10.1002/2015GL065837.
- Skemer, P., Hansen, L.N. (2016) Inferring upper-mantle flow from seismic anisotropy: An experimental perspective, *Tectonophysics*, 668-669:1-14, doi:10.1016/j.tecto.2015.12.003
- *Boneh, Y., Morales, L.F.G., Kaminski, E., Skemer, P. (2015) Modeling olivine CPO evolution with complex deformation histories – Implications for the interpretation of seismic anisotropy in the mantle, *Geochemistry Geophysics Geosystems*, 16, doi:10.1002/2015GC005964
- Moore, J., Surface, J.A., Brenner, A., Wang, L., Skemer, P., Conradi, M., Hayes, S., (2015) Quantitative identification of metastable magnesium carbonate minerals by solid-state ¹³C NMR Spectroscopy, *Environmental Science and Technology*, doi:10.1021/es503390d
- *Boneh, Y., Skemer, P., (2014) The effect of deformation history on the evolution of olivine CPO, *Earth and Planetary Science Letters*, 406:213-222, doi:10.1016/j.epsl.2014.09.018
- *Bruijn, R.H.C., Skemer, P., (2014) Grain size sensitive rheology of orthopyroxene, *Geophysical Research Letters*, 41, doi: 10.1002/2014GL060607
- *Linckens, J., *Bruijn, R.H.C, Skemer, P., (2014) Dynamic recrystallization and phase mixing in experimentally deformed peridotite, *Earth and Planetary Science Letters*, 388:134-142, doi:10.1016/j.epsl.2013.11.037
- Skemer, P., Warren, J.M., Hansen, L.N., Hirth, J.G., Kelemen, P.B., (2013) The influence of water and LPO on the initiation and evolution of mantle shear zones, *Earth and Planetary Science Letters*, 375:222-233, doi:10.1016/j.epsl.2013.05.034
- Surface, J.A., Skemer, P., Hayes, S., Conradi, M., (2012) In situ measurement of magnesium carbonate formation from CO₂ using static high pressure and temperature ¹³C NMR, *Environmental Science and Technology*, doi:10.1021/es301287n
- Skemer, P., Warren, J.M., Hirth, G., (2012) The influence of deformation history on the interpretation of seismic anisotropy, *Geochemistry Geophysics Geosystems*, 13:3, doi:10.1029/2011GC003988
- Skemer, P., Sundberg, M., Hirth, G., Cooper, R., (2011), Torsion experiments on coarse-grained dunite: implications for microstructural evolution when diffusion creep is suppressed, *Deformation Mechanism, Rheology & Tectonics: Microstructures, Mechanics & Anisotropy* Geological Society of London Special Publication, 360:211-223.

Cull, S., Arvidson, R.E., Mellon, M.T., Skemer, P., Shaw, A., Morris, R.V., (2010) Composition of subsurface ices at the Mars Phoenix Landing Site, *Geophysical Research Letters*, 37:L24203, doi:10.1029/2010GL045372

Skemer, P., Warren, J.M., Kelemen, P.B., Hirth, J.G., (2010) Microstructural and rheological evolution of a mantle shear zone, *Journal of Petrology*, 51:43-53.

Skemer, P., Karato, S-i., (2008) Sheared lherzolite xenoliths revisited, *Journal of Geophysical Research*, 113: B07205, doi:10.1029/2007JB005286.

Karato, S-i., Jung, H., Katayama, I., Skemer, P., (2008) Geodynamic significance of seismic anisotropy of the upper mantle: New insights from laboratory studies, *Annual Review of Earth and Planetary Science* 36:59–95.

Skemer, P., Karato, S-i., (2007) Effects of solute segregation on the grain-growth kinetics of orthopyroxene with implications for the deformation of the upper mantle, *Physics of Earth and Planetary Interiors* 164:186-196.

Skemer, P., Katayama, I., Karato, S-i., (2006) Deformation fabrics of the Cima di Gagnone Peridotite Massif, Central Alps, Switzerland: Evidence of deformation at low temperatures in the presence of water, *Contributions to Mineralogy and Petrology* 152:43-51.

Skemer, P., Katayama, I., Jiang, Z., Karato, S-i., (2005) The misorientation index: Development of a new method for calculating the strength of lattice-preferred orientation, *Tectonophysics* 411:157-167.

SELECTED MANUSCRIPTS IN PREPARATION

*Kranjc, K., Thind, A., Borisevich, A.Y., Misha, R., Flores, K.M., Skemer, P. (in review) Amorphization and plasticity of olivine during low temperature micropillar deformation experiments, *Journal of Geophysical Research*

*Rabinowitz, H.S., Williams, J.N., Mitchell, T.M., Toy, V., Di Toro, G., Skemer, P., (in revision) Reactivated deformation of pseudotachylyte-bearing fault rocks at high pressure and temperature, *Geochemistry Geophysics Geosystems*

*Cross, A.J., *Olee, E., Couvy, H., Skemer, P. (in prep) How does viscosity contrast influence phase mixing and strain localization? *Tectonophysics*

*Horn, C., Bouilhol, P., Skemer, P. (in prep) Serpentinization, deformation, and seismic anisotropy in subducted terranes, *Tectonophysics*

ADDITIONAL REPORTS AND PUBLICATIONS (NOT PEER REVIEWED)

Skemer, P., French, M., Hirschmann, M., Hirth, G., Kitajima, H., Krawczynski, M., Till, C., Zhu, W. (2019) Experimental Studies of Subduction Zone Processes: A Vision for

Community-Driven Infrastructure to Support Experimental Earth Science, *Submitted to NSF*

McGuire, J.J., T. Plank, et al. (2017) The SZ4D Initiative: Understanding the Processes that Underlie Subduction Zone Hazards in 4D. Vision Document Submitted to the National Science Foundation. *The IRIS Consortium*, 63 pp.

*Wells, R.K., Giammar, D., Skemer, P. (2016) Sample library of natural and artificial basalts. *National Energy Transfer Lab, Energy Data eXchange*

Tullis, T.E.; Chester, F.; Skemer, P.; Zhu, W.; Burgmann, R (2012) Advancing Experimental Rock Deformation Research: Scientific, Personnel, and Technical Needs, *Submitted to NSF*

Skemer, P., Karato, S-i., (2007) Reply to Comment on “The misorientation index: Development of a new method for calculating the strength of lattice-preferred orientation,” *Tectonophysics* 441:119-120.

ADVISING AND RESEARCH SUPERVISION

Research Staff

Caroline Bollinger (9/2018-present)
Martin Pratt (1/2017-present)
Hélène Couvy (10/2013-present) – *jointly with Mike Krawczynski*

Postdoctoral Supervisor

Hannah Mark (9/2019-present) – *jointly with Douglas Wiens*
Rachel Wells (4/2015-3/2018) – *jointly with Daniel Giammar*
Andrew Cross (2/2015-6/2018)
Rolf Bruijn (9/2012-8/2014)
Jolien Linckens (2/2011-2/2013)

Graduate Student Advisor

Charis Horn (9/2017-present)
Elizabeth Olree (9/2017-6/2018)
Michael Sly (9/2016-present)
Yuval Boneh (9/2012-5/2017)
Brandon Mahan (9/2010-12/2012)

Visiting Graduate Students

Harison Wiseman (10/2019)
Masanori Kido (5/2018 – 7/2018)

Graduate Thesis/Examination Committee Member

Arashdeep Thind (IMSE, 2018-present); Zhengyang Zhou (EPS, 2018-present); Amanda Price (EPS, 2017-present); Ming Wu (EPS, 2017-2018); Arjun Neupane (EPS, 2017); Melody Eimer (EPS, 2016-present); Rongrong Dai (IMSE, 2015); Linhua Xu (IMSE, 2014); Wei Xiong (EECE, 2014-2017); Kelly Kranjc (MEMS/IMSE, 2013-2017); Chen Cai (EPS, 2013-2018); Amanda Lough (EPS, 2012-2014); Lin Wang (EECE, 2013-2015); Narelle Hillier (Physics, 2013); Andrew Lloyd (EPS, 2012-2018); Erica Emry (EPS, 2012); Garrett Euler (EPS, 2012); Martin Pratt (EPS, 2012-2016); Teresa Wong (EPS, 2012-2016); Shawn Wei (EPS, 2012-2016); Andy Surface (Chemistry, 2010-2013); David Heeszal (EPS, 2011); Wenli Bi (Physics, 2011); Maitrayee Bose (Physics, 2011); Yandi Hu (EECE, 2011); Mitchell Barklage (EPS, 2010); Kasey Wagoner (Physics, 2010)

Undergraduate Research Supervisor (in EPS unless otherwise noted)

Maia Cohen (2019-present); David Lie-T'jauw (CSE, 2017-2019); Anna Baker (2018); Kate Padilla (MEMS, 2017-2019); Ben Strozewski (Physics, 2016-2019); Josh Waddell (2017-2018); Zachary Rouse (MEMS, 2014-2016); Molly Chaney (2014); Corie Miller (MEMS, 2013); Matthew Guiang (2013-2015); Adrienne Emmerich (2012-2014); Ethan Kahn (Physics, 2012); Hannah Rabinowitz (2011-2012)

Undergraduate Major Advisor

Approximately 50 students total (currently ~15)