

# Jonathan Perry-Houts

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## Education

### University of Oregon

*Ph.D.*: Geological Sciences, 2018.

Area of specialization: I study lithosphere and mantle deformation mechanisms using numerical models. I am especially interested in tectonophysical processes that shape the western U.S.

*Advanced Certificate of Completion*: Graduate Teaching Initiative, 2018.

### Lewis & Clark College

*B.A.*: Physics with honors, 2011.

Honors Thesis: "Gravitational Charge Separation in Low-Altitude Volcanic Plumes".

*Minor*: Computer Science

## Teaching Experience

I have worked as a teaching assistant for a variety of courses. Several of which (noted below) allowed freedom to develop and test original course content, practice classroom presentation skills, and one-on-one mentorship in office hours.

I also worked closely with an undergraduate physics student over the course of about a year on modeling the geodynamic history of the Wallowa Mountains. Their background in physics, and aptitude with programming, made it an easy mentorship. In the process we both learned a lot about the Wallowa Mountains, an area which would become part of the focus of my dissertation. That student is now pursuing a Ph.D. in geophysics at University of Washington.

### Teaching Assistantships

*Field Camp* (GEOL 406): Diverse mapping projects in stratified and non-stratified rocks, Montana Summer, 2017. Instructor of record: Sammy Castonguay I organized logistics for field mapping project, and camping trip to Glacier NP.

*Fluid Dynamics* (GEOL 410/510) Spring, 2017. Instructor of Record: Leif Karlstrom. Responsible for grading homeworks, substitute lecturer for one class session for which I designed my own lesson plan.

*Earth Physics* (GEOL 315) Winter, 2017. Instructor of Record: Emilie Hooft. Responsible for teaching two lab sections per week, grading lab assignments, and assisting in grading midterm and final exams.

*Field Methods* (GEOL 318) Fall, 2016. Instructor of Record: Becky Dorsey. Responsible for organizing logistics for in-class assignments and field trips, grading homework and lab assignments.

*Field Camp* (GEOL 406): Green Mountain, Newberry Volcano, Wallowa Mountains, and Grand Ronde river rafting Summer, 2016. Instructors of Record: Thomas Giachetti, Leif Karlstrom. I organized camp-life logistics, assisted with field projects, provided first aid to lots of students, and captained a raft for three days down the Grande Ronde.

*Evolving Earth* (GEOL 103) (Science Literacy Program fellow) Spring, 2016. Instructor of record: Win McLaughlin I assisted with, and graded, “flipped” class group activities. I also hosted office hours for formative assessment reviews.

*People, Rocks, Fire* (GEOL 110) (Science Literacy Program fellow) Winter, 2016. Instructor of record: Alan Rempel I taught two lab sections, graded in-class and lab assignments, and designed and taught an in-class module on urban development.

*Geocommunication* (GEOL 420/520) Fall, 2015. Instructor of record: Gene Humphreys I graded assignments and provided feedback on extracurricular academic writing.

*Field Camp* (GEOL 406): Frying Pan & Block Mountain, Montana Summer, 2015. Instructors of record: Sammy Castonguay and Marli Miller I organized logistics for field mapping project, and camping trip to Glacier NP. I also graded parts of both final projects.

*Earthquakes* (Clark Honors College) Spring, 2015. Instructor of record: Gene Humphreys I helped shape the curriculum around philosophy of science with an emphasis on the history of seismology and plate tectonics. I also led class for a week.

*Western U.S. Tectonics* (GEOL 410/510) Spring, 2015. Instructor of record: Gene Humphreys I graded assignments, held office hours, and substitute taught two lectures.

*Field Camp* (GEOL 406): Block Mountain, Montana Summer, 2014. Instructors of record: Sammy Castonguay and Marli Miller I organized logistics for field days during mapping project, and camping trip to Glacier National Park. I also graded part of final project.

*Mechanical Earth* (GEOL 455/555) Winter, 2014. Instructor of record: Gene Humphreys. I graded assignments and helped students individually during office hours.

**Graduate Teaching Initiative** As part of my graduate studies I have completed the University of Oregon’s *Graduate Teaching Initiative: Advanced Certificate*. The following items are some of the components of that program.

### Workshops

*“Floods of Change: the Vanport Floods, Stereotype Threat, and 2YC-4YC Transfer”* (SAGE 2YC; SERC). Discussed the Vanport flood in the context of teaching environmental justice with local significance. Also discussed Earth science transfers from 2YC’s to 4YC’s, and supporting student success through the transfer process.

*“Establishing and Sustaining an Undergraduate Research Program”* (Council on Undergraduate Research; American Geophysical Union Fall Meeting, 2016) Presenters discussed ways to sustain an undergraduate presence in an active research group. The workshop primarily focused on maintaining an active line of research at a primarily undergraduate institution where funding and time allotment for research may be more difficult than at a larger, research-oriented institution.

*“Allies in the Classroom: Gender-Inclusive Teaching”* (Teaching Engagement Program) We discussed common misconceptions and pitfalls around striving to create “safe” spaces for people of all genders. The workshop focused on basic skills like classroom introductions, pronouns, disruptive students, and handling our own mistakes regarding students gender identities.

*“Engaging student resistance”* (Teaching Engagement Program) Discussed strategies/methods to reach students who resist engaging with academic content, especially with regards to controversial or politically charged subject matter.

*“Teaching for the first time as the sole instructor”* (Teaching Engagement Program) Discussed course design principles, techniques for achieving course objectives, building classroom community, facilitating discussion, student accountability, classroom policies, etc.

*“Getting to know your students”* (Teaching Engagement Program) Discussed the importance of, and techniques for getting to know the students in both big and small classes. Including ice breakers, surveys, office hour policies, etc.

### Courses on College Teaching

*“Teaching Science”* Explored methods of employing active learning techniques in science courses. We discussed content design choices from course objectives to individual lesson plans with the goal of developing course content which is engaging to students of a variety of backgrounds and interests.

**Science Literacy Program** I have worked with the University of Oregon’s Science Literacy Program throughout much of my graduate career. SLP facilitates a number of initiatives working towards broader adoption of evidence-based pedagogy.

*SLP Journal Club.* 2013–2018 The SLP Journal Club meets weekly for structured discussions of academic literature on topics related to teaching science, with different themes each term.

*SLP Fellowships* Two of my teaching assistantships (noted above) have been supported by the Science Literacy Program to facilitate participation in designing and/or delivering scientific content for an active-learning classroom.

### Outreach, Volunteer, Community Service

*Graduate Student Representative* University of Oregon Department of Earth Sciences, 2017–2018. Liaison between graduate student body and department faculty. I sit in on faculty meetings and vote on behalf of the graduate students in department issues like hiring decisions. Working on implementing grad student exit interviews to improve the grad student experience for future Ph.D. and Masters students.

*Volunteer presenter* at the University of Oregon Science Open House, 2016. The UO Science Open House is organized by the “SPICE!” program, and the UO STEM CORE. Its goal is to connect the local community with science outreach programs at the University of Oregon, including science summer camps, the UO Science and Invention Fair, and other on and off campus events.

*Science panelist* for the Academy of Arts and Academics high school, Springfield, OR, 2016. Advised groups of 9th and 10th grade students on the scientific content of their research for a “World’s Fair” project. Students’ research focused on the role of technological advancements in society.

*Union Steward* Graduate Teaching Fellows Federation, 2013–2017. Attend quarterly meetings of the executive council for the labor union representing graduate employees at the University of Oregon. Advocated on behalf of the Earth Sciences department on labor matters including through the 8 day graduate employee strike in December, 2014.

### Research

I am interested in long-term tectonics and geodynamic modeling of lithospheric deformation. I mainly focus on physical mechanisms that generate topography by modifying the density of the lithosphere. That includes processes like delamination, foundering, eclogitization, volcanism, etc.

*Doctoral Research:* Department of Earth Sciences, University of Oregon, 2012–2018. (Research advisers: Gene Humphreys and Leif Karlstrom)

I currently work on developing several types of numerical models. My models focus on the ways in which volcanic processes affect the lithosphere. I am particularly interested in processes involving exotic material properties such as anisotropic fabric in the lithosphere, nascent phase transitions, etc. I primarily approach these problems with finite element fluid flow models.

Much of my work focuses on topography generated by density changes in the lithosphere. These can result from loss of a dense mafic root, or eclogite formation in the lower crust promoted by surface loading of lava flows or sediment deposition. I also study exotic rheologies and instability of the crust caused by the presence of magmatic intrusions.

Physical constraints for my simulations typically come from structural field geology and geochemistry but I am also interested in expanding my focus to incorporate surface process constraints. Specifically, landscape geomorphology, and thermochronology can provide a lot of insight into tectonophysical mechanisms which are often overlooked in the geodynamic community.

I am an active contributor to the “Advanced Solver for Problems in Earth’s ConvecTion” (ASPECT) open source geodynamic modeling project (<https://aspect.dealii.org/>).

*Student Assistantship:* Spin-Polarized Electron Microscopy Lab, National Center for Electron Microscopy, Lawrence Berkeley National Lab, Berkeley, CA. 2011–2012. Also summers and winters of 2009 and 2010. (Research mentor: Andreas Schmid)

I developed a front-end software interface from scratch for real-time interaction with, and analysis of data from a spin-polarized low-energy electron microscope (SPLEEM).

*Undergraduate Honors Research:* Department of Physics, Lewis & Clark College, 2010–2011. (Research adviser: Dr. Herschel Snodgrass)

I studied the processes behind bimodal volcanic lightning to understand charge separation in low-altitude volcanic plumes.

*“REU” Student Researcher:* Department of Computer Science, Lewis & Clark College, Portland, OR. Summer, 2008. (Research adviser: Dr. Jens Mache)

I worked with a team to implement elliptic curve cryptography (ECC) functions on resource-limited devices.

## Publications

**J. Perry-Houts**, L. Karlstrom “Anisotropic viscosity and time-evolving lithospheric instabilities due to aligned igneous intrusions” *Geophysical Journal International* 216.2 (2019). doi.org/10.1093/gji/ggy466 [preprint] [supplement]

**J. Perry-Houts**, E. Humphreys “Eclogite-driven subsidence of the Columbia Basin (Washington State, USA) caused by deposition of Columbia River Basalt.” *Geology* 46.7 (2018). doi.org/10.1130/G40328.1

E. Humphreys, B. Schmandt, M. Bezada, **J. Perry-Houts** “Recent craton growth by slab stacking beneath Wyoming.” *Earth and Planetary Science Letters* 429 (2015): 170–180. doi.org/10.1016/j.epsl.2015.07.066

(Author acknowledgement) Gong Chen, and Andreas K. Schmid. “Imaging and Tailoring the Chirality of Domain Walls in Magnetic Films.” *Advanced Materials* 27.38 (2015): 5738–5743. doi.org/10.1002/adma.201500160

J. Mache, S.W. Bock, J. Elwell, D.P. Gosnell, T. Mandel, and **J. Perry-Houts** “Sensor Network Security: Elliptic Curve Cryptography on SunSPOTs.” *Proceedings of the International Conference on Wireless Networks* (2008): 687–692.

## Presentations and Abstracts

**J. Perry-Houts**, and E. Humphreys. “Lower-crustal metamorphism caused subsidence in Pasco Basin, Washington State.” AGU Fall Meeting Abstracts. Vol. 1. 2017.

K. Harvey, **J. Perry-Houts**, J. Domino, M. Muth, S. Carruthers, A. J. Kotowski, K. DeGrandpre, U. Faul, A. Kent, G. Abers, M. Krawczynski, G. Gaetani. “The ins and outs of mélangé diapirs: a multidisciplinary approach to formation, ascent, and observation.” AGU Fall Meeting Abstracts. 2017.

**J. Perry-Houts**, and L. Karlstrom. “Modeling Geodynamic Mobility of Anisotropic Lithosphere.” AGU Fall Meeting Abstracts. Vol. 1. 2016.

**J. Perry-Houts**, and E. Humphreys. “Melt-Enabled Lithospheric Delamination in the Western US.” AGU Fall Meeting Abstracts. Vol. 1. 2014.

**J. Perry-Houts**, M. Calo, C. L. Eddy, Mattia Guerri, A. Holt, E. Hopper, Andrea Tesoniero, B. A. Romanowicz, T. W. Becker, and L. S. Wagner. “Deep vs. shallow expressions of continental cratons: Can cratonic roots be destroyed by subduction?” AGU Fall Meeting Abstracts. Vol. 1. 2013.

(Invited) **J. Perry-Houts**, B. Barton, A. K. Schmid, N. Andresen, and C. Kisielowski. “Novel Long-Lived Electrostatic Work Function Phase Plates for TEM.” *Microscopy and Microanalysis* 18, no. S2 (2012): 476–477.

## Awards & Grants

*Collaborative Research: An integrated mantle to surface study of the causes and consequences of high topography in the Northern US Cordillera.* NSF EAR-1727046/1727139/1727451, 2017.

*Outstanding TA Award*, Department of Earth Sciences, University of Oregon, 2017.

*Departmental Honors*, Department of Physics, Lewis & Clark College, 2011.

*Feynman Prize*, Department of Physics, Lewis & Clark College, 2009.

## Affiliations

Member, National Association of Geoscience Teachers, 2018–present.

Member, Union of Concerned Scientists, 2017–present.

Member, Free Software Foundation, 2013–present.

Member, American Geophysical Union, 2012–present.

Member, Sigma Pi Sigma Physics Honors Society, 2009–2011.

## Certifications

Wilderness First Responder, Wilderness Medicine Institute, NOLS, 2010—2016.

## Technical skills

I have developed numerous technical skills over the years including UNIX system administration (Debian, FreeBSD, Gentoo, Ubuntu); software design (see <https://github.com/jperryhouts> for examples); GIS; electronics and robotics; parametric CAD design; welding; auto, motorcycle, and bicycle mechanics; machining; and woodworking.

I am proficient in many programming languages and related technologies, including: Python, Java, C, C++, BASH, JavaScript, HTML, CSS, SQL, Ruby, AWS, MPI, CUDA, and AVR assembly language.

### Notable professional software development

Since 2012 I have been an active contributor to the finite element code, ASPECT, a widely used computational fluid dynamics software for geodynamic modeling. I participated in the two week ASPECT Hackathon in 2015, and have contributed almost 30,000 lines of code in over 60 patches.

I developed a front-end interface for the spin-polarized low-energy electron microscope (SPLEEM) at Lawrence Berkeley National Lab, which has been used daily since 2009. It is implemented as an ImageJ plugin, with its own Python-based macro architecture.

## Other notable technical projects

Worked on installing seismic stations in remote parts of Oregon and Washington as part of an experiment to image the thickness of the crust near the Wallowa Mountains.

Worked independently and in groups to install solar powered seismometers with autonomous data loggers. Learned to diagnose and troubleshoot electrical and mechanical problems in the field with limited access to tools and parts.

Designed and built a remote humidity data collector using breadboarded electronic components. It lives in the storage shed, logs data to my server, and sends me SMS notifications when my camping gear is in danger of being damaged. I've since used the same tools to build several other small wireless devices.

In the process, I learned about embedded system programming, remote sensing, mesh network topology, server-side Python programming and deployment, and real-time data management with SQL. I also developed a simple encryption algorithm, based on RC4 to run on embedded devices.

Wrote an HTML5 implementation of the “Dual N-Back” memory game (<https://www.dual-n-back.io/>). It averages about 150 unique users per week, with a record of over 2,000 for a couple weeks after it was mentioned in the Houston Chronicle.

In the process, I learned about JavaScript, HTML, service worker API, accessibility best practices, and AWS computing/hosting.

Designed my blog, <http://jphblog.com>, from scratch, using JavaScript, HTML, CSS, and the static site generator, Jekyll.

In the process, I've learned about static web site design, CSS, and the Ruby programming language.

## “Open Source”

I make as much of my code public as I think might be useful to others. I am an active contributor to several Free/Open Source projects, including ASPECT, and have contributed code to several large open source projects like deal.II, and Paraview. I strongly believe that as algorithms become more central to society, it is imperative that code be freely available to use, extend, modify, redistribute, and study. I believe that software freedom is an important component of environmental justice, with broad social implications.

## Interests & Activities

I have a deep appreciation for the outdoors, and back country wilderness. I have been rock climbing and mountaineering in the western U.S. since 2002, plus some notable back country adventures in Canada, Patagonia, and Kyrgyzstan. I participated in regional and national bouldering competitions in the Bay Area during high school. I enjoy mountain biking and road bike touring. I have completed several long-distance bicycle tours on the west coast, both with friends, and solo. I recently got interested in back country skiing, and enjoy skiing the many volcanoes of the Oregon wilderness.

As an extension of those interests I have completed the 80 hour NOLS Wilderness First Responder certification (now expired), and basic avalanche safety training for mountaineering and back country survival. Fortunately, I've never had to use many of those skills, but they've been reassuring to have while in the field with students, and with friends in the back country.