Lindsey J. Heagy

Curriculum Vitae · April, 2019

Postdoctoral Researcher, University of California, Berkeley
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Education

Sept. 2012 – Nov. 2018 **PhD** in Geophysics, University of British Columbia
Supervisor: Dr. Douglas Oldenburg
Thesis: *Electromagnetic imaging for subsurface injections*

Sept. 2008 – June 2012 **BSc** with Honors in Geophysics, University of Alberta
First Class Honors

Appointments

Nov. 2018 – present **Postdoctoral Researcher**, Department of Statistics, University of California, Berkeley

Professional Experience

Apr. 2016 – Sept. 2017 **Aranz Geo Canada Limited** (Calgary, AB)
Computational Geophysics Consultant (part-time)

- Consulting on software architecture and user interface design for Steno3D, a technical communication and 3D visualization software product
- Technical writing and editing, including internal reports and abstracts for scientific conferences

Nov. 2015 – Apr. 2016 **3point Science Inc** (Calgary, AB)
Computational Geophysicist (part-time)

- Consulting on the development and design of interactive 3D visualization software for the geosciences

Jun. 2014 – Aug. 2014 **Schlumberger Doll Research** (Boston, MA)
Geophysics Intern

- Supervisor: Dr. Dzevat Omeragic
- Examined upscaling techniques and performed numerical simulations to investigate the feasibility of electromagnetic imaging of complex hydraulic fractures

Jun. 2013 – Aug. 2013 **Schlumberger Electromagnetic Imaging** (Richmond, CA)
Geophysics Intern

- Supervisor: Dr. Michael Wilt
- Developed a workflow for mapping hydraulic fractures using cross-well electromagnetic surveys
- Awarded the patent: "Determining proppant and fluid distribution" (US Patent App. 14/494,313) which was developed from this work

May 2012 – Aug. 2012 **ConocoPhillips Canada** (Calgary, AB)
Geophysics Summer Student

- Supervisor: Richard Forest
- Interpreted 3D seismic volumes covering 8 townships in Western Canada by tying synthetic seismograms, mapping seismic horizons, and examining seismic attributes.
- Worked with geologists and reservoir engineers to map a potential natural gas resource and propose a drilling location

May 2011 – Aug. 2011 **Alfred Wegener Institute of Polar and Marine Research** (Bremerhaven, Germany)
Geophysics Summer Student

- Conducted numerical simulations to generate velocity profiles and estimate transport of the Antarctic Circumpolar Current south of Africa
- This project was funded through the Research Internships in Science and Engineering (RISE) program of the German Academic Exchange Service (DAAD)

Teaching Assistantships

2013 – 2016 **EOSC 350: Environmental, Geotechnical, and Exploration Geophysics I**
University of British Columbia

- Instructor: Dr. Douglas Oldenburg
- Developed labs and assignments, including interactive numerical simulations for labs
- Coordinated content and website upgrades for the web-based resource "Geophysics for Practicing Geoscientists" (http://gpg.geosci.xyz)
- Worked with a Teaching Assistant Team of 5-6 members to instruct labs, mark assignments & exams for 50-60 geology and engineering students

2015 **Directed Studies: Inversion in Applied Geophysics**
University of British Columbia

- Instructor: Dr. Douglas Oldenburg
- Provided guidance for an undergraduate student in his independent study. He developed Jupyter Notebook Tutorials on the basics of geophysical inversions (https://github.com/jokulhaup/directed_studies)

2012 **EOSC 354: Analysis of Time Series and Inverse Theory for Earth Scientists**
University of British Columbia

- Instructor: Dr. Michael Bostock
- Instructed labs, marked labs and assignments for a class of 14 geophysics students

Service and Outreach

2017 – present **Journal of Open Source Software**
Editor: Geoscience, geophysics (http://joss.theoj.org/about)

2017 **Society of Exploration Geophysics Distinguished Instructor Short Course 2017**
Support Instructor for *Geophysical Electromagnetics: Fundamentals and Applications* by Dr. Douglas Oldenburg (http://disc2017.geosci.xyz)

- Included generating course material, leading tutorials on numerical simulations and inversions for electromagnetics, addressing questions from participants, documenting the events and participant presentations on a blog (https://medium.com/disc2017) and developing and maintaining the course website (https://disc2017.geosci.xyz)
- Locations for which I was a support instructor:
  - Denver, USA (January 30-31, 2017)
  - Perth, Australia (July 27-28, 2017)
  - Adelaide, Australia (August 2-3, 2017)
  - Brisbane, Austraila (August 7-8, 2017)
  - Delft, Netherlands (September 11-12, 2017)
  - Bonn, Germany (September 18-19, 2017)
  - Vienna, Austria (September 21-22, 2017)
  - Zurich, Switzerland (September 26-27, 2017)
  - Aarhus, Denmark (October 2-3, 2017)
  - Toronto, Canada (October 27, 2017)
  - Mexico City, Mexico (November 6-7, 2017)
  - Buenos Aires, Argentina (November 13-14, 2017)
  - Santiago, Chile (November 16-17, 2017)
  - Santa Cruz de la Sierra, Bolivia (November 22-23, 2017) - Cancelled
  - Rio de Janeiro, Brazil (November 28-29, 2017)
  - Calgary, Canada (December 5-6, 2017)
  - Vancouver, Canada (December 12-13, 2017)

2017 **American Geophysical Union (AGU) Annual Meeting Session Organizer: Open Source Software in the Geosciences**
Member of the organizing comittee along with Anna Kelbert, Luz Andelica Caudillo Mata, Jared Peacock, Suzan van der Lee, Juan Lorenzo, and Louise Pellerin

- Selected invited panelists for panel discussion (recording available at: https://youtu.be/0GO4ZZ5Ry6M)
- Drafted discussion questions for the panel and reviewed abstract submissions
- Follow up includes discussion within the AGU to elevate the visibility and support for open source software within the AGU

2017 **JupyterCon**, August 22-25, New York, NY

Program Committee Member (https://conferences.oreilly.com/jupyter/jup-ny)

- This was the inaugural year for JupyterCon
- Committee responsibilities included: reviewing abstracts, outreach to potential speakers, event promotion

2016 **Banff International Research Station: Geophysical Simulation and Inversion Workshop**, August 19-21, Banff, AB
Supporting Organizer with Dr. Douglas Oldenburg, Dr. Adam Pidlisecky and Rowan Cockett (http://www.birs.ca/events/2016/2-day-workshops/16w2695)

- Awarded a 2 day workshop at the Banff International Research Station
- Invited 25 researchers and graduate students from 5 universities across Canada and the United States to discuss strategies for integration and cross-disciplinary communication between each of the sub-disciplines of geophysics.
- Much of the discussion focussed on using the open-source software framework SimPEG as a tangible means of building a community of researchers across the various disciplines of geophysics

2014 – present **GeoSci.xyz**
Core maintainer and contributor to online interactive textbooks for geophysics (http://geosci.xyz). Resources include:

- Geophysics for Practicing Geoscientists (http://gpg.geosci.xyz)
- Electromagnetic Geophysics (http://gpg.geosci.xyz)

2014 – present **SimPEG**
Core maintainer and community developer (https://github.com/simpeg)

- Contribute code, review pull requests, and provide input on development plans
- Organize weekly meetings (all are recorded: https://www.youtube.com/playlist?list=PLhlr7wwe–P8_C31vq6
- Support users by answering questions on the google group (https://groups.google.com/forum/#!forum/simpeg) and slack channel (http://slack.simpeg.xyz)
- Maintain the SimPEG blog (https://medium.com/simpeg)

2014 – 2015 **Undergraduate Research Mentor**
Advised Mohamed Rassas on as a part of the Undergraduate Research Opportunities Research Experience Program at the University of British Columbia

- His work resulted in the presentation: *A comparison of conventional and open channel hydraulic fracturing and the importance of imaging to optimize the fracturing process* at the Multidisciplinary Undergraduate Research Conference at the University of British Columbia

2005 – 2009 **Volunteer Instructor: Alberta Diploma Exam Reviews**
Developed and delivered review courses for Physics 30, Chemistry 30, Pure Math 30 in the Alberta high school curricumum
Supervised by Mr. David Westra

Publications

Peer Reviewed Publications

1.
2. Cockett, R., **L. J. Heagy**, and E. Haber, 2018, Efficient 3d inversions using the richards equation: Computers & Geosciences, **116**, 91 – 102
3. **Heagy, L. J.**, R. Cockett, S. Kang, G. K. Rosenkjaer, and D. W. Oldenburg, 2017a, A framework for simulation and inversion in electromagnetics: Computers & Geosciences, **107**, 1 – 19
4. Caudillo-Mata, L. A., E. Haber, **L. J. Heagy**, and C. Schwarzbach, 2017, A framework for the upscaling of the electrical conductivity in the quasi-static maxwell's equations: Journal of Computational and Applied Mathematics, **317**, 388 – 402
5. Cockett, R., S. Kang, **L. J. Heagy**, A. Pidlisecky, and D. W. Oldenburg, 2015a, Simpeg: An open source framework for simulation and gradient based parameter estimation in geophysical applications: Computers & Geosciences, **85**, 142–154

Non Peer Reviewed Publications

1. Kang, S., **L. J. Heagy**, R. Cockett, and D. W. Oldenburg, 2017, Exploring nonlinear inversions: A 1d magnetotelluric example: The Leading Edge, **36**, 696–699
2. Cockett, R., **L. J. Heagy**, and D. W. Oldenburg, 2016, Pixels and their neighbors: Finite volume: The Leading Edge, **35**, 703–706

Patents

1. Wilt, M., N. Cuevas, and **L. J. Heagy**, 2014a, Determining proppant and fluid distribution. (US Patent App. 14/494,313)

Conference Proceedings

(∗ : invited, † : award)

1.
2. **Heagy, L. J.**, R. Cockett, and D. W. Oldenburg, 2017b, Modular electromagnetic simulations with applications to steel cased wells, *in* Proceedings of the 6th International Symposium on Three-Dimensional Electromagnetics: 125–129
3. ∗ Kang, S., R. Cockett, **L. J. Heagy**, and D. W. Oldenburg, 2016, Practices to enable the geophysical research spectrum: from fundamentals to applications: Presented at the 2016 AGU Fall Meeting
4. ∗ **Heagy, L. J.**, and D. W. Oldenburg, 2016b, Examining the impact of steel cased wells on electromagnetic signals: Presented at the 2016 AGU Fall Meeting
5. ∗ **Heagy, L. J.**, R. Cockett, and D. W. Oldenburg, 2016c, Geosci: Practices to collaboratively build online resources for geophysics education: Presented at the 2016 AGU Fall Meeting
6. Yang, D., D. W. Oldenburg, and **L. J. Heagy**, 2016, 3d dc resistivity modeling of steel casing for reservoir monitoring using equivalent resistor network, *in* SEG Technical Program Expanded Abstracts 2016: Society of Exploration Geophysicists, 932–936
7. **Heagy, L. J.**, R. Cockett, S. Kang, G. K. Rosenkjaer, and D. W. Oldenburg, 2015b, simpegem: An open-source resource for simulation and parameter estimation problems in electromagnetic geophysics: Presented at the 2015 AGU Fall Meeting
8. **Heagy, L. J.**, R. Cockett, S. Kang, and D. W. Oldenburg, 2015a, Real simulation tools in introductory courses: packaging and repurposing our research code.: Presented at the 2015 AGU Fall Meeting

9. Cockett, R., **L. J. Heagy**, S. Kang, and G. K. Rosenkjaer, 2015b, Development practices and lessons learned in developing simpeg: Presented at the 2015 AGU Fall Meeting
10. **Heagy, L. J.**, R. Cockett, D. W. Oldenburg, and M. Wilt, 2015c, Modelling electromagnetic problems in the presence of cased wells, *in* SEG Technical Program Expanded Abstracts 2015: 699–703
11. Kang, S., R. Cockett, **L. J. Heagy**, and D. W. Oldenburg, 2015, Moving between dimensions in electromagnetic inversions, *in* SEG Technical Program Expanded Abstracts 2015: 5000–5004
12. Cockett, R., S. Kang, and **L. J. Heagy**, 2014, Simpeg: An open-source framework for geophysical simulations and inverse problems: AGU Fall Meeting Abstracts, 07
13. **Heagy, L. J.**, A. R. Cockett, and D. W. Oldenburg, 2014a, Parametrized inversion framework for proppant volume in a hydraulically fractured reservoir, *in* SEG Technical Program Expanded Abstracts 2014: 865–869
14. Caudillo-Mata, L., E. Haber, **L. J. Heagy**, and D. W. Oldenburg, 2014, Numerical upscaling of electrical conductivity: A problem specific approach to generate coarse-scale models, *in* SEG Technical Program Expanded Abstracts 2014: 680–684
15. Fournier, D., **L. J. Heagy**, N. Corcoran, D. Cowan, S. G. R. Devriese, D. Bild-Enkin, K. Davis, S. Kang, D. Marchant, M. S. McMillan, M. Mitchell, G. K. Rosenkjar, D. Yang, and D. W. Oldenburg, 2014, Multi-em systems inversion - towards a common conductivity model for the tli kwi cho complex, *in* SEG Technical Program Expanded Abstracts 2014: 1795–1799
16. Devriese, S. G. R., N. Corcoran, D. Cowan, K. Davis, D. Bild-Enkin, D. Fournier, **L. J. Heagy**, S. Kang, D. Marchant, M. S. McMillan, M. Mitchell, G. K. Rosenkjar, D. Yang, and D. W. Oldenburg, 2014, Magnetic inversion of three airborne data sets over the tli kwi cho kimberlite complex, *in* SEG Technical Program Expanded Abstracts 2014: 1790–1794
17. Wilt, M., **L. J. Heagy**, and J. Chen, 2014b, Hydrofracture mapping and monitoring with borehole electromagnetic (em) methods: Presented at the 76th EAGE Conference and Exhibition 2014
18. † **Heagy, L. J.**, D. W. Oldenburg, and J. Chen, 2014b, Where does the proppant go? examining the application of electromagnetic methods for hydraulic fracture characterization: Presented at the GeoConvention 2014, CSEG
    † Student Honourable Mention Integrated Poster
19. † **Heagy, L. J.**, and D. W. Oldenburg, 2013, Investigating the potential of using conductive or permeable proppant particles for hydraulic fracture characterization, *in* SEG Technical Program Expanded Abstracts 2013: 576–580
    † Award of Merit (Best Student Paper, Annual Meeting)

Other Conference Presentations

1. **Heagy, L. J.**, and R. Cockett, 2017, Deploying a reproducible course: Presented at the JupyterCon, https://youtu.be/XY3Tq9Wd1_A
2. **Heagy, L. J.**, D. Fournier, S. Kang, and C. Miller, 2017c, Simulation and parameter estimation in geophysics: Presented at the British Columbia Geophysical Society Meeting
3. **Heagy, L. J.**, 2016, Using open source tools to refactor geoscience education: Presented at the SciPy 2016, Austin, TX, https://youtu.be/lW2LDsevvDk
4. **Heagy, L. J.**, 2015, Using python to span the gap between education, research, and industry applications in geophysics: Presented at the SciPy 2015 Conference in Austin, TX, https://youtu.be/4msHJMBvzaI
5. Rosenkjaer, G. K., **L. J. Heagy**, R. Cockett, S. Kang, and D. W. Oldenburg, 2015, Practical integration of processing, inversion and visualization of magnetotelluric geophysical data: Presented at the SciPy 2015 Conference in Austin, TX
6. ∗ **Heagy, L. J.**, D. W. Oldenburg, M. Wilt, and J. Chen, 2014c, Using electromagnetics to delineate proppant distribution in a hydraulically fractured reservoir: Presented at the SEG Development and Production Forum, Santa Rosa CA
    ∗ Invited to “Best of the Development and Production Forum” at the SEG 2014 Annual Meeting

Software Contributions

I contribute to a number of open-source software projects, all of which are accessible through my GitHub profile https://github.com/lheagy. The major projects I contribute to are:

2014 – present **SimPEG**
Software for numerical simulations and inversions in geophysics
https://github.com/simpeg/simpeg

2014 – present **discretize**
Discretization tools for finite volume and inverse problems
https://github.com/simpeg/discretize

2016 – present **geoana**
Analytic solutions in geophysics
https://github.com/simpeg/geoana

Awards and Scholarships

2016 **UBC Library: Innovative Dissemination of Research Award**
Awarded for the SimPEG framework and community development ($\$1,000$). With Rowan Cockett and Seogi Kang.

2014 – 2017 **NSERC Vanier Scholarship**
Vanier Scholars demonstrate leadership skills and a high standard of scholarly achievement in graduate studies in the social sciences and/or humanities, natural sciences and/or engineering and health. The Vanier Scholarship is the top graduate scholarship in Canada. ($\$50,000 \times 3$)

2014 – 2017 **Alexander Graham Bell Canada Graduate Scholarship**
Awarded to high caliber scholars who are engaged in a doctoral program in the natural sciences or engineering (Declined) ($\$35,000 \times 3$)

2014 – 2018 **Four Year Fellowship (FYF) for PhD Students**
Selection based on academic excellence, upon the recommendation of the graduate program at UBC ($\$18,000 \times 4$, declined 3/4)

2013 **Special UBC Graduate Scholarship - W.H. Mathews Scholarship**
Awarded for academic achievement in Earth, Ocean and Atmospheric Sciences at UBC ($\$5,000$)

2012 **Governor General's Silver Medal**
Awarded annually to the three undergraduate students (institution-wide) who achieve the highest academic standing overall upon graduation from his/her Bachelor degree program (University of Alberta)

2012 **Lieutenant-Governor's Gold Medal**
Awarded to the convocating student from an Honours program in the Faculty of Science who has shown the highest distinction in scholarship (University of Alberta)

2012 **APEGGA Past Presidents' Medal in Geophysics**
Awarded to the convocating student who is a Canadian Citizen or Permanent Resident with the highest academic standing in a specialization or honours program in Geophysics on the basis of the final year

2011 **The APEGGA Scholarship in Geophysics**
Awarded on the basis of superior academic achievement in Honors Geophysics or Specialization in Geophysics ($\$3,000 \times 2$)

2010 – 2012 **The David K Robertson Award in Geophysics and Geology**
Awarded to a student entering the third year of a BSc Specializing in Geology or Geophysics on the basis of passion and talent in their field of study, demonstrated leadership, participation in extracurricular activities, and academic standing. ($\$5,000 \times 2$)

2010 – 2012 **The Encana Geology and Geophysics Scholarship**
Awarded to student(s) with superior academic achievement entering the third or fourth year of study for a Bachelor of Science with a major in Geology or Geophysical Sciences. ($\$3,500 \times 2$)

2009 – 2011 **Louise McKinney Post Secondary Scholarship, Government of Alberta**
Recognizes students for their academic achievements at a provincial level and encourages them to continue in their undergraduate program of study ($\$2,500 \times 3$)

2009 **Pearl Cuthbertson Memorial Award**
Awarded to a student entering the second year of study for a Bachelor of Science degree who has completed Science 100. Selection based on academic standing and demonstrated determination, curiosity and enthusiasm for science. ($\$2,000 \times 2$)

2009 **Pearson Book Prize**
Awarded for academic achievement in Writing Studies in Science 100

2008 – 2012 **Dean's Honor Roll, University of Alberta**
Awarded for academic achievement ($\times 4$)

Grants

2014 **Science Center for Learning and Teaching - Development Grant**
For development of online interactive resources for undergraduate geophysics at the University of British Columbia ($\$2,500$)
Principal Investigator: Dr. Douglas Oldenburg

Media

May 25, 2018 Guest on Episode 163: Python in Geoscience, *Talk Python to Me* by Michael Kennedy (https://talkpython.fm/)

Apr. 24, 2017 Guest on Episode 41, *Undersampled Radio* by Graham Ganssle and Matt Hall (https://undersampledrad.io)

Jan. 24, 2017 Guest on Episode 11, *Seismic Soundoff* by the Society of Exploration Geophysicists (http://seg.org/podcast)

Jun. 7, 2012 Article: *Science 100 pioneer grounded in geophysics - University of Alberta Spring Convocation 2012: Celebrating Talented People* (https://www.ualberta.ca/news-and-events/newsarticles)