# Lindsey J. Heagy

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## Education

**University of British Columbia** 2012 – present
Doctor of Philosophy in Geophysics
Thesis: Monitoring Hydraulic Fracturing with Electromagnetic Geophysics
Supervisor: Dr. Douglas Oldenburg

**University of Alberta** 2008 – 2012
Bachelor of Science with Honors in Geophysics (First Class Honors)

## Professional Experience

**Aranz Geo Canada Limited (Calgary, AB)** Apr. 2016 – Sept. 2017
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

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

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

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

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

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

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

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

**EOSC 350: Environmental, Geotechnical, and Exploration Geophysics I** 2013 – 2016
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

**Directed Studies: Inversion in Applied Geophysics** 2015
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)

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

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

## Service

**Journal of Open Source Software** 2017
Editor: Geoscience, geophysics
JOSS: http://joss.theoj.org/about

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

**JupyterCon** 2017
August 22-25, New York, NY
Program Committee Member
https://conferences.oreilly.com/jupyter/jup-ny

**Banff International Research Station: Geophysical Simulation and Inversion** 2016
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

## Outreach

**GeoSci.xyz** 2014 – present
Online interactive textbooks for geophysics
Editor and contributor
http://geosci.xyz

**SimPEG** 2013 – present
Open source software for Simulation and Parameter Estimation in Geophysics
Lead developer and contributor
http://simpeg.xyz

## Publications

### Peer Reviewed Publications

1. **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
2. 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 maxwells equations: Journal of Computational and Applied Mathematics, **317**, 388 – 402
3. 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. **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

2. * 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

3. * **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

4. * **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

5. 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

6. **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

7. **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

8. 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

9. **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

10. 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

11. 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

12. **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

13. 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

14. 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

15. 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

16. 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

17. † **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

18. † **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
    † Awards of Merit (Best Student Paper, Annual Meeting)

### Other Conference Presentations

1. **Heagy, L. J.**, 2016, Using open source tools to refactor geoscience education: Presented at the SciPy 2016, Austin, TX, https://youtu.be/IW2LDsevvDk

2. **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

3. 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

4. * **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

## Awards and Scholarships

**UBC Library: Innovative Dissemination of Research Award** 2016
Awarded for the SimPEG framework and community development ($1,000)

**NSERC Vanier Scholarship** 2014–2017
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 × 3)

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

**Four Year Fellowship (FYF) for PhD Students** 2014–2018
Selection based on academic excellence, upon the recommendation of the graduate program at UBC

**Special UBC Graduate Scholarship - W.H. Mathews Scholarship** 2013

Awarded for academic achievement in Earth, Ocean and Atmospheric Sciences at UBC ($5,000)

**Governor Generals Silver Medal** 2012

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)

**Lieutenant-Governors Gold Medal** 2012

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)

**APEGGA Past Presidents Medal in Geophysics** 2012

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

**The APEGGA Scholarship in Geophysics** 2011

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

**The David K Robertson Award in Geophysics and Geology** 2010–2012

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. ($5,000 \times 2$)

**The Encana Geology and Geophysics Scholarship** 2010–2012

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. ($3,500 \times 2$)

**Louise McKinney Post Secondary Scholarship, Government of Alberta** 2009 – 2011

Recognizes students for their academic achievements at a provincial level and encourages them to continue in their undergraduate program of study ($2,500 \times 3$)

**Pearl Cuthbertson Memorial Award** 2009

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. ($2,000 \times 2$)

**Pearson Book Prize** 2009

Awarded for academic achievement in Writing Studies in Science 100

**Dean's Honor Roll, University of Alberta** 2008 – 2012

Awarded for academic achievement ($\times 4$)

## Grants

**Science Center for Learning and Teaching - Development Grant** 2014

Development of online interactive resources for undergraduate geophysics at UBC ($2,500)
Principal Investigator: Dr. Douglas Oldenburg

## Media

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| 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) |

## Professional Development

### Conferences Attended

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| 2017 | EM-6: The 6th International Symposium in Three-Dimensional Electromagnetics |
| 2016 | FORCE11: The Future of Research Communications and e-Scholarship Meeting |
| 2015 – 2016 | (2) SciPy Conference |
| 2014 – 2015 | (2) British Columbia Geophysical Society EM Workshop |
| 2014 | SEG Development and Production Forum |
| 2014 | GeoConvention |
| 2014 – 2016 | (3) AGU Annual General Meeting |
| 2011 – 2016 | (6) Society of Exploration Geophysics Annual Meeting |

### Courses Attended

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| 2015 | Presenting Data and Information presented by Edward Tufte |
| 2014 | SEG Distinguished Instructor Short Course: Microseismic Imaging of Hydraulic Fracturing: Improved Engineering of Unconventional Shale Reservoirs presented by Shawn Maxwell |