**STEPHANIE L. OLSON**

Department of the Geophysical Sciences

University of Chicago

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**RESEARCH INTERESTS**

Earth system evolution, marine biogeochemistry, astrobiology, exoplanet life detection

**EDUCATION**

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| --- | --- |
| **2018** | **PhD, Geochemistry**  University of California, Riverside |
| **2013**  **2011** | **MS, Geosciences**  Pennsylvania State University  **BS Geophysics, BS Geology**  University of Minnesota |

**APPOINTMENTS**

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| **2020** | **Assistant Professor**  Department of Earth, Atmospheric, and Planetary Science  Purdue University |
| **2018-**  **2020** | **T.C. Chamberlin Postdoctoral Fellow**  Department of the Geophysical Sciences  University of Chicago |

**SELECTED HONORS & AWARDS**

* Chancellor’s Distinguished Fellow, University of California, 2013
* Outstanding Teaching Assistant, University of Minnesota, 2011
* Ralph and Jayne McMillen Scholarship in Geoscience, 2010
* H. Walter and E. Joyce Rembold Institute of Technology Honors Scholarship, 2009-11
* Richard Clarence Dennis Scholarship in Geoscience, 2009

**PEER REVIEWED PUBLICATIONS** (\*denotes student mentee)

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| **Forthcoming**  **2019**  **2018**  **2017**  **2016**  **2013** | 18. **Olson SL**, Droser ML, Gehling J, Lyons TW. Ediacaran Oxygen Oases Encouraged the Emergence of Bilaterian Burrowing Behavior, *in review for Geobiology.*  17. **Olson SL**, Jansen M, Abbot DS. Oceanographic Constraints on Exoplanet Life, *in revision for Astrophysical Journal*. [arXiv:1909.02928](https://arxiv.org/abs/1909.02928) [astro-ph.EP]  16. \*Alcabes ODN, **Olson SL**, Abbot DS, Typical Climate Perturbations Unlikely to Disrupt Gaia Hypothesis, *in revision for MNRAS*. arXiv:1906.01112 [astro-ph.EP]  15. Ostrander CM, Kendall B, **Olson SL**, et al. An expanded d98Mo record permits recurrent shallow marine oxygenation during the Neoarchean, *Chemical Geology*, accepted.  14. Checlair JH, **Olson SL**, Jansen MF, Abbot DS (2019). No Snowball on Habitable Tidally Locked Planets with a Dynamic Ocean. *Astrophysical Journal Letters* 884: L46.  13. Gregory DD, Mukherjee I, **Olson SL** et al. (2019). The formation mechanisms of sedimentary pyrite nodules determined by trace element and sulfur isotope microanalysis. *Geochimica et Cosmochimica Acta* 259: 53-68.  12. Schwieterman E.W., Reinhard C.T., **Olson S.L**, Harman C.E., Lyons T.W. (2019) A limited habitable zone for complex life. *Astrophysical Journal* 878: 19.  11. Schwieterman E.W., Reinhard C.T., **Olson S.L**., Ozaki K., Harman C, Lyons T.W. (2019) Rethinking CO "Anti-Biosignatures" in the Search for Life Beyond Earth. Astrophysical Journal 874: 9.  10. **Olson SL**, Ostrander C, Gregory DD, Roy M, Anbar AD, Lyons TW. (2019) Volcanically modulated pyrite burial and ocean-atmosphere oxidation. *Earth and Planetary Science Letters* 506: 417-427.  9. **Olson SL**, Schwieterman EW, Reinhard CT, Ridgwell A, Meadows VS, Lyons TW. (2018) Atmospheric seasonality as an exoplanet biosignature. *Astrophysical Journal Letters* 858: L14.  8. Schwieterman EW, Kiang NY, Parenteau MN, … , **Olson SL**, *et al*. (2018) Exoplanet Biosignatures: A Review of Remotely Detectable Signs of Life, *Astrobiology* 18: 663-708.  7. **Olson SL**, Schwieterman EW, Reinhard CT, Lyons TW (2018)*.* Earth: Atmospheric Evolution of a habitable planet*,* in Deeg HJ & Belmonte JA (eds), *Handbook of Exoplanets.*  6. Krissansen-Totton J, **Olson SL**, Catling D (2018)*.* Disequilibrium biosignatures on Earth through time and implications for remote life detection, *Science Advances* 4: eaao5747.  5. Reinhard CT, **Olson SL**, Schwieterman EW, Lyons TW (2017) False Negatives for Remote Life Detection on Ocean-Bearing Planets: Lessons from the Early Earth. *Astrobiology* 17:287–297.  4. **Olson SL**, Reinhard CT, Lyons TW (2016b) Cyanobacterial Diazotrophy and Earth’s Delayed Oxygenation. *Frontiers in Microbiology* 7:1526.  3. **Olson SL**, Reinhard CT, Lyons TW (2016a) Limited role for methane in the mid-Proterozoic greenhouse. *Proceedings of the National Academy of Sciences* 113:11447–11452.  2. Reinhard CT, Planavsky NJ, **Olson SL**, Erwin DH, Lyons TW (2016) Earth’s oxygen cycle and the evolution of animal life. *Proceedings of the National Academy of Sciences* 113:8933–8938.  1. **Olson SL**, Kump LR, Kasting JF (2013) Quantifying the areal extent and dissolved oxygen concentrations of Archean oxygen oases. *Chemical Geology* 362:35–43. |
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**SEMINARS & COLLOQUIA**

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| **2019**  **2018** | Exo-oceanography and the Search for Life in Uncharted Waters  *Department of the Geophysical Sciences, University of Chicago*  Chicago, IL, October 2019  Resolving Ambiguities in the Search for Life in the Universe  *Earth and Ocean Sciences, University of Victoria*  British Columbia, Canada, March 2019  Resolving Ambiguities in the Search for Life in the Universe  *Earth, Atmospheric, and Planetary Sciences, Purdue University*  West Lafayette, IN, February 2019  Characterizing Ozone Detectability and Seasonality on Weakly Oxygenated Terrestrial Exoplanets: Lessons from Early Earth.  *LUVOIR Seminar, NASA Goddard* (remote), April 2018  Atmospheric Seasonality as an Exoplanet Biosignature  *Center for Space and Habitability, University of Bern*  Bern, Switzerland, February 2018  Leveraging Earth Science in the Search for Life Elsewhere  *Department of the Geophysical Sciences, University of Chicago*  Chicago, IL, January 2018 |

**KEYNOTES & INVITED TALKS**

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| **2019**  **2018**  **2016**  **2014** | Exo-oceanography and the Search for Life in Uncharted Waters  ***Keynote,*** *Goldschmidt 2019*. Barcelona, Spain  Distinguishing biological and geological methane  ***Invited,*** *Sagan Workshop 2019*, Pasadena, CA  Higher ocean salinity significantly warms Archean climate  ***Invited,*** *NASA AbSciCon 2019*, Seattle, WA  Co-evolution of Oceanic and Atmospheric Chemistry  ***Invited,*** *Comparative Climatology of Terrestrial Planets III*, Houston, TX  Nutrient-O2 feedbacks and Proterozoic pO2 regulation  ***Invited,*** *Goldschmidt 2016*, Yokohama, Japan  Oxygen oases before and after the GOE: insights from metals and models  ***Invited****, AGU Fall Meeting 2014*, San Francisco, CA |

**CONTRIBUTED ABSTRACTS** (\*denotes student mentee)

\*Barnett M, **Olson SL** (2019) Nutrient Cycling in Exoplanet Oceans. *AGU Fall Meeting*, San Francisco, CA.

\*Alcabes ODN, **Olson SL**, Abbot DS (2019) Typical Climate Perturbations Unlikely to Disrupt Gaia Hypothesis. *AGU Fall Meeting*, San Francisco, CA.

Checlair J, Abbot DS, Jansen MF, Menou K, **Olson SL**, Paradis A, Salazar A (2019) The Snowball Bifurcation on Tidally Locked Planets. *AGU Fall Meeting*, San Francisco, CA.

Abbot DS, Alcabes ODN, Checlair J, Hayworth B, Komacek TD, **Olson SL**, Popovic P (2019) What HabEx and LUVOIR can tell us about Habitability, Inhabitation, and Biosigning. *AGU Fall Meeting*, San Francisco, CA.

**Olson SL**, Checlair J, Abbot DS (2019) Ocean Heat Transport and Glaciation Dynamics on Tidally Locked Planets. *Goldschmidt*, Barcelona, Spain.

Schwieterman EW, Reinhard CT, **Olson SL**, Harman CE, Lyons TW (2019) A Limited Habitable Zone for Complex Life. *Goldschmidt*, Barcelona, Spain.

**Olson SL**, Jansen M, Abbot DS (2019) Exo-oceanography and the Search for Life in Uncharted Waters. *NASA AbSciCon*, Seattle, WA.

Lyons TW, **Olson SL**, Reinhard CT, Schwieterman EW (2019) How Earth’s Early Oceans and Atmosphere Help Guide the Search for Life Beyond our Solar System. *NASA AbSciCon*, Seattle, WA.

Schwieterman EW, Reinhard CT, **Olson SL**, Harman CE, Lyons TW (2019) A Limited Habitable Zone for Complex Life. *NASA AbSciCon*, Seattle, WA.

**Olson SL**, Droser ML, Gehling J, Lyons TW (2018) Ediacaran oxygen oases and the emergence of bilaterian burrowing. *Midwest Geobiology Symposium*, Evanston, IL.

**Olson SL**, Schwieterman EW, Reinhard CT., Ridgwell A, Meadows VS, Lyons TW (2018) Atmospheric Seasonality as an Exoplanet Biosignature. *Goldschmidt*, Boston, MA.

Krissansen-Totton J, **Olson SL**, Garland R, Irwin P, Catling D (2018) Disequilibrium Biosignatures on the Early Earth and their Detectability with the James Webb Space Telescope. *Goldschmidt*, Boston, MA.

Schwieterman EW, **Olson SL**, Reinhard CT, Lyons TW (2018) The Importance of Ozone and UV Capability in Detecting Biosignatures on Planets with Intermediate Oxygenation States. *Goldschmidt*, Boston, MA.

**Olson SL**, Droser ML, Gehling J, Lyons TW (2018) Benthic Oxygen Oases and Early Animal Evolution. *Southern California Geobiology Symposium*, Riverside, CA.

**Olson SL**, Schwieterman EW, Reinhard CT, Ridgwell A, Meadows VS, Lyons TW (2017) Atmospheric seasonality on early Earth and Earth-like exoplanets. *AGU Fall Meeting*, New Orleans, LA.

**Olson SL**, Schwieterman EW, Reinhard CT, Ridgwell A, Lyons TW (2017) Atmospheric seasonality on Earth: Implications for remote life detection. *Goldschmidt*, Paris, France.

**Olson SL**, Droser ML, Gehling J, Lyons TW (2017) Ediacaran trace fossils map benthic oxygen oases. *Geobiology*, Banff, AB.

**Olson SL**, Droser ML, Gehling J, Lyons TW (2017) Ediacaran trace fossils map benthic oxygen oases. *NASA AbSciCon*, Mesa, AZ.

Krissansen-Totton J, **Olson SL**, Catling DC (2017) Atmospehric Disequilibrium Biosignatures on Earth Through Time. *NASA AbSciCon*, Mesa, AZ.

Schwieterman EW, **Olson SL**, Reinhard CT, Lyons TW (2017) Evaluating N2O as an Exoplanet Biosignature: Combining Biogeochemical, Photochemical, and Spectral Models. *NASA AbSciCon*, Mesa, AZ.

Reinhard CT, **Olson SL**, Schwieterman EW, Lyons TW (2017) False Negatives for Remote Life Detection on Ocean-Bearing Planets: Lessons from the Early Earth. *NASA AbSciCon, Mesa*, AZ.

**Olson SL**, Reinhard CT, Lyons TW (2016) Nutrient-O2 feedbacks and Proterozoic pO2 regulation. *Southern California Geobiology Symposium*, Pasadena, CA.

**Olson SL**, Reinhard CT, Lyons TW (2015) Biosignature blind spots: lessons from early Earth. *ExSoCal*, Pasadena, CA, USA.

**Olson SL**, Roy M, Ostrander C, Lyons TW, Anbar AD (2015) Inorganic hints of Archean oxygenation in the ~2.7 Ga Roy Hill Shale. *Goldschmidt*, Prague, CZ.

**Olson SL**, Reinhard CT, Lyons TW (2015) A mid-life crisis for Earth’s greenhouse. *NASA AbSciCon*, Chicago, IL, USA.

**Olson SL**, Reinhard CT, Lyons TW (2015) A mid-life crisis for Earth’s greenhouse. *Southern California Geobiology Symposium*, Riverside, CA.

**Olson SL**, Reinhard CT, Lyons TW (2014) Exploring the effects of oxidant availability on the early methane cycle. *Goldschmidt*, Sacramento, CA.

**Olson SL**, Kump LR, Kasting JF (2013) Quantifying the areal extent and dissolved oxygen concentrations of Archean oxygen oases. *NASA AbGradCon*, Montreal, QC.

**Olson SL**, Kump LR, Kasting JF (2012) Quantifying the areal extent and dissolved oxygen concentrations of Archean oxygen oases. *NASA AbSciCon*, Atlanta, GA.

**WHITE PAPERS & REPORTS**

**Olson S.L.**& Schwieterman E.W. (2019) Leveraging planetary seasonality to recognize habitability and to detect the pulse of a biosphere. *LUVOIR Report*, Appendix A.16

Lisman D., Schwieterman E.W., Seager S., ... , **Olson S.L**., et al. (2019) The Occulting Ozone Observatory (O3) Mission.

Lisman D, Schwieterman EW, Reinhard CT, **Olson SL**, et al. (2019) Surveying the solar neighborhood for ozone in the UV at temperate rocky exoplanets. Bulletin of the American Astronomical Society.

Krissansen-Totton J, Arney G., Catling C., ... , **Olson SL**, et al. (2019) Atmospheric disequilibrium as an exoplanet biosignature: Opportunities for next generation telescopes. Bulletin of the American Astronomical Society.

Arney G, Batalha N, Britt AV, ... , **Olson SL**. et al. (2019) The Sun-like Stars Opportunity. Bulletin of the American Astronomical Society.

Reinhard CT, Schwieterman EW, **Olson SL**, et al. (2019) The remote detectability of Earth's biosphere through time and the importance of UV capability for characterizing habitable exoplanets. arXiv:1903.05611 [astro-ph.EP]

Checlair JH, Abbot DS, ... , **Olson SL**, et al. (2019) A Statistical Comparative Planetology Approach to Maximize the Scientific Return of Future Exoplanet Characterization Efforts. arXiv:1903.05211, 2019 [astro-ph.EP]

Schwieterman EW, Reinhard CT, **Olson SL**, Lyons TW (2018) The Importance of UV Capabilities for Identifying Inhabited Exoplanets with Next Generation Space Telescopes. arXiv:1801.02744 [astro-ph.EP]

**SHORT COURSES & WORKSHOPS**

* Sagan Workshop 2019: Astrobiology for Astronomers, Caltech.
* Rossbypalooza 2018: Understanding Climate Through Simple Models, University of Chicago.
* Searching for Life Across Space and Time (NAS), Irvine, CA, 2016.
* Josep Comas i Solà International Summer School in Astrobiology (NASA/ESA). Santander, Spain, 2016.
* Building a Habitable Earth (DFG), University of Tubingen, Germany, 2016.
* Upstairs Downstairs: Consequences of Internal Planet Evolution for the Habitability and Detectability of life on Extrasolar planets (NASA/NSF), Arizona State University, AZ, 2016.
* Beyond Habitability: Life and the Early Earth (NASA/NSF), Smithsonian Institution, DC, 2014.

**TEACHING**

**Teaching assistant for:**

* *Geochemistry of Natural Waters*, UCR, 2015, 17;
* *Oceanography*, UCR, 2014-16;
* *Earth and Life: Origin and Evolution*, PSU, 2012;
* *The Earth System,* PSU, 2011;
* *Earth and its Environments*, UMN, 2010-11

**STUDENT MENTORSHIP**

**Megan Barnett, 2019—present**

PhD student in Geophysical Sciences, University of Chicago (primary advisor: Fred Ciesla)

**Camila Liu, 2019—present**

PhD student in Geophysical Sciences, University of Chicago (primary advisor: Nicolas Dauphas)

**Andrea Salazar, 2019—present**

Undergraduate in Physics, University of Chicago (primary advisor: Dorian Abbot)

**Olivia Alcabes**, **2018—present**

Undergraduate in Physics, University of Chicago (primary advisor: Dorian Abbot)

**Elise Darragh-Ford, 2018**

Undergraduate in Astrophysics, University of Chicago; now a PhD student in Physics at Stanford

**SERVICE TO PROFESSION**

**Session organizer/convener for:**

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| **2019**  **2018**  **2017**  **2014** | Astrobiogeochemistry: Modelling biology and its co-evolution with the environment on Earth and implications for exoplanets. *NASA AbSciCon 2019*, Seattle, WA  Astrobiogeochemistry: Emerging links between Earth Sciences, Astrophysics, and the Search for Habitability and Life. *Goldschmidt 2019*, Barcelona, Spain  Leveraging Earth Science Approaches in the Search for Life in the Universe. *Goldschmidt 2018*, Boston, MA  The Co-Evolution of Life and Its Environment during the Precambrian: The Rise of Oxygenic Photosynthesis and the Great Oxidation Event. *Geological Society of America 2017*, Seattle, WA  The Co-evolution of Life and its Environments from the GOE to the Rise of Complex Life. *AGU Fall Meeting 2014*, San Francisco, CA |

**Reviewer for:**

* *American Journal of Science*
* *Astrophysical Journal Letters*
* *Chemical Geology*
* *Earth and Planetary Science Letters*
* *Geobiology*
* *Geochimica et Cosmochimica Acta*
* *Geology*
* *Nature*
* *Nature Geoscience*
* *Precambrian Research*
* *Science Advances*

**UNIVERSITY SERVICE**

* Organizer, Joint Geo-Astro Exoplanet Journal Club, 2019-2020
* Search Committee, T.C. Chamberlin Postdoctoral Fellowship, 2018, 2019

**OUTREACH**

* Mentor, Ossining Science Research Program, 2019—
* Volunteer instructor, Python Club at Noble Academy, 2018
* Mentor, Summer Experience in Earth and Mineral Sciences/Upward Bound Math & Science, 2012

**SELECTED MEDIA COVERAGE**

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| **2019** | Exoplanets could have better conditions for life than Earth, study says*,****CNN***, August 2019  Alien Life on Exoplanets May be 'More Abundant and Active' Than on Earth, Say Scientists, ***Forbes***, August 2019  Alien Planets Could be Better Suited for Life than Earth: Study, ***Fox News***, August 2019  Earth 2.0: same same, but better, ***Cosmos Magazine***, July 2019  Extraterrestrial life could be scarcer than first thought, study says, ***Fox News***, June 2019 |
| **2018**  **2017** | The clues to finding alien life could lie in Earth’s deep past, ***New Scientist***(Feature), September 2018  Seasonal changes in exoplanet’s atmosphere could signal alien life, ***Fox News***, May 2018  The search for life on other planets could get a boost from biosignatures, ***Los Angeles Times****,* Jan. 2018  Finding Signs of Alien Life Might be Harder Than We Thought. Here’s Why, ***NBC News***, April 2017 |