

## STEPHANIE L. OLSON

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Purdue University  
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### RESEARCH INTERESTS

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Earth system evolution, marine biogeochemistry, habitability, astrobiology

### EDUCATION

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

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- Scialog Fellow, Research Corporation for Science Advancement, 2020-23
- T.C. Chamberlin Fellowship, University of Chicago, 2018
- 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

### FUNDING (\$1,780,049 total)

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- 2022-  
2024**            *Water water everywhere, drops to drink but nothing to eat? A model for the chemistry of Waterworld oceans.*

**Heising-Simons Foundation** | Role: Co-PI | Total amount: \$165K (55K to Olson)

**2021-2026** *Alternative Earths: How to Build and Sustain and Detectable Biosphere*  
**NASA ICAR** | Role: Co-I | Total amount: \$4.6M (\$595,443 to Olson)

**2020-2023** *Assessing Atmospheric Seasonality as an Exoplanet Biosignature*  
**NASA Exobiology** | Role: PI | Total amount: \$450,459

**2020-2023** *Oceanographic Considerations for the Oxygenation of Habitable Worlds: Lessons from Early Earth*  
**NASA Habitable Worlds** | Role: PI | Total amount: \$507,867

**2018-2020** *T.C. Chamberlin Postdoctoral Fellowship*  
**UChicago DoGS** | Total amount: \$171,280

## **PUBLICATIONS** (h-index = 18; citations = 1544)

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- 2023** 27. Mettler J, Quanz SP, Helled R, **Olson SL**, Schwieterman EW. (2023) Earth as an Exoplanet: II. Earth's Time-Variable Thermal Emission and its Atmospheric Seasonality of Bio-Indicators. *Astrophysical Journal*, *accepted*.
26. Jernigan J, Lafleche E, Burke A, **Olson SL** (2023) Superhabitability of High-Obliquity and High-Eccentricity Planets. *Astrophysical Journal*, *in press*.
- 2022** 25. Schwieterman EW, **Olson SL**, Pidhorodetska D, Reinhard CT, Ganti A, Fauchez TJ, Bastelberger ST, Crouse JS, Ridgwell A, Lyons TW (2022) Evaluating the Plausible Range of N<sub>2</sub>O Biosignatures on ExoEarths: An Integrated Biogeochemical, Photochemical, and Spectral Modeling Approach. *Astrophysical Journal*, 937: 109.
24. Barnett MN, **Olson SL**. (2022) Moderately High Obliquity Promotes Biospheric Oxygenation. *Planetary Science Journal* 3: 132.
23. **Olson SL**, Jansen MF, Abbot DS, Haley I, Goldblatt CZ. (2022) The Effect of Ocean Salinity on Climate and Implications for the Habitability of Archean Earth, *Geophysical Research Letters* 49: e2021GL095748
- 2021** 22. Komacek T, Kang W, Lustig-Yaeger J, **Olson S.L.** (2021) Leveraging Models to Constrain the Climates of Rocky Exoplanets, *Elements* 17: 251-256
21. Fauchez TJ, Turbet M, Sergeev DE, Mayne NJ, Spiga A, Sohl L, Saxena P, Deitrick R, Gilli G, Domagal-Goldman SD, Forget F, Consentino R, Barnes R, Haqq-Misra J, Way M, Wolf E, **Olson SL**, Crouse JS, Janin E, Bolmont E, Leconte J, Chaverot G, Jaziri Y, Tsigaridis K, Yang J, Pidhorodetska D, Kopparapu RK, Chen H, Boutle IA, Lefevre

- M, Charnay B. TRAPPIST Habitable Atmosphere Intercomparison (THAI) workshop report. *Planetary Science Journal* 2: 106
20. Checlair JH, Villanueva GL, Hayworth BPC, **Olson SL**, Komacek TD, Robinson TD, Popovic P, Yang H, Abbot DS. (2021) Probing the Capability of Future Direct Imaging Missions to Spectrally Constrain the Frequency of Earth-like planets. *Astronomical Journal* 161: 150
- 2020**
19. Reinhard CT, **Olson SL**, Kirtland Turner S, Palike C, Kanzaki Y, Ridgwell A. (2020) Oceanic and Atmospheric Methane Cycling in the cGENIE Earth System Model. *Geoscientific Model Development* 13, 5687-5706.
18. Salazar A., **Olson S.L.**, Komacek T., Stephens H., Abbot D.S. (2020) The Effect of Substellar Continent Size on the Ocean Dynamics of Proxima Centauri b. *Astrophysical Journal Letters* 896: L16
17. **Olson SL**, Jansen M, Abbot DS. (2020) Oceanographic Considerations for Exoplanet Life Detection. *Astrophysical Journal* 895: 19.
16. Alcabes ODN, **Olson SL**, Abbot DS (2020) Robustness of Gaian Feedbacks to Climate Perturbations. *Monthly Notices of the Royal Astronomical Society* 492: 2572-2577.
15. Ostrander CM, Kendall B, **Olson SL**, et al. (2020) An expanded  $\delta^{98}\text{Mo}$  record permits recurrent shallow marine oxygenation during the Neoproterozoic, *Chemical Geology* 532: 119391.
- 2019**
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 EW, Reinhard CT, **Olson SL**, Harman C.E., Lyons T.W. (2019) A limited habitable zone for complex life. *Astrophysical Journal* 878: 19.
11. Schwieterman E.W., Reinhard CT, **Olson SL.**, Ozaki K., Harman C, Lyons TW (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.

- 2018**
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.
- 2017**
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.
- 2016**
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.
- 2013**
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.

## SEMINARS & COLLOQUIA

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- 2022**
- Signatures of Photosynthesis Beyond the Solar System  
*Department of Earth and Environmental Science, University of Minnesota*  
December 2022
- Habitability and Biosignatures of High-Obliquity Planets  
*Astrobiology Hour Seminar, Penn State Astrobiology Research Center*  
October 2022
- Habitability and Biosignatures of High-Obliquity Planets  
*Astronomy Seminar, Michigan State University*  
October 2022

Earth System Evolution: Lessons from Exoplanets  
*Dept. of Geological and Atmospheric Science, Iowa State University*  
March 2022

**2021** Oxygenic Photosynthesis in an Anoxic Archean Ocean: Implications for  
Exoplanet Life Detection  
*Precambrian Geology Virtual Seminar Series, UC Riverside*  
October 2021

Geophysical Controls on the Oxygenation of Habitable Worlds  
*Astrobiology Seminar, University of California, Riverside*  
October 2021

Geophysical Controls on the Oxygenation of Habitable Worlds  
*Dept. of Earth Sciences, University of Southern California*  
October 2021

Geophysical Controls on the Oxygenation of Habitable Worlds  
*Dept. of Earth & Planetary Science, Northwestern University*  
October 2021

Exploring the Co-evolution of Life and Environment on Earth to Guide our  
Search for Exoplanet Life  
*Dept. of Geology, University of Illinois*  
September 2021

Exo-oceanography and the oxygenation of inhabited worlds  
*Planetary Lunch, Departments of Astronomy & Astrophysics and Earth &  
Planetary Science, University of California Santa Cruz*  
May 2021 [virtual]

Oxygenic Photosynthesis in an Anoxic Archean Ocean: Implications for  
Exoplanet Life Detection  
*Department of Earth Sciences, University of Toronto*  
January 2021 [virtual]

**2020** Oceanographic Considerations for Exoplanet Life Detection  
*NASA Goddard Exoplanet Seminar*  
October 2020 [virtual]

Oceanographic Considerations for Exoplanet Life Detection  
*Ocean, Atmosphere, and Climate Lunch Seminar,*  
*Department of Earth, Atmospheric, and Planetary Sciences, MIT*  
September 2020 [virtual]

Atmospheric Seasonality: The Pulse of an Alien Biosphere?  
*EcoLunch Seminar, Department of Biological Sciences, Purdue University*  
September 2020 [virtual]

**2019** 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

**2018**

Characterizing Ozone Detectability and Seasonality on Weakly Oxygenated Terrestrial Exoplanets: Lessons from Early Earth.

*LUVOIR Seminar, NASA Goddard, April 2018 [virtual]*

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 CONFERENCE TALKS**

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**2022**

Earth's dynamic oxygenation: oases, whiffs, and overshoots

*Invited, Gordon Geobiology Conference. Ventura, CA. Nov. 2022*

Early Earth and Exoplanets: Eons and Lightyears Apart, but not so Distant

*Invited review, Exoplanets in Our Backyard II Workshop, Albuquerque, NM. Nov. 2022*

Spatial and temporal heterogeneity within marine environments.

*Invited, PCE3 Complex Systems Workshop, October 2022*

Climate of Earth-like planets

*Invited review, CIDER Workshop 2022, Berkeley, CA*

**2021**

Ocean Dynamics and the Oxygenation of Habitable Worlds

*Invited, Goldschmidt 2021 [virtual]*

**2020**

Evolution of Earth and its Biosphere

*Invited review, NASA NExSS Quantitative Habitability Workshop  
Dec. 2020 [virtual]*

Salt: an essential ingredient for modeling exoplanet climates.

*Invited, TRAPPIST Habitable Atmosphere Intercomparison (THAI)  
Workshop. Sept. 2020 [virtual]*

- 2019** Exo-oceanography and the Search for Life in Uncharted Waters  
**Invited**, *What makes a planet uninhabitable?* [virtual conference]
- Exo-oceanography and the Search for Life in Uncharted Waters  
**Keynote**, *Goldschmidt 2019*. Barcelona, Spain
- Distinguishing biological and geological methane  
**Invited review**, *Sagan Workshop 2019*, Pasadena, CA
- Higher ocean salinity significantly warms Archean climate  
**Invited**, *NASA AbSciCon 2019*, Seattle, WA
- 2018** Co-evolution of Oceanic and Atmospheric Chemistry  
**Invited review**, *Comparative Climatology of Terrestrial Planets III*, Houston, TX
- 2016** Nutrient-O<sub>2</sub> feedbacks and Proterozoic pO<sub>2</sub> regulation  
**Invited**, *Goldschmidt 2016*, Yokohama, Japan
- 2014** Oxygen oases before and after the GOE: insights from metals and models  
**Invited**, *AGU Fall Meeting 2014*, San Francisco, CA

### CONTRIBUTED ABSTRACTS

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- Schwieterman EW, **Olson SL**, Pidhorodetska D, Angerhausen D, Reinhard C, Faucher T (2023) A second Look at N<sub>2</sub>O Biosignatures. *AAS 241*, Seattle, WA.
- Schwieterman EW, **Olson SL**, Pidhorodetska D, Reinhard CT, Ganti A, Faucher T, Bastelberger S, Crouse J, Ridgwell A, Lyons T (2022) Evaluating the Plausible Range of N<sub>2</sub>O Biosignatures on ExoEarths: Flux-Abundance Relationships and Simulated Spectra for FGKM Main Sequence Stars. *AGU Fall Meeting*, Chicago, IL.
- Lafleche E, Jernigan J, Schwieterman E, **Olson SL** (2022) Modeling Biospheric Seasonality on Early Earth and Earth-like Exoplanets. *AGU Fall Meeting*, Chicago, IL.
- Batra K, **Olson SL**, Schwieterman E (2022) Exoplanet Ocean Salinity and Climate at the Outer Reaches of the Habitable Zone. *AGU Fall Meeting*, Chicago, IL.
- Capirala A, **Olson SL** (2022) Earth's Geophysical Evolution and the Role of the Marine Biosphere in Surface Oxygenation. *AGU Fall Meeting*, Chicago, IL.
- Burke A, **Olson SL**, Kang W (2022) The Effect of Obliquity on Abiotic Oxygen Production in Habitable Zone Planet Atmospheres. *AGU Fall Meeting*, Chicago, IL.
- Schwieterman EW, **Olson SL**, Pidhorodetska D, Reinhard CT, Ganti A, Faucher TJ, Bastelberger ST, Crouse JS, Ridgwell A, Lyons TW (2022) Evaluating Maximum Plausible N<sub>2</sub>O Biosignatures on ExoEarths: an Integrated Biogeochemical, Photochemical, and Spectral Modeling Approach. *Exoplanets in Our Backyard II Workshop*, Albuquerque, NM.

- Jernigan J, Lafleche E, Burke A, Olson SL (2022) Marine Habitability and Productivity on High-Obliquity and High-Eccentricity Planets. *Midwest Geobiology Conference*. Evanston, IL.
- Capirala A, **Olson SL** (2022) Earth's Geophysical Evolution and the Role of the Marine Biosphere in Surface Oxygenation. *Midwest Geobiology Conference*. Evanston, IL
- Batra K, **Olson SL**, Schwieterman EW (2022) Ocean Salinity and Climate in the Outer Reaches of the Habitable Zone. *Goldschmidt Conference*, Honolulu HI.
- Burke A, **Olson SL**, Kang W (2022) The Effect of Obliquity on Stratospheric Humidity and Implications for Atmospheric Evolution. *Goldschmidt Conference*, Honolulu HI.
- Lafleche E, Schwieterman EW, **Olson SL** (2022) Modeling N Cycle Seasonality on Early Earth and Beyond. *Goldschmidt Conference*, Honolulu HI.
- Capirala A, **Olson SL** (2022) Earth's geophysical evolution and the role of the marine biosphere in surface oxygenation. *Goldschmidt Conference*, Honolulu HI.
- Schwieterman EW, **Olson SL**, Pidhorodetska D, Reinhard CT, Ganti A, Fauchez TJ, Ridgwell A (2022) Evaluating Maximum Plausible N<sub>2</sub>O Biosignatures on ExoEarths orbiting FGKM Stars. *AAS 240*, Pasadena, CA.
- Jernigan J, **Olson SL** (2022) Simulating Ocean Life on High Obliquity and High Eccentricity Planets. *NASA AbSciCon*, Atlanta GA
- Capirala A, **Olson SL** (2022) Earth's Rotation Rate and the Role of the Marine Biosphere in Surface Oxygenation. *NASA AbSciCon*, Atlanta GA
- Lafleche EA, Schwieterman EW, **Olson SL** (2022) Modelling N Cycle Seasonality for Early Earth and Earth-like Exoplanets. *NASA AbSciCon*, Atlanta, GA.
- Batra KP, Schwieterman EW, **Olson SL** (2022) Ocean Salinity and Climate at the Outer Edge of the Habitable Zone of Sun-like Stars and M-dwarfs. *NASA AbSciCon*, Atlanta, GA.
- Schwieterman EW, **Olson SL**, Pidhorodetska D, Reinhard CT, Ridgwell A. (2022) Evaluating Maximum Plausible N<sub>2</sub>O Biosignatures on ExoEarths. *NASA AbSciCon*, Atlanta, GA.
- Liu CX, **Olson SL**, Jansen MF, Chen X, Dauphas N. (2021) Modelling Precambrian ocean mixing timescale and tracer residence time: implications for Earth's oxygenation. *AGU Fall Meeting*, New Orleans LA.
- Checlair JH, Villanueva GL, Hayworth BPC, **Olson SL**, Komacek TD, Robinson TD, Popovic P, Yang H, Abbot DS. (2021) Probing the Capability of Future Direct Imaging Missions to Spectrally Constrain the Frequency of Earth-like planets. *AASTCS 8: Habitable Worlds*. [virtual]
- Barnett M, **Olson SL** (2021) High orbital obliquity promotes planetary oxygenation. *AASTCS 8: Habitable Worlds*. [virtual]

- Checlair JH, Hayworth BPC, **Olson SL**, Komacek TD, Villanueva G, Popovic P, Yang H, Abbot DS. (2020) Non-detection of O<sub>2</sub>/O<sub>3</sub> informs frequency of Earth-like planets with LUVOIR but not HabEx. *AGU Fall Meeting* [virtual]
- Barnett M, **Olson SL** (2020) High orbital obliquity promotes planetary oxygenation. *AGU Fall Meeting* [virtual]
- Liu X, **Olson SL** (2020) Modelling Early Earth Ocean Mixing Timescales: Implications for the Oxygenation of Habitable Worlds. *LPSC*. [virtual]
- Schwieterman E, **Olson S**, Reinhard C (2020) Chemical consequences of high CO<sub>2</sub> on temperate terrestrial planets in the habitable zone. AAS 235, Honolulu, HI.
- Barnett M, **Olson SL** (2019) Nutrient Cycling in Exoplanet Oceans. *AGU Fall Meeting*, San Francisco, CA.
- Alcibes 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, Alcibes 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) Atmospheric Disequilibrium Biosignatures on Earth Through Time. *NASA AbSciCon*, Mesa, AZ.
- Schwieterman EW, **Olson SL**, Reinhard CT, Lyons TW (2017) Evaluating N<sub>2</sub>O 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-O<sub>2</sub> feedbacks and Proterozoic pO<sub>2</sub> 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

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Meadows & Graham *et al.* (2022) Community Report from the Biosignatures Standards of Evidence Workshop.

Unterborn CT, Byrne PK, ... **Olson SL**, *et al.* (2020) Exogeoscience and Its Role in Characterizing Exoplanet Habitability and the Detectability of Life. [arXiv:2007.08665](https://arxiv.org/abs/2007.08665) [astro-ph.IM]

Reinhard C.T., Planavsky N.J., Cole D.B., ... , **Olson S.L.**, *et al.* (2020) Environmental drivers of increasing biological complexity on Earth.

**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 (O<sub>3</sub>) 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](https://arxiv.org/abs/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](https://arxiv.org/abs/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](https://arxiv.org/abs/1801.02744) [astro-ph.EP]

**TEACHING** (\*denotes *Teaching Honor Roll* based on student evaluations)

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<b>S 2023</b>	EAPS591 Planetary Habitability
<b>S 2022</b>	EAPS591 Exoplanets* EAPS395 Astrobiology*
<b>F 2021</b>	EAPS112 Earth Through Time*
<b>S 2021</b>	EAPS395 Astrobiology*

**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**

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**Graduate Students Advised:**

- Kyle Batra, PhD student, Purdue EAPS, 2021—present
- Angela Burke, PhD student, Purdue EAPS, 2021—present
- Ashika Capirala, PhD student, Purdue EAPS, 2021—present
- Emilie Lafleche, PhD student, Purdue EAPS, 2021—present

**Undergraduate Students Advised:**

- Benjamin Carpenter, Planetary Science, Purdue, 2022—present
- Liam Michka, Planetary Science, Purdue, 2021-22
- Jared France, Environmental Engineering, Purdue, 2021
- Darya Corry, Aeronautics and Astronautics, Purdue, 2020-22
- Jonathan Jernigan, Applied Math & Environmental Engineering, Purdue, 2020—present
- Andrea Salazar, Physics, University of Chicago; now a PhD student in Earth & Planetary Science at Harvard, 2019-2020
- Olivia Alcabes, Physics, University of Chicago, 2018-2019
- Elise Darragh-Ford, Astrophysics, University of Chicago; now a PhD student in Physics at Stanford, 2018

**Committee Member:**

- Adam Aleksinski, PhD student, Atmospheric Science, Purdue University, 2021—
- Megan Barnett, PhD candidate, Geophysical Sciences, University of Chicago, 2019—
- Camilla Liu, PhD Candidate, Geophysical Sciences, University of Chicago, 2019—

## **SYNERGYSTIC ACTIVITIES**

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- Theme Chair, Goldschmidt Conference (theme 8), Lyon France, 2023
- Science Organizing Committee, Oxygen in Planetary Biospheres, Green Bank Observatory, 2023
- Science Organizing Committee, NExSS + NfoLD Standards of Evidence Workshop, 2021
- Steering Committee, NASA Network for Ocean Worlds (NOW), 2020—
- Steering Council, NASA Nexus for Exoplanet System Science (NExSS), 2020—
- Scialog Fellow, 2020—

### **Session organizer/convener for:**

- 2022** Exoplanet Biosignatures in the 2020s and Beyond. *NASA AbSciCon 2022*, Atlanta, GA
- Crossing the Divides: Joint Earth History/Exoplanet/Solar System Research. *NASA AbSciCon 2022*, Atlanta, GA
- 2019** 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
- 2018** Leveraging Earth Science Approaches in the Search for Life in the Universe. *Goldschmidt 2018*, Boston, MA
- 2017** 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
- 2014** The Co-evolution of Life and its Environments from the GOE to the Rise of Complex Life. *AGU Fall Meeting 2014*, San Francisco, CA

### **Short courses & Workshops:**

- Standards of Evidence, NExSS + NfoLD, July 2021
- Scialog: Search for Life in the Universe, June 2021
- NASA NExSS Quantitative Habitability Workshop, Dec. 2020
- TRAPPIST-1 Habitable Atmosphere Intercomparison (THAI) Workshop, 2020.
- Sagan Workshop 2019: Astrobiology for Astronomers, Caltech.
- Rossbypalooza 2018: Understanding Climate Through Simple Models, University of Chicago.
- Searching for Life Across Space and Time, National Academy of Sciences, 2016.

- Josep Comas i Solà International Summer School in Astrobiology, Santander, Spain, 2016.
- Building a Habitable Earth, University of Tubingen, Germany, 2016.
- Upstairs Downstairs: Consequences of Internal Planet Evolution for the Habitability and Detectability of life on Extrasolar planets, Arizona State University, AZ, 2016.
- Beyond Habitability: Life and the Early Earth, Smithsonian Institution, DC, 2014.

**Reviewer for:**

*American Journal of Science, Astronomical Journal, Astrophysical Journal Letters, Chemical Geology, Communications Earth and Environment, Earth and Planetary Science Letters, Geobiology, Geochimica et Cosmochimica Acta, Geology, G-cubed, Geophysical Research Letters, Interface Focus, Nature, Nature Astronomy, Nature Geoscience, Paleoceanography and Paleoclimatology, Planetary Science Journal, Science Advances*

**SERVICE**

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- Member, Purdue Origin of Life Cluster Hire search committee, 2021-22, 2022—
- Member, Purdue EAPS Graduate Coordinator search committee, 2021
- Member, Purdue EAPS ad hoc hiring committee, 2020-21
- Member, Purdue EAPS Computing Committee, 2020—
- Member, Purdue EAPS Graduate Committee, 2020—
- Organizer, UChicago Geo & Astro Exoplanet Journal Club, 2019-20
- Member, T.C. Chamberlin Postdoctoral Fellowship Search Committee, 2018-19, 2019-20

**OUTREACH**

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- 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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|-------------|---|
| <b>2022</b> | Looking for life beyond our solar system? Laughing gas could be a sign, new study suggests. <b>USA Today</b> , October 2022 |
|             | Salt May Have Been Key to Life on Earth, New Study Suggests, <b>Newsweek</b> , June 2022                                    |
| <b>2021</b> | Geochemist solves mystery over why her dog's fur was turning green, <b>Indy100</b> , July 2021                              |
|             | You'll Never Guess What Made this Saint Bernard's Fur Turn Green Overnight, <b>Yahoo! News</b> , July 2021                  |

- Planets With Seasons Like Our Could Host Complex Alien Life, Suggests NASA Research, **Forbes**, July 2021
- 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** The clues to finding alien life could lie in Earth's deep past, **New Scientist** September 2018
- Seasonal changes in exoplanet's atmosphere could signal alien life, **Fox News**, May 2018
- How would Aliens Detect Life on Earth?, **National Geographic**, March 2018
- The search for life on other planets could get a boost from biosignatures, **Los Angeles Times**, January 2018
- A New Recipe for Hunting Alien Life, **Scientific American**, January 2018
- 2017** Finding Signs of Alien Life Might be Harder Than We Thought. Here's Why, **NBC News**, April 2017