

## STEPHANIE L. OLSON

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Purdue University  
West Lafayette, IN 47907

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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** (\$1,880,049 total)

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- 2023-2026**      *A Window into Day and Night: Investigations into Obliquity of Temperate Planets Around Small Stars*  
**NASA Exoplanet Research Program** | Role: Co-I | \$100,000 to Olson
- 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 = 19; citations = 1742; underline denotes mentee)

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- forthcoming*      30. Batra K, **Olson SL** (2023) Climatic Effects of Ocean Salinity on M-dwarf Exoplanets, submitted.
29. Liu X, **Olson SL**, Jansen MF, Dauphas N (2023) Ocean mixing timescale through geological eons, in review.
28. Stüeken EE, **Olson SL**, Moore E, Foley BJ. (2023), The early Earth as an analogue for exoplanetary biogeochemistry, *Reviews in Mineralogy and Geochemistry* (invited), in revision.
- 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*, 946: 82.
26. Jernigan J, Lafleche E, Burke A, **Olson SL** (2023) Superhabitability of High-Obliquity and High-Eccentricity Planets. *Astrophysical Journal*, 944: 205.
- 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: eaa05747.
- 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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- 2023**            Habitability and Biosignatures of High-Obliquity and High-Eccentricity Exoplanets  
*Department of Astronomy, University of Maryland*  
September 2023
- 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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- 2023** Orbital Controls on the Oxygenation of Marine Habitats on Earth & Beyond  
**Invited**, Goldschmidt Conference. Lyon, France. July 2023
- 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]
- Exo-oceanography and the Search for Life in Uncharted Waters  
**Invited**, *What makes a planet uninhabitable?* [virtual conference]
- 2019** 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** (underline denotes mentee)

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Batra K, **Olson SL** (2023) Climatic Effects of Ocean Salinity on G Star and M Dwarf Exoplanets. *AGU Fall Meeting*, San Francisco, CA

Lafleche E, **Olson SL** (2023) Impacts of Oxygen Seasonality on the Neoproterozoic Biosphere. *Midwest Geobiology Conference*, Minneapolis, MN

Capirala A, Liu X, **Olson SL** (2023) Ocean Dynamics shape Spatiotemporal Patterns of Marine Oxygen. *Midwest Geobiology Conference*, Minneapolis, MN

Jernigan J, Lafleche E, **Olson SL** (2023) Effects of seasonality on planetary habitability for complex life. *Midwest Geobiology Conference*, Minneapolis, MN

Capirala A, Liu X, **Olson SL** (2023) Geophysical Influences on Ocean Circulation and Spatiotemporal Patterns of Marine Oxygenation. *Network for Ocean Worlds Retreat*, Catalina Island, CA

Lafleche E, Jernigan J, Schwieterman E, **Olson SL** (2023) Modeling Biospheric Seasonality on Early Earth and Earth-like Exoplanets. *Goldschmidt Conference*, Lyon, France

Batra K, Schwieterman E, **Olson SL** (2023) Impact of Ocean Salinity and Planetary Obliquity on Climate in the Outer Habitable Zone. *Goldschmidt Conference*, Lyon, France

Capirala A, Liu X, **Olson SL** (2023) Geophysical Influences on Ocean Circulation and Spatiotemporal Patterns of Marine Oxygenation. *Goldschmidt Conference*, Lyon, France

Burke A, Kang W, **Olson SL** (2023) Abiotic Oxygen Production in High-Obliquity and High-Eccentricity Planet Atmospheres. *Sagan Workshop*, Pasadena CA

Burke A, Kang W, **Olson SL** (2023) Abiotic Oxygen Production in High-Obliquity and High-Eccentricity Planet Atmospheres. *Exoclimes VI*, Exteter, UK

Jernigan J, Lafleche E, Burke A, **Olson SL** (2023) Superhabitability of High-Obliquity and High Eccentricity Exoplanets. *Exoclimes VI*, Exteter, UK

Lafleche E, Jernigan J, Schwieterman E, **Olson SL** (2023) Modeling Seasonality in the Biospheres of Early Earth and Earth-like Exoplanets. *AbGradCon*, San Diego, CA

Burke A, Kang W, **Olson SL** (2023) Abiotic Oxygen Production in High-Obliquity and High-Eccentricity Planet Atmospheres. *AbGradCon*, San Diego, CA

Lafleche E, Jernigan J, Schwieterman E, **Olson SL** (2023) Modeling O<sub>2</sub> Seasonality on Early Earth and Earth-like Exoplanets, *Oxygen in Planetary Biospheres*, Green Bank Observatory, WV

Capiral A, Liu X, **Olson SL** (2023) Earth's Geophysical Evolution and the Role of the Marine Biosphere in Surface Oxygenation



**Olson SL** (2023) Oxygenation of High-Obliquity Planets. *Oxygen in Planetary Biospheres*, Green Bank Observatory, WV

Schwieterman EW, **Olson SL**, Pidhorodetska D, Angerhausen D, Reinhard C, Fauchez 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, Fauchez 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, Fauchez 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 E, 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 LUVOR 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.

Alcubes 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) 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 (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]

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

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<b>F 2023</b>	EAPS391 Earth and Planetary System Science
<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:**

- Haleigh Brown, PhD student, Purdue EAPS, 2023—present
- 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:**

- River Allison, Computer Science, Purdue, 2023—present
- John Coulter, Planetary Science, Purdue, 2023—present
- Jonathan Jernigan, Environmental Engineering, Purdue, 2020—present
- Benjamin Carpenter, Planetary Science, Purdue, 2022-23
- Liam Michka, Planetary Science, Purdue, 2021-22
- Jared France, Environmental Engineering, Purdue, 2021
- Darya Corry, Aeronautics and Astronautics, Purdue, 2020-22
- Andrea Salazar, Physics, University of Chicago, 2019-2020
- Olivia Alcabes, Physics, University of Chicago, 2018-2019
- Elise Darragh-Ford, Astrophysics, University of Chicago, 2018

### **Committee Member:**

- Isabelle Rein, PhD student, Geology and Geophysics, Purdue University, 2023—
- Emily Apel, PhD student, Geology and Geophysics, Purdue University, 2023—
- Aaron Kruskie, PhD student, Atmospheric Science, Purdue University, 2023—
- Adam Aleksinski, PhD student, Atmospheric Science, Purdue University, 2021—
- Camilla Liu, PhD Candidate, Geophysical Sciences, University of Chicago, 2019—
- Megan Barnett, PhD candidate, Geophysical Sciences, University of Chicago, 2019-23

## **SYNERGYSTIC ACTIVITIES**

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- Science Organizing Committee, Exoplanets in Our Backyard III, Louisville, KY, 2024
- 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
- Affiliate PI, Pennsylvania State University Astrobiology Research Center, 2021—
- Steering Committee, NASA Network for Ocean Worlds (NOW), 2020—
- Steering Committee, NASA Nexus for Exoplanet System Science (NExSS), 2020—
- Scialog Fellow, 2020-23

**Session organizer/convener for:**

- 2024** Exoplanet Climatology & Habitability: Orbital Dynamics, Geophysical Processes, and Atmospheres. *AbSciCon 2024*, Providence RI.
- 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

**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*

**UNIVERSITY SERVICE**

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**Department**

- Point of Contact, talent-based ‘dream’ hire initiative, 2023
- Member, Purdue EAPS Strategic Planning committee, 2023—
- 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—
- Member, T.C. Chamberlin Postdoctoral Fellowship Search Committee, 2018-19, 2019-20

**College**

- Founder, Geobiology, Origins, Astrobiology, and Living Systems (GOALS) cross-department journal club, 2023
- Member, Purdue CoS Origin of Life Cluster Hire search committee, 2021-22, 2022-23
- Organizer, UChicago Geo & Astro Exoplanet Journal Club, 2019-20

**OUTREACH & DIVERSITY ACTIVITIES**

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- Trans inclusion training, 2022
- ADVANCE/OVPEC Faculty Search Committee Workshop, 2021
- Hollaback! Bystander Intervention Training, 2021
- Purdue Safe Zone Training, 2020
- 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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- 2022**      Looking for life beyond our solar system? Laughing gas could be a sign, new study suggests. *USA Today*, October 2022
- Salt May Have Been Key to Life on Earth, New Study Suggests, *Newsweek*, June 2022
- 2021**      Geochemist solves mystery over why her dog's fur was turning green, *Indy100*, July 2021
- You'll Never Guess What Made this Saint Bernard's Fur Turn Green Overnight, *Yahoo! News*, 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