

**STEPHANIE L. OLSON**  
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## RESEARCH INTERESTS

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

## EDUCATION

### PhD Geochemistry, University of California, Riverside, 2018

*Earth's oxygenation: causes, consequences, and implications for exoplanet life detection*

Committee: Timothy Lyons (co-chair), Christopher Reinhard (co-chair), Andy Ridgwell

### MS Geosciences, Pennsylvania State University, 2013

*Quantifying the areal extent and dissolved oxygen concentrations of Archean oxygen oases*

Committee: Lee Kump (chair), James Kasting, Katherine Freeman

### BS Geophysics, BS Geology, University of Minnesota, 2011

## APPOINTMENTS

T.C. Chamberlin Postdoctoral Fellow, Geophysical Sciences, University of Chicago, 2018—

## 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

## PUBLICATIONS

### Peer reviewed articles and book chapters:

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*.
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.

**Submitted manuscripts:**

Schwieterman EW, Reinhard CT, **Olson SL**, Harman CE, Lyons TW. A limited circumstellar habitable zone for complex life. Submitted to *Nature Geoscience*.

Schwieterman EW, Ozaki K, **Olson SL**, Harman CE, Lyons TW, Reinhard CT. Rethinking “Anti-Biosignatures” in the Search for Life Beyond Earth.” Submitted to the *Astrophysical Journal*

Gregory DD, Mukherjee I, Large RR, Danyushevsky LV, Stepanov AS, Avila JN, Cliff J, **Olson SL**, Ireland TR, Raiswell R, Olin PH, Maslennikov VV, Lyons TW. The formation mechanisms of sedimentary pyrite nodules determined by trace element and sulfur isotope microanalysis. In review for *Geochimica et Cosmochimica Acta*.

**Manuscripts in preparation:**

**Olson SL**, Jansen M, Waldbauer J, Abbot DS. Exo-oceanography and the Search for Life in Uncharted Waters.

**Olson SL**, Droser ML, Gehling J, Lyons TW. Ediacaran Oxygen Oases and the Emergence of Bilateral Burrowing Behavior.

Reinhard CT, **Olson SL**, Palike C, Kirtland Turner S, Ridgwell A. Oceanic and atmospheric methane cycling in the cGENIE Earth system model.

**White papers & reports:**

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. [Submitted in response to the National Academies of Sciences Astrobiology Science Strategy and Exoplanet Science Strategy calls.]

Domagal-Goldman S., Kiang NY, Parenteau MN, ... , **Olson SL**, *et al.* (2018) Life Beyond the Solar System: Remotely Detectable Biosignatures. arXiv:1801.06714 [Submitted in response to the National Academies of Sciences Astrobiology Science Strategy and Exoplanet Science Strategy calls.]

**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 advising:**

Elise Darragh-Ford (UChicago undergrad): Climate Cycles at the outer edge of the Habitable Zone

Olivia Alcabes (UChicago undergrad): Exploring (anti-)Gaian feedbacks and biospheric extinction.

**Outreach:**

Volunteer instructor, Python Club at Noble Academy, 2018—

Mentor, Summer Experience in Earth and Mineral Sciences/Upward Bound Math & Science, 2012

**INVITED SEMINARS & COLLOQUIA**

**Olson SL**. Earth and Ocean Sciences, University of Victoria, British Columbia, Canada, March 2019

**Olson SL** & Schwieterman EW. Characterizing Ozone Detectability and Seasonality on Weakly Oxygenated Terrestrial Exoplanets: Lessons from Early Earth. LUVOIR Seminar, NASA Goddard Space Flight Center (GSFC), April 2018

**Olson SL.** Atmospheric Seasonality as an Exoplanet Biosignature. Center for Space and Habitability, University of Bern, Switzerland, February 2018

**Olson SL.** Leveraging Earth Science in the Search for Life Elsewhere. Geophysical Sciences, University of Chicago, Chicago, IL, January 2018

## **CONFERENCE PARTICIPATION**

### **Keynotes & invited talks:**

4. **Olson SL** (2019) Exoplanet biosignatures: lessons from early Earth. Goldschmidt. Barcelona, Spain.
3. **Olson SL** (2018) Co-evolution of Oceanic and Atmospheric Chemistry. Comparative Climatology of Terrestrial Planets III. Houston, TX.
2. **Olson SL**, Reinhard CT, Lyons TW (2016) Nutrient-O<sub>2</sub> feedbacks and Proterozoic pO<sub>2</sub> regulation. Goldschmidt, Yokohama, Japan.
1. **Olson SL**, Reinhard CT, Planavsky NJ, Anbar AD, Lyons, TW (2014) Oxygen oases before and after the GOE: insights from metals and models. AGU Fall Meeting, San Francisco, CA.

### **Contributed abstracts:**

15. **Olson SL**, Droser ML, Gehling J, Lyons TW (2018) Ediacaran oxygen oases and the emergence of bilaterian burrowing. Midwest Geobiology Symposium, Evanston, IL.
14. **Olson SL**, Schwieterman EW, Reinhard CT., Ridgwell A, Meadows VS, Lyons TW (2018) Atmospheric Seasonality as an Exoplanet Biosignature. Goldschmidt, Boston, MA.
13. **Olson SL**, Droser ML, Gehling J, Lyons TW (2018) Benthic Oxygen Oases and Early Animal Evolution. Southern California Geobiology Symposium, Riverside, CA.
12. **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.
11. **Olson SL**, Schwieterman EW, Reinhard CT, Ridgwell A, Lyons TW (2017) Atmospheric seasonality on Earth: Implications for remote life detection. Goldschmidt, Paris, France.
10. **Olson SL**, Droser ML, Gehling J, Lyons TW (2017) Ediacaran trace fossils map benthic oxygen oases. Geobiology, Banff, AB.
9. **Olson SL**, Droser ML, Gehling J, Lyons TW (2017) Ediacaran trace fossils map benthic oxygen oases. NASA AbSciCon, Mesa, AZ.
8. **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.
7. **Olson SL**, Reinhard CT, Lyons TW (2015) Biosignature blind spots: lessons from early Earth. ExSoCal, Pasadena, CA, USA.
6. **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.
5. **Olson SL**, Reinhard CT, Lyons TW (2015) A mid-life crisis for Earth's greenhouse. NASA AbSciCon, Chicago, IL, USA.
4. **Olson SL**, Reinhard CT, Lyons TW (2015) A mid-life crisis for Earth's greenhouse. Southern California Geobiology Symposium, Riverside, CA.
3. **Olson SL**, Reinhard CT, Lyons TW (2014) Exploring the effects of oxidant availability on the early methane cycle. Goldschmidt, Sacramento, CA.
2. **Olson SL**, Kump LR, Kasting JF (2013) Quantifying the areal extent and dissolved oxygen concentrations of Archean oxygen oases. NASA AbGradCon, Montreal, QC.
1. **Olson SL**, Kump LR, Kasting JF (2012) Quantifying the areal extent and dissolved oxygen concentrations of Archean oxygen oases. NASA AbSciCon, Atlanta, GA.

## **SHORT COURSES & WORKSHOPS**

Rosbypalooza: Understanding Climate Through Simple Models, University of Chicago, 2018.  
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 Tübingen, 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.

## **SERVICE TO PROFESSION**

### **Session convener:**

*Astrobiology Science Conference (AbSciCon):*

2019: Astrobiogeochemistry: Modelling biology and its co-evolution with the environment on Earth and implications for exoplanets

*Goldschmidt Conference:*

2019: Astrobiogeochemistry: Emerging links between Earth Sciences, Astrophysics, and the Search for Habitability and Life

2018: Leveraging Earth Science Approaches in the Search for Life in the Universe

*Geological Society of America (GSA):*

2017: The Co-Evolution of Life and Its Environment during the Precambrian: The Rise of Oxygenic Photosynthesis and the Great Oxidation Event

*American Geophysical Union Fall Meeting (AGU):*

2016: The Co-evolution of Life and its Environments from the GOE to the Rise of Complex Life

### **Reviewer for:**

*Nature, Nature Geoscience, Geology, Astrophysical Journal Letters, Chemical Geology, Geochimica et Cosmochimica Acta, Geobiology, American Journal of Science.*

## **SELECTED MEDIA COVERAGE**

The clues to finding alien life could lie in Earth's deep past, *New Scientist* (Feature), September 2018

Aliens Could Detect Life on Earth. Here's How, *National Geographic*, March 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