Laura E. Rodriguez, PhD.

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EDUCATION

Ph.D. Geosciences and Astrobiology, Penn State University May 2019
B.S. Earth Science-Geochemistry, Minor in Biochemistry and Cell Biology, Rice University May 2013

RESEARCH INTERESTS

- Investigating the origins of life under aqueous conditions: elucidating the catalytic role of minerals
- Geochemical transformations of CHONPS elements from inorganic (gases/minerals) to organic species and the chemical evolution of lipids and N-heterocycles throughout solar system formation
- Evaluating patterns unique and universal to life and testing their preservation through geologic time

RESEARCH EXPERIENCE

NASA Jet Propulsion Laboratory, Pasadena, CA **Aug. 2019 – Present**

Postdoctoral Fellow in the Origins and Habitability Lab: PI Dr. Laurie Barge

- Testing conditions for transforming inorganic P in minerals to functional groups in organics
- Exploring the readiness of Raman and LIBS to search for life on Ocean worlds
    - Working with engineers and scientists to deploy Raman/LIBS to a hydrothermal vent
    - Science co-lead on cruise (July 2020) to deploy the underwater instrument package
    - Developed analytical pipeline using R/python to analyze large data sets of LIBS spectra
- Studying organic processes and biosignatures detectable by EPR: Co-I JPL grant (won Feb 2020)

The Pennsylvania State University, University Park, PA **Aug. 2013 – Aug 2019**

Ph.D. Advisor: Dr. Christopher House; Project PI: Dr. Michael Callahan (Boise State)

- Studied N-heterocycles in prebiotic mixtures: identified genetic precursors relevant for abiogenesis
- Characterized trace analytes in complex organic matrices using a combination of high-performance liquid chromatography, mass spectrometry, NMR, and Mössbauer spectroscopy.

Rice University, Houston, TX **Jan. 2012 – May 2013**

Undergraduate advisor: Dr. Caroline Masiello

- RA for study aimed to determine the chemical composition of switchgrass in response to N-fertilizer.

NASA Ames Research Center, Moffett Field, CA **Jun. – Sept. 2012**

Intern for Dr. Christopher McKay and Dr. Alfonso Davila, NASA Ames Space Academy

- Characterized pigments from endoliths collected from the Atacama Desert (a Mars Analog)
    - Conducted field work in the Atacama (May 2013; NASA Early Career Collab. Award)
- Showed Raman can identify unsaturated lipids (proposed Martian biosignature) of halophiles.

Lamont-Doherty Earth Observatory, Palisades, NY **Jun. – Aug. 2011**

Intern for Dr. Dallas Abbott, Lamont Summer Intern Program

- Found evidence (SEM-EDS) of an impact in the Gulf of Carpentaria 1500 yrs ago (AGU 2011).

PUBLICATIONS (ACCEPTED AND IN PROGRESS)

L. E. Rodriguez, C. H. House, K. E. Smith, M. R. Roberts, and M. P. Callahan, Nitrogen heterocycles form peptide nucleic acid precursors in complex prebiotic mixtures, *Scientific Reports* **9,** 9281 (2019).

L. E. Rodriguez, C. H. House, and M. P. Callahan, The robust glycosylation of nitrogen heterocycles under aqueous conditions (*In Prep*).

L. E. Rodriguez, The Building Blocks of Life in Ch. 4 (Section 1.2) Chemistry to Life, Astrobiology 3.0 Primer. Lead Eds: Micah Schaible, Nadia Szeinbaum, and George Tan (*In Prep*).

GRANTS, HONORS, AND AWARDS

2020 Selected **Co-Chair for the 2022 Gordon Research Seminar** on the Origins of Life
2020 Co-I, **JPL R&TD Grant**, "A New Magnet Electron Detection Technique for Astrobiology"
2016-2018 Alfred P. Sloan **Graduate Scholarship**: "Evaluating robust genetic precursors on early Earth"
2015-2018 Ford Foundation **Predoctoral Fellowship**: "The Plausibility of an Fe-S linked pre-RNA"
2017 **Poster Award** at the XVIIIth International Conference on the Origin of Life
2016 **NASA Scholarship** to attend the Josep Comas iSola International Summer School in Astrobiology
2015 **NASA Scholarship** to attend the Nordic-NASA summer school in Iceland
2015 **Penn State Geosciences'** Paul D. Krynine **Travel Scholarship**
2015 **Penn State Astrobiology's** Richard Standish Good Graduate **Scholarship** in Geosciences
2014, 2015 **NASA Pennsylvania Space Grant Consortium Fellowship**
2013-2018 Penn State **STEM Scholars Graduate Award**
2013 **Rice University** Earth Science's Alex Tula Award for **outstanding undergraduate in Geology**
2012 **NASA Astrobiology Early Career Collaboration Award**
2012 **Rice University** Earth Science's Chevron Minority **Scholarship**
2012 **Rice University** Earth Science's The Devlin-Schnable Memorial **Award in Geology**
2008 National Hispanic Scholar

ANALYTICAL EXPERIENCE

- High Performance Liquid Chromatography
- ESI/DART Mass Spectrometry
- Raman Spectroscopy
- Laser Induced Breakdown Spect. (LIBS)
- Mössbauer Spectroscopy
- Electron Paramagnetic Spectroscopy (EPR)
- Nuclear Magnetic Resonance Spect. (NMR)
- Conducting spark-discharge experiments

TEACHING EXPERIENCE AND PUBLIC SERVICE

Invited Peer Reviewer: Geochimica et Cosmochimica Acta

51st Lunar and Planetary Science Conference, Woodlands, TX **Mar 2020**

- Session chair for Astrobiology: Life Detection and Prebiotic Chemistry

American Public Media: Brains On! Aliens and UFOs: Making Sense of Myths, pt. 4 **Jan 2020**

- Interviewed about astrobiology for a science podcast aimed at kids

Amazing Aliens: The Stellar Science of Life in Space by Zachary Woodard **Jan 2020**

- Expert content reviewer for a children's astrobiology book published by American Reading Co.

The Pennsylvania State University, University Park, PA

- Teaching Assistant
  - **Lab Instructor**: Earth in the Future, Dr. Timothy Bralower (Professor), *Spring* 2019
  - **Lab Instructor**: Physical Geology, Dr. Andy Nyblade (Professor), *Fall 2016*
- Guest Lecture: Astrobiology, Dr. Christopher House (Professor), *Fall 2015, Fall 2017, Spring 2018*
- Guest Lecture: Chemical Principles, Dr. Phillip Bevilacqua (Professor), *Fall 2017, Fall 2018*
- Shake Rattle Rocks: Volunteer, taught 5th graders about astrobiology, *Jan 2015*
- Science-U Alien Astronomysteries Astrobiology summer camp volunteer, *June 2014*
- Bellefonte Science Night: spoke to local community about NASA and astrobiology, *Oct 2013*

Allegheny Valley Elementary School, Clarendon, PA **Oct 2014**

- Taught 5th graders about the rock cycle

TestMasters, Houston, TX **Dec 2012 – Aug 2013**

- Professional math and science tutor for middle and high school students

Nehemiah Center, Houston, TX **Jan 2010 – May 2013**

- Math and science tutor for at risk children in grades K-7

INVITED LECTURES

Los Alamos National Laboratory: Los Alamos, NM
Title: Prebiotic chemistry as a framework for assessing potentially habitable environments, *Feb 2020*

University of Texas at Austin, Jackson School of Geosciences: Austin, TX
Title: The Pre-RNA World: N-heterocycles & Plausible Structures of Primitive Genetic Material, *Mar 2019*

Nordic-NASA Summer School, "Water, Ice, and the origin of Life," Reykjavík, Iceland
Title: Fundamentals of Biology, *July 2015*

CONFERENCE PRESENTATIONS

L. E. Rodriguez, L. M. Barge, J. Major, M. A. Pasek, and D. Vander Velde, Phosphorus Redox Geochemistry on Rocky Worlds: Exploring Phosphite Oxidation and Organic Phosphorylation Catalyzed by Iron and Manganese Oxyhydroxides, *51st LPSC,* Abstract 1667, March 2020 (**Poster**).

L. E. Rodriguez, M. P. Callahan, and C. H. House, The Aqueous Glycosylation of Nucleobases, Abscicon, Bellevue, WA, July 2019 (**Talk**).

L. E. Rodriguez and C. H. House, The Plausibility of an Fe-S linked pre-RNA, Goldschmidt, Boston, MA, August 2018 (**Talk**).

L. E. Rodriguez, C. H. House, and M. P. Callahan, Nitrogen Heterocycles in Miller-Urey Spark-Discharge Mixtures: Using Chemical Trends to Elucidate Plausible Pre-RNAs on the Early Earth, The XVIIIth International Conference on the Origin of Life, San Diego, Ca, July 2017. (**Poster**)

L. E. Rodriguez, C. H. House, and M. P. Callahan, Reactions of Nitrogen Heterocycles in Plausible Prebiotic Mixtures, 5th ELSI International Symposium: Expanding Views on the Emergence of the Biosphere, Tokyo, Japan, January 2017. **(Poster)**

L. E. Rodriguez, C. H. House, and M. P. Callahan, Hints of the earliest genetic molecules for the origin of life, Conference of Ford Fellows, Washington, D.C., September 2016. **(Talk)**

L. E. Rodriguez, C. H. House, and M. P. Callahan, The reactions of nitrogen heterocycles with acrylic acid under prebiotic conditions, Astrobiology Graduate Conference, Boulder, CO, July 2016. **(Poster)**

L. E. Rodriguez, C. H. House, and M. P. Callahan, Reactions of Nitrogen Heterocycles in a Miller-Urey Spark-Discharge Mixture, Astrobiology Graduate Conference, Madison, WI, July 2015. **(Talk)**

L. E. Rodriguez, C. H. House, and M. P. Callahan, Reactions of Nitrogen Heterocycles in Plausible Prebiotic Mixtures, Astrobiology Science Conference, Chicago, IL, June 2015. **(Poster)**

L. E. Rodriguez, D. H. Abbott, and B. Dee. P., Distal Impact Ejecta from the Gulf of Carpentaria: Have We Found Cometary Fragments as Part of the Ejecta Suite? AGU, San Francisco, CA, Dec 2011. **(Poster)**

WORKSHOPS ATTENDED

2016 Nov. American Society for Mass Spectrometry Fall Workshop: "**Sample Preparation for Analysis of Real-World Samples by Mass Spectrometry: The Common Denominator for Quality Data**," Baltimore, MD

2016 Oct. Compact for Faculty Diversity: 23rd **Institute on Teaching and Mentoring**, Tampa, FL

2016 Jul. Josep Comas iSola International Summer School in Astrobiology, "**Earth Analog Environments and the Search for Life Beyond Earth,"** Santander, Spain

2015 Jul. Nordic-NASA Summer School, **"Water, Ice, and the origin of Life,"** Reykjavík, Iceland

PROFESSIONAL MEMBERSHIPS

- International Society for the Study of the Origin of Life (ISSOL)
- Geochemical Society
- American Chemical Society (ACS)

ADDITIONAL SKILLS

- NAUI Scuba certified
- Adobe Illustrator CC
- R programming
- ChemDoodle Drawing Software