# ELEANOR L. MORELAND

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## EDUCATION

**Doctor of Philosophy in Earth, Environmental, and Planetary Science** *Expected 2026*
Rice University, Houston, TX
Advisor: Dr. Kirsten Siebach

**Bachelor of Arts in Geology** May 2021
Washington University in St. Louis, St. Louis, MO
*Cum Laude* with Thesis and Highest Distinction in Earth and Planetary Sciences
Thesis: Mineralogy of Aeolian Deposits in Gale Crater, Mars: The Bagnold Dunes to Glen Torridon
Advisor: Dr. Raymond E. Arvidson

## AWARDS AND PRIZES

**Harold Levin Award**, Washington University in St. Louis May 2021
Outstanding Job as Assistant to the Instructor
**Courtney Werner Memorial Prize**, Washington University in St. Louis May 2021
Outstanding Achievement in Earth and Planetary Sciences
**Dean's List**, Washington University in St. Louis Dec. '17, '19, '20; May '18, '19, '20, '21
Semester GPA ≥ 3.60
**Academic All-American**, University Athletic Association Dec. 2018, 2019, 2020
**Summer Undergraduate Research Award**, Washington University in St. Louis May 2019
Award of $4,000 to conduct summer research in Earth and Planetary Sciences

## PUBLICATIONS

### Referred Journal Articles

1. Mitra, K., **Moreland, E.L.**, and Catalano, J.G. Capacity of chlorate to oxidize Ferrous Iron: Implications for Iron Oxide Formation on Mars. *Minerals 10*(9). *Feature Paper in Special Issue "Expanding Views of Clays, Oxides, and Evaporites on Aquaplanets in the Solar System."*

### Conference Proceedings: Poster Presentations

1. **Moreland, E.L.**, Arvidson, R.E., 2021, Compositional Variance of Aeolian Deposits in Gale Crater, Mars. In 52nd LPSC, Abstract ID #2397
2. Condus, T., Arvidson, R.E., **Moreland, E.L.**, 2021, CRISM-Derived Modal Mineralogy and Thermal Inertia for Oxia Planum. In 52nd LPSC, Abstract ID #1670.
3. **Moreland, E.L.**, Arvidson, R.E., Christian, J.R., 2020, Windblown Basaltic Sands on the Northern Slopes of Mount Sharp and Adjacent Plains, Gale Crater, Mars. In *AGU Fall 2020* (EP018-0004).
4. Mitra, K., **Moreland, E.L.**, Ledingham, G.J., Arvidson, R.E. and Catalano, J.G., 2020, Manganese Oxide Formation by Oxyhalogens: Faster Alternatives to Oxygen as Mn Oxidants on Mars. In *AGU Fall 2020* (P041-03).
5. Christian, J.R., Arvidson, R.E., O'Sullivan, J.A., **Moreland, E.L.**, 2020, High Spatial Resolution Thermal Inertia Mapping of Mount Sharp and Northern Plains, Gale Crater, Mars. In *AGU Fall 2020* (P069-0013).
6. **Moreland, E.L.**, Mitra, K., and Catalano, J.G., 2020, Stoichiometric Efficiency of Iron Oxidation by Chlorate on Mars. In 51st LPSC, Abstract ID #1033.

7. Mitra, K., **Moreland, E.L.**, Ledingham, G.J., Arvidson, R.E. and Catalano, J.G., 2020, Dissolved Manganese Oxidation by Bromate and Chlorate: An Alternate Hypothesis of Manganese Oxide Formation on Mars. In 51st LPSC, Abstract ID #1068.
8. Mitra, K., **Moreland, E.L.**, and Catalano, J.G., 2020, Fe(II) Oxidation and Fe(III) Mineral Production by Chlorate at Mars-Relevant Temperatures: Reaction Rates & Mineral Products. In 51st LPSC, Abstract ID #1069.

# FIELD EXPERIENCE

**Colorado Plateau, Utah** (2020); **Johnson Shut-Ins, Missouri** (2019); **Patagonia, Argentina** (2019)

# RESEARCH EXPERIENCE

**Rice University**
Siebach Laboratory Aug. 2021 – *ongoing*
Graduate Student; Advisor: *Prof. Kirsten Siebach*

- Algorithm for Mineral Identification by Stoichiometry (MIST)
  Develop a working algorithm to analyze data returned from the PIXEL instrument on the Mars 2020 Perseverance rover. Algorithm will take input of oxide percentages derived from XRD spectra and output the class, group, species, and formula of the mineral (or mixture of minerals) present at each pixel within the image.

**Washington University in St. Louis**
Remote Sensing Laboratory Jan. 2020 – *ongoing*
Research Assistant; Advisor: *Prof. Raymond E. Arvidson*

- Investigation of Basaltic Sands in Gale Crater, Mars by a Synergy of Orbital and Rover Data
  *Aim*: Investigate the relationship between mineralogy, grain size, and the morphology of the Bagnold Dunes and nearby Sands of Forvie using available HiRISE and CRISM orbital data and Curiosity rover in- situ instrumentation and measurements.
  *Role*: Process and interpret orbital and ground-based datasets to understand current aeolian dynamics in Gale Crater and implications for past conditions and future exploration. Utilize MATLAB code to model the composition and grain sizes of deposits near the Curiosity Rover's traverses.

**Washington University in St. Louis**
Aqueous Geochemistry & Mineralogy Laboratory Jan. 2019 – Dec. 2019
Undergraduate Research Assistant; Advisor: *Prof. Jeffrey G. Catalano*

- Capacity of Chlorate to Oxidize Ferrous Iron & Investigation of Fe(II) Oxidation by Chlorate at Mars-relevant Low Temperatures (0-20ºC)
  *Aim:* Investigate the stoichiometric capability of chlorate to oxidize Fe(II) and form Fe(III)-bearing minerals in Mars-relevant fluids and understand implications for oxidation conditions in Gale Crater. Determine the effect of lower temperature on iron (II) oxidation by chlorate and identify mineral precipitates at varying temperatures through experiments in a temperature-controlled cold-room.
  *Role:* Conducted aqueous experiments in an anaerobic chamber, modeled reaction kinetics using The Geochemist's Workbench (GWB); fluid and mineral analysis using X-ray diffraction (XRD), UV-Vis spectroscopy, Ion Chromatography (IC), and Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES).
- Dissolved Manganese Oxidation by Bromate and Chlorate
  *Aim:* Explore manganese oxidation by bromate and chlorate in Mars-relevant fluids.
  *Role:* Prepare aqueous experiments using IC, monitor progress of experimental solutions, collect and prepare mineral precipitates, and assist in XRD analysis of manganese oxide solids.

## PRESENTATIONS

- **Washington University Earth and Planetary Sciences Colloquia**, Senior Theses Presentations and Awards, Spring 2021. "Mineralogy of Aeolian Deposits in Gale Crater, Mars: The Bagnold Dunes to Glen Torridon".
- **Washington University Undergraduate Research Symposium**, 2019. "Efficiency of Fe(II) Oxidation by Chlorate on Mars".
- **Brown Bag Series,** Washington University Earth & Planetary Sciences Department, 2019. "Our Trip to Patagonia".

## TEACHING & MENTORING EXPERIENCE

- **Teaching Assistant,** "What's the Curiosity Rover Doing this Week?", Washington University in St. Louis. Spring 2021.
- **Washington University Geology Club,** Co-President. 2019 – Present.
- **Teaching Assistant, "**Earth and the Environment", Washington University in St. Louis. Spring 2020.