

# RACHEL Y. SHEPPARD

324 Brook St, Box 1846 ♦ Providence, RI 02912  
rachel.sheppard@brown.edu ♦ rachelshppard.com

## EDUCATION

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**Brown University**, Providence, RI

♦ **2020 Ph.D.**, Earth, Environmental & Planetary Sciences

*Spatial and temporal variations in the chemistry and mineralogy of mafic lacustrine systems on Earth and Mars. Advisor: Ralph Milliken*

♦ **2017 M.Sc.**, Earth, Environmental & Planetary Sciences

*Spectroscopic analysis of iron cycling in a terrestrial ultramafic lake and its implications for martian sedimentary systems. Advisor: Ralph Milliken*

**Columbia University**, New York, NY

♦ **2013 B.A.**, Earth Science

*Extractable organic molecules are an effective thermometer of both naturally and artificially heated fault rocks. Advisors: Pratigya Polissar & Heather Savage*

## PUBLICATIONS

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**Sheppard, R. Y.**, Milliken, R. E., Itoh, Y., & Parente, M. Updated Perspectives and Hypotheses on the Mineralogy of Lower Mt. Sharp, Mars, as seen from Orbit. In review, *Journal of Geophysical Research: Planets*.

Russell, J., Vogel, H., Bijaksana, S., Melles, M., Deino, A., Hafidz, A., Hasberg, A., Morlock, M., von Rintelen, T., **Sheppard, R. Y.**, Stelbrink, B., & Stevenson, J. The Late Quaternary Tectonic, Biogeochemical, and Environmental Evolution of Ferruginous Lake Towuti, Indonesia. In review, *Palaeogeography, Palaeoclimatology, Palaeoecology*.

**2019 Sheppard, R. Y.**, Milliken, R. E., Russell, J. M., Dyar, M. D., Sklute, E., Vogel, H., Melles, M., Bijaksana, S., Hasberg, A. K. M., & Morlock, M. A. Characterization of iron in Lake Towuti sediment. *Chemical Geology*. 512, pp. 11-30.

**2017 Johnson, B. C., Sheppard, R. Y.**, Pascuzzo, A. C., Fisher, E. A., & Wiggins, S. E. Porosity and salt content determine if subduction can occur in Europa's ice shell. *Journal of Geophysical Research: Planets*. 122.

**2015 Sheppard, R. E.**, D'Haenens-Johansson, U., Moe, K. S., & Wang, W. HPHT synthetic diamond melee in high-quality mounted jewelry piece. *Gems & Gemology*. 51(1).

**2015 Sheppard, R. E.**, Wang, W., & Moses, T. Analysis of melee diamonds using FTIR spectroscopy. *Gems & Gemology*. 51(1).

**2015 Sheppard, R. E.**, Polissar, P. J., & Savage, H. M. Organic thermal maturity as a proxy for frictional fault heating: experimental constraints on methylphenanthrene kinetics at earthquake timescales. *Geochimica et Cosmochimica Acta*. 151, pp. 103-116.

**2014 Savage, H. M., Polissar, P. J., Sheppard, R.**, Rowe, C. D., & Brodsky, E. E. Biomarkers heat up during earthquakes: New evidence of seismic slip in the rock record. *Geology*. 42(2), pp. 99-102.

**2014** Wang, W., Altobelli, M., Dieck, C., & **Sheppard, R. E.** Screening of small yellow melee for treatment and synthetics. *Gems & Gemology*. 50(4).

## RELEVANT EXPERIENCE

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<b>Mars Science Laboratory Team</b> <i>Science Team member</i>	May 2016 - present
<b>Gemological Institute of America</b> <i>Research Laboratory Technician, diamond color origin research team</i>	October 2013 - June 2015 New York, NY
<b>Lamont-Doherty Earth Observatory</b> <i>Research Assistant</i>	May 2011 - August 2013 Palisades, NY

## AWARDS & FELLOWSHIPS

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**2019** Dissertation fellowship, Brown University Graduate School.

**2019** Sigma Xi, Full Member, Brown University Chapter.

**2017, 2015** NASA Group Achievement Award, MSL Science and Operations Team.

**2015-2018** Presidential Fellowship, Brown University Graduate School, three years full support.

**2013** Walter C. Pitman III Award for excellence in thesis research and presentation, Columbia University Department of Earth and Environmental Sciences.

## CONFERENCE PRESENTATIONS: FIRST AUTHOR (\*ORAL PRESENTATIONS)

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**2020** Sheppard, R. Y., Milliken, R., & Robertson, K. M. Reflectance measurements of clays and sulfates under Mars-like temperature and relative humidity cycles and implications for clay-sulfate assemblages in Gale crater. Lunar and Planetary Science Conference, The Woodlands, TX. (*Canceled due to COVID-19.*)

**2020** Sheppard, R. Y., Milliken, R., Russell, J., Dyar, M. D., Sklute, E. C., Bijaksana, S., Melles, M., & Vogel, H. Mineral and chemical changes in a 100 m long sediment core from Lake Towuti, Indonesia and implications for mafic lacustrine sediments in Gale crater, Mars. Lunar and Planetary Science Conference, The Woodlands, TX. (*Canceled due to COVID-19.*)

**2019** Sheppard, R. Y.\*, Milliken, R., & Robertson, K. M. Cycling of hydrous minerals and implications for the martian hydrological cycle. American Geophysical Union Fall Meeting, San Francisco, CA.

**2019** Sheppard, R. Y., Milliken, R., Itoh, Y., & Parente, M. Mineral stratigraphy around Mt. Sharp suggests aqueous processes affected the entire mound: directions for upcoming rover observations from orbital data. Ninth International Conference on Mars, Pasadena, CA.

**2019** Sheppard, R. Y., Milliken, R., Itoh, Y., & Parente, M. Lateral continuity of mineralogical and morphological contacts in Mt. Sharp: linking upcoming rover observations and orbital data. Lunar and Planetary Science Conference, The Woodlands, TX.

**2018** Sheppard, R. Y.\*, Milliken, R., Itoh, Y., & Parente, M. Assessing Lateral Variations in the Mineralogical Stratigraphy of Mt. Sharp: Linking Rover and Orbital Observations. American Geophysical Union Fall Meeting, Washington, D.C.

**2018 Sheppard, R. Y.\***, Milliken, R., Russell, J., Vogel, H., Melles, M., & Bijaksana, S. Signatures of iron cycling in a terrestrial redox-stratified lake and implications for Gale Crater, Mars. Lunar and Planetary Science Conference, The Woodlands, TX.

**2017 Sheppard, R. Y.**, Milliken, R., & Russell, J. Tracking changes in iron mineralogy through time in a terrestrial analogue for Gale Crater. American Geophysical Union Fall Meeting, New Orleans, LA.

**2017 Sheppard, R. Y.**, Milliken, R., & Russell, J. Iron oxidation state and cycling in sediments of Lake Towuti, Indonesia and implications for chemistry and mineralogy of Martian mudstones. Lunar and Planetary Science Conference, The Woodlands, TX.

**2013 Sheppard, R. E.**, Polissar, P. J., & Savage, H. M. Organic thermal maturity as a proxy for frictional fault heating: experimental constraints on biomarker kinetics at earthquake timescales. American Geophysical Union Fall Meeting, San Francisco, CA.

**2012 Sheppard, R. E.**, Polissar, P. J., & Savage, H. M. Rapid heating experiments demonstrate the usefulness of organic molecules as an earthquake thermometer. American Geophysical Union Fall Meeting, San Francisco, CA.

## INVITED COLLOQUIA & TEAM MEETING TALKS

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**2020 Sheppard, R. Y.** Research Colloquium, Jet Propulsion Laboratory, Pasadena, CA. (*Canceled due to COVID-19*)

**2020 Sheppard, R. Y.** Geochemistry Colloquium, Lamont-Doherty Earth Observatory, Palisades, NY.

**2019 Sheppard, R. Y.**, Milliken, R., Itoh, Y., & Parente, M. Updated orbital view of mineral stratigraphy of Mount Sharp and implications for Curiosity's traverse. Mars Science Laboratory team meeting, NASA Goddard, Greenbelt, MD.

**2018 Sheppard, R. Y.**, Milliken, R., & Russell, J. Sedimentation in Lake Towuti & martian planetary processes. Towuti Drilling Project team meeting, Makassar, Indonesia.

**2017 Sheppard, R. Y.**, Milliken, R., & Russell, J. Lake Towuti as an analogue for trends seen in Gale Crater, Mars. Towuti Drilling Project team meeting, Bandung, Indonesia.

**2016 Sheppard, R. Y.**, Milliken, R., & Russell, J. Terrestrial analogs for chemical trends in Gale Crater: Ultramafic lakes in Indonesia and Iceland. NASA Astrobiology Institute team meeting, Williamstown, MA.

## PRESENTATIONS: CONTRIBUTING AUTHOR

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**2020** Milliken, R. E., Grotzinger, J. P., **Sheppard R.**, Wiens, R., Gellert, R., Thompson, L. M., Vasavada, A., Bristow, T., & Mangold, N. The chemistry and mineralogy of an ancient lacustrine sequence on Mars: observations, interpretations, and future prospects. Lunar and Planetary Science Conference, The Woodlands, TX. (*Canceled due to COVID-19*)

**2019** Milliken, R. E., Grotzinger, J. P., Wiens, R., Gellert, R., Thompson, L. M., **Sheppard R.**, Vasavada, A., Bristow, T., & Mangold, N. The chemistry and mineralogy of an ancient lacustrine sequence on Mars: lessons learned from integrating rover and orbiter datasets. Ninth International Conference on Mars, Pasadena, CA.

**2018** Morriss, D., Sanders, C. B., Grotzinger, J. P., Busch, J., Cury, L. F., Daoust, P., Fischer, W. W., Howes, B., Jones, D. S., **Sheppard, R.**, Nelson, L. L., Pu, J. P., Quinn, D. P., Wilcots, J., & Swart,

R. Cap Sequence Post-dating Marinoan Glacial Deposits, Naukluft Mountains, Namibia. American Geophysical Union Fall Meeting, Washington, D.C.

**2017** Pascuzzo, A. C., Brandon, B. C., **Sheppard, R. Y.**, Fisher, E. A., & Wiggins, S. E. Porosity and salt content determine if subduction can occur in Europa's ice shell. Europa Deep Dive 1: Ice-Shell Exchange Processes, Houston, TX.

**2015** Savage, H., Polissar, P. J., Rabinowitz, H., & **Sheppard, R.** Some like it hot: the spectrum of temperature rise during earthquakes. American Geophysical Union Fall Meeting, San Francisco, CA.

**2012** Savage, H., Polissar, P. J., **Sheppard, R.**, Rowe, C., & Kirkpatrick, J. Organic geochemical evidence for frictional heating of the NE Japan décollement in drillcores from Expedition 343: JFAST. American Geophysical Union Fall Meeting, San Francisco, CA.

**2011** Savage, H., Polissar, P. J., **Sheppard, R.**, Brodsky, E., & Rowe, C. Do faults stay cool under stress? American Geophysical Union Fall Meeting, San Francisco, CA.

**2011** Polissar, P. J., Savage, H., **Sheppard, R.**, Rowe, C., & Brodsky, E. What's Cooking? Evaluating frictional stress using extractable organic material in fault zones. American Geophysical Union Fall Meeting, San Francisco, CA.

## TEACHING EXPERIENCE

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**2018 Instructor**, summer course, Brown University's STEM II program.

**2018 Teaching Assistant**, *Planetary Geology* (GEOL0810), Brown University.

**2017 Teaching Assistant**, summer course, Brown University's STEM II program.

## MENTORING EXPERIENCE

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**2018-2019 Mentor**, Sarah Martinez, Brown undergraduate.

**2018 Leadership Alliance Program Mentor**, Brown University.

**2017 Mentor**, Grant Rutherford, Brown undergraduate.

**2017 Mentor**, Ana Colón, Dartmouth undergraduate, Leadership Alliance program. (*Now a PhD student at University of Oregon.*)

**2017 Mentor**, Catherine Miranda, Brown undergraduate, Undergraduate Teaching and Research Awards program.

**2016-2017 Mentor**, Christopher Yen, Brown undergraduate, Undergraduate Teaching and Research Awards program. (*Now a PhD student at WashU.*)

## OTHER SERVICE & OUTREACH

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**2020 Reviewer**, *Journal of Geophysical Research*.

**2019 Session Convener and Chair**, American Geophysical Union Fall Meeting, "Evidence of water-rock interaction throughout the Solar System," oral and poster session.

**2019 Executive Secretary**, NASA review panel.

**2019 Workshop Leader**, Girl Scout Senior Leadership Conference, Salve Regina University. *“Craters, spacecraft, and the surfaces of our Solar System.”*

**2019-present Participant**, semiannual Skype a Scientist program.

**2018-present GeoW+ Co-Founder, Graduate Student Leader**, Brown University. Intersectional mentoring group for geoscience undergraduates.

**2018-present Graduate Student DIAP Representative**, Brown University. Faculty-selected member of the department’s Diversity and Inclusion Action Plan Committee.

**2018-present Graduate Student Faculty Representative**, Brown University. Student-elected liaison between faculty and graduate students, attends faculty meetings.

**2018-2019 Graduate Student Climate Task Force Representative**, Brown University. Student-elected member of the Department’s Planetary Climate Task Force.

## FIELD WORK

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**2018** Agouyon Institute Advanced Geobiology Field School, Caltech, **Naukluft Mountains, Namibia** (12 days in the field).

**2016** Field component of Sedimentary Cycle of Earth and Mars course, Brown University, **Guadalupe Mountains, TX** (5 days in the field).

**2013** Research sample collection from the Punchbowl Fault, **San Gabriel Mountains, CA** (3 days in the field).

**2012** Geologic Mapping course, Columbia University, **Catskill Mountains, NY** (12 days in the field).

**2011** Research sample collection from the Champlain Thrust Fault, **Adirondack Mountains, VT** (2 days in the field).