RACHEL Y. SHEPPARD

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PROFESSIONAL APPOINTMENTS

Jet Propulsion Laboratory, Caltech August 2020 - present
Postdoctoral Fellow *Pasadena, CA*

EDUCATION

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

PEER-REVIEWED PUBLICATIONS (†STUDENT)

R. S. Vachula, **R. Y. Sheppard**, A. H. Cheung†. Preservation biases are pervasive in Quaternary paleofire records. Under review at *Palaeogeography, Palaeoclimatology, Palaeoecology.*

2022 R. Y. Sheppard, R. E. Milliken, K. M. Robertson. Presence of clay minerals can obscure spectral evidence of Mg sulfates: Implications for orbital observations of Mars. *Icarus.* 383, 115083.

2022 C. Lee, J. M. Weber, L. E. Rodriguez, **R. Y. Sheppard**, L. M. Barge, E. L. Berger, & A. S. Burton. Chirality in organic and mineral systems: A review of reactivity and alteration processes relevant to prebiotic chemistry and life detection missions. *Symmetry* special issue, "Chirality, Prebiotic Chemistry, and the Origins of Life." 14(3), 460.

2022 M. Prakash†, J. M. Weber, L. E. Rodriguez, **R. Y. Sheppard**, L. M. Barge. Database on carbon reduction: Implications for future research. In press, *International Journal of Astrobiology.*

2021 R. Y. Sheppard, M. T. Thorpe, A. A. Fraeman, V. K. Fox, R. E. Milliken. Merging perspectives on secondary minerals on Mars: A review of ancient water-rock interactions in Gale crater inferred from orbital and in situ observations. *Minerals* special issue, "Expanding Views of Clays, Oxides, and Evaporites on Aquaplanets in the Solar System," 11(986).

2021 R. Y. Sheppard, R. E. Milliken, J. M. Russell, M. D. Dyar, E. Sklute, H. Vogel, M. Melles, S. Bijaksana, A. K. M. Hasberg, & M. A. Morlock. Iron mineralogy and sediment color in a 100 m drill core from Lake Towuti, Indonesia reflect catchment and diagenetic conditions. *Geochemistry, Geophysics, Geosystems.* 22, e2020GC009582.

2020 R. Y. Sheppard, R. E. Milliken, Y. Itoh, & M. Parente. Updated perspectives and hypotheses on the mineralogy of Lower Mt. Sharp, Mars, as seen from orbit. *Journal of Geophysical Research: Planets*. 26.

2020 J. Russell, H. Vogel, S. Bijaksana, M. Melles, A. Deino, A. Hafidz, A. Hasberg, M. Morlock, T. von Rintelen, **R. Y. Sheppard**, B. Stelbrink, & J. Stevenson. The Late Quaternary tectonic, biogeochemical, and environmental evolution of ferruginous Lake Towuti, Indonesia. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 556, 109905.

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

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

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

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

OTHER PUBLICATIONS (TRADE JOURNALS, WHITE PAPERS, ETC.)

2021 Keck Institute for Space Studies (KISS), Revolutionizing Access to the Mars Surface. C. J. Culbert, B. L. Ehlmann, A. A. Fraeman, editors. Final Workshop Report for the W. M. Keck Institute for Space Studies, Pasadena, CA.

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

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

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

PUBLICATIONS IN PREPARATION (DRAFT AVAILABLE, †STUDENT)

R. Y. Sheppard, J. M. Weber, L. E. Rodriguez, E. Hausrath, A. A. Fraeman, L. M. Barge. The effect of clay minerals on Li in martian groundwater simulant. For submission to *GRL*, Summer 2022.

J. M. Weber, E. M. Martinez†, **R. Y. Sheppard**, L. E. Rodriguez, A. Celestian, L. M. Barge. Mars weathering experiments in continuous-flow reactor. For submission to *Chemical Geology*, Summer 2022.

M. Melwani Daswani, **R. Y. Sheppard**, J. M. Weber, L. E. Rodriguez, M. Grady, S. Schwenzer, I. Wright. Opaque alteration minerals in ALH 84001: Implications for aqueous alteration processes. For submission to *Meteoritics & Planetary Science*, Summer 2022.

E. M. Martinez†, E. Flores†, D. Valadez†, J. M. Weber, D. VanderVelde, **R. Y. Sheppard**, R. P. Hodyss, J. Castillo-Rogez†, M. Melwani Daswani, B. Henderson†, L. M. Barge. Organic adsorption

onto iron sulfide and hydroxide minerals: Implications for Ceres sample analysis. For submission to *Journal of Geophysical Research: Planets*, Summer 2022.

H. T. Manelski†, **R. Y. Sheppard**, A. A. Fraeman, R. Wiens, J. Johnson., J. Frydenvang, N. Lanza. Statistical classification of Gale crater targets based on ChemCam passive spectra. For submission to *Icarus*, Fall 2022.

J. Ando†, **R. Y. Sheppard**, A. A. Fraeman, C. Seeger†, V. Sun, A. Rudolph†. Classes of diagenetic features within the Murray formation and their Mastcam multispectral properties. For submission to *Icarus*, Fall 2022.

R. Y. Sheppard, J. M. Weber, L. E. Rodriguez, A. A. Fraeman, L. M. Barge. Nitrogen redox processes in simulated Mars groundwater environment. For submission to *JGR: Planets*, Fall 2022.

E. M. Martinez†, L. E. Rodriguez, **R. Y. Sheppard**, A. Khodayari, L. M. Barge. Reduction of nitrate to form magnetite. For submission to *Earth & Space Science*, Fall 2022.

L. E. Rodriguez, S. Lamm†, **R. Y. Sheppard**, A. Celestian, S. P. Perl, L. M. Barge. Classification of iron (oxy)hydroxides and sulfides using mission-ready spectroscopic techniques and machine learning. For submission to *Spectrochimica Acta: Atomic Spectroscopy*, Fall 2022.

M. Meyer†, R. E. Milliken, K. M. Stack Morgan, **R. Y. Sheppard**. Orbital and rover-based evidence for a base Mirador formation erosional unconformity in Gale crater with implications for the clay-sulfate transition on early Mars. For submission to *JGR: Planets*, Fall 2022.

R. Y. Sheppard, J. Frydenvang, A. A. Fraeman, R. E. Milliken. Comparison of orbital and *in situ* subtleties in the chemostratigraphy of Mt. Sharp: A statistical approach.

RESEARCH GRANTS

2022-2025 ROSES Mars Science Laboratory Participating Scientist Program (MSL-PSP). **Science PI**. "Understanding Mg-sulfate distribution, hydration state, and crystallinity in Mt. Sharp." ($300,000.)

2022 Spontaneous Research and Technology Development Program, Jet Propulsion Laboratory. **Co-I**. "Novel reaction design to test martian weathering." ($40,000.)

2022 Data Science Working Group, Jet Propulsion Laboratory. **Co-I**. "Developing machine learning models to facilitate the untargeted identification and classification of organics in complex mixtures via tandem mass spectrometry." ($50,000.)

2020-2022 Strategic Research and Technology Development Program, Jet Propulsion Laboratory. **Science PI**. "Experimental constraints on groundwater driven redox gradients on Mars." ($300,000.)

MISSION AND LABORATORY EXPERIENCE

Mars Science Laboratory Team — May 2016 - present
Participating Scientist — *2022-present*
Science Team Collaborator — *2016-2022*

Origins & Habitability Lab, JPL — August 2020 - present
Postdoctoral Fellow — *Pasadena, CA*

NASA RELAB & Milliken Lab, Brown University — August 2015 - July 2020
Graduate Student — *Providence, RI*

Gemological Institute of America October 2013 - June 2015
Research Laboratory, Diamond Color Origin *New York, NY*

Lamont-Doherty Earth Observatory, Columbia University May 2011 - August 2013
Research Assistant *Palisades, NY*

AWARDS & FELLOWSHIPS

2022 Seal of Excellence, European Commission, Marie Skłodowska-Curie Actions.

2019 Dissertation Fellowship, Brown University (6 mo.).

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

2015-2018 Presidential Fellowship, Brown University (3 yr.).

2013 Walter C. Pitman III Award, Columbia University Dept. Earth & Environmental Sciences.

CONFERENCE PRESENTATIONS: FIRST AUTHOR (*ORAL PRESENTATIONS)

2022 R. Y. Sheppard, A. A. Fraeman, L. M. Barge, J. M. Weber, L. Rodriguez, E. Martinez. Laboratory sediment columns to explore habitability of the martian subsurface under different groundwater conditions. AbSciCon, Atlanta, GA.

2022 R. Y. Sheppard*, A. A. Fraeman, L. M. Barge, J. M. Weber, L. Rodriguez, E. Martinez. Laboratory sediment column simulations of chemical and redox gradients in the martian groundwater environment. Lunar and Planetary Science Conference, The Woodlands, TX.

2021 R. Y. Sheppard*, L. Barge, A. A. Fraeman, J. M. Weber, L. Rodriguez, E. Flores, E. Martinez. Laboratory sediment column simulations of chemical and redox gradients in the martian groundwater environment. American Geophysical Union Fall Meeting, New Orleans, LA.

2021 R. Y. Sheppard, R. E. Milliken, J. M. Russell, M. D. Dyar, E. C. Sklute, S. Bijaksana, M. Melles, & H. Vogel. 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. American Geophysical Union Fall Meeting, New Orleans, LA.

2021 R. Y. Sheppard*, R. E. Milliken, & K. M. Robertson. Presence of clay minerals can obscure spectral evidence of Mg sulfates: Implications for orbital observations of Mars. Lunar and Planetary Science Conference, The Woodlands, TX.

2020 R. Y. Sheppard, R. E. Milliken, & K. M. Robertson. 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 R. Y. Sheppard, R. E. Milliken, J. M. Russell, M. D. Dyar, E. C. Sklute, S. Bijaksana, M. Melles, & H. Vogel. 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 R. Y. Sheppard*, R. Milliken, & K. M. Robertson, Cycling of hydrous minerals and implications for the martian hydrological cycle. American Geophysical Union Fall Meeting, San Francisco, CA.

2019 R. Y. Sheppard, R. Milliken, Y. Itoh, & M. Parente. 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 R. Y. Sheppard, R. Milliken, Y. Itoh, & M. Parente. 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 R. Y. Sheppard*, R. Milliken, Y. Itoh, & M. Parente. Assessing Lateral Variations in the Mineralogical Stratigraphy of Mt. Sharp: Linking Rover and Orbital Observations. American Geophysical Union Fall Meeting, Washington, D.C.

2018 R. Y. Sheppard*, R. Milliken, J. Russell, H. Vogel, M. Melles, & S. Bijaksana. 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 R. Y. Sheppard, R. Milliken, & J. Russell. Tracking changes in iron mineralogy through time in a terrestrial analogue for Gale Crater. American Geophysical Union Fall Meeting, New Orleans, LA.

2017 R. Y. Sheppard, R. Milliken, & J. Russell. 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 R. E. Sheppard, P. J. Polissar, & H. M. Savage. 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 R. E. Sheppard, P. J. Polissar, & H. M. Savage. Rapid heating experiments demonstrate the usefulness of organic molecules as an earthquake thermometer. American Geophysical Union Fall Meeting, San Francisco, CA.

INVITED EXTERNAL TALKS & TEAM MEETINGS

2022 R. Y. Sheppard. Astrobiology & Planetary Science Colloquium, Georgia Tech, Atlanta, GA.

2021 R. Y. Sheppard. Research Colloquium, EAPS, Purdue, West Lafayette, IN.

2020 R. Y. Sheppard. Research Colloquium, GPS, Caltech, Pasadena, CA.

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

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

2019 R. Y. Sheppard. Mars Science Laboratory team meeting, NASA Goddard, Greenbelt, MD.

2018 R. Y. Sheppard. Towuti Drilling Project team meeting, Makassar, Indonesia.

2017 R. Y. Sheppard. Towuti Drilling Project team meeting, Bandung, Indonesia.

2016 R. Y. Sheppard. NASA Astrobiology Institute (NAI) team meeting, Williamstown, MA.

PRESENTATIONS: CONTRIBUTING AUTHOR (†STUDENT)

2022 W. Rapin, **R. Y. Sheppard**, G. Dromart, J. Schieber, B. C. Clark, L. Kah, D. Rubin, B. L. Ehlmann, S. Gupta, G. Caravaca, N. Mangold, E. Dehouck, S. Le Mouelic, O. Gasnault, J. V. Clark,

A. Bryk, B. Dietrich, R. C. Wiens. The Curiosity rover investigates an aridification sequence in the layered sulfate-bearing unit. Europlanet Science Conference, Granada, Spain.

2022 J. M. Weber, L. E. Rodriguez, **R. Y. Sheppard**, E. Martinez†, L. M. Barge. Understanding habitability and prebiotic chemistry with continuous-flow terrestrial analogs. *Invited.* AbSciCon, Atlanta, GA.

2022 T. C. Marlin†, J. M. Weber, **R. Y. Sheppard**, S. M. Perl, L. M. Barge. Chemical gardens as analogs for prebiotic chemistry on ocean worlds. AbSciCon, Atlanta, GA.

2022 D. Valadez†, E. Flores†, E. Martinez†, **R. Y. Sheppard**, R. P. Hodyss, J. M. Weber, J. Castillo†, B. Henderson, L. M. Barge. Sorption of prebiotic organics on iron sulfide minerals in ocean world analog systems. AbSciCon, Atlanta, GA.

2022 E. Martinez†, E. Flores†, D. Valadez†, J. M. Weber, T. C. Marlin†, **R. Y. Sheppard**, L. M. Barge. Organic acid adsorption onto iron (oxy)hydroxides under ocean world analog conditions. AbSciCon, Atlanta, GA.

2022 J. M. Weber, E. Martinez†, **R. Y. Sheppard**, L. E. Rodriguez, L. M. Barge. Mars weathering experiments: development and use of continuous-flow packed bed for geologic exploration. Lunar and Planetary Science Conference, The Woodlands, TX.

2022 H. T. Manelski†, **R. Y. Sheppard**, A. A. Fraeman, J. R. Johnson, R. Wiens, N. Lanza, J. Frydenvang. Classification of ChemCam passive spectral targets in Gale crater. Lunar and Planetary Science Conference, The Woodlands, TX.

2022 J. K. Ando†, **R. Y. Sheppard**, A. A. Fraeman, V. Sun. Locations and multispectral features of distinct classes of diagenetic features within the Murray formation, Gale crater, Mars. Lunar and Planetary Science Conference, The Woodlands, TX. *(Received the LPSC Dwornik Award.)*

2022 W. Rapin, **R. Y. Sheppard**, G. Dromart, J. Schieber, B. Clark, L. Kah, D. Rubin, B. L. Ehlmann, S. Gupta, G. Caravaca, N. Mangold, E. Dehouck, S. Le Mouelic, O. Gasnault, J. V. Clark, A. Bryk, B. Dietrich, R. C. Wiens. The Curiosity rover is exploring a key sulfate-bearing orbital facies. Lunar and Planetary Science Conference, The Woodlands, TX.

2022 E. Martinez†, E. Flores†, T. C. Marlin†, D. Valadez†, J. M. Weber, **R. Y. Sheppard**, R. P. Hodyss, L. M. Barge. Organic acid adsorption on iron (oxy)hydroxides under ocean world analog conditions. Origins of Life Gordon Research Conference, Oxnard, CA. *(Canceled due to Covid-19)*

2021 T. F. Bristow, E. B. Rampe, **R. Sheppard**, R. Milliken. In situ mineralogy of a clay-sulfate transition in Gale crater. American Geophysical Union Fall Meeting, New Orleans, LA.

2021 A. A. Fraeman, M. Hughes, C. Seeger, J. Ando†, S. Jacob, J. Johnson, **R. Sheppard**, R. Arvidson, M. Rice, J. Bell. Spectral properties of diagenetic features near the clay-sulfate transition in Mt. Sharp. American Geophysical Union Fall Meeting, New Orleans, LA.

2021 S. N. Lamm†, L. E. Rodriguez, **R. Y. Sheppard**, S. M. Perl, A. J. Celestian, L. M. Barge. Classification of iron (oxy)hydroxides and sulfides using mission-ready spectroscopic techniques and machine learning. Geological Society of America Annual Meeting, Portland, OR.

2020 R. E. Milliken, J. P. Grotzinger, **R. Sheppard**, R. Wiens, R. Gellert, L. M. Thompson, A. Vasavada, T. Bristow, & N. Mangold. 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 R. E. Milliken, J. P. Grotzinger, R. Wiens, R. Gellert, L. M. Thompson, **R. Sheppard**, A. Vasavada, T. Bristow, & N. Mangold. 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 D. Morriss, C. B. Sanders, J. P. Grotzinger, J. Busch, L. F. Cury, P. Daoust, W. W. Fischer, B. Howes, D. S. Jones, **R. Sheppard**, L. L. Nelson, J. P. Pu, D. P. Quinn, J. Wilcots, & R. Swart. Cap Sequence Post-dating Marinoan Glacial Deposits, Naukluft Mountains, Namibia. American Geophysical Union Fall Meeting, Washington, D.C.

2017 A. C. Pascuzzo, B. C. Johnson, **R. Y. Sheppard**, E. A. Fisher, & S. E. Wiggins. 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 H. Savage, P. J. Polissar, H. Rabinowitz, & **R. Sheppard**. Some like it hot: the spectrum of temperature rise during earthquakes. American Geophysical Union Fall Meeting, San Francisco, CA.

2012 H. Savage, P. J. Polissar, **R. Sheppard**, C. Rowe, & J. Kirkpatrick. 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 H. Savage, P. J. Polissar, **R. Sheppard**, E. Brodsky, & C. Rowe. Do faults stay cool under stress? American Geophysical Union Fall Meeting, San Francisco, CA.

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

TEACHING EXPERIENCE

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

2021 Undergraduate advisees hosted by Caltech/JPL:
◇ Jordan Ando – *LPSC Dwornik Award 2022. Now a PhD student at the University of Hawaii*
◇ Henry Manelski – *now a PhD student at Purdue*

2016-2020 Undergraduate advisees hosted by Brown University:
◇ Ana Colón – *now a PhD student at the University of Oregon*
◇ Christopher Yen – *LPSC Dwornik Award Honorable Mention 2019. Now a PhD student at WashU*
◇ Grant Rutherford – *now a PhD student at MIT*
◇ Catherine Miranda
◇ Sarah Martinez

2018 Leadership Alliance Summer Program Coordinator, Brown University.

OTHER SERVICE & OUTREACH

Journals recently reviewed for: *Journal of Geophysical Research: Planets, Journal of Geophysical Research: Biogeosciences, Icarus.*

2022 Session Convener and Chair, AbSciCon, *"Diagenesis and subsurface habitable environments."*

2021 Reviewer, Graduate Women In Science (GWIS) National Fellowship Program.

2020 Panelist, NASA review panel.

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 outreach program for K-12 students and incarcerated adults across the world.

2018-2020 GeoW+ Co-Founder, Graduate Student Leader, Brown University DEEPS. Intersectional mentoring group for geoscience undergraduates.

2018-2020 Diversity & Inclusion Action Committee, Brown University DEEPS. Committee consisted of faculty, staff, and graduate students. *Invited by Department Chair.*

2018-2020 Faculty Representative, Brown University DEEPS. Liaison between faculty and graduate students, invited attendee to faculty meetings. *Elected.*

2018-2019 Planetary Climate Task Force, Brown University DEEPS. Task force consisted of faculty, staff, and graduate students. *Elected.*

FIELD WORK & SHORT COURSES

2021 Revolutionizing Access to the Martian Surface, **Keck Institute for Space Studies**, Caltech (10 day workshop, invited).

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

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

2016 Reflective Teaching, Harriet W. Sheridan Center, Brown University (12 week course).

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

2012 Geologic Mapping intensive, 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).