SAMANTHA R. BAKER

samantha.r.baker@stonybrook.edu

EMPLOYMENT

Stony Brook University
Postdoctoral Associate in Geosciences, September 2026 –

EDUCATION

California Institute of Technology
Ph.D. in Planetary Science, June 2026
M.S. in Planetary Science, June 2023
Thesis: "Remote sensing aqueous surface processes on planets red and blue: From chemical weathering mineralogy on Mars to water temperature in Alaska's river corridors"

- NSF Graduate Research Fellowship
- Keck Institute for Space Studies Student Affiliate
- Resnick Sustainability Institute Scholar
- Teaching assistant: Remote Sensing for Environmental and Geologic Applications (2023, 2024), Earth and the Environment (2025)

University of Chicago
B.S. in Geophysical Sciences with Honors, *suma cum laude*, June 2021
Thesis: "Investigating the behavior of volatiles on Ceres and Vesta through vacuum experiments"

- Enrico Fermi Scholar in the Physical Sciences
- Illinois Space Grant Consortium Scholarship
- Phi Beta Kappa

RESEARCH EXPERIENCE

Stony Brook University, Department of Geosciences, 2026–
Advisor: Deanne Rogers, Ph.D.

- Mapping sulfates and the enigmatic high thermal inertia "etched terrain" in Meridiani Planum to understand its formation from groundwater or ice melt and the implications for regional hydrology. Combining spectroscopic data, thermal imaging, and high-resolution imagining to characterize the composition, thermal properties, and stratigraphic context of this geologic unit.

Stony Brook University, Department of Geosciences, 2026–
Advisor: Joel Hurowitz, Ph.D.

- Developing methods to bridge the Perseverance rover's local geochemical measurements from the PIXL X-ray fluorescence instrument with the outcrop-scale imagery from the Mastcam-Z instrument. Applying these methods to characterize alteration processes of Noachian and pre-Noachian Mars crust outside Jezero Crater.

Caltech, Department of Geological and Planetary Sciences, 2021–2026
Advisor: Bethany Ehlmann, Ph.D.

- Constructing algorithms for automatic mineral detection and mapping with Mars

spectroscopic data from the CRISM instrument; integrating these data with high-resolution imaging and digital elevation models to understand the minerology, stratigraphic relationships, and formation processes of Al-phyllosilicate and associated aqueous alteration minerals in Nili Fossae and globally.

Caltech, Department of Geological and Planetary Sciences, 2022–2026
Advisor: Michael Lamb, Ph.D.

- Developing and implementing methodology to use thermal infrared remotely-sensed data from Landsat to analyze the spatial and temporal patterns of river temperature across wetland environments, with particular application to determining the thermal response of Alaskan rivers to climate change.

University of Chicago, Department of Geophysical Sciences, 2019 – 2021
Advisor: Andrew Davis, Ph.D.

- Honors thesis analyzing volatiles of Ceres and Vesta in post-impact conditions.

NASA Jet Propulsion Laboratory, Summer Internship Program, Summers 2019 – 2020
Planetary Science Section, Small Bodies Group
Advisors: Jennifer Scully, Ph.D., Michael Poston, Ph.D., and Elizabeth Carrey, M.S.

- Experimentally simulated the behavior of volatiles in Ceres and Vesta post-impact conditions using the vacuum chamber and instrumentation at JPL's Extraterrestrial Materials Simulation Lab.

NASA Jet Propulsion Laboratory, Summer Internship Program, Summer 2018
Planetary Science Section, Planetary Mission Development
Advisors: Chester Borden, Ph.D. and Jennifer Scully, Ph.D.

- Developed methodology to select a landing site for potential future Ceres exploration mission to fulfill engineering and scientific objectives.
- Conducted chemical and physical analyses of Dawn mission data to understand the structure, terrain, and composition of Ceres using ArcMap and ArcScene.

University of Chicago, Department of Geophysical Sciences, 2018–2019
Advisor: Edwin Kite, Ph.D.

- Investigated the geomorphology of Martian craters using ArcGIS and JMARS with images from the Mars Reconnaissance Orbiter to determine mechanism of development of crater outflow channels.

Duke University, Earth & Ocean Sciences Division, Summers 2015 – 2017
Advisor: Alan Boudreau, Ph.D.

- Analyzed the igneous petrology and geochemistry of the Montana Stillwater igneous complex using electron microprobe elemental analysis and petrographic microscopy to determine if hydration was the cause of troctolite formation.

PUBLICATIONS

Baker SR, Ehlmann BL (in review). A Global Survey of Aluminum Phyllosilicates Across Mars: Multiple Formation Mechanisms from Alteration of Volcaniclastics and Basalt Leaching. *Journal of Geophysical Research: Planets*.

Baker SR, Lamb MP (in prep). Remote Sensing Water Temperature in Permafrost Riverine Corridors.

Baker SR, Ehlmann BL (2026). Aluminum Phyllosilicate and Jarosite Formation Through Alteration of Reworked Al/Si-Rich Volcaniclastic Sediments in Nili Fossae, Mars. *Journal of Geophysical Research: Planets. 131(*e2025JE009605). DOI: 10.1029/2025JE009605.

Zaki AS, Wang D, **Baker SR**, Grotzinger JP, Dickson J, Lamb MP (2025). Mars' Hourglass Landforms as Local Source-to-Sink Fluvial Systems. *Journal of Geophysical Research: Planets, 130* (7). DOI: 10.1029/2024JE008745.

Poston MJ, **Baker SR**, Scully JEC, Carey EM, McKeown LE, Castillo-Rogez JC, Raymond, CA (2024). Experimental Examination of Brine and Water Lifetimes After Impact on Airless Worlds. *Planetary Science Journal, 5*(10). DOI: 10.3847/PSJ/ad696a.

Scully JEC, **Baker SR**, Castillo-Rogez JC, Buczkowski DL (2021). The In-Situ Exploration of a Relict Ocean Word: An Assessment of Potential Landing and Sampling Sites for a Future Mission to the Surface of Ceres. *Planetary Science Journal, 2*(94). DOI: 10.3847/psj/abee28.

Baker SR, Boudreau AE (2019). The Influence of the Thick Banded Series Anorthosites on the Crystallization of the Surrounding Rock of the Stillwater Complex, Montana. *Contributions to Mineralogy and Petrology, 174*(99). DOI: 10.1007/s00410-019-1635-x.

GRANTS AWARDED

Baker SR, Ehlmann BL (2022). Revealing Mars's Chemical Weathering History Through Infrared Spectroscopy. National Science Foundation Graduate Research Fellowship Program.

INVITED PRESENTATIONS

Baker SR. A Story of Mars Water and Volcanism Revealed in the Clays. Department of Earth, Geographic, and Climate Sciences, University of Massachusetts, Amherst. November 2026.

SELECTED CONFERENCE PROCEEDINGS

Baker SR, Ehlmann BL. Aluminum Phyllosilicate and Jarosite–Alunite Formation from Probable Volcanic Ash Deposits Across Mars. Mars Through Time Conference. Paris, France. October 2025.

Baker SR, Ehlmann BL. Al-Phyllosilicate Formation Through Acidic Alteration of Transported Sedimentary Material in Nili Fossae and Implications for the Mars 2020 Mission. Lunar and Planetary Science Conference. Houston, TX. March 2025.

Baker SR, Lamb MP. Remote Sensing Seasonal and Spatial Patterns of Water Temperature in Alaska Riverine Environments. American Geophysical Union Annual Meeting. Washington, D.C. December 2024.

Baker SR, Ehlmann BL. Chemical Weathering Conditions in Nili Fossae as Indicated by Aluminum Phyllosilicates and Associated Mineralogy. Lunar and Planetary Science Conference.

Houston, TX. March 2024.

Baker SR, Scully JEC, Poston M, Carey E, Castillo-Rogez JC, Raymond CA. Investigating the Behavior of Volatiles on Vesta and Ceres Through Vacuum Experiments. Geological Society of America Annual Meeting. Montreal, Canada. October 2020.

Baker SR, Scully JEC, Borden CS. An Analysis of Possible Landing Sites on Ceres. Geological Society of America Annual Meeting. Indianapolis, IN. November 2018.

Baker SR, Boudreau AE. Analyzing Hydration as the Potential Cause of Olivine and Plagioclase Troctolites. Geological Society of America Annual Meeting. Denver, CO. September 2016.

Baker SR. Surface Layer Thermal Inertia Reveals Presence and Depth of Subsurface Ice. Lunar and Planetary Science Conference, Houston, TX. March 2015.

Baker SR, Breitfeld A, Quiambao R, et al. The Effect of Porosity on the Thermal Inertia of Pebble Gravel. Lunar and Planetary Science Conference, Houston, TX. March 2014.

INSTRUMENTATION AND DATA ANALYSIS EXPERIENCE

Remote Sensing Data: CRISM, HiRISE, Mars Context Camera, MOLA, Landsat

Programming and Software: Python, ArcGIS, ENVI, Google Earth Engine, Ames Stereo Pipeline, SOCET SET, WISER, JMARS, ImageJ

Laboratory Equipment: hyperspectral imaging spectrometer, ASD portable spectrometer, scanning electron microscope, electron microprobe, vacuum chamber system