CURRICULUM VITAE

ZACHARY K. GARVIN

Georgetown University
Science, Technology, and International Affairs Program & Department of Biology
Regents Hall, Office 514 | 6411 Tondorf Road, Washington, D.C. 20057
zkg3@georgetown.edu | (443) 253-9594
https://zkgarvin.github.io/

EDUCATION

Ph.D., Geosciences (May 2024) **Princeton University**, Princeton, NJ
Dissertation: "Assessing the Influence of Hot Spring Proximity on the Microbiology of Surrounding Soils: Spatial Patterns in Metabolisms and Organic Signatures"

M.A., Geosciences (October 2019) **Princeton University**, Princeton, NJ

Sc.B. with Honors, Microbiology/Immunology (May 2017) **Brown University**, Providence, RI

RESEARCH INTERESTS

I utilize techniques from traditional microbiology, metagenomics, and analytical chemistry to study "extreme" terrestrial environments, the microorganisms that inhabit them, and the strategies life employs to survive under such challenging conditions. My research has spanned topics from bacterial ether lipid production in peat environments to microbial trace gas oxidation in desert soils as analogs for the surface environments of early and modern Mars. My current work focuses on modifying and employing a commercial LDI-MS to serve as a science analog for the MOMA instrument onboard the upcoming Rosalind Franklin rover.

RESEARCH AND PROFESSIONAL EXPERIENCE

Adjunct Professor, **Georgetown Universit**y Spring 2026

Contributing Scientist, **MOMA Science Team** 2026-present

STIA Postdoctoral Fellow, **Georgetown University** 2024-present
PI: Professor Sarah Stewart Johnson

Graduate Student/Candidate Researcher, **Princeton University** 2017-2024
Advisor: Professor Tullis C. Onstott

Voss Undergraduate Research Fellow, **Brown University** 2016-2017
Advisor: Professor Yongsong Huang

Research Intern, **NASA Goddard Space Flight Center** Summer 2014, 2015
Advisors: Ms. Melissa Floyd, Dr. Alex Pavlov, Dr. Paul Mahaffy

FIELD WORK

Krýsuvík, Iceland — Summer 2025

Sampling and in situ geochemical/mineralogical measurements of mineral and sediment deposits around various hydrothermal features within and around Lake Kleifarvatn.

Yellowstone National Park, USA — Fall 2020

Soil and water sampling trip of phase-separated hot springs in Norris Geyser Basin.

Arica-Tarapacá region, Chile — Spring 2019

Soil sampling trip of an environmental gradient in the Arica-Tarapacá region of northern Chile, including a soil transect at Polloquere Hot Springs in the Salar de Surire salt flat.

Moab Khotsong Gold Mine, Orkney, South Africa — Fall 2018

Installed U-tube water sampling device into a ~400 meter borehole at ~3 km depth to study the chemistry and microbial community in the highly saline water.

PUBLICATIONS

Garvin, Z. K., Roussel, A., Chou, L., Castillo, M. E., Li, X., Brinckerhoff, W. B. & Johnson, S. S. Application of a modified commercial laser mass spectrometer as a science analog of the Mars Organic Molecule Analyzer (MOMA). *Frontiers in Astronomy and Space Sciences* **13** (2026).

Garvin, Z. K., Abades, S. R., Trefault, N., Alfaro, F. D., Sipes, K., Lloyd, K. G., & Onstott, T. C. Prevalence of trace gas-oxidizing soil bacteria increases with radial distance from Polloquere hot spring within a high-elevation Andean cold desert. *The ISME Journal* **18**, 1 (2024).

Garvin, Z. K., Boyd, E., Floyd, M., Harris, R. L., Kalucha, H., Mahaffy, P., Moores, J. E., Onstott, T. C., Sapers, H. M., & Trainer, M. Mars Trace Gas Fluxes: Critical Strategies and Implications for the Upcoming Decade. *Bulletin of the American Astronomical Society* **53**, 4 (2021).

Harris, R. L., Schuerger, A. C., Wang, W., Tamama, Y., **Garvin, Z. K.**, & Onstott, T. C. Transcriptional response to prolonged perchlorate exposure in the methanogen *Methanosarcina barkeri* and implications for Martian habitability. *Scientific Reports* **11**, 1 (2021).

Carrier, B. L., Beaty, D. W., Meyer, M. A., …, **Garvin, Z. K.**, et al. Mars Extant Life: What's Next? Conference Report. *Astrobiology* **20**, 6 (2020).

Liang, R., Lau, M. C. Y., Saitta, E. T., **Garvin, Z. K.** & Onstott, T. C. Genome-centric resolution of novel microbial lineages in an excavated Centrosaurus dinosaur fossil bone from the Late Cretaceous of North America. *Environ. Microbiome* **15**, 8 (2020).

PROFESSIONAL PRESENTATIONS

Garvin, Z. K. Molecules to Microbes from Earth to Mars. Invited oral presentation at Voss Symposium, Brown University. September 19, 2025.

Garvin, Z. K., Roussel, A., Chou, L., Castillo, M. E., Li, X., Brinckerhoff, W. B., Johnson, S. S. Analysis of Mars analog soils and minerals via a modified benchtop MOMA-like LDI-MS. Oral presentation at the Biennial European Astrobiology Conference. July 4, 2025.

Garvin, Z. K., Abades, S. R., Trefault, N., Alfaro, F. D., Huang, Y., Onstott, T. C. Assessment of lipids as a life detection strategy in low biomass desert soils surrounding an Andean hot spring. Virtual oral presentation at AbSciCon 2022. May 18, 2022.

Garvin, Z. K., Abades, S. R., Trefault, N., Alfaro, F. D., Arnold, J., Kennedy, M., Onstott, T. C. Using Soil Trace Gas Flux as a Signature for Life: A Terrestrial Case Study in Martian Life Detection. Poster presented virtually at AGU Fall Meeting. December 9, 2020.

Garvin, Z. K. Trace Gas Consumption as a Metabolic Strategy for Life Beneath the Martian Surface and the Means to Detect It. Presented virtually at Mars Exploration Program Analysis Group (MEPAG) Meeting 38. April 16, 2020.

Garvin, Z. K., Abades, S. R., Trefault, N., Alfaro, F. D., Onstott, T. C. High-Affinity Trace Gas Consumption by Soil Microbial Communities Around Hot Springs in the Andean Altiplano with Implications for Early Mars. Poster presented at AGU Fall Meeting. San Francisco, CA. December 10, 2019.

Garvin, Z. K., Abades, S. R., Trefault, N., Alfaro, F. D., Onstott, T. C. High-Affinity Trace Gas Consumption by Soil Microbial Communities Around Hot Springs in the Andean Altiplano: Implications for the Evolution of Martian Metabolisms. Oral presentation at Mars Extant Life: What's Next? Carlsbad, NM. November 7, 2019.

Garvin, Z. K., Huang, Y. Inducing the bacterial production of brGDGT lipids in a suboxic peat environment. Presented at the Brown University Undergraduate Honors Thesis Oral Presentation Forum. May 1, 2017.

Garvin, Z. K., Floyd, M. Life on Mars: extremophilic bacteria in a simulated martian environment. Presented at the NASA Goddard Summer Intern Poster Competition. July 30, 2015.

HONORS AND AWARDS

JGI Community Science Program (CSP) New Investigator Award 2026

Selected as PI for a sequencing project through JGI to perform metagenomics on samples collected from a variety of Icelandic hydrothermal environments.

Mars Mission Ideation Factory 2023, 2024

Selected as one of 30 early career participants for an intensive program at NASA Goddard

Space Flight Center (2023) and NASA Ames Research Center (2024) to begin designing a mission to Mars for the detection of extant life.

Princeton Geosciences Graduate Student Research Fund 2022
Selected to support research in collaboration with Dr. Amy Williams (UF) comparing lipid detection via typical laboratory techniques and Mars Curiosity Rover methods.

Walbridge Fund Graduate Award for Environmental Research 2020
Competitively selected by the Princeton Environmental Institute (PEI) to support Ph.D. dissertation research focused on environmental topics.

NASA Astrobiology Early Career Collaboration Award 2019
Received travel grant to conduct field research along an environmental gradient across the Arica-Tarapacá region of northern Chile and to perform trace gas analyses.

W. Michael Blumenthal Family Fund Fellowship, Princeton University 2017-2018
Selected by the Geosciences Graduate Studies Work Committee to receive the named fellowship to support full-time graduate study for the 2017-2018 academic year.

Sigma Xi, Brown University Chapter, Associate Membership 2017
Inducted into the Brown University Chapter of the Society of Sigma Xi for a high level of competence in science and demonstration of significant scientific research.

Brown University Voss Undergraduate Research Fellowship 2016-2017
Fellowship awarded by the Institute at Brown for Environment and Society to support environmental research to be completed for a senior honors thesis project.

NASA Goddard Space Flight Center Intern Poster Competition, 1st Place 2015
Awarded 1st place among all NASA Goddard interns in the *Science* category for summer research poster presentations (title: "Life on Mars: Extremophilic Bacteria in a Simulated Martian Environment").

TEACHING AND ADVISING

Foundations of Space Studies (STIA 4005), Georgetown University Spring 2026
Adjunct Professor for Space Science module

Astrobiology Pop-Up Lab, Georgetown University Fall 2025-Spring 2026
Assistant lecturer and adviser for a guided undergraduate research course

Alumni Career Mentor, Brown University Summer 2025
Career mentorship for small group of Brown STEM undergraduates

Environmental Microbiology (GEO 417), Princeton University Fall 2023
Guest Lecturer on microbiology in extreme environments

Undergraduate Junior Project Mentor, Princeton University — Fall 2021-Spring 2022
Mentor for Princeton undergraduate Junior project research
Isabel Rodrigues, Class of 2023

High Meadows Environmental Institute Summer Internship Program — Summer 2021
Mentor and project lead for Princeton undergraduate intern
Isabel Rodrigues, Class of 2023

Princeton Environmental Institute Summer Internship Program — Summer 2020
Mentor and project lead for Princeton undergraduate interns
Janelle Arnold, Class of 2023
Mae Kennedy, Class of 2023

Natural Disasters (GEO 103), Princeton University — Spring 2019
TA, lab instructor and grader