

Avery Fulford

afulford@mit.edu

Education

PhD in Biological Oceanography | Sept. 2022 – Feb. 2028 (anticipated) | Massachusetts Institute of Technology and Woods Hole Oceanographic Institution Joint Program

- National Science Foundation Graduate Research Fellow

BSc in Biology | Class of 2021 | Duke University

- Earth and Ocean Science minor; graduated with High Distinction for honors thesis
- Biology | Fall 2019 | Trinity College Dublin

Publications

Fulford AH*, Ratliff L*, Graham HV, Pozarycki CI, Wimp GM, Nichols F, Osburn M. The Vacant Niche Revisited: Using Negative Results to Refine the Limits of Habitability. Submitted to *Nature Astronomy*. ***Co-first author.**

Bright M, Gollner S, de Oliveira AL, Espada-Hinojosa S, **Fulford AH**, et al. Animal life in the shallow seafloor at deep-sea hydrothermal vents. *Nature Communications* 15 (2024).

Case NT, Song M, **Fulford AH**, Graham HV, Mustard J, Heitman J, Sherwood Lollar B, Cowen LE. Exploring Space via Astromycology: A Report on the CIFAR Programs *Earth 4D* and *Fungal Kingdom* Inaugural Joint Meeting. *Astrobiology* 22(6) (2022).

Liao IT, **Fulford AH**, Ostevik KL, Rausher MD. Reclassifying *Ipomoea "austini"* as North American *I. grandifolia*, member of the Convolvulaceae series *Batatas*. *Systematic Botany* 47(3): 817-831 (2022).

Presentations

Fulford AH, Zhivkova T, Lopez P, Saito M, Sievert S, Seewald J, Huber J (July 2026) Energy Landscapes Drive Microbial Metabolic Function in a Brine-Dominated Hydrothermal Vent System. Oral presentation at the Goldschmidt Conference, Montréal, CA.

Fulford AH, Sievert SM (May 2024) Assessing viability and activity in response to electron donor starvation in thiosulfate-oxidizing bacteria isolated from a shallow hydrothermal vent in the Aegean Sea. Poster at the Astrobiology Science Conference, Providence, RI.

Graham HV, Johnson SS, **Fulford AH** (July 2022) Developing a biosignature framework for ocean worlds: Mechanistic fundamentals for understanding biological potential and expression. Presentation at the 44th COSPAR Scientific Assembly, Athens, Greece.

Fulford AH, Graham HV (May 2022) Energy, chemistry, physiology: Approaches to understanding the biological potential of ocean worlds. Oral presentation at the Astrobiology Science Conference, Atlanta, GA.

Ratliff LE, **Fulford AH**, Pozarycki C, Wimp G, Graham HV (May 2022) Exploring the limits of terrestrial habitability: The challenges of a statistical meta-analysis with negative data. Poster at the Astrobiology Science Conference, Atlanta, GA.

Kempes C, Levin S, H Graham, **Fulford AH**, Follows M, Smith HH, House CH (May 2022) A generalized biogeochemical theory for astrobiology. Presentation and discussion at the Astrobiology Science Conference, Atlanta, GA.

Fulford AH, Ratliff LE, Pozarycki CI, Osburn MR, Graham HV (December 2021) The Vacant Niche Revisited: Using Negative Results to Refine the Limits of Habitability. Poster at the American Geophysical Union Fall Meeting, New Orleans, LA (virtual).

- Fulford AH**, Schmid AK (Sept. 2021) A comparative genomic analysis of the 250-million-year-old halophilic archaeon *Halosimplex carlsbadense* with related species. Oral presentation at the Astrobiology Graduate Conference, Tokyo, Japan (virtual).
- Fulford AH**, Schmid AK (Sept. 2021) A comparative genomic analysis of the 250-million-year-old halophilic archaeon *Halosimplex carlsbadense* with related species. Oral presentation at the Archaea Power Hour, online.
- Fulford AH**, Graham HV, Ratliff LE, Pozarycki CI, Nichols F (August 2020) Null Life Detection Survey: Defining the Boundaries of Habitability. Oral presentation at the 17th Annual URAA Seminar, NASA Goddard Center for Astrobiology, MD.

Grants and Awards

WHOI Grassle Fund	2026
Santa Fe Institute Complexity Science Micro Working Group	2025
WHOI Ocean Ventures Fund	2024
Access to the Sea Grant	2024
Lewis and Clark Fellowship in Astrobiology, American Philosophical Society	2024
NSF Graduate Research Fellowship	2022
High Distinction for Biology Thesis	2021
Duke Engage Scholarship Recipient	2019

Field Work

- 2024 **Brine-dominated vent field on Cleft Segment, Juan de Fuca Ridge:** Month-long research cruise on R/V *Atlantis* with ROV *Jason* to collect samples for thesis research.
- 2023 **Hydrothermal vent field at East Pacific Rise, 9°N:** Month-long research cruise on Schmidt Ocean Institute's R/V *Falkor (too)* with ROV *SuBastian* to investigate larval and microbial dispersal in the marine subsurface of a hydrothermal vent field.
- 2023 **Methane seeps at Hydrate Ridge, North Pacific:** Research cruise on the R/V *Atlantis* with HOV *Alvin* to study rates of microbial CH₄ oxidation in incubations under pressure.
- 2019 **Alpine Lake system, Neltume, Chile:** Duke Engage Scholarship. Led data collection and analysis for an environmental science project in ten alpine lakes of southern Chile.

Workshops and Courses

Path of Professorship Certificate, MIT	2026
NASA Astrobiology Mission Ideation Factory (Funded by NASA), Glenn Research Center, Cleveland, OH	2025
Strategies and Techniques for Analyzing Microbial Populations (STAMPS), Marine Biological Laboratory, Woods Hole, MA	2025
Complexity-GAINS International School (Funded by Santa Fe Institute), Sète, France	2024
NASA/ESA International Summer School in Astrobiology (Funded by NASA), Santander, Spain	2021

Previous Research Experience

Research Associate in Astrobiology | NASA Goddard | June 2020 – July 2022

Conducted a literature survey of negative life detections with Dr. Heather Graham. Used thermodynamic modeling to estimate potential biomass on moons of Saturn and Jupiter.

Honors Thesis Researcher | Schmid Lab at Duke University | January 2019 – May 2021

Assembled and analyzed the genome of an ancient halophile extracted from 250-million-year-old halite crystals. Identified core, conserved genes involved in oxidative stress response.