

Anthony M. Gargano Ph.D.

Postdoctoral Researcher · NASA ARES, Johnson Space Center & Lunar and Planetary Institute, Houston, TX
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RESEARCH FOCUS

Astromaterials scientist and geochemist with expertise in lunar samples, meteoritics, stable isotopes, and volatile element systematics. Laboratory skills span MC-ICP-MS and IRMS measurements focused on non-traditional isotope geochemistry, custom fabrication of high-vacuum and high-temperature experimental systems, ultra-clean sample preparation, and computational modeling.

EDUCATION

Ph.D., Earth and Planetary Sciences — University of New Mexico

April 2022

Halogen and non-traditional isotope geochemistry of planetary and terrestrial materials · Advisor: Dr. Zachary Sharp

B.S., Geology — University of North Carolina at Charlotte

May 2016

Department of Geography and Earth Sciences

PROFESSIONAL APPOINTMENTS

Postdoctoral Researcher — NASA ARES, Johnson Space Center

December 2023–present

Houston, TX · Advisor: Dr. Justin Simon · Lunar regolith evolution; experimental method development

Postdoctoral Researcher — University of New Mexico, Center for Stable Isotopes

July–November 2023

Albuquerque, NM · Advisors: Drs. Zachary Sharp & Seth Newsome · Stable isotope method development

Postdoctoral Researcher — Scripps Institution of Oceanography, UC San Diego

June 2022–June 2023

La Jolla, CA · Advisor: Dr. James Day · Impactite geochemistry; co-PI, R/V Sally Ride research expedition

PUBLICATIONS

Manuscripts in review / published

- **Gargano AM**, Vaci Z, Simon JI, Buckley W, Sharp ZD, Koefoed P, and Wang K. (*In review*). Halogen geochemistry and Cl, K isotope compositions of non-carbonaceous chondrites. *Icarus*.
- Garai S, Sharp ZD, Olson PL, and **Gargano AM**. (2026). Experimental simulation of water formation on Earth from dry pebble rain. *Nature Geoscience*. <https://doi.org/10.1038/s41561-026-02118-7>
- Sharp Z, **Gargano AM**, et al. (2026). Reply to Alexandre et al.: Insensitivity of the $\Delta^{17}\text{O}$ value of equisetum to atmospheric relative humidity. *Proceedings of the National Academy of Sciences*. 123: e2604539123. <https://doi.org/10.1073/pnas.2604539123>
- Srivastava Y, Day J, **Gargano AM**, Bigouse A, Qin L, Tait K, and Joy B. (2026). Osmium isotope dichotomy between impactites from the Procellarum KREEP terrane and the lunar highlands. *Earth and Planetary Science Letters*. 684: 120013. <https://doi.org/10.1016/j.epsl.2026.120013>
- **Gargano AM**, Simon JI, Cano E, Ziegler K, Shearer C, Day J, and Sharp Z. (2026). Constraints on the impactor flux to the Earth-Moon system from oxygen isotopes of the lunar regolith. *Proceedings of the National Academy of Sciences*. 123: e2531796123. <https://doi.org/10.1073/pnas.2531796123>
- Sharp Z, Wostbrock J, **Gargano AM**, IsoCamp Science Team, and Ehleringer J. (2025). Extreme triple oxygen isotope fractionation in Equisetum. *Proceedings of the National Academy of Sciences*. 122: e2507455122. <https://doi.org/10.1073/pnas.2507455122>
- Dottin J, and **ANGSA Science Team**. (2025). Endogenous, yet Exotic, Sulfur in the Lunar Mantle. *Journal of Geophysical Research: Planets*. 130: e2024JE008834. <https://doi.org/10.1029/2024JE008834>
- McFadden J, and **ANGSA Science Team**. (2024). Analyzing the Mineralogy and Space Weathering Characteristics of the Finest Fraction in Apollo Core Sample 73002. *Journal of Geophysical Research: Planets*. 129: e2024JE008528. <https://doi.org/10.1029/2024JE008528>
- **Gargano AM**, Dottin J, Hopkins S, Sharp ZD, Shearer CK, Halliday A, and Farquhar J. (2022). The Zn, S, and Cl isotope compositions of mare basalts: implications for the effects of eruption style and pressure on volatile element stable isotope fractionation on the Moon. *American Mineralogist*. 107: 1985–1994. <https://doi.org/10.2138/am-2022-8290>
- **Gargano AM**, Sharp ZD, Shearer CK, Simon JI, Halliday A, and Buckley W. (2020). Chlorine isotope compositions and halogen contents of Apollo-return samples. *Proceedings of the National Academy of Sciences*. 117: 23418–23425. <https://doi.org/10.1073/pnas.2014503117>
- Li Y, Li Q, Tang G, **Gargano AM**, Sharp ZD, Pitwala A, Zhao L, Zhai M, and Li X. (2020). Eppwala-AP, Sri Lanka, an apatite reference material for high precision chlorine isotope analysis. *Atomic Spectroscopy*. 41: 51–56. <http://dx.doi.org/10.46770/AS.2020.02.001>
- **Gargano AM**, and Sharp ZD. (2019). The chlorine isotope composition of iron meteorites: Evidence for the Cl isotope composition of the solar nebula and implications for extensive volatilization during planet formation. *Meteoritics and Planetary Science*. 54: 1619–1631. <https://doi.org/10.1111/maps.13303>

Manuscripts in preparation

- **Gargano AM**, Yap T, and Lawrence W. (*In prep for submission to ApJ*). Fresh stardust explains the non-solar oxygen isotope composition of the inner solar system.

GRANTS, FELLOWSHIPS & AWARDS

NASA ROSES S3 (selectable, lead-PI) — Investigating the Origin of the Earth-Moon Alkali Dichotomy with Novel Isopiestic Vapor-Melt Exchange Experiments 2026

\$1,278,328 · co-PI: Dr. Aaron Bell (University of Colorado, Boulder) · submitted February 2026

NASA Harriett G. Jenkins Graduate Fellowship — Volatile sources to chondrites 2019

\$165,000

RELEVANT SKILLS

Technical Programming

- Fluent in Python for scientific computing, data processing, and analytical workflow development.

High-Vacuum Systems & Experimental Apparatus Design

- Design, construction, and maintenance of high-vacuum glass and metal line systems.
- Gas-liquid distillation, gas purification via cryogenic trapping and GC interfaces.
- Custom hardware fabrication and machining.

Plasma and Gas-Source Mass Spectrometry

- Major, trace, siderophile element quantification by solution and laser ablation ICP-MS (*iCAP Q*, *Element2*).
- Os isotope analyses by TIMS (*Triton*).
- K isotope analyses by solution MC-ICPMS (*Neptune Plus*).
- Oxygen isotope analysis via fluorination pressure vessels and laser fluorination systems.
- Analytical experience in H, O, S, and Cl isotopic measurements via IRMS.

Volatile Element Geochemistry & Sample Preparation

- Integration of gas, liquid, and solid analytical methods for extraction across multi-phase systems.
- Isolation, purification, and measurement of volatile species in complex geological materials.
- Ultra-clean laboratory practices for elemental and isotopic analysis.
- HF/HNO₃ whole-rock digestions and targeted HF leaching protocols.
- HCl-HNO₃-acetic acid etching for trace element and highly siderophile element workflows.
- Matrix purification via column chromatography for K isotope sample preparation.

OUTREACH

Youth Mentorship

- **LPI Summer Intern Program mentor (2024–2026)** — mentored Sadie DiCarlo (2024), Brayden Lipscomb (2025), and Leon Kelly (2026) through the Lunar and Planetary Institute internship program.
- **High School Isotope Research** — In collaboration with local high school science educators, I participate in an annual mentorship program for high school students in Albuquerque, New Mexico. Building on an established framework in the environmental sciences, I have expanded the program to include research questions focused on planetary materials and lunar samples. Students participate in all stages of the scientific workflow, including sample preparation, laboratory analysis, data interpretation, and the development of professional research products. As a capstone experience, students prepare and submit abstracts to the *Lunar and Planetary Science Conference (LPSC)*, producing citable contributions and presenting their work within the international planetary science community. I am currently mentoring two students, Brooklyn Bird & Violet Delu, who will present at LPSC 2026.

Popular Writings and Press Releases

- *Gargano et al. (2020)*, *PNAS*. Featured in University of New Mexico News, "[UNM, NASA scientists find depletion of halogens due to Giant Impact](#)"
- *Gargano et al. (2026)*, *PNAS*. Featured in University of New Mexico News, "[UNM researchers analyze Moon record, challenging Earth's water origins](#)"
- *Gargano et al. (2026)*, *PNAS*. Featured in Phys.org / Universe Today, "[A new study of lunar rocks suggests Earth's water might not have come from meteorites](#)"
- *Gargano et al. (2026)*, *PNAS*. Featured on Planetary Radio, The Planetary Society, "[Where did Earth's water come from? Clues hidden in Apollo Moon dust](#)"

PRESENTATIONS

Invited Talks

- *Constraints on the impactor flux to the Earth-Moon system from triple oxygen isotopes and highly siderophile elements*. Department of Earth and Planetary Sciences Spring Seminar Series, UC Santa Cruz. March 2026.

Conference Presentations **student mentee*

- **Gargano AM**, Bell A, Simon JI, Shearer CK, and Sharp Z. (2026, oral presentation). Multivariate statistical constraints on the compositional diversity of accretionary feedstock following the moon forming giant impact. *LPSC*.
- *Delu V, and **Gargano AM**. (2026, poster presentation). Microtomography of metal-graphite-silicate relationships in the ureilite, Kenna. *LPSC*.
- *Bird B, and **Gargano AM**. (2026, poster presentation). Endogenous alteration features in fayalite-rich lunar meteorites NWA 14341 & 15192. *LPSC*.
- *Lipscomb B, and **Gargano AM**. (2026, poster presentation). Multivariate statistical analysis of regolith and the missing protoliths at the Apollo 17 site. *LPSC*.
- **Gargano AM**, Bell A, Simon J, and Shearer C. (2025, oral presentation). Mass balance considerations for redox state disequilibria during explosive volcanism on the Moon. *NASA Exploration Science Forum*.
- Garai S, Sharp Z, Olson P, and **Gargano AM**. (2025, poster presentation). Chondritic component pebbles as sources of Earth's composition and water. *Goldschmidt*.
- **Gargano AM**, Simon J, Cano EJ, Ziegler K, and Shearer C. (2025, oral presentation). Constraints on the impactor flux to the Earth-Moon system from the triple oxygen isotope compositions of lunar regolith. *LPSC*.
- *DiCarlo S, **Gargano AM**, et al. (2025, poster presentation). Maximizing Mission Return Sample Science Through Integrated Inorganic and Organic Analyses. *LPSC*.
- **Gargano AM**, Sharp Z, Simon J, and Shearer C. (2024, poster presentation). The Isotopic Composition of Molecular Water Formed by Hydrogen Reduction of Iron Oxides: A Proxy for Endogenous Water Formed from Solar Wind Implantation. *LPSC*.
- Neuman N, **Gargano AM**, et al. (2022, poster presentation). Volatile Element Evolution in the Martian Crust: Communications with the Martian Surface and Atmosphere? *LPSC*.
- **Gargano AM**, Cano E, Ziegler K, Sharp Z, and Shearer C. (2022, oral presentation). Stable Isotope Geochemistry (H, Cl, O) of ANGSA Soils. *ANGSA & Apollo 17 Workshop*.
- **Gargano AM**, Day J, and Simon J. (2022, oral presentation). The Effects of Impact Processing on Lunar Volatile Element Isotope Geochemistry of Apollo 17 Soils. *ANGSA & Apollo 17 Workshop*.
- **Gargano AM**, Wostbrock J, Sharp Z, and Simon J. (2022, oral presentation). Exploring the Halogen Geochemistry of Marine Sediments. *GSA*.

TEACHING EXPERIENCE

Guest Lecturer

Stable Isotope Geochemistry (EPS 405) — University of New Mexico 2024, 2026
Earth and Planetary Science Department · Cross-listed undergraduate-graduate course

Advanced Igneous Petrology (EPS 400) — University of New Mexico 2025
Earth and Planetary Science Department · Graduate course

Teaching Assistant

Blue Planet (ENVS 1130L) — University of New Mexico 2020
Earth and Planetary Science Department

Training Courses

IsoCamp — Laboratory Instructor & Project Group Leader Annually, 2022–present

Founded in 1996 at the University of Utah, *IsoCamp* is a specialized course in stable isotope principles, analytical techniques, and their application in Earth, environmental, and ecological studies, and includes lectures, field- and laboratory-based experiences. I was invited to participate as a laboratory instructor at *IsoCamp* in 2022 following course migration to the UNM Center for Stable Isotopes. Albuquerque, NM.

SERVICE

Reviewer & Panelist

NASA FINESST Graduate Fellowship Program — Review Panelist 2024, 2025
Served on review panels evaluating competitive proposals for graduate research fellowships, specifically the Future Investigators in NASA Earth and Space Science and Technology program.

Peer Reviewer: *Chemical Geology, Earth and Planetary Science Letters, Geochimica et Cosmochimica Acta, Geochemical Perspectives, Geology, Icarus, Nature Communications, PNAS*