

Hypatia Meraviglia

Geological Sciences PhD Student

I'm a planetary geoscience PhD researcher with a background in atmospheric chemistry, astrophysics, and linguistics. I'm fascinated by planets and languages as systems with a view to life and information as planetary-scale phenomena.

Education

- **Arizona State University School of Earth and Space Exploration (g. 2028)** - *Ph.D., Geological Sciences, ELIFE Lab*
- **University of Central Arkansas (g. 2023)** - *B. S., Physics, B.A., Linguistics, minors in Mathematics and Honors Interdisciplinary Studies (Magna cum laude)*
Physics/chemistry thesis: Investigating interactions between meteoric metal ions and Titan's atmospheric organics
Linguistics thesis: Membranes: Imagining online communication as biological exchange
- **University of Arkansas at Hope-Texarkana (g. 2019)** - *A. A., General Education (Summa cum laude)*

Research

August 2023 - present -- **Comparative planetary biochemistry**

ASU School of Earth and Space Exploration (PI: Dr. Sara Imari Walker)

- Explore assembly spaces of amino acids in a spectrum of geochemical environments
- Improve and extend existing Python tools for calculating aspects of assembly space
- Collaborate with colleagues to build broadly useful tools and interpret implications for the search for life

August 2023 - present -- **Saltation at Titan's equatorial dunes (NSF GRFP)**

ASU School of Earth and Space Exploration (PI: Dr. Vernon Morris)

- Map disagreeing models for the emergence and sustaining of Titan's dunes
- Develop open-source tool to sweep space of possible dune-sustaining mechanisms and organize constraints from Cassini-Huygens data
- Identify strategic points to reduce uncertainty in preparation for Dragonfly mission

January 2022 - present -- **Water ice refraction in Enceladus' plumes**

NASA Goddard (PI: Dr. Conor Nixon)

- Model light-scattering behavior for ices observed by Cassini-Huygens
- Identify major gaps in the water ice refractive index literature and create tool to estimate missing values and appropriate errors
- Maintain tool and data on GitHub for open, free community use

September 2021 - May 2023 -- **Meteoric metal ions in Titan's atmosphere**

University of Central Arkansas (PI: Dr. Bill Taylor)

- Use ion-mobility spectrometry to map reactions between metal ions and organic nitriles in Titan's atmosphere
- Model molecules and reaction pathways in computational chemistry program Gaussian

Contact Information

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Soft Skills

- 4+ years communicating science to colleagues and public

- Science communication experience in a variety of mediums (talks, posters, art, social media)

- Application of experimental method from paper to lab

- Strong team communication and collaboration

- Ability to maintain focus and momentum working both alone or with a team

Hard Skills

- 4+ years using Python, Git and GitHub, LaTeX and Overleaf

- Communicate work to a spectrum of audiences, from public to major conferences

June 2021 - September 2021 -- **Mapping Titan's atmosphere with ALMA**

NASA Goddard (PI: Dr. Conor Nixon)

- Sort ALMA observations of Titan millimeter/submillimeter range for resolution and signal-to-noise ratio
- Clean and identify spectral emission lines using Python, Zshell, and Common Astronomy Software Applications (CASA)
- Map emissions across the disc of the moon

September 2020 - December 2021 -- **Microgravity and radiation on bone strength**

University of Central Arkansas (PI: Dr. Rahul Mehta)

- Test the strength of rat femurs and tibias subjected to radiation and simulated microgravity conditions with three-point bending
- Collect and record data with DATAQ, IDEA, and WinDaq
- Maintain data files and a lab notebook with detailed notes

September 2019 - May 2023 -- **Supernova lightcurves with parallel computing**

University of Central Arkansas (PI: Dr. Jeremy Lusk)

- Build and troubleshoot a six-node parallel supercomputer for astrophysics and departmental research
- Develop code to model the bolometric lightcurve of 1987A-like supernovae and calculate key variables to check external models
- Present work to researchers, faculty, students, and state legislators

Publications

- H. Meraviglia, C. A. Nixon, S. Aslam, M. Neveu, R. E. Gold, P. G. J. Irwin, J. L. Eigenbrode, "Chasing Rainbows: New Solutions to Gaps in Refractive Indices for Enceladus' Plumes." In prep.
- H. Meraviglia, E. Stinnett, J. A. Lusk. "The Bolometric Luminosity of SN-2018hna." In prep.
- C. Foscue, H. Meraviglia, M. P. Long, and W. S. Taylor. "Interaction of Small Nitriles Occurring in the Atmosphere of Titan with Metal Ions of Meteoric Origin." In prep.
- C. Ahrens, H. Meraviglia, C. Bennett. "A Geoscientific Review on CO and CO₂ Ices in the Outer Solar System." *Geosciences*, 2022.

Selected Talks

- "Chasing Rainbows: Light Scattering from Icy Particles in Enceladus' Plumes" at Ancient and Future Brines (2023) and Outer Planets Assessment Group (2023)
- "Gas Phase Reactions of Meteoric Mg⁺ and Al⁺ with Nitriles Occurring in the Atmosphere of Titan" at American Chemical Society Spring Meeting (2023)
- "Queer-friendly Workspace in the Current Environment" (panel discussion) at the American Astronomical Society 241 (2023)
- "Toward a unified tool for calculating supernova bolometric luminosities" at the American Astronomical Society 241 (2023)
- "Nickel-56 Yields and Bolometric Lightcurves of Peculiar Type II-P Supernovae" at the Arkansas Academy of Sciences (2022)
- "Effects of microgravity and radiation on rat bone strength and composition" at IDeA Network of Biomedical Research Excellence (2021)

- CASA (Common Astronomy Software Application)

- Gaussian (molecular modeling tool)

- HTML 5 + CSS 3, C++

- 3 years lab use of drift cell ion reactor

- Scientific poster design and presentation

Additional Languages

- Spanish (intermediate)

- American Sign Language (conversational)

Awards and Grants

- National Science Foundation Graduate Research Fellow (2023, 3 yrs funding)

- Outer Planets Assessment Group Travel Support (2023)

- Sigma Pi Sigma inductee (2023)

- First place AURS STEM Communicator (2023)

- Outstanding Student in the University of Central Arkansas' College of Natural Sciences and Mathematics (2023)

- Outstanding Student in the University of Central Arkansas' School of Language and Literature (2023)

- "Distribution of nitriles in Titan's atmosphere from 2013 to 2016 with ALMA" at the Division of Planetary Sciences 53 (2021)
- "Mapping the formation and dynamics of C₂H₅CN from 2013 to 2016 with ALMA" at Titan Through Time V (2021)

- Outstanding Undergraduate Poster Presentation in Astronomy at 105th Arkansas Academy of Sciences (2022)

- Arkansas Space Grant Consortium Workforce Development Grant (2021, 2022, 4 months funding each)

- First place oral presentation in physics at INBRE Research Conference (2021)

- University of Central Arkansas Dean's List (2020, 2021, 2022, 2023)

- Norbert O. Schedler Honors College Scholarship (2019 - 2023, 4 yrs funding)

- Graduated summa cum laude from the University of Arkansas at Hope-Texarkana (2019)

Service

August 2023 - present -- **United Campus Workers Arizona**
Student Caucus Representative (spring 2024)

- Collaborated with faculty, staff, students, and union executive committee to develop specific and achievable goals
- Coordinated student needs to campaigns and actions
- Communicated student needs to state-level and university-level administration

September 2020 - May 2023 -- **UCA Robotics**
Vice President (2020/2021)

- Design, build, and code VEX robots for university-level competition
- Mentor students from local middle schools to promote STEM during the pandemic
- Organize and lead weekly meetings
- Prepare meeting minutes, flyers, and engineering documentation

August 2020 - May 2023 -- **Green Bear Coalition**
Garden Lead

- Build and tend community garden on undergrad campus using repurposed materials and donated seeds
- Set up regular donations of fresh produce to college food bank
- Lead monthly trash cleanups of local parks and waterways
- Organize and lead community events to teach students about gardening, sustainability-focused agriculture, and cooking with local produce

September 2019 - May 2023 -- **Society of Physics Students**
President 2021 - 2023

- Record weekly meeting minutes and manage club files
- Organize and host science festivals, star parties, and club meetings
- Demonstrate experiments at outreach events to teach physics concepts
- Present club success and efforts at regional Society of Physics Students conference

Teaching

August 2023 - present -- **ASU School of Earth and Space Exploration**
Teaching Assistant

- Courses TA'd: SES 123 Earth, Solar System, and the Universe, SES 376: Communicating Astronomical and Planetary Sciences
- Grade labs and writing samples and provide feedback and one-on-one support
- Lead observational astronomy, citizen science, and computational labs

August 2020 - May 2023 -- **UCA Dept of Physics and Astronomy**
Crossdiscipline Tutor

- Explain concepts from physics, calculus, chemistry, and biology classes to fellow students in a variety of disciplines
- Use a spectrum of educational tools (GoBoard, Zoom, whiteboards, auditory explanations) to meet students' specific learning styles
- Consulted with professors and other physics educators to identify specific places of friction for students learning during a pandemic