Trent B. Thomas

National Science Foundation Graduate Research Fellow
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EDUCATION

Dual-Title Ph.D., University of Washington, Seattle (UW). Sep 2020 - Present.

- *Titles*: Earth and Space Sciences (ESS), Astrobiology.
- *Advisor*: Prof. David Catling.

B.S., University of California, Los Angeles (UCLA). 2020.

- *Major*: Astrophysics.
- *Honors*: Phi Beta Kappa.

RESEARCH INTERESTS

I am interested in how the surface environment, atmosphere, and geochemistry of terrestrial planets change over time, specifically as it relates to astrobiology and planetary habitability.

RESEARCH EXPERIENCE

NSF Graduate Research Fellow, **University of Washington.** Sep 2020 – Present.

- *Advisor*: Prof. David Catling.
- *Topics*: geochemical cycles, environmental geochemistry, Earth atmospheric evolution, systems modeling.

Visiting Researcher, **Massachusetts Institute of Technology (MIT).** Mar 2024 – May 2024.

- *Advisors*: Prof. Gaia Stucky de Quay and Dr. W. Hamish Mitchell.
- *Topics*: machine learning, geographic information systems, Mars geomorphology, Mars paleoclimate.

Research Intern, **NASA Jet Propulsion Laboratory (JPL).** Oct 2018 – Mar 2023.

- *Advisor*: Dr. Renyu Hu.
- Topics: atmospheric escape, photochemistry, Mars atmospheric evolution, stable isotope geochemistry.

AWARDS AND FELLOWSHIPS

- 2024 Finalist, Student Poster Competition, Astrobiology Science Conference.
- **2023 Robert and Jenny Winglee Endowed Graduate Support Fund and Space Physics Fellowship, UW.**
- 2023 Best astrobiology talk, UW ESS Research Gala.
- 2023 NASA/Geochemical Society Planetary science travel grant.
- 2022 American Astronomical Society Hartmann travel grant.
- 2022 Lunar and Planetary Institute career development award.
- **2020 National Science Foundation Graduate Research Fellowship.**
- 2020 UCLA Dean's prize for excellence in undergraduate research.
- 2019 NASA Astrobiology early career collaboration award.
- 2019 UCLA Physics & Astronomy Rudnick-Abelmann Scholarship.

PEER-REVIEWED PUBLICATIONS

1. **Thomas, T.B.**, and Catling, D.C., (2024) "Three-stage Formation of Cap Carbonates after Marinoan Snowball Glaciations Consistent with Depositional Timescales and Geochemistry". *Nature Communications*. DOI: doi.org/10.1038/s41467-024-51412-8

2. **Thomas, T.B.**, Hu, R., Lo, D.Y., (2023) "Constraints on the Size and Composition of the Ancient Martian Atmosphere from Coupled CO_2–N_2–Ar Isotopic Evolution Models". *The Planetary Science Journal*. DOI: doi.org/10.1038/s41561-021-00886-y
3. Hu R., and **Thomas, T.B.**, (2022) "A Nitrogen-Rich Atmosphere on Ancient Mars Consistent with Isotopic Evolution Models". *Nature Geoscience*. DOI: doi.org/10.3847/PSJ/acb924

MANUSCRIPTS IN PREPARATION

1. Adams, D., et al. (incl. **Thomas, T.B.**), Crustal Hydration Primed Early Mars with Warm and Habitable Conditions. *In revision, Nature Geoscience.*
2. **Thomas, T.B.**, Meadows, V.S., et al., Volcanic Outgassing of Water on the TRAPPIST-1 Exoplanets. *In preparation*.
3. **Thomas, T.B.**, Catling, D.C., et al., A model for the difference in Sturtian and Marinoan Snowball Earth durations. *In preparation*.

CONFERENCE PRESENTATIONS

9 Talks. 3 Posters.

1. **Thomas, T. B.**, and Catling, D. C., (2024) "A New Model for the Formation of Cap Carbonates after Neoproterozoic Glaciations". Astrobiology Science Conference. Providence, Rhode Island. *Poster*.
2. **Thomas, T. B.,** et al., (2024) "Constraints on water outgassing rates on the TRAPPIST-1 planets from interior modeling". Extreme Solar Systems V. Christchurch, New Zealand. *Poster.*
3. **Thomas, T. B.**, and Catling, D. C., (2023) "Untangling Planetary Processes in the Neoproterozoic with Cap Carbonates and a Geologic Carbon Cycle Model". Goldschmidt Conference. Lyon, France. *Talk*.
4. **Thomas, T. B.**, (2023) "The 4 Billion Year History of Mars's Atmospheric Evolution Revealed by Isotopic Evolution Models". UW Earth and Space Science Research Gala. Seattle, Washington. *Talk*.
5. **Thomas, T. B.**, Hu, R., and Lo, D. Y., (2022) "Constraints on the Evolution and Ancient Composition of the Martian Atmosphere from Coupled CO2-N2-Ar Isotopic Evolution Models". 54th Division for Planetary Science Conference. London, Ontario, Canada. *Talk*.
6. **Thomas, T. B.**, and Catling, D. C., (2022) "A Self-Consistent Model for Generating Marinoan Cap Carbonates and Constraining Neoproterozoic Climate". Astrobiology Science Conference. Atlanta, Georgia. *Talk*.
7. **Thomas, T. B.,** (2022) "A Self-Consistent Model for Generating Marinoan Cap Carbonates and Constraining Neoproterozoic Climate". UW Earth and Space Science Research Gala. Seattle, Washington. *Talk*.
8. **Thomas, T. B.**, Hu, R., and Lo, D. Y., (2022) "Joint Models for the Evolutionary History of Carbon, Nitrogen, and Argon in the Martian Atmosphere". 53rd Lunar and Planetary and Science Conference. The Woodlands, Texas. *Talk*.
9. **Thomas, T. B.**, and Hu, R., (2020) "A Nitrogen-Rich Atmosphere on Ancient Mars Indicated by Isotopic Evolution". American Geophysical Union Fall Meeting. Virtual. *Talk*.
10. **Thomas, T. B.**, and Hu, R., (2020) "A Nitrogen-Rich Atmosphere on Ancient Mars Indicated by Isotopic Evolution. 52nd Division for Planetary Science Conference. Virtual. *Talk*.
11. **Thomas, T. B.**, and Hu, R., (2020) "A Nitrogen-Rich Atmosphere on Ancient Mars Indicated by Isotopic Evolution". UCLA Undergraduate Research Week. Virtual. *Talk*.
12. **Thomas, T. B.**, and Hu, R., (2019) "Evolutionary History of the Isotopic Composition of Nitrogen in the Martian Atmosphere". 9th International Conference on Mars. Pasadena, California. *Poster*.

OTHER PRESENTATIONS

- 2024 Harvard University, Presentation to Wordsworth Research Group. *Talk*.

- 2024 MIT, Presentation to Stucky de Quay Research Group. *Talk*.
- 2023 UW Foundations Board, Discover UW. *Poster*.
- 2023 NASA Virtual Planetary Laboratory, Task C Group Meeting. *Talk*.
- 2022 NASA JPL, High Performance Computing User Group Meeting. *Talk*.
- 2022 NASA GISS, ROCKE-3D GCM Journal Club. *Talk*.
- 2020 Caltech, Mars Atmosphere Journal Club. *Talk*.

ADDITIONAL TRAINING

- 2023 Mars Analog Workshop, UW Astrobiology.
- 2023 Sagan Summer Workshop, NASA Exoplanet Science Institute.
- 2022 Origin of Life Workshop, UW Astrobiology.
- 2022 Storytelling Fellows Podcasting Workshop, UW Libraries.
- 2022 Planetary Exploration Mission Design Workshop, UW Astrobiology.
- 2021 VPLanet Developers Workshop, Virtual Planetary Laboratory.
- 2021 ROCKE-3D GCM Tutorial, NASA Goddard Institute for Space Science.
- 2020 Quantitative Habitability Workshop, NASA NExSS.
- 2019 Exoclimes Simulation Platform Summer School, University of Bern.

SERVICE

Council Member, UW College of the Environment Student Advisory Committee. May 2024 – Present.

- Representative for the Department of Earth and Space Science for discussions with the Dean's Office regarding College-level budgets, policies, DEI (diversity, equity and inclusion), and more.

Primary Convener & Session Chair, Astrobiology Science Conference. 2024.

- Session title: "Global Environmental Changes and Increased Biological Complexity in the Neoproterozoic and Paleozoic". Oral & Poster session. 14 abstracts submitted.

UW ESS Graduate Student Positions. 2020 – Present.

- Awards committee, computing committee, graduate-nominated speaker committee (x2), retreat committee, peer mentor.

TEACHING EXPERIENCE

Instructor, Coyote Central Youth Arts. Aug 2024.

- *Course Title:* "Generative Design: Creating Art with Code"
- Developed and taught a 20-hour course for 8 students aged 10-15 with no prior coding experience.
- Student final projects: https://youtu.be/h2j7Wz74lHA?si=dqsuV41ywle0cF5B

Instructor & Teaching Assistant, UW. Aug 2022 – Mar 2023.

- *Course Title:* "ESS 103 Earth's Origin and Transformation over 4.6 Billion Years".
- Developed ten 80-minute lectures, syllabus, and other course material.
- Guest lectured 1 time. Teaching assistant for 1 quarter. 61 students.

OUTREACH

Classroom Mentor, Coyote Central Youth Arts Organization. 2024.

- Mentored 8 K-12 students in 3D computer modeling.

Contributor, NASA NExSS & NASA NFoLD Science Communication group. 2022 – 2023.

- Created 1-slide science "nuggets" summarizing key new papers for NASA employees and the public.

Speaker, Astronomy on Tap, Seattle. 2022.

- Gave a 30-minute public facing talk and answered questions about the exploration of Mars.

Volunteer Teacher, Nelson Middle School. 2022.

- Taught ~120 K-12 students about Mars with five 30-minute lessons via UW's Rockin' Out program.

Page Creator, Wikipedia. 2022.

- Created and maintained the Wikipedia page for "Prebiotic atmosphere".

Graduate Student Mentor, Geoscience Education and Mentorship Support. 2022.

- Mentored prospective PhD student through application process in Mentor Match program.

Invited Speaker, Delran School System. 2022.

- Spoke about my journey through science at K-12 STEM Family Engagement Night.

Social Media Manager, UW Astrobiology. 2021-2022.

- Managed official Twitter and Instagram pages to highlight department activity.

Creator, UW Astrobiology Public Science Panel Series. 2021.

- Organized, moderated, and spoke on 4 live-streamed panels receiving 1600+ views.

Volunteer Guide, UCLA Planetarium. 2019-2020.

- Gave 10+ public and private facing planetarium shows of ~40 people each.

Volunteer Scientist, UCLA Exploring Your Universe. 2019.

- Taught K-12 students intro lesson on the science of Venus.