

# Matthew T. Scoggins

## Education

2021–2026 (expected)

**PhD** Astrophysics

Columbia University, New York, NY

2015–2020

**BS** Physics, Math, **BA** Philosophy

Western Washington University, Bellingham WA

## Positions

2021–

**Graduate Researcher**

Columbia University, New York, NY

- Supermassive black holes, supermassive stars, Pop. III stars, and SETI.
- Advised by Zoltan Haiman, Greg Bryan, David Kipping

2021-2023

**Graduate Teaching Assistant**

Columbia University, New York, NY

2015–2021

**Undergraduate Researcher**

Western Washington University, Bellingham, WA

## Honors & Awards

2023-2024

**Explore Computing Time:** 400,000 CU

ACCESS

2022-2023

**Edith and Robert Fehr Fellowship**

Columbia U.

2020

**Magna Cum Laude in both BS & BA**

WWU

2019

**Material Science Undergraduate Research Grant**

WWU

2018-2019

**Oscar Edwin Olson Scholarship (x2)**

WWU

2018

**Willard A. and Anne W. Brown Astronomy Scholarship**

WWU

2018

**Summer Student Research Stipend**

WWU

## Software

**first\_stars**

**Repository**

- Scripts that set up an ENZO simulation, run halo finding and merger trees, as well as find the critical mass for halo collapse.

**lunar\_impacts**

**Repository**

- Code used to set up a suite of simulations that run NASA's MEM3 code, as well as process and analyze their outputs.

**star\_lifting**

**Repository**

- A MESA wrapper which evolves the star with a time-dependent mass loss rate, keeping flux on a habitable planet constant.

**qubit\_simulation**

**Repository**

- Simulating the evolution of a superconducting chip with the goal of finding patterns in the optimal protocols (values of the controls over time which evolve an initial state into a target state in the shortest possible time) over a variety of initial and target combinations.

## Teaching & Service

2023-

**Journal Referee:** ApJ, A&A

2023-

**Associate Director:** Student Training in Astronomy Research (STARs) Columbia University

2021-2023

**Graduate Teaching Assistant**

Columbia University

2017-2021

**Mathematics TA, Physics TA, Physics Study Group Lead**

WWU

# Mentoring

2024-

## STARs program

- Co-advising with another Graduate student, James Sullivan – Three high-school students are using ENZO simulation data to measure the specific temperature and mass when atomic cooling begins in high redshift atomic cooling halos.
- Co-advising with another Graduate student, Daniel Yahalomi – Three high-school students are using NASA's Meteoroid Engineering Model (MEM) code to measure the impact rates of debris on the lunar surface, with the goal of determining the shielding needed for the Artemis mission. Expecting publication Oct. 2025.

2023

## Undergraduate Students

- Andrea Dubbels - Abnormal Photometry in the GAIA DR3 Catalog

2023-2025

## High School Students

- Students took part in 2-12 month projects designed to expose them to research, typically within astronomy. Some projects have been (or will be) submitted to high school journals.

# Publications

9 first-author papers (3 in prep), 5 co-author papers. NASA ADS link here

- **Scoggins, M. T.**, Haiman, Z., Bryan, G., & Kulkarni, M., 2025, Measuring the influence of merger histories on the formation of the first stars, (in prep)
- **Scoggins, M. T.**, Haiman, Z., & Paucci, F., 2025, Assessing the likelihood of Leo I hosting a Heavy Seed Black Hole, (in prep)
- **Scoggins, M. T.**, & Kipping, D., 2025, Lazarus Stars: A method for detecting engineered stars in the Milky Way, (in prep)
- Yahalomi, D., **Scoggins, M. T.**, Anderson, N., Driker, M., et al., 2025, Meteoroid Impact Rate Analysis for an Artemis-Era Lunar Base, (in prep)
- Onoue, M., Ding, X., Silverman, J., Matsuoka, Y., et al. (including **Scoggins, M. T.**, 2025, [A Post-Starburst Pathway for the Formation of Massive Galaxies and Black Holes at  \$Z \gtrsim 6\$](#) , Nature Astronomy
- Li, J., Silverman, J., Shen, Y., Volonteri, M., et al. (including **Scoggins, M. T.**, 2025, [Tip of the Iceberg: Overmassive Black Holes at  \$4 \lesssim Z \lesssim 7\$  Found by JWST Are Not Inconsistent With the Local  \$\langle \dot{M} \rangle\$  Relation](#), ApJ, **981**, 19
- **Scoggins, M. T.**, Ho, M., Villaescusa-Navarro, F., Jamieson, D., et al., 2025, [Learning the Universe:  \$3 h^{\frac{1}{2}} - 1\$  Gpc Tests of a Field Level  \$N\$ -Body Simulation Emulator](#), arXiv:2502.13242
- **Scoggins, M. T.**, & Haiman, Z., 2024, Diagnosing the Massive-Seed Pathway to High-Redshift Black Holes: Statistics of the Evolving Black Hole to Host Galaxy Mass Ratio, MNRAS, **531**, 4584
- **Scoggins, M. T.**, & Kipping, D., 2023, Lazarus Stars: Numerical Investigations of Stellar Evolution With Star-Lifting as a Life Extension Strategy, MNRAS, **523**, 3251
- Roser, P., & **Scoggins, M. T.**, 2023, Non-Quantum Behaviors of Configuration-Space Density Formulations of Quantum Mechanics, arXiv:2303.04959
- **Scoggins, M. T.**, Haiman, Z., & Wise, J., 2023, [How Long Do High Redshift Massive Black Hole Seeds Remain Outliers in Black Hole Versus Host Galaxy Relations?](#), MNRAS, **519**, 2155
- **Scoggins, M. T.**, & Rahmani, A., 2021, Topological and Geometric Patterns in Optimal Bang-Bang Protocols for Variational Quantum Algorithms: Application to the XXZ Model on the Square Lattice, Physical Review Research, **3**, 43165
- Olney, R., Kounkel, M., Schillinger, C., **Scoggins, M. T.**, et al., 2020, APOGEE Net: Improving the Derived Spectral Parameters for Young Stars Through Deep Learning, AJ, **159**, 182
- **Scoggins, M. T.**, Davenport, J., & Covey, K., 2019, [Using Flare Rates to Search for Stellar Activity Cycles](#), Research Notes of the American Astronomical Society, **3**, 137