Matthew Scoggins

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Astronomy Department
Columbia University 📍

Education

2021–	**PhD** Astrophysics	Columbia University, New York, NY

– On connecting the 'direct-collapse' formation mechanism for suppermassive black holes to observation
– On extending the lifetime of habitable planets via star-lifting, a possible technosignature
– Advised by Zoltan Haiman, David Kipping

2015–2020	**BS** Physics and Math, **BA** Philosophy	Western Washington University, Bellingham WA
2013-2015	**AS**	Whatcom Community College, Bellingham WA

About Me

I am a first-year PhD Student in the Department of Astronomy at Columbia. My research interests span most areas of computational astrophysics and cosmology. Specifically, I'm interested in questions involving black holes, the early universe, and dark matter. Outside of academia I enjoy mountain climbing, skiing, videogames, piano, motorcycles, and chess.

Positions

2021–	**Graduate Researcher**	Columbia University, New York, NY
2021–	**Graduate Teaching Assistant**	Columbia University, New York, NY

– Spring 2022: Astrophysics II for Mary Putman
– Fall 2021: Another Earth for Caleb Scharf

2015–2021	**Undergraduate Researcher**	Western Washington University, Bellingham, WA

– Projects on machine learning applied to astronomy, flare cycles, quantum dynamics, and quantum foundations.
– Developed 2 open source simulators, `no_wave_qm` which simulates a no-wave approach to QM and `qubit_simulation` which applies Monte-Carlo methods to find paths which optimally prepare a desired state.

stats

Total Pubs	**6**
Refereed	**2**
First Author	**3**
Citations	**18**
h-index	**2**

Honors & Awards

2020	**Magna Cum Laude in both BS & BA**	WWU, Bellingham, WA
2020	**Graduation w/ Merit in Mathematics**	WWU, Bellingham, WA
2019	**Material Science Undergraduate Research Grant**	WWU, Bellingham, WA
2018-2019	**Oscar Edwin Olson Scholarship (x2)**	WWU, Bellingham, WA
2018	**Willard A. and Anne W. Brown Astronomy Scholarship**	WWU, Bellingham, WA
2018	**Summer Student Research Stipend**	WWU, Bellingham, WA

References

metrics
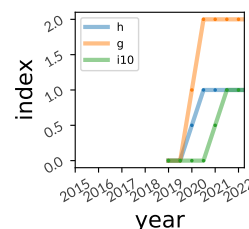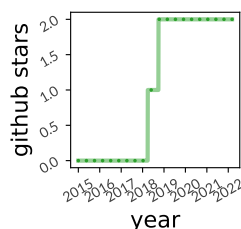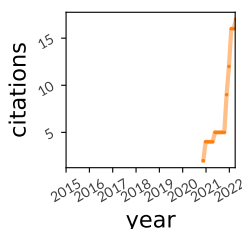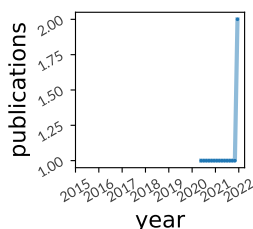
Teaching & Outreach

2021-	**Graduate Teaching Assistant**	Columbia University

2020-2021	**Mathematics Teaching Assistant**	WWU

2017-2020	**Physics Teaching Assistant**	WWU

— Responsible for facilitating/grading a section of the weekly lab for Physics w/ Calc 161-163, 220, and Tools and Data Analysis 322

2018-2019	**Physics Study Group Facilitator**	WWU

— Responsible for creating content and leading a 2 hour weekly study group for Physics w/ Calc 161-163

2018-2019	**Math Tutoring Fellow**	WWU

— Responsible for tutoring a majority of the undergraduate math classes, Calculus I up to Intro. to Abstract Algebra.

Other

2019	**Student Faculty Hiring Committee**	WWU

Software

qubit_sim   `github.com/mscoggs/qubit_simulation`

— 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.

no_wave_qm `github.com/mscoggs/no_wave_qm`

— Simulating the evolution according to a hamilton-jacobi formulation of QM which replaces the wave with a configuration space density and equations of motion. Trajectory tracking using a 4-th order Runge Kutta technique.

primary developer

secondary developer

Computing Experience

Languages(years): C++(4), Python(4), C(3), Java(1), Matlab(1), Wolfram(1), Scheme(0.5), SQL(0.5)

OS: Linux, mostly Ubuntu (5), Windows (10+) Mac OS X (1)

HPC Experience: WWU's CSCI Cluster & CSE Cluster (Over 250 CPU years), Stampede2 (ongoing

Publications

— **Scoggins, M. T.**, Zoltan, H., Wise, J., & Dudley, R., (In Prep), How long do high-redshift massive black hole seeds remain outliers in the back hole vs. host galaxy relations

— Roser, P., & **Scoggins, M. T.**, (In Prep), Non-Quantum Behaviors of Hamilton-Jacobi Quantum Theory

— **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

17 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

– Davenport, J., Tovar, G., **Scoggins, M. T.**, & Wallace, S., 2020, Combining Kepler and TESS: 10 Years of Stellar Flare Studies From Space, AAS, **235**

1 **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

Selected Talks

: Downloadable
: Watchable

The DCBH formation mechanism for suppermassive black holes, Pizza Lunch Talk, Columbia University, December 01, 2021

Combining Kepler and TESS: 10 years of Stellar Flare Studies from Space, American Astronomical Society, , September 01, 2019

Simulating Strongly Correlated Fermions and Spins with an Optimally Controlled Superconducting Device, American Physical Society, WWU, May 01, 2019

Simulating Strongly Correlated Fermions and Spins with an Optimally Controlled Superconducting Device, WWU Physics Symposium, WWU, May 01, 2019

Applying Deep Learning to Improve Stellar Parameters from APOGEE spectra, WWU Physics Symposium, WWU, May 01, 2019