THOMAS K. WATERS

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EDUCATION

University of Michigan | *PhD, Astronomy & Astrophysics* **2022-Present**

- PhD candidate in the Astronomy & Astrophysics program.
- Awarded a Masters of Science degree in Astronomy & Astrophysics following the successful completion of the PhD candidacy exam.

University of Washington | *BS, Comprehensive Physics & Astronomy* **2019-2022**

- Cumulative GPA: 3.77
- Graduated with honors in the Comprehensive Physics and Astronomy majors.
- Pre-Major in Astronomy Program Member.

South Seattle College | *AS, Physics* **2017-2019**

- Cumulative GPA: 4.0
- RST S-STEM Scholarship Recipient.
- Capstone Project: "An Exploration of Black Holes: Calculating the Mass of Sagittarius A*"

RESEARCH EXPERIENCE

Improving Intermediate-Mass Black Hole Demographics **Aug 2024 – Present**

Advisor: Kayhan Gültekin (Waters et al. 2025, in prep.)

- Currently working to improve the demographics and understanding of intermediate-mass black holes (IMBHs) using stellar dynamical mass measurements of 13 galaxies with archival data.
- We seek to refine fundamental galaxy scaling relations for low-mass black holes and enhance our understanding of black hole seeding mechanisms and their role in gravitational wave astronomy.

University of Michigan Pre-Candidate Research **Aug 2022 – Aug 2024**

Advisor: Kayhan Gültekin (Waters et al. 2024b)

- Extracted high-resolution line-of-sight velocity dispersion profiles and employed axisymmetric Schwarzschild orbit modeling to constrain galaxy properties.
- Measured the mass of the supermassive black hole in NGC 3258, achieving results consistent with previous Atacama Large Millimeter/submillimeter Array (ALMA) measurements.

Center for Astrophysics, Harvard & Smithsonian **Jun 2021 – Jan 2024**

Advisor: Razieh Emami (Waters et al. 2024a)

- Inferred, classified, and analyzed gaseous halo morphologies for Milky Way-like galaxies in the IllustrisTNG TNG50 simulation.
- Discovered a strong correlation between dark matter halo morphologies with warm-hot gas distribution morphologies.

University of Washington Undergraduate Research **Sep 2020 – Jun 2022**

Advisor: Jessica Werk

- Constrained properties of cold gas within the circumgalactic medium (CGM) using analytic models and observational data.
- Utilized several Python packages in conjunction with Veeper, a curve fitting algorithm, to perform Voigt profile fitting on CGM absorbers.

California Institute of Technology, GROWTH SURF **Jun 2020 – Sep 2020**

Advisor: Kishalay De

- Optimized parameters for Source Extractor to detect astronomical sources in Palomar Gattini-IR images, which contain correlated pixel noise.
- Crossmatched resultant Source Extractor catalogs to Two-Micron All Sky Survey to assess performance of parameter sets.

COLLABORATIONS

NANOGrav Collaboration[1] **Dec 2024 – Present**

Advisors: Kayhan Gültekin & Luke Zoltan Kelley

- Currently assiting in the development of `holodeck`, a massive black binary population synthesis framework used in the characterizaion of the recently discovered Gravitational Wave Background.

PUBLICATIONS

"A Stellar Dynamical Mass Measurement of the Supermassive Black Hole in NGC 3258",
Waters, T. K., Gültekin, K., Gebhardt, K., et al. 2024, The Astrophysical Journal, 971, 149,
doi: 10.3847/1538-4357/ad5a91

"Gas Morphology of Milky Way–like Galaxies in the TNG50 Simulation: Signals of Twisting and Stretching"
Waters, T. K., Peterson, C., Emami, R., et al. 2024, The Astrophysical Journal, 961, 193,
doi: 10.3847/1538-4357/ad165a

TEACHING EXPERIENCE

Graduate Student Instructor, University of Michigan

ASTRO 461 – Ground-Based Observatories (Intensive)	Spring 2025
ASTRO 361 – Astronomical Techniques	Fall 2024
ASTRO 201 – Introduction to Astrophysics	Winter 2025 – Fall 2025
ASTRO 115 – Introductory Astrobiology	Winter 2024
ASTRO 101 – Introductory Astronomy	Winter 2023 – Fall 2024

OUTREACH ACTIVITIES

Letters to a Pre-Scientist Program	2024–Present
Women+ Excelling More in Math Engineering and the Sciences (FEMMES)	2023–present

PROFESSIONAL DEVELOPMENT

EMIT Summer School in Multimessenger Astronomy	July 2025

PRIOR WORK EXPERIENCE

United States Marine Corps **June 2013 – May 2017**

0311 Infantry Rifleman, Light Armored Reconnaissance Scout.

[1] North American Nanohertz Observatory for Gravitational Waves