Michael A. Reefe

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Michael-Reefe
Michael Reefe
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Education

Ph.D. Candidate, Physics — **2022 – Present**
Massachusetts Institute of Technology (MIT) — GPA: 5.0/5.0
Advisor: *Prof. Michael McDonald*

B.S., Physics | **Concentration in Astrophysics** | *Summa cum laude* — **2018 – 2022**
George Mason University (GMU) — GPA: 4.0/4.0
Honors Thesis: *"CLASS: Coronal Line Activity Spectroscopic Survey"*
Advisor: *Prof. Shobita Satyapal*

Research Experience

NSF Graduate Research Fellow, MIT — **2022 – Present**
Advisor: *Prof. Michael McDonald*
Research Focuses: Galaxy clusters, structure and dynamics of the intracluster medium, cool-core clusters, AGN feeding and feedback, supermassive black hole and host galaxy evolution, multiwavelength astronomy, integral field spectroscopy.

Undergraduate Research Assistant, GMU — **2021 – 2022**
Advisor: *Prof. Shobita Satyapal*
Research Focuses: Heavily obscured or dim/dwarf AGN, AGN feedback and host galaxy evolution, SDSS optical spectroscopy, integral field spectroscopy, coronal emission lines, cluster computing and parallelization, machine learning.

Undergraduate Research Assistant, GMU — **2019 – 2021**
Advisor: *Prof. Peter Plavchan*
Research Focuses: Exoplanet transits, radial velocities, fully automating the operations of GMU's 0.8 m telescope in Python, multi-band time-series photometry and spectroscopy.

Teaching Experience

Learning Assistant | PHYS 260: Electricity & Magnetism, GMU — **Fall 2019**
The undergraduate equivalent of a graduate teaching assistant position, including answering students' questions in class and holding office hours. Additionally included a final presentation on the challenges that the COVID-19 pandemic brought to this position, and how the other LAs and I managed them.

Honors & Awards

Graduate Research Fellowship, NSF	**2022 – 2027**
Whiteman Fellowship, MIT	**2022 – 2023**
Dean's Award for Excellence in Academics and Research, GMU	**2022**
Outstanding Undergraduate Research Award, GMU	**2022**
Outstanding Graduating Senior Award, GMU	**2022**
Mason Distinction Scholarship, GMU	**2018 – 2022**
Outstanding Learning Assistant Award, GMU	**2021**
Osher Lifelong Learning Institute Scholarship, GMU	**2020**

Refereed Publications

First Author

7. **M. Reefe**, M. McDonald, M. Chatzikos et al., "Cold Gas and Star Formation in the Phoenix Cluster with JWST." *ApJ* **989** (2), 156 (2025), [ADS].
6. **M. Reefe**, M. McDonald, M. Chatzikos et al., "Directly imaging the cooling flow in the Phoenix cluster." *Nature* **638** (8050), 360–364 (2025), [ADS].
5. **M. Reefe**, S. Satyapal, R. O. Sexton et al., "Nuclear Activity in the Low-metallicity Dwarf Galaxy SDSS J0944-0038 : A Glimpse into the Primordial Universe." *ApJL* **946** (2), L38 (2023).
4. **M. Reefe**, R. O. Sexton, S. M. Doan et al., "CLASS Survey Description: Coronal-line Needles in the SDSS Haystack." *ApJS* **265** (1), 21 (2023).

3. **M. Reefe**, O. Alfaro, S. Foster et al., "Asynchronous object-oriented approach to the automation of the 0.8-meter George Mason University campus telescope in Python." *JATIS* **8**, 027002 (2022).
2. **M. Reefe**, R. Luque, E. Gaidos et al., "A Close-in Puffy Neptune with Hidden Friends: The Enigma of TOI 620." *AJ* **163** (6), 269 (2022).
1. **M. Reefe**, S. Satyapal, R. O. Sexton et al., "CLASS: Coronal Line Activity Spectroscopic Survey." *ApJ* **936** (2), 140 (2022).

Coauthor

16. S. Doan, S. Satyapal, **M. Reefe** et al., "The CLASS Quasar Catalog: Coronal Line Activity in Type 1 SDSS Quasars." *ApJS* **280** (2), 57 (2025), [ADS].
15. W. Matzko, S. Satyapal, **M. Reefe** et al., "An Increase in the Prevalence of Ionized Outflows in Galaxies with Coronal Line Emission: Feedback in Action?" *ApJ* **984** (2), 170 (2025), [ADS].
14. M. El Mufti, P. P. Plavchan, H. Isaacson et al. incl. **M. Reefe**, "TOI 560: Two Transiting Planets Orbiting a K Dwarf Validated with iSHELL, PFS, and HIRES RVs." *AJ* **165** (1), 10 (2023).
13. C. R. Mann, P. A. Dalba, D. Lafrenière et al. incl. **M. Reefe**, "Giant Outer Transiting Exoplanet Mass (GOT 'EM) Survey. III. Recovery and Confirmation of a Temperate, Mildly Eccentric, Single-transit Jupiter Orbiting TOI-2010." *AJ* **166** (6), 239 (2023).
12. R. W. Pfeifle, B. Rothberg, K. A. Weaver et al. incl. **M. Reefe**, "The Messy Nature of Fiber Spectra: Star-Quasar Pairs Masquerading as Dual Type 1 AGNs." *ApJ* **945** (2), 167 (2023).
11. R. W. Pfeifle, S. Satyapal, C. Ricci et al. incl. **M. Reefe**, "NuSTAR Observes Two Bulgeless Galaxies: No Hard X-Ray AGN Detected in NGC 4178 or J0851+3926." *ApJ* **943** (2), 109 (2023).
10. J. E. Rodriguez, S. N. Quinn, A. Vanderburg et al. incl. **M. Reefe**, "Another shipment of six short-period giant planets from TESS." *MNRAS* **521** (2), 2765–2785 (2023).
9. J. M. Wittrock, P. P. Plavchan, B. L. Cale et al. incl. **M. Reefe**, "Validating AU Microscopii d with Transit Timing Variations." *AJ* **166** (6), 232 (2023).
8. S. W. Yee, J. N. Winn, J. D. Hartman et al. incl. **M. Reefe**, "The TESS Grand Unified Hot Jupiter Survey. II. Twenty New Giant Planets." *ApJS* **265** (1), 1 (2023).
7. E. A. Gilbert, T. Barclay, E. V. Quintana et al. incl. **M. Reefe**, "Flares, Rotation, and Planets of the AU Mic System from TESS Observations." *AJ* **163** (4), 147 (2022).
6. J. M. Wittrock, S. Dreizler, **M. Reefe** et al., "Transit Timing Variations for AU Microscopii b and c." *AJ* **164** (1), 27 (2022).
5. B. L. Cale, **M. Reefe**, P. Plavchan et al., "Diving Beneath the Sea of Stellar Activity: Chromatic Radial Velocities of the Young AU Mic Planetary System." *AJ* **162** (6), 295 (2021).
4. A. Fukui, J. Korth, J. H. Livingston et al. incl. **M. Reefe**, "TOI-1749: an M dwarf with a Trio of Planets including a Near-resonant Pair." *AJ* **162** (4), 167 (2021).
3. A. Osborn, D. J. Armstrong, B. Cale et al. incl. **M. Reefe**, "TOI-431/HIP 26013: a super-Earth and a sub-Neptune transiting a bright, early K dwarf, with a third RV planet." *MNRAS* **507** (2), 2782–2803 (2021).
2. J. Teske, S. X. Wang, A. Wolfgang et al. incl. **M. Reefe**, "The Magellan-TESS Survey. I. Survey Description and Midsurvey Results." *ApJS* **256** (2), 33 (2021).
1. S. Dreizler, I. J. M. Crossfield, D. Kossakowski et al. incl. **M. Reefe**, "The CARMENES search for exoplanets around M dwarfs. LP 714-47 b (TOI 442.01): populating the Neptune desert." *A&A* **644**, A127 (2020).

Presentations

Invited

- Astronomy on Tap | Aeronaut Brewing Co, Somerville, MA **Dec. 2025**
  "Galaxy Clusters: From the subatomic to the extragalactic"
- Graduation Ceremony | GMU College of Science, Fairfax, VA **May 2022**
  **Invited to be the student speaker for the College of Science's graduation ceremony.

Contributed

- BlackHoleWeather | Sexten, IT **Dec. 2025**
  Talk: *"Coronal Gas in the CGM of BCGs"*
- Multi-phase, Multi-temperature, and Complex | Olbia, IT **Oct. 2025**
  Talk: *"Directly Observing the Cooling Flow in the Phoenix Cluster with JWST"*
- Tracing Cosmic Evolution with Galaxy Clusters V | Sexten, IT **July 2025**
  Poster: *"Directly Observing the Cooling Flow in the Phoenix Cluster with JWST"*
- 25 Years of Science with Chandra | Boston, MA, US **Dec. 2024**
  Talk: *"Mapping the Cooling Flow in the Phoenix Cluster with JWST and Chandra"*
- 243rd Meeting of the American Astronomical Society | New Orleans, LA, US **Jan. 2024**
  Talk: *"Shaken or stirred? Dynamics of the coronal temperature gas in the Phoenix Cluster"*
- 240th Meeting of the American Astronomical Society | Pasadena, CA, US **June 2022**
  Poster: *"A Large Scale Survey of Galaxies with Coronal Line Emission Selected from the Sloan Digital Sky Survey"*
- TESS Science Conference II | Virtual **Aug. 2021**
  Poster: *"A Flexible Python Observatory Automation Framework for the George Mason University Campus Telescope"*
- GMU College of Science Undergraduate Research Colloquium | Virtual **Apr. 2021**
  Poster: *"Automation of TESS Follow-up Observations with the GMU Campus Telescope"*
- 237th Meeting of the American Astronomical Society | Virtual **Jan. 2021**
  Poster: *"An Asynchronous Object-Oriented Approach to Automation of the 0.8-meter George Mason University Campus Telescope in Python"*

Observing Experience

Accepted Observing Proposals (Co-I)

HST/COS Cycle 32 | 24 orbits | ID: 17716 **2024**
"Probing Multiphase Cooling Via O VI Emission in the Cores of the Most Extreme Cooling Flows"

Ground-Based Observing Experience

NASA IRTF / iSHELL | 5 nights **2019 – 2021**
GMU Observatory / 0.8 m Ritchey-Chrétien Telescope | 36 nights **2019 – 2021**
>300 nights and counting facilitated by the automation software I wrote

Service

MIT Physics Graduates Advising Graduate Admissions (GAGA)
Co-chair **2025 – Present**
Member **2024 – Present**
GAGA advises the MIT Chair of Graduate Admissions from the graduate student perspective, aiming for increased diversity, equity, and inclusion, and organizes the PhysGAAP program (see below).

MIT Physics Graduate Application Assistance Program (PhysGAAP)
Mentor **2024 – Present**
Guided prospective PhD students (primarily from under-represented groups) through the MIT Physics application and how to write competitive personal statements. I have mentored a total of 5 prospective students over 2 application cycles.

MIT Physics Graduate Student Council (PGSC)
Vice President of Academic Advocacy **2024 – 2025**
Webmaster **2023 – 2025**
Worked as the primary graduate student advocate and webmaster for the PGSC, leading initiatives to improve the quality of education, mentorship, and inclusiveness in department policy. E.g. creating

guidelines for academic advisors, standardizing expectations for the oral qualifying exam across the different physics divisions, implementing professional development requirements, maintaining the website and mailing lists, etc.

MKI Graduate Student Lunch
Organizer **2023 – 2024**
Organized a weekly lunch and a talk series for the graduate students in the MIT Kavli Institute (MKI).

GMU Department of Physics & Astronomy
Faculty Search Undergraduate Liaison **Winter 2022**
Attended a mock lecture and research colloquium presented by each candidate, as well as interviews, and provided feedback to the faculty hiring committee from the undergraduate student perspective.

SPECTRUM
President **2021 – 2022**
Mentor **2020 – 2022**
Planned talks, discussions, fundraisers, and other events, as well as managing website and budgetary concerns and working with the College of Science Faculty to improve diversity, equity, and inclusion efforts at GMU. Also provided academic and professional development tutoring for students in the physics and astronomy department.

GMU Office of Fellowships NSF GRFP Cohort Workshop
Panelist **July 2022**
Answered students' questions about the NSF GRFP application and review process.

Aspiring Scientists' Summer Internship Program
Mentor **Summer 2020, 2021**
Tutored high school interns on observing and analyzing exoplanet transit data.

Outreach

MIT Astrogazers
Member **2023 – Present**
As a member of the Astrogazers, I have engaged with the public at a number of public sidewalk observing nights and exhibits at the annual Cambridge Science Festival and MIT Museum.

MIT Museum After Dark
Trivia Cohost **Dec. 2024**
Worked with the Astrogazers to cohost trivia on the *Hubble Space Telescope* at one of the MIT Museum's After Dark events themed around the 90s.

Cambridge Science Festival
Volunteer **Sep. 2023, 2024**
Worked at the Astrogazers booths for the Cambridge Science Festival.

ASSIP Career Day
Panelist **Aug. 2022**
Served on a panel of graduate students for a Career Day event hosted by GMU's ASSIP program, answering high school students' questions about a career in academia.

Computer Skills

Coding: Python, Julia, Fortran, IDL, MATLAB, Mathematica, Bash, Git, HTML/CSS/JS
Python Packages: Numpy, Numba, Scipy, Astropy, Pandas, Matplotlib, Plotly, & many more
High Performance Cluster Computing: Slurm, MPI
Astronomy Programs: DS9, AstroImageJ
Document Creation: LaTeX, Vim, Microsoft Office