Michael A. Reefe

MIT Department of Physics
77 Massachusetts Avenue
Cambridge, MA 02139-4307

+1 (540) 848-4434
mreefe@mit.edu
www.mit.edu/∼mreefe/

Michael-Reefe
Michael Reefe
0000-0003-4701-8497

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

6. **M. Reefe**, M. McDonald, M. Chatzikos et al., "Directly imaging the cooling flow in the Phoenix Cluster." *Nature* (2025), in press.
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**, L38 (2023), [ADS].
4. **M. Reefe**, R. O. Sexton, S. M. Doan et al., "CLASS Survey Description: Coronal-line Needles in the SDSS Haystack." *ApJS* **265**, 21 (2023), [ADS].
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), [ADS].

2. **M. Reefe**, R. Luque, E. Gaidos et al., "A Close-in Puffy Neptune with Hidden Friends: The Enigma of TOI 620." *AJ* **163**, 269 (2022), [ADS].

1. **M. Reefe**, S. Satyapal, R. O. Sexton et al., "CLASS: Coronal Line Activity Spectroscopic Survey." *ApJ* **936**, 140 (2022), [ADS].

Coauthor

13. 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**, 10 (2023), [ADS].

12. 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**, 239 (2023), [ADS].

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**, 109 (2023), [ADS].

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**, 2765–2785 (2023), [ADS].

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**, 232 (2023), [ADS].

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 (2023), [ADS].

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**, 147 (2022), [ADS].

6. J. M. Wittrock, S. Dreizler, **M. Reefe** et al., "Transit Timing Variations for AU Microscopii b and c." *AJ* **164**, 27 (2022), [ADS].

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**, 295 (2021), [ADS].

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**, 167 (2021), [ADS].

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**, 2782–2803 (2021), [ADS].

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**, 33 (2021), [ADS].

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), [ADS].

COLLOQUIA & SEMINARS (INVITED)

2. MIT Kavli Institute for Astrophysics and Space Research | Journal Club **Mar. 2023**
"On: AGN feedback in an infant galaxy cluster: the LOFAR-Chandra view of the giant FRII radio galaxy J103025+052430 at z=1.7"

1. GMU College of Science | Graduation Ceremony **May 2022**
**Invited to be the student speaker for the College of Science's Spring 2022 graduation.

CONFERENCE PRESENTATIONS (INVITED & CONTRIBUTED)

[I] = Invited Talk, [C] = Contributed Talk, [P] = Poster

6. 25 Years of Science with Chandra | Boston, MA **Dec. 2024**
[C] *"Mapping the Cooling Flow in the Phoenix Cluster with JWST and Chandra"*

5. 243rd Meeting of the American Astronomical Society | New Orleans, LA **Jan. 2024**
[C] *"Shaken or stirred? Dynamics of the coronal temperature gas in the Phoenix Cluster"*

4. 240th Meeting of the American Astronomical Society | Pasadena, CA **June 2022**
   [P] *"A Large Scale Survey of Galaxies with Coronal Line Emission Selected from the Sloan Digital Sky Survey"*
3. TESS Science Conference II | Virtual **Aug. 2021**
   [P] *"A Flexible Python Observatory Automation Framework for the George Mason University Campus Telescope"*
2. GMU College of Science Undergraduate Research Colloquium | Virtual **Apr. 2021**
   [P] *"Automation of TESS Follow-up Observations with the GMU Campus Telescope"*
1. 237th Meeting of the American Astronomical Society | Virtual **Jan. 2021**
   [P] *"An Asynchronous Object-Oriented Approach to Automation of the 0.8-meter George Mason University Campus Telescope in Python"*

Observing Proposals

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

Service

V.P. of Academic Advocacy, MIT Physics Graduate Student Council **2024 – Present**
Served as the MIT Physics Graduate Student Council (PGSC)'s primary advocate for the students to the physics department leadership, holding regular meetings on how aspects of the PhD program and the department can be improved, i.e. more explicitly defined guidelines for academic advisors and academic advising meetings, uniform sets of expectations for the oral qualifying exam across the different physics divisions, implementing professional development requirements, etc.

Member, MIT Physics Admissions Advisory Council **2024 – Present**
Served on the Admissions Advisory Council, AKA Graduates Advising Graduate Admissions (GAGA), which is a subcommittee of the Physics Graduate Student Council that advises the MIT Chair of Graduate Admissions from the graduate student perspective and organizes the PhysGAAP program (see below).

Webmaster, MIT Physics Graduate Student Council **2023 – Present**
Served as the MIT PGSC's webmaster, maintaining the website, mailing lists, and calendar, and keeping them all up-to-date.

Mentor, MIT Physics Graduate Application Assistance Program **Fall 2024**
Served as a mentor in MIT's PhysGAAP Program, aiding prospective PhD students (primarily from under-represented groups) with the MIT Physics application, providing guidance on how to navigate the application and how best to present themselves. I have mentored 3 prospective students through this program.

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

Faculty Search Undergraduate Liaison, GMU Dept. of Physics & Astronomy **Winter 2022**
Worked as the undergraduate representative during a faculty search for a new astrophysics professor at GMU. 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.

President, GMU Spectrum **2021 – 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 at GMU for student-led group Spectrum, which promotes the enhancement of under-represented groups in STEM.

Mentor, GMU Spectrum **2020 – 2022**
Provided academic and professional development tutoring for students in physics and astronomy at GMU through the student-led group Spectrum.

Panelist, GMU Office of Fellowships NSF GRFP Cohort Workshop **July 2022**
Served on a panel of NSF GRFP recipients and reviewers to answer students' questions about the application and review process.

Mentor, Aspiring Scientists' Summer Internship Program **Summer 2020, 2021**
Taught high school interns about the research done in Prof. Peter Plavchan's group, and tutored them on how to perform it themselves to synthesize a presentable project by the end of the summer.

Outreach

Member, MIT Astrogazers **2023 – Present**
As a member of the Astrogazers, I have been involved in engaging with the public at a number of sidewalk observing nights, exhibits at the annual Cambridge Science Festival, and other miscellaneous science-themed events in the greater Boston/Cambridge area.

Trivia Cohost, MIT Museum After Dark **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.

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

Panelist, ASSIP Career Day **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, MATLAB, Mathematica, Bash, Git
Python Packages: Numpy, Numba, Scipy, Astropy, Pandas, Matplotlib, Plotly
Astronomy Programs: DS9, AstroImageJ
Document Creation: LaTeX, Vim, Microsoft Office

References

Michael McDonald: MIT, Associate Professor, PhD research advisor.
Shobita Satyapal: GMU, Professor, Undergraduate research advisor.
Peter Plavchan: GMU, Associate Professor, Undergraduate research advisor.
Joseph Weingartner: GMU, Associate Professor, Undergraduate academic advisor.