

# Michael A. Reefer

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EDUCATION	<b>Ph.D. Candidate, Physics</b> Massachusetts Institute of Technology (MIT) Advisor: <i>Prof. Michael McDonald</i>	<b>2022 – Present</b> GPA: 5.0/5.0
	<b>B.S., Physics   Concentration in Astrophysics   Summa cum laude</b> George Mason University (GMU) Honors Thesis: “CLASS: Coronal Line Activity Spectroscopic Survey” Advisor: <i>Prof. Shobita Satyapal</i>	<b>2018 – 2022</b> GPA: 4.0/4.0
RESEARCH EXPERIENCE	<b>NSF Graduate Research Fellow, MIT</b> Advisor: <i>Prof. Michael McDonald</i> 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.	<b>2022 – Present</b>
	<b>Undergraduate Research Assistant, GMU</b> Advisor: <i>Prof. Shobita Satyapal</i> 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.	<b>2021 – 2022</b>
	<b>Undergraduate Research Assistant, GMU</b> Advisor: <i>Prof. Peter Plavchan</i> 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.	<b>2019 – 2021</b>
	<b>Learning Assistant   PHYS 260: Electricity &amp; Magnetism, GMU</b> 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.	<b>Fall 2019</b>
HONORS & AWARDS	Graduate Research Fellowship, NSF	<b>2022 – 2027</b>
	Whiteman Fellowship, MIT	<b>2022 – 2023</b>
	Dean’s Award for Excellence in Academics and Research, GMU	<b>2022</b>
	Outstanding Undergraduate Research Award, GMU	<b>2022</b>
	Outstanding Graduating Senior Award, GMU	<b>2022</b>
	Mason Distinction Scholarship, GMU	<b>2018 – 2022</b>
	Outstanding Learning Assistant Award, GMU	<b>2021</b>
REFEREED PUBLICATIONS	<b>First Author</b>	
	6. <b>M. Reefer</b> , M. McDonald, M. Chatzikos et al., “Directly imaging the cooling flow in the Phoenix Cluster.” <i>Nature</i> (2025), in press.	
	5. <b>M. Reefer</b> , S. Satyapal, R. O. Sexton et al., “Nuclear Activity in the Low-metallicity Dwarf Galaxy SDSS J0944-0038 : A Glimpse into the Primordial Universe.” <i>ApJL</i> <b>946</b> , L38 (2023), [ADS].	
	4. <b>M. Reefer</b> , R. O. Sexton, S. M. Doan et al., “CLASS Survey Description: Coronal-line Needles in the SDSS Haystack.” <i>ApJS</i> <b>265</b> , 21 (2023), [ADS].	
	3. <b>M. Reefer</b> , 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.” <i>JATIS</i> <b>8</b> , 027002 (2022), [ADS].	

2. **M. Reefer**, 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. Reefer**, 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. Reefer**, “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. Reefer**, “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. Reefer**, “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. Reefer**, “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. Reefer**, “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. Reefer**, “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. Reefer**, “Flares, Rotation, and Planets of the AU Mic System from TESS Observations.” *AJ* **163**, 147 (2022), [ADS].
6. J. M. Wittrock, S. Dreizler, **M. Reefer** et al., “Transit Timing Variations for AU Microscopii b and c.” *AJ* **164**, 27 (2022), [ADS].
5. B. L. Cale, **M. Reefer**, 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. Reefer**, “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. Reefer**, “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. Reefer**, “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. Reefer**, “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].

#### PRESENTATIONS

##### Colloquia & Seminars (Invited Talks)

- Journal Club | MIT Kavli Institute for Astrophysics and Space Research **Mar. 2023**  
“On: AGN feedback in an infant galaxy cluster: the LOFAR-Chandra view of the giant FR II radio galaxy J103025+052430 at  $z=1.7$ ”
- Graduation Ceremony | GMU College of Science **May 2022**  
\*\*Invited to be the student speaker for the College of Science’s [graduation ceremony](#).

##### Conferences

- 25 Years of Science with Chandra | Boston, MA **Dec. 2024**  
[Contributed Talk](#): “Mapping the Cooling Flow in the Phoenix Cluster with JWST and Chandra”

- 243<sup>rd</sup> Meeting of the American Astronomical Society | New Orleans, LA **Jan. 2024**  
**Contributed Talk:** “Shaken or stirred? Dynamics of the coronal temperature gas in the Phoenix Cluster”
- 240<sup>th</sup> Meeting of the American Astronomical Society | Pasadena, CA **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”
- 237<sup>th</sup> 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

### V.P. of Academic Advocacy, MIT Physics Graduate Student Council (PGSC) **2024 – Present**

Worked as the primary graduate student advocate 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, etc.

### Member, MIT Physics Graduates Advising Graduate Admissions (GAGA) **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).

### Webmaster, MIT Physics Graduate Student Council (PGSC) **2023 – Present**

Maintained the PGSC’s website, mailing lists, and calendar.

### Mentor, MIT Physics Graduate Application Assistance Program (PhysGAAP) **Fall 2024**

Guided prospective PhD students (primarily from under-represented groups) through the MIT Physics application and how to write competitive personal statements. I have mentored 3 prospective students.

### 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**

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, equity, and inclusion efforts at GMU.

### 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**

Answered students’ questions about the NSF GRFP application and review process.

Mentor, [Aspiring Scientists' Summer Internship Program](#)
Summer 2020, 2021

Tutored high school interns on observing and analyzing exoplanet transit data.

OUTREACH

Member, [MIT Astrogazers](#)
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.

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, IDL, MATLAB, Mathematica, Bash, Git, HTML/CSS  
Python Packages: Numpy, Numba, Scipy, Astropy, Pandas, Matplotlib, Plotly  
High Performance Computing: MPI, Slurm  
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.