

# Nicole Mulyk

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## Education

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**Doctor of Philosophy (Thesis) in Astrophysics**, *McGill University* Sept. 2024 – Present

- Supervisors: Dr. Vicky Kaspi and Dr. Jason Hessels

**Master of Science (Thesis) in Physics and Astronomy**, *McMaster University* Sept. 2022 – Aug. 2024

- Thesis: Creating Effective Training Sets for Machine Learning Package ALED with Dragonfly Telephoto Array Images to Identify Historic Supernova Light Echoes Around Supernova 1054 (Crab)
- Supervisor: Dr. Doug Welch
- Committee Members: Dr. Alison Sills and Dr. Laura Parker
- [macsphere.mcmaster.ca/handle/11375/30091](https://macsphere.mcmaster.ca/handle/11375/30091)

**Theory and Inquiry Certificate of Completion**, *Paul R. MacPherson Institute for Leadership, Innovation and Excellence in Teaching, McMaster University* Sept. 2023 – Apr. 2024

- Certificate required completion of course work on higher education teaching, equity, and accessibility.

**Bachelor of Science with Honors in Astrophysics** with First Class Honors, *University of Alberta* Sept. 2018 – Jun. 2022

- Thesis: Comparing the initial conditions of a binary neutron star merger to optimize the production of r-process elements, using SkyNet to simulate nucleosynthesis
- Supervisor: Dr. Rodrigo Fernandez

## Extracurricular Research Experience

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**Research Assistant**, Student Partners Program, *Paul R. MacPherson Institute for Leadership, Innovation and Excellence in Teaching, McMaster University* Sept. 2023 – Apr. 2024

- Created a longitudinal study to examine students' attitudes toward their courses and programs in the Department of Physics and Astronomy.
- Supervisors: Dr. Pat Clancy and Dr. Miranda Schmidt

**Research Assistant**, Department of Physics, *University of Alberta* May 2022 - Aug. 2022

- Simulated the spin-up of neutron stars by accretion from a companion star.
- Supervisor: Dr. Sharon Morsink

**Research Assistant**, Department of Physics, *University of Alberta* May 2021 - Aug. 2021

- Worked with SkyNet to simulate nucleosynthesis in possibly significant sources of r-process elements.
- Supervisor: Dr. Rodrigo Fernandez

**Research Assistant**, Department of Physics, *University of Alberta* May 2020 - Aug. 2020

- Worked with GIZMO to create simulations of a black hole binary and a Keplerian disk.
- Supervisor: Dr. Rodrigo Fernandez

## Teaching Experience

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**Teaching Assistant**, Department of Physics, *McGill University* Sept. 2024 – Present

- Running office hours, invigilating and marking exams for undergraduate physics class.

**Planetarium Presenter**, W. J. McCallion Planetarium, *McMaster University* Sept. 2022 – Jul. 2024

- Public outreach position involving creating and presenting shows at the planetarium, and answering the public's questions.

**Teaching Assistant**, Department of Physics and Astronomy, *McMaster University* Sept. 2022 – Apr. 2024

- Ran tutorials and labs, invigilating exams, marking for undergraduate astronomy and physics classes.

## Publications

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**Fast Flavor Instability in Hypermassive Neutron Star Disk Outflows** Nov. 2022  
Rodrigo Fernández, Sherwood Richers *Nicole Mulyk*, Steven Fahlman  
doi.org/10.1103/PhysRevD.106.103003

- Paper achieved Editors' Suggestion.
- I utilized the experience I gained during my undergraduate thesis and other undergraduate research to assist with examining how neutrino flavour transformations affect the abundance patterns in hypermassive neutron star outflows. The results are in Section III C of the paper. I post-processed the results of their hydrodynamic simulation with SkyNet, a particle-based nuclear reaction network code, to simulate nucleosynthesis in the hypermassive neutron stars outflow. I also gave suggestions during the editing phase to Section III C of the paper.

## Presentations and Posters

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**Canadian Astronomical Society Annual Meeting, University of Toronto and York** Jun. 2024  
University, Toronto, ON. Poster Presentation.

- Presentation Title: **Using Machine Learning and the Dragonfly Telephoto Array to Identify Historic Supernova Light Echoes**

**Canadian Astronomical Society Annual Meeting, University of Toronto and York** Jun. 2024  
University, Toronto, ON. Poster Presentation.

- Presentation Title: **Physics and Astronomy Undergraduate Longitudinal Survey at McMaster University**

**Canadian Association of Physicists Congress, Western University, London, ON.** May 2024  
Poster Presentation.

- Presentation Title: **Physics and Astronomy Undergraduate Longitudinal Survey at McMaster University**

**Department of Physics and Astronomy Symposium Day, McMaster University,** Oct. 2023  
Hamilton, ON. Oral Presentation.

- Presentation Title: **Searching for Historic Supernovae Light Echoes using Machine Learning**

**Canadian Undergraduate Physics Conference, Toronto Metropolitan University,** Nov. 2021  
Remote. Oral Presentation.

- Presentation Title: **Searching for Significant Sources of R-process Elements**

## Volunteer Experience

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**Volunteer with the Canadian Astronomical Society's Westar Program** May 2024 - Present  
• Building a reciprocal, long-term relationship with under-served communities in Canada to mutually share in astronomical education.

**Volunteer Coordinator with Astronomy on Tap Montreal** Sept. 2024 - Present  
• Organizing volunteers for public astronomy events at a local bar. Astronomy on Tap events include talks and games intended for a general public audience.

**Volunteer for Elevate, Promoting Inclusion in Physics and Astronomy, McMaster University** Mar. 2024 - May 2024  
• Presented shows at the W. J. McCallion Planetarium during a full-day event intended for Grade 10 students to promote the love of science to those in equity seeking groups.

**Eclipse Talk Presenter, Department of Physics and Astronomy, McMaster University** Mar. 2024 - Apr. 2024  
• Presented talks about the April 2024 total solar eclipse at several location in the community.  
• Article: [gs.mcmaster.ca/eclipse-ambassador-brings-science-into-the-community/](https://gs.mcmaster.ca/eclipse-ambassador-brings-science-into-the-community/)

**Graduate Student Representative in Equity, Diversity & Inclusion Committee,** Sept. 2023 - Apr. 2024  
Department of Physics and Astronomy, McMaster University  
• Represented the physics graduate student population and presented their concerns to the Equity, Diversity & Inclusion Committee.

<b>Consultant for third-year “Light, the Universe, and Everything” Course,</b> Integrated Science Program, <i>McMaster University</i>	Jan. 2024 - Apr. 2024 and Jan. 2023 - Apr. 2023
<ul style="list-style-type: none"> <li>• Consulted with a group of students about their research project on “Stellar Remnants” during short tutorial sessions throughout the semester.</li> </ul>	
<b>Mentor to New Graduate Student,</b> Department of Physics and Astronomy, <i>McMaster University</i>	Mar. 2023 - Sept. 2024
<ul style="list-style-type: none"> <li>• Mentoring new graduate student as they make the transition to McMaster University.</li> </ul>	
<b>Member of Organizing Committee and Group Leader for Elevate,</b> Promoting Inclusion in Physics and Astronomy, <i>McMaster University</i>	Feb. 2023 - Jun. 2024
<ul style="list-style-type: none"> <li>• Assisted with the organization of a full-day event intended for Grade 10 students to promote the love of science to those in equity seeking groups.</li> <li>• Acted as group leader during the event. Lead a group of students through the day’s science activities and assisted with accommodations.</li> </ul>	
<b>Public Outreach Volunteer at Department of Physics Astronomical Observatory</b> <i>University of Alberta</i>	Jan. 2019 - Jun. 2022
<ul style="list-style-type: none"> <li>• Guiding the public through using the telescopes, answering questions, and operating the telescopes.</li> </ul>	
<b>Member of Organizing Committee for Canadian Conference for Undergraduate Women in Physics,</b> <i>University of Alberta</i>	Aug. 2021 - Jan. 2022
<ul style="list-style-type: none"> <li>• Organizing a virtual conference for undergraduate students who belong to underrepresented groups in physics</li> <li>• Moderated virtual panels</li> <li>• Hosted virtual talks</li> <li>• Maintained and updated conference website</li> </ul>	

## Awards

<b>Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Awards,</b> <i>University of Alberta</i> , Value: \$6,000	May 2022 - Aug. 2022
<b>Dean’s Honor Roll,</b> <i>University of Alberta</i>	Sept. 2021 - Apr. 2022
<ul style="list-style-type: none"> <li>• Received for completing 24 or more credits with a grade point average (GPA) of at least 3.5 for that academic year.</li> </ul>	
<b>Golden Bell Jar Undergraduate Scholarship in Physics,</b> <i>University of Alberta</i> , Value: \$1,625	Sept. 2021 - Apr. 2022
<b>Douglas M Sheppard Memorial Scholarship,</b> <i>University of Alberta</i> , Value: \$1,100	Sept. 2021 - Apr. 2022
<b>Jason Lang Scholarship,</b> <i>University of Alberta</i> , Value: \$1,000	Sept. 2021 - Dec. 2021
<b>Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Awards,</b> <i>University of Alberta</i> , Value: \$6,000	May 2021 - Aug. 2021
<b>Dean’s Honor Roll,</b> <i>University of Alberta</i>	Sept. 2020 - Apr. 2021
<b>Jason Lang Scholarship,</b> <i>University of Alberta</i> , Value: \$1,000	Jan. 2020 - Apr. 2020
<b>Dean’s Honor Roll,</b> <i>University of Alberta</i>	Sept. 2019 - Apr. 2020

## Certificates

<b>Convolutional Neural Networks,</b> DeepLearning.AI, <i>Coursera</i>	Jan. 2024
<b>Structuring Machine Learning Projects,</b> DeepLearning.AI, <i>Coursera</i>	Aug. 2023
<b>Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization,</b> DeepLearning.AI, <i>Coursera</i>	Jul. 2023
<b>Neural Networks and Deep Learning,</b> DeepLearning.AI, <i>Coursera</i>	Apr. 2023

## Workshops Attended

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**Teaching and Learning Month**, *Paul R. MacPherson Institute for Leadership, Innovation and Excellence in Teaching, McMaster University*

May 2024 and May 2023

- A month of daily teaching and learning workshops.

**Designing and Assigning Accessible Assessments**, Department of Physics and Astronomy, *McMaster University*

May 2023