Amanda M. Cook

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EDUCATION

Ph.D. Astronomy and Astrophysics, University of Toronto, Toronto ON (exp.) 2024
Thesis Title: "*Fast Radio Burst statistics in time and space: FRB repetition patterns and the Milky Way's plasma probed by CHIME/FRB*"
Thesis Supervisors: Prof. Gwendolyn Eadie, Prof. Bryan Gaensler, Prof. Paul Scholz

B.Sc. First Class Honours in Mathematics and Physics McGill University, Montreal QC 2019
Thesis Title: *"Survey for Repeating Radio Transients with CHIME/FRB"*
Thesis Supervisors: Prof. Victoria Kaspi, Dr. Ziggy Pleunis

ADDITIONAL EXPERIENCE

Visiting Astrostatistics Researcher, Canadian Statistical Sciences Institute (CANSSI) 2023
Supervised by Prof. David Stenning, Prof. Derek Bingham

- Collaborated on astrostastics methodology with experts at Simon Fraser University
- Completed first draft of a paper detailing this work, to be submitted to the Annals of Applied Statistics
- Visit was sponsored by a 'Collaborative Research Team' grant from CANSSI

Undergraduate Researcher in High Energy Astrophysics, University of Kyoto 2019
Supervised by Prof. Teruaki Enoto

- Developed periodicity search pipeline for archival NICER observations of neutron stars which had a reported period from radio observations but had not yet been seen to emit periodically in X-ray emission.

Student Intern, Caltech & NASA Jet Propulsion Labs 2018
"X-ray Monitoring of Magnetar PSR J1622-4950"/"All-Sky Survey for Radio Transients"
Supervised by Dr. Walid Majid

- Conducted multi-wavelength analysis of magnetar following its reactivation in radio emission using X-ray data from NICER and gamma-ray data from Fermi-LAT. Analysis included periodicity searches and maximum likelihood region modeling
- Assisted a team developing an efficient processing pipeline to search for FRBs in archival data from the Deep Space Network

Undergraduate Researcher, McGill University 2017
"Gamma-ray Astrophysics with Fermi-LAT"
Supervised by Prof. Ken Ragan

- Investigated astrophysical objects and systems of interest to VHE observatories using Fermi-LAT data and analysis tools. Analysis included pulsar timing, spectral energy distribution modelling and maximum likelihood fitting of gamma-ray photon event data.

AWARDS

Walter C. Sumner Fellowship – National, $16,000, Research, 2022-2023
NSERC Brockhouse Prize, *as member of CHIME/FRB* – National, Research 2022
NSERC PGS-D – National, $63,000, Research 2022-2025
AAS Lancelot M. Berkley award, *as member of CHIME/FRB* – International, Research 2022
Dunlap Institute 'You got us through 2022' Award – for my service as the president of the UofToronto Graduate Astronomy Students Association 2022
Ontario Graduate Scholarship – Provincial, $15,000, Research 2021
Dunlap Student Training Grant *to attend Penn State Astrostats Summer School* 120 USD 2021
Dunlap Institute Seed Funding *as a member of LUVS* – Institutional, $67,182, Research 2021
Dunlap Institute Seed Funding *as a member of LUVS* – Institutional, $26,046, Research 2020
Governer General's Innovation Award, *as member of CHIME/FRB* – National, Research 2020
Student Internship Stipend, JPL/Caltech – Institutional, $8000, Research 2018

	Student Poster Award, Canadian Undergraduate Research Conference – Communication	2017
	Undergraduate Student Research Award, NSERC – National, $4500, Research	2017
	Undergraduate Research Award, McGill University – Institutional, $1625, Research	2017
	Supplement de NSERC USRA, Fonds de recherche du Québec – Provincial, $2000, Research	2017
	Higher Education Award, Enbridge – Institutional, $6900, Academic	2015
	Rutherford Scholarship, Government of Alberta – Provincial, $2500, Academic	2015

OBSERVING PROPOSALS (AS PI)

'Simultaneous XMM-Newton and Radio observations of Repeating FRBs' Submitted as PI to *XMM-Newton* AO-21. Time Awarded: 42ks 2021

FRB 20220912A High-Urgency Target of Opportunity, Submitted as PI to *Swift*. Awarded two visits, 24 hours apart to provide simultaneous exposure to CHIME/FRB. 2022

FIRST AUTHOR PUBLICATIONS

[1] **Cook, A. M.**, Bhardwaj, M., Gaensler, B. M., Scholz, P., Eadie, G. M., Hill, A. S., Kaspi, V. M., Masui, K. W., and 20 colleagues (2023). An FRB Sent Me a DM: Constraining the Electron Column of the Milky Way Halo with Fast Radio Burst Dispersion Measures from CHIME/FRB, The Astrophysical Journal, Volume 946, Issue 2, id.58, 14 pp. (17 citations, Ph.D. work)

[2] **Cook, A.** (2018) Exploration of Fermi-LAT Data: An Analysis of Pulsar J1930+1852, McGill Science Undergraduate Research Journal, 13, 12-15 (B.Sc. work)

COLLAB. PUBLICATIONS

[3] **CHIME/FRB Collaboration** (2023). CHIME/FRB Discovery of 25 Repeating Fast Radio Burst Sources, The Astrophysical Journal, Volume 947, Issue 2, id.83, 31 pp. (32 citations, Ph.D. work)
Individual Contribution: I defined the sample for publication by developing a method to characterize probability of chance coincidence of each of the candidate repeaters. This quantifies the likelihood that each cluster of bursts with positions consistent within errors would be physically unrelated to one another. For CHIME, a telescope with uneven exposure on the sky and significant uncertainties in burst localization, this is a non-trivial problem with consequences for modelling and follow-up efforts. This work included the practical implementation of the methodology and writing sections of the paper.

[4] **CHIME/FRB Collaboration** (2021). The First CHIME/FRB Fast Radio Burst Catalog, The Astrophysical Journal Supplement Series, Volume 257, Issue 2, id.59, 41 pp. (260 citations, Ph.D. work)
Individual Contribution: I maintained and developed software within CHIME/FRB's realtime pipeline, including the 'known source sifter' which identifies any associated sources with each detected pulse, and the L4 pipeline, which coordinates, for each detected pulse, the actions taken by the system (intensity/baseband callbacks, community notifications) according to the science priorities of the team. In addition, I helped classify signals to discriminate between real and non-astrophysical during regular monitoring shifts for the experiment. I also measured physical parameters (burst widths, fluences, etc) for a subset of the bursts.

[5] **CHIME/FRB Collaboration** (2020). A bright millisecond-duration radio burst from a Galactic magnetar, Nature, Volume 587, Issue 7832, p.54-58 (474 citations, Ph.D. work)
Individual Contribution: I crafted the argument confirming the FRB's measured DM was consistent with having originated from the magnetar, using free electron models of the Galaxy and the magnetar's X–ray absorbing column density. This evidence was essential to our paper claiming we had detected the first FRB with known progenitor—a Galactic magnetar.

NTH AUTHOR PUBLICATIONS

[6] Sand, K. R., Breitman, D., Michilli, D., Kaspi, V. M., Chawla, P., Fonseca, E., Mckinven, R., Nimmo, K., and 26 colleagues including Cook, A. M. (2023). A CHIME/FRB Study of Burst Rate and Morphological Evolution of the Periodically Repeating FRB 20180916B, The Astrophysical Journal, Volume 956, Issue 1, id.23, 19 pp. (0 citations, PhD work)

[7] Bhardwaj, M., Michilli, D., Kirichenko, A. Y., Modilim, O., Shin, K., Kaspi, V. M., Andersen, B. C., Cassanelli, T., and 8 colleagues including Cook, A. M. (2023). Host Galaxies for Four Nearby CHIME/FRB Sources and the Local Universe FRB Host Galaxy Population, eprint arXiv:2310.10018 (0 citations, Ph.D. work)

[8] Dong, F. A., Crowter, K., Meyers, B. W., Pleunis, Z., Stairs, I., Tan, C. M., Yu, T. T., Boyle, P. J., and 8 colleagues including Cook, A. M. (2023). The second set of pulsar discoveries by CHIME/FRB/Pulsar: 14 rotating radio transients and 7 pulsars, Monthly Notices of the Royal Astronomical Society, Volume 524, Issue 4, pp.5132-5147 (5 citations, Ph.D. work)

[9] Curtin, A. P., Tendulkar, S. P., Josephy, A., Chawla, P., Andersen, B., Kaspi, V. M., Bhardwaj, M., Cassanelli, T., and 16 colleagues including Cook, A. M. (2023). Limits on Fast Radio Burst-like Counterparts to Gamma-Ray Bursts Using CHIME/FRB, The Astrophysical Journal, Volume 954, Issue 2, id.154, 16 pp. (6 citations, Ph.D. work)

[10] Pearlman, A. B., Scholz, P., Bethapudi, S., Hessels, J. W. T., Kaspi, V. M., Kirsten, F., Nimmo, K., Spitler, L. G., and 21 colleagues including Cook, A. M. (2023). Multiwavelength Constraints on the Origin of a Nearby Repeating Fast Radio Burst Source in a Globular Cluster, eprint arXiv:2308.10930 (2 citations, Ph.D. work)

[11] Lin, H.-H., Scholz, P., Ng, C., Pen, U.-L., Li, D. Z., Newburgh, L., Reda, A., Andersen, B., and 35 colleagues including Cook, A. M. (2023). Constraints on the Intergalactic and Local Dispersion Measure of Fast Radio Bursts with the CHIME/FRB far side-lobe events, eprint arXiv:2307.05262 (1 citation, Ph.D. work)

[12] Lin, H.-H., Scholz, P., Ng, C., Pen, U.-L., Bhardwaj, M., Chawla, P., Curtin, A. P., Sand, K. R., and 35 colleagues including Cook, A. M. (2023). Do All Fast Radio Bursts Repeat? Constraints from CHIME/FRB Far Side-Lobe FRBs, eprint arXiv:2307.05261 (5 citations, Ph.D. work)

[13] Michilli, D., Bhardwaj, M., Brar, C., Gaensler, B. M., Kaspi, V. M., Kirichenko, A., Masui, K. W., Mckinven, R., and 22 colleagues including Cook, A. M. (2023). Subarcminute Localization of 13 Repeating Fast Radio Bursts Detected by CHIME/FRB, The Astrophysical Journal, Volume 950, Issue 2, id.134, 12 pp. (8 citations, Ph.D. work)

[14] Ibik, A. L., Drout, M. R., Gaensler, B. M., Scholz, P., Michilli, D., Bhardwaj, M., Kaspi, V. M., Pleunis, Z., and 12 colleagues including Cook, A. M. (2023). Proposed host galaxies of repeating fast radio burst sources detected by CHIME/FRB, eprint arXiv:2304.02638. Revised version submitted to The Astrophysical Journal on Oct 2nd, 2023 (10 citations, Ph.D. work)

[15] Bhardwaj, M., Gaensler, B. M., Kaspi, V. M., Landecker, T. L., Mckinven, R., Michilli, D., Pleunis, Z., Tendulkar, S. P., and 18 colleagues including Cook A. M. (2021). A Nearby Repeating Fast Radio Burst in the Direction of M81, The Astrophysical Journal Letters, Volume 910, Issue 2, id.L18, 14 pp. (144 citations, Ph.D. work)

[16] Scholz, P., **Cook, A. M.**, Cruces, M., Hessels, J. W. T., Kaspi, V. M., Majid, W. A., Naidu, A., Pearlman, A. B., and 30 colleagues (2020). Simultaneous X-Ray and Radio Observations of the Repeating Fast Radio Burst FRB 180916.J0158+65, The Astrophysical Journal, Volume 901, Issue 2, id.165, 9 pp. (44 citations, Ph.D. work)

PRESENTATIONS *Presenter indicated by ***

[17] ***Cook, A. M.***, Scholz, P., Stenning, D., Bingham, D., *Eadie, G.*, Towards Solving the Fast Radio Burst Enigma: Probability of Event Chance Coincidence for Inhomogeneous Noisy Spatial Point Processes., October 2023, Astrostats in Canada and Beyond, Plenary Speaker (20 minutes), National Workshop, (PhD work)

[18] **Cook, A. M.**, Scholz, P., Stenning, D., Bingham, D., *Eadie, G.*, Towards Solving the Fast Radio Burst Enigma: Probability of Event Chance Coincidence for Inhomogeneous Noisy Spatial Point Processes., Joint Statistical Meeting 2023, Invited Speaker (20 minutes), International Conference, (PhD work)

[19] ***Cook, A. M.***, Bhardwaj, M., Gaensler, B.M., Scholz, P., Eadie, G., Constraining the Plasma in the Milky Way's Halo with CHIME/FRB, Gas Evolution in and Around Galaxies, Stanley Idaho, August 2023, Plenary Speaker (20 minutes), International Workshop, (PhD work)

[20] ***Cook, A. M.***, Bhardwaj, M., Gaensler, B.M., Scholz, P., Eadie, G., Constraining the Plasma in the Milky Way's Halo with CHIME/FRB, Plenty of Room at the Bottom; Fast Radio Bursts in our Backyard Cornell University, October 2022, Plenary Speaker (20 minutes), International Workshop, (PhD work)

[21] ***Cook, A. M.***, Gaensler, B.M., Scholz, P., Eadie, G., Constraining the Plasma in the Milky Way's Halo with CHIME/FRB, Caltech Tea Talk, Invited speaker (45+15 minutes), Institutional, (PhD work)

[22] ***Cook, A. M.***, Gaensler, B.M., Scholz, P., Eadie, G., Constraining the Plasma in the Milky Way's Halo with CHIME/FRB, FRB 2021, Plenary talk (12+3 minutes), International Conference, (PhD work)

[23] Chen S., **Cook, A. M.**, *Taylor, J.* , Tohuvavohu A. (2020) Preliminary design for a small UV space telescope. Poster Presentation, CASCA 2020, National Conference (PhD work)

[24] ***Cook, A. M.***, Amsellem, A., Pearlman, Arzoumanian, Z., Enoto, T., Gendreau, K., Horiuchi, S., Kocz, J., Kuiper, T., Majid, W. A., Naudet, C., Prince, T. (2019) Radio and X-ray Monitoring of the Recently Reactivated Magnetar PSR J1622-4950, Oral Presentation, 233rd Meeting of the American Astronomical Society, International Conference (BSc work)

[25] ***Cook, A. M.*** (2017) Exploration of Fermi-LAT Data: An Analysis of Pulsar J1930+1852, Poster Presentation Canadian Undergraduate Physics Conference, National Conference (BSc work)

TEACHING

Graduate Teaching Assistant, University of Toronto 2019-2023

As a Teaching Assistant:

- Creating and leading weekly tutorials and coding workshops
- Holding office hours and offering assistance with lab report completion

As the Head Tutorial TA for the largest course in North America:

- developed tutorial content for students
- developed material about effective online teaching during the 2020 pandemic
- managed a team of more than a dozen TAs and led weekly preparation meetings

Course topics include practical/observational astronomy, stellar astrophysics, radiation, and cosmology for third year students in the astronomy specialist program and observational astronomy for non-astronomy students (AST 326, AST 301, AST 320, AST 101, AST 201, AST 101).

Grader, (MATH 325) McGill University 2018

Supervised by Prof. Antony Humphries

- Responsible for grading assignments, creating solution sets, and submitting students' marks for an upper year honours ordinary differential equations course.

SERVICE

Instrumentation Summer School Admissions Committee Dunlap Institute 2023

Reviewed candidate's application material and made admissions rankings, allocated available travel funds.

Local Organizing Committee Member Dunlap Institute & CHIME/FRB 2023

"Multi-wavelength follow-up of fast radio bursts in the era of routine (sub)arcsecond localizations", a two-day hybrid meeting in April 2023 with invited plenary talks and discussion groups.

Public Outreach Volunteer Dunlap Institute/University of Toronto since 2019

Highlights include:

- Invited guest speaker at Cawthra High School STEM conference
- Filmed three episodes of 'Cosmos on your Couch', a YouTube series aimed at non-astronomers
- Hosted a panel of experts to speak about the Ethics of Space Colonization at the Dunlap Institute's 2021 'Planet Party'. This event drew 2.3k viewers.

- Multiple appearances as a panelist for becoming an astronomer for students at the high school to senior undergraduate level.

Collaboration Member, CHIME/FRB Since 2019

Roles/Responsibilities include:

- Pipeline Expert: maintenance and continued development of number of pipelines and software 'actors' within the telescope, including the 'known source sifter' which identifies any associated sources with each detected pulse in real time, the L4 pipeline, which coordinates, for each detected pulse, the actions taken by the system (intensity/baseband callbacks) according to the science priorities of the team and stores a database of astrophysical events
- Convener of biweekly "Counterparts Working Group" meetings, oversee relevant projects

Executive Committee, *President*, Graduate Astronomy Students Association, DADDAA 2021-2022

- Assisted in organizing opportunities for graduate students to meet candidates and collating the student's feedback for three astronomy faculty hires.
- Negotiated a $5.3k (19%) stipend increase for graduate students, the largest in department history
- Acted as advocate for graduate student interests and as a liaison between graduate students and astronomy department executives. Priorities included student mental health and ensuring PhD success in the final months of and return from large-scale COVID-19 isolation
- Acted as department student representative for prospective and incoming graduate students

Executive Committee, *Secretary*, Graduate Astronomy Students Association, DADDAA 2020-2021

Editor, Delta Epsilon, McGill Journal of Undergraduate Mathematics 2017-2019

Graduate Student Mentor University of Toronto 2020-2022

- Providing support and mentorship for three undergraduate students and a graduate student.

Public Outreach Volunteer Astro McGill 2017-2019

- Assisted in the execution of astrophysics public outreach talks and events such as the "Public Astro Night" lecture series and the solar eclipse watch party.

COMPETENCES

Languages English (*native*), French (*intermediate*)

Techniques Python, R, LaTeX, bash, git, basic mathematica, and Matlab