

PATRICK HORLAVILLE

ASTRONOMY STUDENT, RESEARCHER & COMMUNICATOR

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SUMMARY

I am a PhD student in Physics at McGill University working on developing novel statistics for upcoming telescopes that will map the large scale structure of the Universe at a time when stars and galaxies started to form. Aside from my research activities, I am invested in practicing and developing meaningful science communication methods, in particular in the context of youth outreach and education in my community.

EDUCATION

2025–present	PhD in Physics , McGill University <i>Supervisor</i> : Prof. Adrian Liu	
2023–2025	MSc in Physics , Bishop’s University <i>Supervisor</i> : Prof. John Ruan <i>Thesis</i> : Predicting the Host Galaxies of Supermassive Black Hole Binaries	GPA: 86.5/100
2023–2025	Certificate in Knowledge Mobilization, Bishop’s University <i>Supervisors</i> : Prof. Heather Lawford & Wade Lynch <i>Final project</i> : How Can LLMs Help Sci-Comm Writers?	GPA: 96.2/100
2019–2023	BSc in Honours Physics , McGill University <i>Supervisors</i> : Prof. Matt Dobbs & Dr. Dallas Wulf <i>Thesis</i> : Blazar Monitoring with the CHIME Telescope <i>Distinctions</i> : First Class Honours in Physics, Dean’s Multidisciplinary Research List	GPA: 3.92/4.00

SELECTED AWARDS *Listed amounts in Canadian dollars*

2025–2028	NSERC Postgraduate Scholarship – Doctoral	\$120,000
Summer 2025	FRQNT Master’s Scholarship Declined \$20,000 for the 2024/25 academic year in favor of NSERC CGS–M	\$6,667
2024–2025	NSERC Canada Graduate Scholarship – Master’s	\$27,000
2023–2024	Bishop’s Graduate Entrance Scholarship	\$10,000

PUBLICATIONS

- Carlson, N. J., Bond, J.R., Chung, D.T., **Horlaverse, P.**, Morrison, T., “The WebSky [C II] Forecasts and the search for primordial intermittent non-Gaussianity”, 2025, submitted to JCAP [[arXiv.2510.18312](#)].
- Horlaverse, P.**, Ruan, J. J., Runnoe, J. C., Eracleous, M., Haggard, D., Bardati, J., “Predicting Potential Host Galaxies of Supermassive Black Hole Binaries Based on Stellar Kinematics in Archival IFU Surveys”, 2025, submitted to ApJ [[arXiv.2504.21145](#)]
- Bardati, J., Ruan, J. J., Haggard, D., Tremmel, M., **Horlaverse, P.**, “Signatures of Massive Black Hole Merger Host Galaxies from Cosmological Simulations II: Unique Stellar Kinematics in Integral Field Unit Spectroscopy”, 2024, ApJ, 977, 265 [DOI: [10.3847/1538-4357/ad9471](#)]
- Horlaverse, P.**, Chung, D. T., Bond, J. R., & Liang, L., “The informativeness of [C II] line intensity mapping as a probe of the H I content and metallicity of galaxies at the end of reionization”, 2024, MNRAS, 531, 2958 [DOI: [10.1093/mnras/stae1333](#)]

RESEARCH PROJECTS

Bayesian Stacking of Galaxies for Line-Intensity Mapping Experiments 2025–present

Summary: For my PhD, I am developing a Bayesian formalism for stacking galaxy signals as traced by line-intensity mapping (LIM) telescopes in the context of cross-correlations with galaxy catalogs.

Supervisor: Prof. Adrian Liu, McGill University

Predicting the Host Galaxies of Supermassive Black Hole Binaries 2023–2025

Summary: For my MSc, I developed a new method to identify candidate supermassive black hole binary host galaxies in archival galaxy surveys based on their stellar kinematics (cf. [Publications #3](#)). I also contributed to a related project, where I debugged some code in the analysis of cosmological simulations data, which resulted in my implication on the associated paper (cf. [Publications #2](#)).

Supervisor: Prof. John Ruan, Bishop’s University

Modelization and Statistics of [C II] Line Intensity Mapping 2022–2025

Summary: For my internship at the Canadian Institute for Theoretical Astrophysics (CITA) in Toronto in the summer of 2022, I revitalized a line intensity mock map program and used it to implement a new model for the parametrization of the cosmological [C II] signal, whose follow-up work and statistical analysis led to my first first-author publication (cf. [Publications #1](#)). Continued collaboration with CITA folks led to my participation in the analysis of the effects of early Universe’s non-Gaussianities on line-intensity maps of galaxies billions of years later, at redshifts ~ 3 to 8 (cf. [Publications #4](#)).

Supervisors: Dr. (now Prof.) Dongwoo Chung & Prof. J. Richard Bond, CITA

Blazar Radio Variability Monitoring with the CHIME Telescope 2021–2022

Summary: For my undergraduate honours thesis, I worked on quantifying the radio variability of northern hemisphere blazars observed daily by the CHIME telescope. To do so, I worked on the mitigation of instrument systematics and developed statistics to distinguish different classes of blazars.

Supervisors: Dr. Dallas Wulf & Prof. Matt Dobbs, McGill University

Occurrence Rates of Exoplanets around M stars Summer 2021

Summary: For my internship at the Exoplanets Research Institute (iREx) at the Université de Montréal, I explored the modeling statistics of generating populations of exoplanets and the retrieval of their transit signature with TESS lightcurves in order to investigate their occurrence rates around M stars.

Supervisor: Prof. Björn Benneke, Université de Montréal

Daily Validation with the CHIME Telescope Winter 2021

Summary: I was an undergraduate research apprentice in the Matt Dobbs cosmology radio lab for one semester, where I worked on the daily validation of the CHIME telescope data. I notably built template models for the spectrum of stable radio sources and investigated day-to-day variations.

Supervisor: Dr. (now Prof.) Saurabh Singh, Prof. Matt Dobbs, McGill University

COMPUTER SKILLS

Programming: Python (numpy, matplotlib, astropy, pandas, emcee...), R, Bash scripting, git/GitHub

Computing Environments: Unix/Linux, macOS, Windows; experience with remote HPC servers

Document & Design Tools: L^AT_EX, Microsoft Office Suite, Canva

REFERENCES

Adrian C. Liu Associate Professor in the Department of Physics @ McGill

John J. Ruan Associate Professor in the Department of Physics & Astronomy @ Bishop’s

Dongwoo T. Chung Assistant Professor in the Department of Astronomy @ Cornell

J. Richard Bond University Professor @ the Canadian Institute for Theoretical Astrophysics

COMMUNITY ENGAGEMENT & OUTREACH

[†]Denotes paid position

2025–present	Outreach Coordinator [†] @ the Trottier Space Institute	McGill University
2018–present	Magazine Columnist @ the Montreal Planetarium Astronomy Society	Montreal, Canada
Summer 2025	Journal Club Organizer @ the Physics & Astronomy Department	Bishop's University
2024–2025	Tutor [†] @ Bishop's Physics Help Center	Bishop's University
2023–2025	University Representative on CASCA's Graduate Student Council	Bishop's University
June 3–6 2024	Poster and Talk Grader @ 2024 CASCA General Meeting	Toronto, Canada
May 24–26 2024	Science Facilitator [†] for CRAQ at 2024 Eurêka! Science Festival	Montreal, Canada
Winter 2024	Volunteer Facilitator for the Éclipse-Estrie Committee	Sherbrooke, Canada
Winter 2023	Elementary School Mentor & Conference Speaker Mentored a group of grade 5 students to conceptualize, storyboard, direct and shoot a short stop-motion movie; presented the initiative of this project at the ISLS 2023 annual meeting	Montreal, Canada
Winter 2022	Speaker @ Vanier College, Cégep du Vieux-Montréal	Montreal, Canada
2019–2022	Outreach Volunteer @ McGill Space Institute	McGill University
Summer 2021	Outreach Volunteer @ iREx for visiting high school students	Université de Montréal
2017–2019	Peer Tutor [†] @ Cégep du Vieux-Montréal	Montreal, Canada
Nov 24 2017	Conference Speaker @ the Montreal Planetarium Astronomy Society	Montreal, Canada

OTHER AWARDS & DISTINCTIONS *Listed amounts in Canadian dollars*

Winter 2024	Research Week Award (2 nd Prize in the Graduate Category) @ Bishop's University	\$150
Fall 2023	GIS Day Award (3 rd Prize) @ Bishop's University	\$100
Summer 2022	NSERC Undergraduate Research Award + Research Fellowship @ CITA	\$6,000+\$3,500
Fall '21, Winter '22	Tomlinson Engagement Award for Mentoring (x2) @ McGill University	2 x \$300
Summer 2021	NSERC Undergraduate Research Award + Top Up @ iREx	\$6,000+\$2,500
2020	Golden Key Society Fellowship @ McGill University	<i>Distinction</i>
2019	Senior Cégep Thesis Award (3 rd Prize) @ Cégep du Vieux-Montréal	\$100

CONFERENCES & SPECIALIZED SCHOOLS ATTENDED

June 26-28 2024	CRAQ Summer School: <i>Machine Learning for Astrophysics</i>	Université de Montréal
June 3–6 2024	CASCA Annual General Meeting <i>Poster</i> : “A New Method to Search for sub-100 pc Dual AGNs”	Toronto, Canada
August 3–4 2023	Pan-Canadian Reionization Workshop	CITA
July 18–22 2022	CMB+EoR Workshop	McGill University
June 15–17 2022	CRAQ Summer School: <i>Probes of Cosmology</i>	McGill University

RELEVANT GRADUATE COURSEWORK

<i>Course</i>	<i>Instructor @ Institution</i>	<i>Semester</i>
PHYS644: Galaxies & Cosmology	Prof. Adrian Liu @ McGill University	Fall 2025
PHY566: Theoretical Topics	Prof. Valerio Faraoni @ Bishop's University	Winter 2025
PHY587: Exoplanet Astrophysics	Prof. Jason Rowe @ Bishop's University	Fall 2024
PHY576: Stellar Astrophysics	Prof. Lorne Nelson @ Bishop's University	Winter 2024
PHY574: Cosmology	Prof. John Ruan @ Bishop's University	Fall 2023
PHYS641: Obs. Meth. in Mod. Astro.	Prof. Jonathan Sievers @ McGill University	Fall 2022
PHYS512: Computational Physics	Prof. Jonathan Sievers @ McGill University	Fall 2022

ONLINE MENTIONS

February 2025 [CASCA Graduate Student Highlight](#)

Last updated: October 28, 2025