Curriculum Vitae

Vincent MacKay, PhD
Citizenship: Canadian | Languages: French, English
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Research interests

I am a cosmologist and radio astronomer specializing in 21 cm experiments and transient detection. I devise analysis methods and build highly sensitive antennas, addressing challenges such as foreground subtraction and mutual coupling mitigation. My work sits at the intersection of physics, data science, and engineering.

Positions

Postdoctoral Scholar — *2023–present*
MIT Kavli Institute for Astrophysics and Space Research — *Cambridge, MA, USA*

Education

PhD, Physics — *2018–2023*
University of Toronto — *Toronto, ON, Canada*
Supervisor: Keith Vanderlinde

BSc, First-Class Honours, Mathematics and Physics — *2015–2018*
McGill University — *Montréal, QC, Canada*

BMus, Piano performance — *2012–2015*
Conservatoire de musique de Québec — *Québec City, QC, Canada*

Fellowships, scholarships, awards

Trottier Space Institute Fellowship (declined) — *2022–2025*
CAD $65,000.00/year

Ontario Graduate Scholarship — *2020–2021*
CAD $15,000.00

University of Alberta Undergraduate Summer Research Award — *Summer 2017*
CAD $8,000.00

NSERC Undergraduate Summer Research Award — *Summer 2016*
CAD $4,500.00

FRQNT Supplement to NSERC — *Summer 2016*
CAD $2,000.00

Publications

1. Vincent MacKay, Mark Lai, et al. Low-cost, Low-loss, Ultra-wideband Compact Feed for Interferometric Radio Telescopes. *Journal of Astronomical Instrumentation*, 2023. ISSN 2251-1717
PhD work

2. Mark Lai, Vincent MacKay, et al. 0.3–1.5-GHz LNA With Wideband Noise and Power Matching for Radio Astronomy. *IEEE Microwave and Wireless Technology Letters*, 33(8):1163, 2023. ISSN 2771-9588
PhD work

3. Devin Crichton, Moumita Aich, et al. Hydrogen Intensity and Real-Time Analysis Experiment: 256-element array status and overview. *Journal of Astronomical Telescopes, Instruments, and Systems*, 8(1):011019
PhD work

4. Benjamin R. B. Saliwanchik, Aaron Ewall-Wice, et al. Mechanical and optical design of the HIRAX radio telescope. In Heather K. Marshall, Jason Spyromilio, et al., editors, *Ground-based and Airborne Telescopes VIII*, volume 11445, page 114455O. International Society for Optics and Photonics, SPIE, 2021
PhD work

5. Eric N. Cytrynbaum, Vincent MacKay, et al. Double-wave reentry in excitable media. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 29(7):073103, 2019
Undergraduate work

Talks

Conference talks

1. National Radio Science Meeting *Boulder, CO, USA, 2023*
   "An Ultra-Wideband, Low-Loss, Low-Cost Feed Design for Large-N, Small-D Observatories, and Implementation on CHORD"
2. URSI Atlantic Radio Science Meeting *Gran Canaria, Spain, 2022*
   "Hardware Design and Array Layout for CHORD: the Canadian Hydrogen Observatory and Radio-transient Detector"
3. National Radio Science Meeting *Boulder, CO, USA, 2022**
   "Design Considerations for CHORD: the Canadian Hydrogen Observatory and Radio-transient Detector"
4. Science at Low Frequencies Conference *Fully online conference, 2020*
   "The Canadian Hydrogen Observatory and Radio-transient Detector (CHORD): Feed and Dish Design and Trade-offs"
5. IEEE AP-S/URSI Conference *Montréal, QC, Canada, 2020**
   "A Miniaturized Ultra-Wideband, Low-Loss, Low-Cost Feed for Astrophysics"
6. Society for Mathematical Biology Annual Meeting *Montréal, QC Canada, 2019*
   "Double-wave Reentry in Excitable Media"

Colloquium and seminar talks

7. Astronomy and Space Physics Seminar, Kansas University *Lawrence, KS, USA, 2021**
   "Cosmology and Detection of Radio Transients with CHORD: Science Goals and Design Considerations"
8. Summer colloquium, Department of Physics, University of Toronto *Toronto, ON Canada, 2020**
   "Development of CHORD: the Canadian Hydrogen Observatory and Radio-transient Detector"

Outreach talks

9. Astronomy on Tap NYC: Cosmic Happy Hour *New York, NY, USA, 2022**
   "The Hubble Tension: A Crisis of Cosmic Proportions"
10. Cosmos From Your Couch *Toronto, ON, Canada, 2020**
    "Peeking into the Invisible Universe with Radio Astronomy"

**Remote presentation*

Teaching

Physics Directed Reading Program, University of Toronto

Directed reading program in observational cosmology *2022–2023*

Dunlap Instrumentation Summer School

Workshop: Radio signal detection and the properties of thermal radiation and noise *Summer 2021*

Teaching Assistant, University of Toronto

PHY293: Waves and Modern Physics *Fall 2020, Fall 2022*
PHY250: Electricity and Magnetism *Summer 2022*
PHY294: Quantum and Thermal Physics *Winter 2022*
PHY151: Foundations of Physics I *Fall 2018, Fall 2021*
PHY205: The Physics of Everyday Life *Summer 2021*
PHY491/1491: Current Interpretations of Quantum Mechanics *Winter 2021*
PHY207: The Physics of Music *Winter 2020, Winter 2021*
PHY100: The Magic of Physics *Fall 2019*
PHY132: Introduction to Physics II *Winter 2019*

Community involvement

Member of the organizing committee for the 2021 Dunlap Instrumentation Lectures
Helping organize a week-long virtual lecture series with invited speakers and visiting student researchers

Judge at young scientist competitions
2021 Canada-Wide Science Fair (CWSF)
2021 Canadian Undergraduate Physics Conference (CUPC)

President of the Physics Graduate Student Association 2019-2020
Organizing social activities for physics graduate students, representing them at the graduate student union

Other volunteering activities
Leading lab tours for University of Toronto's AstroTours
Representing the Dunlap Institute at the 2022 Black Excellence in STEM and Medicine (BE-STEMM) conference career fair
Discussing with grade school students on video calls as part of the *Skype a Scientist* program