Michael James Yantovski Barth

Curriculum Vitae

Departement de Physique
Université de Montréal
✉ *michael.barth@umontreal.ca*
Personal Website Link

*Version en français disponible sur demande

Education

2027 (anticip.) **Ph.D in Physics**, Université de Montréal (University of Montreal).
July-September 2025: Mitacs Globalink visiting researcher at University of Oxford

2022 **B.S. in Physics and Astronomy**, *Summa Cum Laude, with honors, Graduate School Preparation Track*, University of Pittsburgh.

2022 **B.A. in Russian**, *Summa Cum Laude*, University of Pittsburgh.

Peer-Reviewed Publications

Publications in each are listed in reverse chronological order. First author publications are in bold. Papers led by a student under close supervision by M.J.Y.B. indicated with an asterisk (*). Note that I publish under the name M. J. Yantovski-Barth to avoid confusion with similar names.

6. **GLAMOR I. A supermassive black hole mass measurement using visibility-space modelling of molecular gas dynamics and flexible stellar mass parametrizations (in prep.)**.
Author list: **M. J. Yantovski-Barth**, Hengyue Zhang, et al.

5. **Neural Deprojection of Galaxy Stellar Mass Profiles**, ML4PS Workshop at 2025 NeurIPS conference, Dec 2025.
Author list: **M. J. Yantovski-Barth**, Hengyue Zhang, et al.
`https://ui.adsabs.harvard.edu/abs/2025arXiv251120746Y/abstract`

4. *IRIS: A Bayesian approach for image reconstruction in radio interferometry with expressive score-based priors (submitted to Astrophysical Journal).
Author list: Noé Dia, **M. J. Yantovski-Barth**, et al.
`https://ui.adsabs.harvard.edu/abs/2025arXiv250102473D/abstract`

3. Caustics: A Python Package for Accelerated Strong Gravitational Lensing Simulations, Journal of Open Source Software, 9(103), 7081, 22 November 2024.
Author list: Connor Stone, Alexandre Adam, Adam Coogan, **M. J. Yantovski-Barth**, et al.
`https://ui.adsabs.harvard.edu/abs/2024JOSS....9.7081S/abstract`

2. **The CluMPR Galaxy Cluster-Finding Algorithm and DESI Legacy Survey Galaxy Cluster Catalogue, MNRAS, 531, 2, Jun 2024.**
Author list: **M. J. Yantovski-Barth**, Jeffrey A. Newman, Biprateep Dey, et al.
`https://ui.adsabs.harvard.edu/abs/2024MNRAS.531.2285Y/abstract`

1. *Bayesian Imaging for Radio Interferometry with Score-Based Priors, ML4PS Workshop at 2023 NeurIPS conference, Dec 2023.
Author list: Noé Dia, **M. J. Yantovski-Barth**, et al.
`https://ui.adsabs.harvard.edu/abs/2023arXiv231118012D/abstract`

Accepted Telescope Observing Proposals

2025 **Co-I, Atacama Large Millimeter/submillimeter Array (ALMA)**, *5.3 hours*, A gas-dynamical SMBH mass measurement at z=4.23: probing the sphere of influence of SPT0113 at 50 pc resolution (PI: Jacob Elford).

2025 **Co-I, Atacama Large Millimeter/submillimeter Array (ALMA)**, *1.1 hours*, First dynamical supermassive black hole mass measurement at z 4: resolving the lensed sphere of influence of ID141 (PI: Hengyue Zhang).

2024 **Co-I, Atacama Large Millimeter/submillimeter Array (ALMA)**, *8.6 hours*, First dynamical supermassive black hole mass measurement at z 4: resolving the sphere of influence of a z=4.24 galaxy (PI: Hengyue Zhang).

Open Source Software

Projects where I contributed greater than 75% of the code development are listed in bold.

1. **SuperMAGE: Superb masses from gas kinematics**. A differentiable, modular gas dynamics simulator for galaxies.
   Tech Stack: `PyTorch, Caskade, VisCube, astropy, numpy, scipy`
   `https://github.com/mjyb16/supermage`
2. **VisCube: Visibility-space gridder for spectral cubes**. Handles radio interferometry data gridding and uncertainty quantification.
   Tech stack: `numpy, scipy, casa, XRADIO`
   `https://github.com/mjyb16/viscube`
3. Caustics: A gravitational lensing simulator for the machine learning era.
   Tech Stack: `PyTorch, Caskade`
   `https://github.com/Ciela-Institute/caustics`

Research Experience

2023-Present **GLAMOR (Gravitational Lensing and Massive Object Recovery): Dynamical SMBH mass measurement in gravitationally lensed galaxies**, University of Montreal and University of Oxford.
Advisors: Yashar Hezaveh, Laurence Perreault-Levasseur, and Martin Bureau

2023-Present **Caustics: GPU-accelerated ray tracing simulations for gravitational lensing**, University of Montreal.
Advisors: Yashar Hezaveh and Laurence Perreault-Levasseur

2019-2024 **CluMPR: A new galaxy cluster-finding algorithm**, University of Pittsburgh, University of Montreal.
Advisor: Jeffrey Newman

2021-2022 **SiRIUS (Simulation of Radio Interferometry from Unique Sources)**, National Radio Astronomy Observatory (NRAO).
Advisors: Jan-Willem Steeb and Andrew McNichols

Research Supervision (Mentoring)

2023-Present **Bayesian Imaging for Radio Interferometry with Score-Based Priors**, University of Montreal.
Co-supervised undergraduate student Noé Dia. Co-supervisors: Alexandre Adam, Yashar Hezaveh, Laurence Perreault-Levasseur

Scholarships and Fellowships

2025 **Mitacs Globalink Research Award**, Competitive grant to support my visiting researcher role at the University of Oxford for the summer.

2024 **Bourse Gilles Beaudet**, Competitive scholarship award for PhD students in the physics department of the University of Montreal.

2024 **Bourse du passage accéléré UdeM**, Competitive scholarship award for successfully transitioning from a masters to PhD on the accelerated track.

2022-Present **Bourse d'exemption UdeM**, Competitive international student scholarship, covers tuition fees.

2022 **Bourse d'excellence du centenaire**, Scholarship warded to a top incoming graduate student in the physics department at University of Montreal.

2022 **Bourse d'excellence des ESP**, Scholarship awarded to a top incoming graduate student in the physics department at University of Montreal.

2020, 2022 **NASA Pennsylvania Space Grant Consortium Research Award**, Undergraduate summer research scholarship.

2021 **NSF (National Science Foundation) Research Experiences for Undergraduates (REU) at NRAO**, Undergraduate summer research scholarship to fund a research internship at the National Radio Astronomy Observatory (NRAO).

2018-22 **University of Pittsburgh Full Tuition Scholarship**.

Presentations (selected)

2025 **Poster presentation, "Neural Deprojection of Galaxy Stellar Mass Profiles"**, *Neural Information Processing Systems conference, Machine Learning for Physical Sciences workshop*, 06 December 2025.

2025 **Talk, "Supermassive black hole mass measurement across cosmic time using visibility-space modelling of molecular gas dynamics and flexible stellar mass parametrizations"**, *Department of Physics, University of Oxford*, 26 September 2025.

2025 **Talk, "Supermassive black hole mass measurement across cosmic time using visibility-space modelling of molecular gas dynamics and flexible stellar mass parametrizations"**, *School of Physics and Astronomy, Cardiff University*, 4 September 2025.

2024 **Talk, "Score-based Bayesian Imaging for Interferometry"**, *Spatio-spectral Modeling of Interferometric Data Workshop, National Radio Astronomy Observatory*, 29 May 2024.

2023 **Poster Presentation, "CluMPR: A new galaxy cluster-finding algorithm"**, *Statistical Challenges in Modern Astronomy VIII*, 13 June 2023.

2022 **Poster Presentation, "CluMPR: A new galaxy cluster-finding algorithm"**, *240th Meeting of the AAS*, 13 June 2022.

2021 **Talk, "SiRIUS: Simulation of Radio Interferometry from Unique Sources"**, *NRAO Summer Student Symposium at Green Bank Observatory*, 2 August 2021.

Professional Service

2025 **Peer reviewer**, *Astronomy & Astrophysics (A&A)*, Reviewed a submitted paper.

2025 **Peer reviewer**, *ICML (International Conference on Machine Learning) ML4Astro Workshop*, Reviewed two papers submitted to the workshop.

2023 **Organizing committee member and instructor**, *Astromatic Hackathon*, University of Montreal.

Professional Development (selected)

2025 **NRAO ALMA Cycle 12 Proposal Preparation workshop**, gave invited talk.

2023 **Statistical Challenges in Modern Astronomy VIII conference and Summer School in Statistics for Astronomers XVIII**, gave poster presentation.

2023 **CRAQ (Center for Research in Astrophysics of Quebec) conference**, gave flash talk.

2022 **NRAO 18th Synthesis Imaging Workshop**.

Community Service

2025 **Invited lecturer**, *Club des Astronomes Amateurs de Rosemère*, French-language outreach talk on cosmology (1 hour).

2023-Present **Organizing committee member**, *Student Symphony Orchestra (OSEUM)*, University of Montreal.

2019-2020 **Public Outreach Volunteer/Guide**, *Buhl Planetarium at the Carnegie Science Center*.

2017-2018 **Public Outreach Volunteer/Guide**, *Observatory at Turner Farm, Great Falls, VA*.

Computer Skills

Programming languages: `Python`, `bash/SLURM`, `git`, `LaTeX`, `XML/HTML/CSS`, `Mathematica`, `Java`, `Swift`, `SQL`

Python Libraries: `PyTorch`, `Dask`, `KeOps`, `Numba`, `Scikit-learn`, `Pandas`, `numpy/scipy`, `astropy/photutils`, `Matplotlib`, `astroalign`

Software: CASA (Common Astronomy Software Applications) radio astronomy data reduction and analysis suite

Languages (self-assessed CEFR level, not tested)

English Native Language

Russian C2 (heritage/native)

French C1

Research Interests

Strong gravitational lensing, supermassive black holes, radio astronomy/interferometry, neural networks/machine learning, Bayesian statistics, galaxy clusters/large scale structure, multiwavelength galaxy surveys, measurement of cosmological parameters, statistical and machine learning methods in cosmology, high-performance computing

Citizenship

U.S. Citizen

Current Canadian status: study permit with work authorization for on- and off-campus work

References

Yashar Hezaveh, Professor, *Department of Physics, University of Montreal*, yashar.hezaveh@umontreal.ca.

Laurence Perreault-Levasseur, Professor, *Department of Physics, University of Montreal*, laurence.perreault.levasseur@umontreal.ca.

Jeffrey Newman, Professor, *Department of Physics and Astronomy, University of Pittsburgh*, janewman@pitt.edu.