



Nathaniel Starkman

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📄 Publications 🔗 arXiv 📄 Zenodo 📄 0000-0003-3954-3291



🏛️ EDUCATION

2018 – 2024	PhD in Astronomy & Astrophysics , University of Toronto 🔗	Toronto, ON, Canada
2014 – 2018	B.S. in Mathematical Physics and Astronomy , Case Western Reserve University 🔗	Cleveland, OH, USA

🏢 PROFESSIONAL APPOINTMENTS

2024 – 2027	Postdoctoral Associate , MIT Kavli Institute for Astrophysics and Space Research 🔗	Cambridge, MA, USA
2021 –	Coordinator (2025 – 2028), Strategic Planner (2025 – 2026) & Core Developer , Astropy 🔗	Remote

📄 GRANTS & FELLOWSHIPS

Feb 2024	Brinson Prize Fellowship , Prize Fellow, Brinson Foundation 🔗	USD 360,000
Jul 2022	Astropy Cycle III Funding Grant 🔗	USD 12,000
Jul 2022	Astropy Cycle III Funding Grants 🔗	USD 8,000
2020 – 2023	NSERC - CGS D 🔗	CAD 105,000
2019 – 2020	NSERC - CGS M 🔗	CAD 17,500
2018 – 2024	University of Toronto Graduate Fellowship , University of Toronto	CAD 23,000–32,000 p.a.

🏆 AWARDS

Jan 2025	AAS Lancelot M. Berkeley–New York Community Trust Prize , American Astronomical Society 🔗, to the Astropy Collaboration
2014 – 2018	Case Western Reserve University Merit Scholarship

📄 PUBLICATIONS

Students I supervised or advised: [undergraduate[†]](#), [graduate[†]](#).

10. **N. Starkman**, J. Nibauer, S. Pearson, [S. Wu[†]](#), L. Necib. *When Streams Curve Away: a Test of Dark Matter from Extragalactic Stellar Stream Populations*. [SUBMITTED](#) 🔗 [arXiv:2609.40057](#)
9. Euclid Collaboration, **N. Starkman**, J. Nibauer, S. Pearson, [S. Wu[†]](#), M. Walmsley, L. Necib, et al. *Euclid Quick Data Release (Q1): The geometry of dark matter halos from extragalactic streams*. *Astronomy & Astrophysics* [SUBMITTED](#) 📄 ADS 🔗 [arXiv:2606.21774](#)
8. [C. Myers[†]](#), **N. Starkman**, L. Necib. *Reconstructing Galactic Gravitational Potentials from Stellar Kinematics with Physics-Informed Neural Networks*. *Monthly Notices of the Royal Astronomical Society* [SUBMITTED](#) 🔗 [ADS](#) 🔗 [arXiv:2606.18386](#) 🔗
7. L. Necib, D. Folsom, E. Y. Davies, **N. Starkman**, A. Thoyas. *Galactic Amnesia: The Information Washout of the Milky Way Merger History*. [SUBMITTED](#) 📄 ADS 🔗 [arXiv:2605.04138](#)
6. **N. Starkman**, J. Nibauer. *phasecurvefit: A High-Performance JAX Framework for Phase-Space Walks with Pluggable Metrics and Strategies*. *Journal of Open Source Software* [SUBMITTED](#) 📄 [pyOpenSci review](#) 🔗
5. [S. Wu[†]](#), **N. Starkman**, S. Pearson, J. Nibauer, J. Miro-Carretero, D. Martinez-Delgado. *Potamides: Mapping Dark Matter Halo Shapes from Stellar Stream Tracks in the Local Universe*. *The Astrophysical Journal* [ACCEPTED](#) 📄 ADS 🔗 [arXiv:2605.07809](#)
4. [S. Wu[†]](#), **N. Starkman**, J. Nibauer, S. Pearson. *Potamides: JAX tools for curvature-based inference from stellar streams*. *Journal of Open Source Software* 11, 10712 📄 [10.21105/joss.10712](#) 🔗

3. J. Nibauer, A. Bonaca, D. N. Spergel, A. M. Price-Whelan, J. E. Greene, **N. Starkman**, et al. *Stream-Sculptor: Hamiltonian Perturbation Theory for Stellar Streams in Flexible Potentials with Differentiable Simulations*. The Astrophysical Journal 983, 68  [10.3847/1538-4357/adb8e8](https://doi.org/10.3847/1538-4357/adb8e8)  ADS  [arXiv:2410.21174](https://arxiv.org/abs/2410.21174)
2. **N. Starkman**, A. M. Price-Whelan, J. Nibauer. *unxt: A Python package for unit-aware computing with JAX*. Journal of Open Source Software 10, 7771  [10.21105/joss.07771](https://doi.org/10.21105/joss.07771)  
1. **N. Starkman**, J. Nibauer, J. Bovy, J. Webb, K. Tavangar, A. Price-Whelan, et al. *Stream Members Only: Data-Driven Characterization of Stellar Streams with Mixture Density Networks*. The Astrophysical Journal 980, 253  [10.3847/1538-4357/ad94f2](https://doi.org/10.3847/1538-4357/ad94f2)  ADS  [arXiv:2311.16960](https://arxiv.org/abs/2311.16960)  

SOFTWARE DEVELOPMENT

phasecurvefit  2026
Paths through phase space

potamides  2026
Constrain gravitational potentials from stellar stream curvature

galax  
Galactic dynamics in JAX

coordinax 
Coordinates in JAX

unxt  2025 
Units in JAX

quax 
Multiple dispatch in JAX

Astropy  2022 
Astronomy in Python

INVITED TALKS

Aug 2026	Marche III: Big Bang, Big Stars, Big Computers (Jesi) Energy Structures of Extragalactic Stellar Streams Reveal Dark Matter Halos	Jesi, Italy
Jun 2026	EAS 26-S10 (Lausanne)  The Geometry of Dark Matter Halos from Extragalactic Streams	Lausanne, Switzerland
Feb 2026	CWRU Seminar (Cleveland) Computationally Unscrambling EGGS (Extra-Galactic Gravity from Streams)	Cleveland, OH, USA
Nov 2025	TevPA (Valencia) The Geometry of Dark Matter Halos from Extragalactic Streams	Valencia, Spain
Oct 2025	DARK seminar (Copenhagen) The Geometry of Dark Matter Halos from Extragalactic Streams	Copenhagen, Denmark
Oct 2025	Texas A&M Seminar (Texas) The Geometry of Dark Matter Halos from Extragalactic Streams	College Station, TX, USA
Sep 2025	CCA Software seminar (NYC) unxt, coordinax, and software development in JAX	New York, NY, USA
Sep 2025	Princeton Thunch Seminar (Princeton)  Euclid: The Geometry of Dark Matter Halos from Extragalactic Streams	Princeton, NJ, USA

MENTORING

May 2026	Reem Hamraz Google Summer of Code for Astropy  Hardening Astropy's core stability
2025 – 2026	Amir Abdul (Howard) Baryon Modeling in External Galaxies with Stellar Streams Leadership Alliance National Symposium, July 23–25, 2025 2025 NSBP-NSHP Joint Annual Conference, November 19–23, 2025 2026 APS Global Physics Summit, March 14–20, 2026
2024 – 2026	Charlotte Myers (MIT) with Prof. Lina Necib (MIT) Physics-Informed Neural Networks for Modeling Galactic Gravitational Potentials NeurIPS Paper

PEER REVIEW

Journals — Astronomy & Astrophysics · The Astrophysical Journal · European Physical Journal C · Monthly Notices of the Royal Astronomical Society · Journal of Open Source Software ([commensurability: a Python package for classifying astronomical orbits based on their toroid volume](#)), Panels — National Science Foundation project funding panel