Katelyn **Breivik**

Flatiron Institute -- Center for Computational Astrophysics

kbreivik@flatironinstitute.org | katiebreivik.github.io

Education

2018	**Ph.D. in Physics and Astronomy** Thesis: Simulating Binary Populations in the Milky Way	*Northwestern University*
2015	**M.S. in Physics and Astronomy**	*Northwestern University*
2012	**B.S. in Physics with Professional Emphasis, Cum Laude**	*Utah State University*

Research Experience

2020 - now	**Flatiron Institute – Center for Computational Astrophysics** Flatiron Research Fellow	*New York City, NY*
2018 - 2020	**Canadian Institute for Theoretical Astrophysics** Postdoctoral Fellow	*Toronto, ON*
2013 - 2018	**Northwestern University** Research Assistant	*Evanston, IL*

Honors & Awards

2019	**Jeffrey L. Bishop Fellowship** Bi-annually awarded to CITA postdoc: $\$3,000$
2017	**Blue Apple Award** Best student talk at the 27th Midwest Relativity Meeting
2017	**NSF GK-12 'Reach for the Stars' Fellowship** Graduate Teaching Fellowship
2017	**Chambliss Astronomy Achievement Award** Honorable Mention, 229th AAS Meeting
2016	**Northwestern Physics & Astronomy Rapid Fire Research** 2nd Place
2014	**Illinois Space Grant Consortium Graduate Fellowship** Award Amount: $\$10,000$
2010	**Undergraduate Teaching Fellowship** Utah State University
2010	**Undergraduate Research and Creative Opportunities (URCO) Grant** Award Amount: $\$2,000$
2008	**Presidential Fellowship - 4 years** Utah State University

Grant and Observing Awards

2021	**Chandra Cycle 23, Co-I** Confirmation of the First Helium Star Stripped by a Black Hole
2020	**Chandra Cycle 22, Co-I** Probing the dark remnant of 2MASS J0521658+4359220
2019	**NASA ROSES-2019, Co-I** Multi-messenger constraints on close binary evolution in the Milky Way

Selected Seminars/Colloquia: 30

Mar 2022	**Harvard University** ITC Colloquium, scheduled	*Cambridge, MA*
Dec 2022	**University of Zurich** Gravitational Waves Seminar Series, scheduled	*Zurich, Switzerland*
Oct 2022	**Johns Hopkins University** Theory Group Seminar, scheduled	*Baltimore, MD*
Jun 2022	**Pontificia Universidad Católica de Chile** Colloquium	*Santiago, Chile – virtual*
Mar 2022	**Michigan State University** Astronomy Seminar	*East Lansing, MI – virtual*
Feb 2022	**AEI MPG** Astrophysics & Cosmological Relativity Seminar	*Potsdam, Germany – virtual*
Jan 2022	**Los Alamos National Lab** Astrophysics Seminar	*Los Alamos, NM – virtual*
Jan 2022	**Ohio State University** Astronomy Colloquium	*Columbus, OH – virtual*
Nov 2021	**University of Wisconsin Milwaukee** CGCA Seminar	*Milwaukee, WI – virtual*
Feb 2021	**University of Oklahoma** Colloquium	*Norman, OK – virtual*
Nov 2020	**University of British Columbia** Astronomy Colloquium	*Vancouver, BC – virtual*
Nov 2019	**KICP - University of Chicago** KICP Seminar	*Chicago, IL*
Oct 2019	**Carnegie Observatories** Colloquium	*Pasadena, CA*
Jun 2018	**NASA GSFC** Astrophysics Colloquium	*Greenbelt, MA*
Dec 2017	**Caltech** TAPIR Seminar	*Pasadena, CA*

Selected Conferences and Workshops: 8 Invited, 16 Contributed

Oct 2022	**KITP program: White Dwarfs** Workshop participant, seminar	*Santa Barbara, CA*
Apr 2022	**KITP program: Accretion and Orbital Evolution in Binaries** Workshop participant, seminar	*Santa Barbara, CA*
Jun 2021	**24th CAPRA Meeting** Invited plenary	*Perimeter Institute, virtual*
May 2021	**2021 Multiband Gravitational-Wave Science Workshop** Invited talk	*Carnegie Mellon, virtual*
Mar 2020	**LISA Sprint** Workshop attendee	*Flatiron Institute*
Jul 2019	**Beginnings and Ends of Double White Dwarfs** Invited talk/workshop	*DARK Institute, NBI*
Dec 2018	**Future by the Future Workshop** Invited talk	*Columbia University*
Oct 2018	**2nd COFI Workshop on GWs** Invited talk	*COFI, Puerto Rico*
Jan 2018	**The architecture of LISA Science Analysis: Imagining the Future** Workshop participant	*Keck Institute*
Oct 2017	**27th Midwest Relativity Meeting** talk; Blue Apple award	*Ann Arbor, MI*
Jan 2017	**AAS 229** Poster, Chambliss Honorable mention	*Grapevine, TX*

Membership and Leadership

Member of the American Astronomical Society (AAS) and the LISA Consortium

LISA Science Interpretation Work Package — *LISA Consortium*

Co-Chair of sub-work package 7.2:

Demography of stellar mass compact objects and electromagnetic counterparts — *May 2019 - present*

Mentoring

Maleah Rhem — *AstroCom NYC; May 2022 - now*

Comparing the formation scenarios of merging binary black holes

Nathalia Torres; co-supervised with Mathieu Renzo — *AstroCom NYC; May 2021 - Sept 2021*

Connecting HMXBs and gravitational wave sources

Sarah Thiele — *UofT SURP; May 2020 - now*

Predicting metallicity-dependent double white dwarf populations observable by LISA; arXiv:2111.13700 — *Current undergrad @ UBC*

Tom Wagg — *Harvard Post-bacc; May 2020 - now*

LEGWORK: a LISA signal-to-noise ratio calculator python package; arXiv:2111.08717 — *Current grad @ UW Seattle*

Eesha Das Gupta; co-supervised with Maria Drout — *Graduate research; May 2020 - now*

Effects of red supergiant winds on binary populations — *Current grad @ University of Toronto*

Chirag Chawla; co-supervised with Sourav Chatterjee — *Graduate research; Feb 2019 - now*

Populations of compact object + luminous companion binaries observable by Gaia; arXiv:2110.05979 — *Current grad @ TIFR Mumbai*

Maryam Esmat — *Senior Thesis; Sep 2020 - June 2021*

Constraining the Galactic electron density with multi-messenger astronomy — *Current grad @ Johns Hopkins*

Amia Ross — *High school intern; Summer 2017*

Populations of double neutron star binaries observable by LISA and LIGO — *Currently attending Harvard*

Michael Bueno; co-supervised with Shane Larson — *REU student; Summer 2016*

Populations of double white dwarf binaries observable by LISA and Gaia; arXiv:1710.08370 — *Masters in Physics from Northwestern*

Teaching Experience

Guest Lectures

University of Toronto (St George and Scarborough campuses)

- Jun 19, 2019: GWs 101 (Summer undergrad research program Astro 101)
- Jan 29, 2019: Introduction to gravitational waves and their detection for upper division undergraduate laboratory course (PHYC 11H3)

Northwestern University

- May 25, 2017: Introduction to gravitational waves for upper division undergraduate astronomy course (Astron 331)
- Nov 11, 2016: Overview of the atomic model for introductory, concept-based physics course (Phys 103)

NSF GK-12 Graduate Teaching Fellow — *2017-2018*

Northwestern/Lake View High School

Created lesson plans on Kepler's Laws designed to bring computational thinking and current astrophysics research to high school classrooms.

Undergraduate Teaching Fellow — *2009 - 2011*

Utah State University

- Phys 2210/2220: Introductory Physics for Physical Sciences

Service, Outreach, and Engagement

Referee for ApJ, ApJL, MNRAS, A&A, JOSS, PRD

Panel reviewer for NASA, NSF, Chandra

International Workshop on AM CVn binaries – AM CVn 4.5 — *Virtual*
Science Organizing Committee — *Aug 2022*

Time domain and Multimessenger Astrophysics NASA Workshop — *Annapolis, MD*
Science Organizing Committee — *Aug 2022*

Gaia DR3 Fête — *NYC, NY*
Local Organizing Committee — *Jun 2022*

From data to software to science with the Rubin observatory LSST — *NYC, NY*
Science Organizing Committee — *Mar 2022*

NYC-wide SDSS-V and Gaia EDR3 Hack Sessions — *NYC, NY*
Co-organizer — *Jun 2021 - present*

dotAstronomy TO — *Toronto, ON*
Science Organizing Committee — *Oct 2019*

UofT Astro-ph coffee & CITA Blackboard Seminar — *University of Toronto*
Co-Organizer — *Sep 2018 - Aug 2020*

CIERA Astronomer Evenings — *Dearborn Observatory*
Founder and Lead Organizer — *Jan 2016 - Aug 2018*

Physics & Astronomy Graduate Student Council — *Evanston, IL*
Astronomy Outreach Committee head, Equity and Inclusion Committee member — *Dec 2015 - May 2018*

General Science Outreach and Education

I'm committed to sharing the work that I do with the public. I have interacted with over 2000 people at more than 25 events across the Toronto, Chicago, and Salt Lake City areas can provide a full list on request. — *2010-Present*

Publications: 29 refereed/under review, h-index: 15

First author: 6

Constraining Galactic structure with the LISA white dwarf foreground — *2020, ApJ, 901, 4*
Breivik, K., Mingarelli, C. M. F., Larson, S. L. — *arXiv: 1912.02200*

COSMIC variance in binary population synthesis — *2020, ApJ, 898, 71*
Breivik, K., Coughlin, S., Zevin, M., et al. — *arXiv: 1911.00903*

Constraining black hole formation with 2M0521 — *2019, ApJ, 878, L4*
Breivik, K., Chatterjee, S., Andrews, J. J. — *arXiv:1810.08206*

Characterizing double white dwarf binaries with LISA and Gaia — *2018, ApJ, 854L 1*
Breivik, K., Kremer, K., Bueno, M., Larson, S. L., Coughlin, S. Kalogera, V. — *arXiv:1710.08370*

Revealing black holes with Gaia — *2017, ApJ, 850, L13*
Breivik, K., Chatterjee, S., Larson, S. L. — *arXiv:1710.04657*

Distinguishing between formation channels for binary black holes with LISA — *2016, ApJ, 830, L18*
Breivik, K., Rodriguez, C. L., Larson, S. L., Kalogera, V., Rasio, F. A. — *arXiv: 1606.0955*

2nd/3rd author: 13

Backward Population Synthesis: Mapping the Evolutionary History of Gravitational-Wave Progenitors — *submitted to AAS Journals*
Wong, K. W. K., **Breivik, K.**, Farr, W. M., Luger, R. — *arXiv:2206.04062*

LEGWORK: The LISA Evolution and Gravitational Wave Orbit Kit — *2022, JOSS, 7, 70*
Wagg, T., **Breivik, K.**, de Mink, S. E.

LEGWORK: A python package for computing the evolution and detectability of stellar-origin gravitational-wave sources with space-based detectors — *2022, ApJS, 260, 52*
Wagg, T., **Breivik, K.**, de Mink, S. E. — *arXiv:2111.087179*

Applying the metallicity-dependent binary fraction to double white dwarf formation: Implications for LISA — *submitted to AAS Journals*
Thiele, S., **Breivik, K.**, Sanderson, R. E. — *arXiv:2111.13700*

Gaia may detect hundreds of well-characterised stellar black holes *2022, ApJ, 931, 107*
Chawla, C., Chatterjee, S., **Breivik, K.**, Andrews, J. J., Moorthy, C. K., Sanderson, R. E. *arXiv:2110.05979*

Weighing the darkness II: Astrometric measurement of partial orbits with Gaia *submitted to AAS Journals*
Andrews, J. J., **Breivik, K.**, Chawla, C., Chatterjee, S., Rodriguez, C. *arXiv:2110.05549*

Joint constraints on the field-cluster mixing fraction, common envelope efficiency, and globular cluster radii from a population of binary hole mergers via deep learning *2021, PRD, 103, 8*
Wong, K. W. K., **Breivik, K.**, Kremer, K., Callister, T. *arXiv:2011.03564*

Weighing in on black hole binaries with BPASS: LB-1 does not contain a 70$M_\odot$ black hole *2020, MNRAS, 495, 3*
Eldridge, J. J., Stanway, E. R., **Breivik, K.**, Casey, A. R., Steeghs, D. T. H., Stevance, H. F. *arXiv:1912.03599*

Eclipses of continuous gravitational waves as a probe of stellar structure *2020, PRD, 101, 024039*
Marchant, P., **Breivik, K.**, Larson, S. L., Mandel, I., Berry, C. P. L. *arXiv:1912.04268*

LISA and the existence of a fast-merging double neutron star formation channel *2020, ApJ, 892L, 9A*
Andrews, J. J., **Breivik, K.**, Pankow, C., D'Orazio, D. J., Safarzadeh, M. *arXiv:1910.13436*

Weighing the darkness: astrometric mass measurement of hidden stellar companions using Gaia *2019, ApJ, 886, 68*
Andrews, J. J., **Breivik, K.**, Chatterjee, S. *arXiv:1909.05606*

LISA sources in Milky Way globular clusters *2018, PRL, 120, 191103*
Kremer, K., Chatterjee, S., **Breivik, K.**, Rodriguez, C. L., Larson, S. L., Rasio, F. A. *arXiv:1802.05661*

Accreting double white dwarf binaries: implications for LISA *2017, ApJ, 846, 2*
Kremer, K., **Breivik, K.**, Larson, S. L., Kalogera, V. *arXiv:1707.0110*

>= 4th author: 10

Rejuvenated accretors have less bound envelopes: Impact of Roche lobe overflow on subsequent common envelope events *submitted to AAS Journals*
Renzo, M., et al. (incl **Breivik, K.**) *arXiv:2206.15338*

Astrophysics with the Laser Interferometer Space Antenna *submitted to LRR*
Amaro Seoane, P., et al. (incl **Breivik, K**) *arXiv:2203.06016*

The effect of mission duration on LISA science objectives *2022, GReGr, 54, 3*
Amaro Seoane, P., Arca Sedda, M., Babak, S., et al. (incl **Breivik, K**) *arXiv:2107.09665*

Modeling dense star clusters in the Milky Way and beyond with the Cluster Monte Carlo code *2022, ApJS, 258, 2*
Rodriguez, C L., Weatherford, N. C., Coughlin, S. C., et al. (incl.**Breivik, K.**) *arXiv:2106.02643*

Gravitational-Wave signatures from compact object binaries in the Galactic center *2021, ApJ, 917, 2*
Wang, H., Stephan, A. P., Naoz, S., Hoang, B., **Breivik, K.** *arXiv:2010.15841*

GPU-accelerated periodic source identification in large-scale surveys: measuring P and $\dot{P}$ *2021, MNRAS, 503, 2*
Katz, M. L., Cooper, O. R., Coughlin, M. W., **Breivik, K.**, Larson, S. L. *arXiv:2006.06866*

The missing link in gravitational-wave astronomy: Discoveries waiting in the decihertz range *2020, CQG, 37, 21*
Arca Sedda, M., Berry, C. P. L., Jani, K., et al. (incl. **Breivik, K.**) *arxiv: 1908.11375*

Stars stripped in binaries – the living gravitational wave sources *2020, ApJ, 904, 1*
Gotberg, Y., Korol, V., Lamberts, A., et al. (incl. **Breivik, K.**) *arXiv:2006.07382*

The fate of binaries in the Galactic center: the mundane and the exotic *2019, ApJ, 878, 58*
Stephan, A. P., Naoz, S., Ghez, A. M., et al. (incl. **Breivik, K.**) *arXiv:1903.00010*

Post-Newtonian dynamics in dense star clusters: BBHs in the LISA band *2019, PRD, 99, 063003*
Kremer, K., Rodriguez, C. L., Amaro-Seoane, P., .et al. (incl. **Breivik, K.**) *arXiv:1802.05661*

White papers: 5 total, 1 co-lead

From Data to Software to Science with the Rubin Observatory LSST
Breivik, K., Connolly, A. J, et al. (alphabetical) *arxiv: 1904.11842*

Populations of black holes in binaries
Maccarone, T. J., et al. (incl. **Breivik, K.**) *arxiv: 1904.11842*

Gravitational wave survey of Galactic ultra compact binaries

Littenberg, T. B., **Breivik, K.**, et al. *arxiv: 1903.05583*

Stellar multiplicity: an interdisciplinary nexus

Breivik, K., Price-Whelan, A. M., et al. *arxiv: 1903.05094*

Multimessenger science opportunities with mHz gravitational waves

Baker, J., et al. (incl. **Breivik, K.**) *arxiv: 1903.04417*