

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

COMPARING THE FORMATION SCENARIOS OF MERGING BINARY BLACK HOLES

NSBP Scholar; May 2022 - Jan 2023

current grad @ University of Kansas

Nathalia Torres; co-supervised with Mathieu Renzo

CONNECTING HMXBs AND GRAVITATIONAL WAVE SOURCES

AstroCom NYC; May 2021 - Sept 2021

Sarah Thiele

PREDICTING METALLICITY-DEPENDENT DOUBLE WHITE DWARF POPULATIONS OBSERVABLE BY LISA; ARXIV:2111.13700

UofT SURP; May 2020 - Sept 2022

Current grad @ Princeton

Tom Wagg

LEGWORK: A LISA SIGNAL-TO-NOISE RATIO CALCULATOR PYTHON PACKAGE; ARXIV:2111.08717

Harvard Post-bacc; May 2020 - now

Current grad @ UW Seattle

Eesha Das Gupta; co-supervised with Maria Drout

EFFECTS OF RED SUPERGIANT WINDS ON BINARY POPULATIONS

Graduate research; May 2020 - now

Current grad @ University of Toronto

Chirag Chawla; co-supervised with Sourav Chatterjee

POPULATIONS OF COMPACT OBJECT + LUMINOUS COMPANION BINARIES OBSERVABLE BY GAIA; ARXIV:2110.05979

Graduate research; Feb 2019 - now

Current grad @ TIFR Mumbai

Maryam Esmat

CONSTRAINING THE GALACTIC ELECTRON DENSITY WITH MULTI-MESSENGER ASTRONOMY

Senior Thesis; Sep 2020 - June 2021

Current grad @ Johns Hopkins

Amia Ross

POPULATIONS OF DOUBLE NEUTRON STAR BINARIES OBSERVABLE BY LISA AND LIGO

High school intern; Summer 2017

Currently attending Harvard

Michael Bueno; co-supervised with Shane Larson

POPULATIONS OF DOUBLE WHITE DWARF BINARIES OBSERVABLE BY LISA AND GAIA; ARXIV:1710.08370

REU student; Summer 2016

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, Nature Astronomy

Panel reviewer for NASA, NSF, Chandra

International Workshop on AM CVn binaries – AM CVn 4.5

SCIENCE ORGANIZING COMMITTEE

Virtual

Aug 2022

Time domain and Multimessenger Astrophysics NASA Workshop

SCIENCE ORGANIZING COMMITTEE

Annapolis, MD

Aug 2022

Gaia DR3 Fête

LOCAL ORGANIZING COMMITTEE

NYC, NY

Jun 2022

From data to software to science with the Rubin observatory LSST

SCIENCE ORGANIZING COMMITTEE

NYC, NY

Mar 2022

NYC-wide SDSS-V and Gaia EDR3 Hack Sessions

CO-ORGANIZER

NYC, NY

Jun 2021 - present

dotAstronomy TO

SCIENCE ORGANIZING COMMITTEE

Toronto, ON

Oct 2019

UofT Astro-ph coffee & CITA Blackboard Seminar

CO-ORGANIZER

University of Toronto

Sep 2018 - Aug 2020

CIERA Astronomer Evenings

FOUNDER AND LEAD ORGANIZER

Dearborn Observatory

Jan 2016 - Aug 2018

Physics & Astronomy Graduate Student Council

ASTRONOMY OUTREACH COMMITTEE HEAD, EQUITY AND INCLUSION COMMITTEE MEMBER

Evanston, IL

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: 35 refereed/under review, h-index: 19

First author: 6

Constraining Galactic structure with the LISA white dwarf foreground

Breivik, K., MINGARELLI, C. M. F., LARSON, S. L.

2020, ApJ, 901, 4

arXiv: 1912.02200

COSMIC variance in binary population synthesis

Breivik, K., COUGHLIN, S., ZEVIN, M., ET AL.

2020, ApJ, 898, 71

arXiv: 1911.00903

Constraining black hole formation with 2M0521

Breivik, K., CHATTERJEE, S., ANDREWS, J. J.

2019, ApJ, 878, L4

arXiv:1810.08206

Characterizing double white dwarf binaries with LISA and Gaia

Breivik, K., KREMER, K., BUENO, M., LARSON, S. L., COUGHLIN, S., KALOGERA, V.

2018, ApJ, 854L 1

arXiv:1710.08370

Revealing black holes with Gaia

Breivik, K., CHATTERJEE, S., LARSON, S. L.

2017, ApJ, 850, L13

arXiv:1710.04657

Distinguishing between formation channels for binary black holes with LISA

Breivik, K., RODRIGUEZ, C. L., LARSON, S. L., KALOGERA, V., RASIO, F. A.

2016, ApJ, 830, L18

arXiv: 1606.0955

2nd/3rd author: 14

Cataclysmic variables are a key population of gravitational wave sources for LISA

SCARINGI, S., Breivik, K., ET. AL.

submitted to MNRAS

Backward Population Synthesis: Mapping the Evolutionary History of Gravitational-Wave Progenitors

WONG, K. W. K., Breivik, K., FARR, W. M., LUGER, R.

submitted to AAS Journals

arXiv:2206.04062

Weighing the darkness II: Astrometric measurement of partial orbits with Gaia

ANDREWS, J. J., Breivik, K., CHAWLA, C., CHATTERJEE, S., RODRIGUEZ, C.

2023, ApJ, 946, 111

arXiv:2110.05549

Applying the metallicity-dependent binary fraction to double white dwarf formation: Implications for LISA

THIELE, S., Breivik, K., SANDERSON, R. E.

2023, ApJ, 945, 162

arXiv:2111.13700

LEGWORK: The LISA Evolution and Gravitational Wave Orbit Kit

WAGG, T., Breivik, K., DE MINK, S. E.

2022, JOSS, 7, 70

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
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
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 $70M_{\odot}$ 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:1707.01110
>= 4th author: 15	
Investigating the Lower Mass Gap with Low Mass X-ray Binary Population Synthesis	submitted to ApJ
SIEGEL, J. C., ET AL. (INCL Breivik, K)	arXiv:2209.06844
Astrophysics with the Laser Interferometer Space Antenna	2023, Living Rev. Rel., 26, 2
AMARO SEOANE, P., ET AL. (INCL Breivik, K)	arXiv:2203.06016
A red giant orbiting a black hole	2023, MNRAS, 521, 4323
EL-BADRY, K., ET AL. (INCL Breivik, K.)	arXiv:2302.07880
TESS Giants Transiting Giants. III. An Eccentric Warm Jupiter Supports a Period-Eccentricity Relation for Giant Planets Transiting Evolved Stars	2023, AJ, 165, 44
GRUNBLATT, S. K., ET AL. (INCL Breivik, K.)	arXiv:2209.06833
A Sun-like star orbiting a black hole	2023, MNRAS, 518, 1057
EL-BADRY, K., ET AL. (INCL Breivik, K.)	arXiv:2209.06833
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
No Peaks without Valleys: The Stable Mass Transfer Channel for Gravitational-wave Sources in Light of the Neutron Star-Black Hole Mass Gap	2022, ApJ, 940, 184
VAN SON, L. A. C. ET AL. (INCL Breivik, K)	arXiv:2209.13609
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

ARCA SEDDA, M., BERRY, C. P. L., JANI, K., ET AL. (INCL. **Breivik, K.**)

2020, CQG, 37, 21

arxiv: 1908.11375

Stars stripped in binaries – the living gravitational wave sources

GOTBERG, Y., KOROL, V., LAMBERTS, A., ET AL. (INCL. **Breivik, K.**)

2020, ApJ, 904, 1

arXiv:2006.07382

The fate of binaries in the Galactic center: the mundane and the exotic

STEPHAN, A. P., NAOZ, S., GHEZ, A. M., ET AL. (INCL. **Breivik, K.**)

2019, ApJ, 878, 58

arXiv:1903.00010

Post-Newtonian dynamics in dense star clusters: BBHs in the LISA band

KREMER, K., RODRIGUEZ, C. L., AMARO-SEOANE, P., .ET AL. (INCL. **Breivik, K.**)

2019, PRD, 99, 063003

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