

Lindheimer postdoctoral fellow | CIERA  
Chair, NANOGrav astrophysics working group  
[LZKelley@northwestern.edu](mailto:LZKelley@northwestern.edu)  
[www.lzkelley.com](http://www.lzkelley.com)  
(510) 325 - 5830

Northwestern University  
1800 Sherman Ave, 8th Floor  
Evanston, IL 60201  
[ciera@northwestern.edu](mailto:ciera@northwestern.edu)  
(847) 491 - 8646

## Research Interests

The interface of gravitational-waves and cosmological environments: trying to understand the origin and evolution of the most energetic objects in the universe.

sources massive black holes, active galactic nuclei, broad line regions, tidal disruption events, neutron stars, gamma ray bursts and kilonovae

tools hydrodynamic simulations, semi-analytic models, statistical inference, pulsar timing arrays, LISA, LIGO-Virgo, large spectroscopic & time-domain surveys

## Education & Positions

- 2018 – **CIERA Linheimer Fellow**, Northwestern University  
*advisor: Claude-Andre Faucher-Giguere*
- 2018 **PhD, Harvard University**, Astronomy & Astrophysics  
*advisor: Lars Hernquist & Laura Blecha*  
Massive Black-Hole Binary Mergers: Dynamics, Environments & Expected Detections
- 2013 **MS, Harvard University**, Astronomy & Astrophysics  
*advisor: Ramesh Narayan & Alexander Tchekhovskoy*  
Tidal Disruption Events and Magnetic Flux Capture
- 2011 **BS with Honors, UC Santa Cruz**, Astrophysics  
*advisor: Enrico Ramirez-Ruiz*  
Coalescing Compact Binaries: implications for gravitational-wave observations  
**BS with Honors, UC Santa Cruz**, Biology

## Publications [\[ads link\]](#)

28 papers (1000 ref. citations), 10 first-author (300 ref. citations), 3 student-led as primary advisor

- major contribution [kaupy: a python package for kernel density estimation and sampling](#)  
Kelley, L.Z.; *submitted, JOSS:2784*
- [Astrophysics Milestones For Pulsar Timing Array Gravitational Wave Detection](#)  
Pol, N.S.; Taylor, S.R.; Kelley, L.Z.; et al. *submitted, Nat.Ast.*
- [Basic Considerations for the Observability of Kinematically Offset Binary AGN](#)  
Kelley, L.Z.; *MNRAS, accepted*
- [Massive BH Binaries as Periodically-Variable AGN](#)  
Kelley, L.Z.; Haiman, Z.; Sesana, A.; Hernquist, L. *MNRAS, May 2019*
- [Multi-Messenger Astrophysics with Pulsar Timing Arrays](#)  
Kelley, L.Z.; Charisi, M.; Burke-Spolaor, S.; et al. *white paper, Mar 2019*
- [Single sources in the low-frequency gravitational wave sky properties and time to detection by pulsar timing arrays](#)  
Kelley, L.Z.; Blecha, L.; Hernquist, L.; Sesana, A.; Taylor, S. *MNRAS, Jun 2018*
- [the Gravitational Wave Background from Massive Black Hole Binaries in Illustris spectral features and time to detection with pulsar timing arrays](#)  
Kelley, L.Z.; Blecha, L.; Hernquist, L.; Sesana, A.; Taylor, S. *MNRAS, Nov 2017*

- An Open Catalog for Supernova Data  
Guillochon, J.; Parrent, J.; Kelley, L.Z.; Margutti, R. [ApJ](#), Jan 2017
- Massive Black Hole Binary Mergers in Dynamical Galactic Environments  
Kelley, L.Z.; Blecha, L.; Hernquist, L. [MNRAS](#), Oct 2016
- Tidal Disruption and Magnetic Flux Capture  
*Powering a Jet from a Quiescent Black Hole*  
Kelley, L.Z.; Tchekhovskoy, A.; Narayan, R. [MNRAS](#), Oct 2014
- Electromagnetic transients as triggers in searches for gravitational waves  
from compact binary mergers [PRD](#), Jun 2013  
Kelley, L.Z.; Mandel, I.; Ramirez-Ruiz, E.
- The Distribution of Coalescing Compact Binaries in the Local Universe  
*Prospects for Gravitational-Wave Observations* [ApJL](#), Dec 2010  
Kelley, L.Z.; Ramirez-Ruiz, E.; Zemp, M.; Diemand, J.; Mandel, I.
- advisor Massive Black Hole Binary Inspiral And Spin Evolution In A Cosmological Framework  
Sayeb, M.; Blecha, L.; Kelley, L.Z.; et al. *submitted, MNRAS*
- The effect of differential accretion on the Gravitational Wave Background  
and the present day MBH Binary population [MNRAS](#), Aug 2020  
Siwek, M.; Kelley, L.Z.; Hernquist, L.
- Forward-Modeling of Double Neutron Stars:  
*Insights from Highly-Offset Short Gamma-ray Bursts* [MNRAS](#), accepted  
Zevin, M.; Kelley, L.Z.; Nugent, A.; Fong, W.; Berry, C. P. L.; Kalogera, V.
- Probing Massive Black Hole Binary Populations with LISA [MNRAS](#), Jan 2020  
Katz, M.; Kelley, L.Z.; Dosopoulou, F.; Berry, S.; Blecha, L.; Larson, S.
- moderate contribution The NANOGrav 12.5-year Data Set:  
*Search For An Isotropic Stochastic Gravitational-Wave Background* [ApJLetters](#), submitted  
the NANOGrav Collaboration (Arzoumanian, Z.; et al.)
- The Astrophysics of Nanohertz Gravitational Waves  
Burke-Spolaor, S.; Taylor, S.R.; Charisi, M.; et al. [A&AR](#), Jun 2019
- The IllustrisTNG Simulations: Public Data Release  
Nelson, D.; Springel, V.; Pillepich, A.; et al. [CA&C](#), May 2019
- Testing the binary hypothesis:  
*pulsar timing constraints on supermassive black hole binary candidates* [ApJ](#), Mar 2017  
Sesana, A.; Haiman, Z.; Kocsis, B.; Kelley, L.Z.;
- Recoiling black holes: prospects for detection  
and implications of spin alignment [MNRAS](#), Feb 2016  
Blecha, L.; Sijacki, D.; Kelley, L.Z.; Torrey, P.; Vogelsberger, M.; et al.
- Swift J1644+57 gone MAD: *the case for dynamically-important magnetic flux  
threading the black hole in a jetted tidal disruption event* [MNRAS](#), Jan 2014  
Tchekhovskoy, A.; Metzger, B.D.; Giannios, D.; Kelley, L.Z.
- collaboration Multimessenger Gravitational-wave Searches with Pulsar Timing Arrays:  
Application to 3C 66B Using the NANOGrav 11-year Data Set [ApJ](#), Sep 2020  
the NANOGrav collaboration (Arzoumanian, Z.; et al.)
- Modeling the Uncertainties of Solar System Ephemerides for Robust  
Gravitational-wave Searches with Pulsar-timing Arrays  
Vallisneri, M.; et al. (the NANOGrav collaboration) [ApJ](#), Apr 2020
- The NANOGrav 11 yr Data Set: Evolution of  
Gravitational-wave Background Statistics  
Hazboun, J.; et al. (the NANOGrav collaboration) [ApJ](#), Feb 2020

The NANOGrav 11 yr Data Set: Limits on Gravitational Wave Memory  
the NANOGrav collaboration (Aggarwal, K.; et al.) ApJ, Jan 2020

The NANOGrav 11-Year Data Set: *Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries*  
the NANOGrav Collaboration (Aggarwal, K.; et al.) ApJ, Jul 2019

Supermassive Black-hole Demographics & Environments With Pulsar Timing Arrays  
Taylor, S.R.; Burke-Spolaor, S.; Baker, P.T.; et al. white paper, Mar 2019

## Funding & Awards

2019	AAG (Co-PI, 1910209) <i>Impacts of massive black hole formation and evolution pathways on Gravitational Wave sources</i>	NSF
	ATP (Collaborator, 19-ATP19-0031) <i>Probing the AGN/Galaxy Connection with a Novel, Explicit Feedback Implementation</i>	NASA
2018	Lindheimer Fellowship	Northwestern
2011	Smith Family Graduate Science and Engineering Fellowship Kenneth and Ann Thimann Scholarship Dean's Award, Chancellor's Award Steck Award - <i>best undergraduate senior thesis</i>	Harvard UCSC

## Talks & Presentations

	<i>*non-invited contributions</i>		
2021	<i>Special Session, American Astronomical Society</i>	<i>remote</i>	<i>Jan</i>
2020	Physics & Astronomy Colloquium, Vanderbilt	Nashville, TN	Oct 30
2019	CGCA Seminar, UWM	Milwaukee, WI	Oct 04
	TAPIR Seminar, Caltech	Pasadena, CA	Jun 13
	NANOGrav Meeting, U.W. Bothell	Bothell, WA	Mar 29
	Astrophysics Seminar, U. Florida	Gainesville, FL	Feb 27
	*Astrophysics with GW Populations	Aspen, CO	Feb 12
	Brown Bag Seminar, Northwestern	Evanston, IL	Jan 29
	*AAS Thesis Talk	Seattle, WA	Jan 07
2018	Astronomy Seminar, U. Connecticut	Storrs, CT	Apr 25
	Theoretical Astrophysics Seminar, U. Florida	Gainesville, FL	Apr 18
	LISA Consortium Special Seminar	remote	Oct 09
	*Joint Galaxies Meeting, U. Chicago	Chicago, IL	Sep 14
	*LISA Symposium	Chicago, IL	Jul 12
2017	*NANOGrav Meeting, Lafayette	Lafayette, PA	Nov 09
	*Kavli Meeting, Niels Bohr Institute	Copenhagen, Denmark	Aug 14
	HPC Meeting - keynote lecture, U. Mass Amherst	Amherst, MA	May 25
	*CosmoFest, Harvard CfA	Cambridge, MA	May 22
	*NANOGrav Meeting, WVU	Morgantown, WV	Apr 21
	ITC Luncheon, Harvard CfA	Cambridge, MA	Apr 13
	ITC Lunch Seminar, Harvard CfA	Cambridge, MA	Mar 01
	*The Dawning Era of GW Astrophysics	Aspen, CO	Feb 09

2016	TAPIR Seminar, Caltech	Pasadena, CA	Dec 02
	Astronomy Lunch Talk, UC Berkeley	Berkeley, CA	Dec 01
	Cosmology Group Seminar, LBNL	Berkeley, CA	Nov 29
	Kavli Seminar, MIT	Cambridge, MA	Nov 07
	Astrophysics Seminar, Colombia	New York, NY	Sep 29
	Astrophysics Luncheon, IAS	Princeton, NJ	Sep 29
	HEAD Seminar, Harvard CfA	Cambridge, MA	Aug 14
	Radio/Millimeter/Submillimeter Science Futures II	Baltimore, MD	Aug 08
	NANOGrav Meeting, CalTech	Pasadena, CA	Mar 17
2013	Astrophysics Seminar, University of Birmingham	Birmingham, UK	Aug 15
2012	LIGO (LSC) Special Seminar	remote	Sep 28
2011	Astrophysics Seminar, MIT Kavli	Cambridge, MA	Jan 24

## Advising

---

graduate	Michael Zevin (Northwestern, PI: Kalogera)	2019 – 2020
	Michael Bueno (Northwestern, PI: Larson)	2019 – 2020
	Michael Katz (Northwestern, PI: Larson)	2018 – 2019
	Magdalena Siwek (Harvard, PI: Hernquist)	2018 –
	Mohammad Sayeb (UF Gainesville, PI: Blecha)	2018 –
undergrad	Katherine Cella (Vanderbilt, PI: Taylor)	2020 –
	Estephani TorresVillanueva (Northwestern REU, PI: Faucher-Giguere)	Summer 2020
	Sophia Taylor (Northwestern REU, PI: Faucher-Giguere)	Summer 2019
	Tenley Hutchinson (Harvard Banneker Institute, PI: Johnson)	Summer 2017
mentor	graduate student mentor, Northwestern Physics & Astronomy	2018 – 2019
	summer student mentor, Harvard Banneker & Aztlán Institutes	2015 – 2016
	graduate student mentor, Harvard Astronomy & Astrophysics	2014 – 2016

## Teaching

---

lecturer	Harvard Banneker and Aztlán Institutes	
	<i>Python For Astrophysics</i>	Summer 2017
	<i>Order of Magnitude Astrophysics</i>	Summer 2016
assistant	Harvard University, Astronomy & Astrophysics	
	Bok Center, distinction in teaching award	Spring 2014
	<i>Astr 16 - Stellar and Planetary Astrophysics (Prof. John Johnson)</i>	Spring 2014
	<i>Astr 17 - High Energy Astrophysics (Prof. Daniel Eisenstein)</i>	Fall 2013
	UC Santa Cruz, Astronomy & Astrophysics	
	<i>Astr 111 - Order of Magnitude Astrophysics (Prof. Enrico Ramirez-Ruiz)</i>	Fall 2010

## Professional Service & Community Impact

service	Chair, NANOGrav Astrophysics Working Group	2020 –
	Northwestern, Physics & Astronomy Equity Committee	2020 –
	AAS Site Visit Team	2019 –
	CIERA, astro-ph/arXiv discussion organizer	2018 –
	SOC: COSPAR 2020, Sydney, Australia	Aug. 2020
	CIERA, REU admissions committee	Jan. 2020
	Volunteer: Adler After Dark / Astronomy on Tap Chicago	Aug. 2019
	SOC: NANOGrav Spring Meeting, UW Bothell	Mar. 2019
	CIERA, REU admissions committee	Jan. 2019
	SOC: Conference for Undergraduate Women in Physics, Northwestern	Jan. 2019
	NANOGrav Equity & Climate Committee	2018 – 2019
	Public Safety Committee, Harvard	2017 – 2018
	Harvard graduate student admissions committee	2015
	Harvard Observing Program for Undergraduates	2014 – 2015
reviewer	Nature Astronomy, ApJ, ApJ Letters, MNRAS, MNRAS Letters HST DDT, NASA FINESST	
data	Kinematically Offset Binary AGN [Data set], <b>Kelley</b> (2020) <a href="https://zenodo.org/record/4068485">zenodo.4068485</a> Illustris & IllustrisTNG public data releases. Nelson <b>et al.</b> 2015, 2018	
software	<i>creator:</i> kalepy, <b>Kelley</b> 2020 <i>contributor:</i> numpy, astropy, matplotlib, and open supernova catalog (OSC)	

## Public Outreach

talks	Supermassive Black Holes, Active Galactic Nuclei & Quasars Astronomy on Tap Chicago	Evanston, IL	Dec 12, 2019
	Active Galactic Nuclei: the Fire at Galaxy Centers Chicago Astronomical Society, Adler Planetarium	Chicago, IL	Oct 08, 2019
	What is Astronomy and being an Astronomer? Jouett Middle School ( <i>AVID classrooms</i> )	Charlottesville, VA	Sep 22, 2019
	The New Era Of Gravitational Wave Astrophysics Pint of Science	Boston, MA	May 23, 2016
	The Era of Gravitational Wave Astrophysics Society of Physics Students, UMass Boston	Boston, MA	Apr 07, 2016
lectures	Gravity, Relativity and Black Holes	Brookline, MA	May 04, 2014
	Light, Relativity and Spacetime		May 18, 2014
	Orbits, Dynamics and Space Travel		Jun 01, 2014
tutoring	Cogitania advanced education program, Brookline, MA		2013 – 2014
	Academic Aptos Tutoring Center, Aptos, CA		2007 – 2009

## References

advisor	<b>Laura Blecha</b> (UF Gainesville; mentor, collaborator) <b>Claude-Andre Faucher-Giguere</b> (Northwestern; postdoc advisor) <b>Lars Hernquist</b> (Harvard; PhD advisor) <b>Enrico Ramirez-Ruiz</b> (UC Santa Cruz; undergraduate advisor)	
collaborator	<b>Wen-fai Fong</b> (Northwestern) <b>Vicky Kalogera</b> (Northwestern) <b>Stephen Taylor</b> (Vanderbilt)	<b>Zoltan Haiman</b> (Columbia) <b>Raffaella Margutti</b> (Northwestern) <b>Sasha Tchekhovskoy</b> (Northwestern)