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## 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

- 2020 – **Chair, Astrophysics Working Group**, NANOGrav Collaboration
- 2018 – **CIERA Linheimer Fellow**, Northwestern University  
*mentor: 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 [\[ads link\]](#)

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

- first-author [kalepy: a python package for kernel density estimation and sampling](#)  
Kelley, L.Z. *submitted, JOSS:2784*
- [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*
- [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* MNRAS, Oct 2014  
Kelley, L.Z.; Tchekhovskoy, A.; Narayan, R.
- 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.
- student-led Astrophysics Milestones For Pulsar Timing Array  
Gravitational Wave Detection  
Pol, N.S.; Taylor, S.R.; Kelley, L.Z.; et al. *submitted, Nat.Ast.*
- 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.
- NANOGrav contributor The NANOGrav 12.5-year Data Set:  
*Search For An Isotropic Stochastic Gravitational-Wave Background* ApJLetters, submitted  
the NANOGrav Collaboration (Arzoumanian, Z.; et al.)
- 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.)
- The NANOGrav 12.5-year Data Set:  
Wideband Timing of 47 Millisecond Pulsars  
Alam, Md. F.; et al. (the NANOGrav collaboration) ApJS, accepted
- The NANOGrav 12.5-year Data Set:  
Observations and Narrowband Timing of 47 Millisecond Pulsars  
Alam, Md. F.; et al. (the NANOGrav collaboration) ApJS, accepted
- 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
- The Astrophysics of Nanohertz Gravitational Waves  
Burke-Spolaor, S.; Taylor, S.R.; Charisi, M.; et al. A&AR, Jun 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](#)
- other works [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.;
- [An Open Catalog for Supernova Data](#)  
Guillochon, J.; Parrent, J.; Kelley, L.Z.; Margutti, R. [ApJ, Jan 2017](#)
- [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.

## Funding & Awards

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

## Talks & Presentations

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- \*non-invited contributions*
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|------|---|-----------------|------------|
| 2021 | <i>Special Session, American Astronomical Society</i> | <i>remote</i>   | <i>Jan</i> |
| 2020 | Physics & Astronomy Seminar, 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 & Aztlan Institutes	2015 – 2016
	graduate student mentor, Harvard Astronomy & Astrophysics	2014 – 2016

## Teaching

lecturer	Harvard Banneker and Aztlan 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

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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
	LOC: Conf. for Undergrad Women in Physics (CUWiP), Northwestern	Jan. 2019
	NANOGrav Equity & Climate Committee	2018 – 2019
	University-wide 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> <i>subm.</i> <i>contributor:</i> numpy, astropy, matplotlib, and the open supernova catalog (Guillochon, Parrent, <b>Kelley</b> et al. 2017)	

## Public Outreach

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talks	The Astrophysics of Supermassive Black Holes NANOStars, Undergraduate Telecon	remote	Nov 20, 2020
	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

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advisor    **Laura Blecha** (UF Gainesville; mentor, collaborator)  
            **Claude-Andre Faucher-Giguere** (Northwestern; postdoctoral mentor)  
            **Lars Hernquist** (Harvard; PhD advisor)  
            **Enrico Ramirez-Ruiz** (UC Santa Cruz; undergraduate advisor)

collaborator **Wen-fai Fong** (Northwestern)                      **Zoltan Haiman** (Columbia)  
                    **Vicky Kalogera** (Northwestern)                      **Raffaella Margutti** (Northwestern)  
                    **Stephen Taylor** (Vanderbilt; NANOGrav)                      **Sasha Tchekhovskoy** (Northwestern)

NANOGrav **Scott Ransom** (NRAO, UVA; NANOGrav chair)  
                    **Maura McLaughlin** (WVU; NANOGrav former chair)