

# Michael J. Zevin || Curriculum Vitae

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NHFP postdoctoral fellow with research interests in gravitational waves, compact objects, and stellar evolution.

## Education

### Academic Qualifications .....

#### Northwestern University

Evanston, IL

Ph.D., September 2020

M.Sc., December 2016

Program: Physics and Astronomy

Certificates: Integrated Data Science

Thesis: Unveiling the Lives and Deaths of Stars through Compact Object Mergers

Advisor: Vicky Kalogera

#### University of Illinois

Champaign, IL

B.S., May 2012

Majors: Astronomy, Physics

Minor: Music Performance

### Fellowships .....

- ▷ NASA Hubble Fellowship Program: Hubble Postdoctoral fellow 2020–present
- ▷ Zhengtong/Enrico Fermi Postdoctoral Fellow 2020–present
- ▷ KICP Postdoctoral Fellow 2020–present
- ▷ NSF IDEAS Fellowship 2016–2020
- ▷ Illinois Space Grant Consortium Fellowship 2017–2020
- ▷ NSF GK12 Fellowship 2017–2018
- ▷ Oxford Centre for Cosmological Studies Balzan Fellowship<sup>1</sup> 2018
- ▷ Kavli Summer Fellowship<sup>2</sup> 2017

## Publications

### First Author & Chaired Papers (with links) .....

#### Observational Inference on the Delay Time Distribution of Short Gamma-ray Bursts

ApJL

[M. Zevin](#), A. Nugent, S. Adhikari, W.-f. Fong, D. Holz, L. Kelley

2022

The Astrophysical Journal Letters **940** L18

Citations: 5

#### Avoiding a Cluster Catastrophe: Retention Efficiency and the Binary Black Hole Mass Spectrum

ApJL

[M. Zevin](#), D. Holz

2022

The Astrophysical Journal Letters **935** L20

Citations: 7

#### Suspicious Siblings: The Distribution of Mass and Spin Across Component Black Holes in Isolated Binary Evolution

ApJ

2022

[M. Zevin](#), S. Bavera

The Astrophysical Journal **933** 86

<sup>1</sup>Research Advisor: Dr. Chris Lintott (New College, University of Oxford)

<sup>2</sup>Research Advisor: Dr. Enrico Ramirez-Ruiz (University of California Santa Cruz)

Citations: 22

**Implications of Eccentric Observations on Binary Black Hole Formation Channels** ApJL  
2021

[M. Zevin](#), I. Romero-Shaw, K. Kremer, E. Thrane, P. Lasky

The Astrophysical Journal Letters **921**, L43

Citations: 24

**One Channel to Rule Them All? Constraining the Origins of Binary Black Holes using Multiple Formation Pathways** ApJ  
2021

[M. Zevin](#), S. Bavera, C. Berry, V. Kalogera, T. Fragos, P. Marchant, C. Rodriguez, F. Antonini, D. Holz, C. Pankow

The Astrophysical Journal **910**, 152

Citations: 146

**Forward Modeling of Double Neutron Stars: Insights from Highly-Offset Short Gamma-ray Bursts** ApJ  
2020

[M. Zevin](#), L. Kelley, A. Nugent, W.-f. Fong, C. Berry, V. Kalogera

The Astrophysical Journal **904**, 190

Citations: 13

**Exploring the Lower Mass Gap and Unequal Mass Regime in Compact Binary Evolution** ApJL  
2020

[M. Zevin](#), M. Spera, C. Berry, V. Kalogera

The Astrophysical Journal Letters **899**, L1

Citations: 94

**You Can't Always Get What You Want: The Impact of Prior Assumptions on Interpreting GW190412** ApJL  
2020

[M. Zevin](#), C. Berry, S. Coughlin, K. Chatziioannou, S. Vitale

The Astrophysical Journal Letters **899**, L17

Citations: 46

**Can Neutron-Star Mergers Explain the r-process Enrichment in Globular Clusters?** ApJ  
2019

[M. Zevin](#), K. Kremer, D. M. Siegel, S. Coughlin, B. T.-H. Tsang, C. P. L. Berry, V. Kalogera

The Astrophysical Journal **886**, 1

Citations: 29

**Eccentric Black Hole Mergers in Dense Star Clusters: The Role of Binary-Binary Encounters** ApJ  
2019

[M. Zevin](#), J. Samsing, C. L. Rodriguez, C. J. Haster, E. Ramirez-Ruiz

The Astrophysical Journal **871**, 91

Citations: 144

– Covered by AAS Nova

**On the Progenitor of Binary Neutron Star Merger GW170817** ApJL  
2017

The LIGO Scientific Collaboration and Virgo Collaboration<sup>3</sup>

The Astrophysical Journal Letters **850**, L40

Citations: 71

**Constraining Formation Models of Binary Black Holes with Gravitational-Wave Observations** ApJ  
2017

[M. Zevin](#), C. Pankow, C. Rodriguez, L. Sampson, E. Chase, V. Kalogera, F. Rasio

The Astrophysical Journal **846**, 82

Citations: 129

**Gravity Spy: Integrating Advanced LIGO Detector Characterization, Machine Learning, and Citizen Science** CQG  
2017

[M. Zevin](#), S. Coughlin, S. Bahaadini, et al.

Classical and Quantum Gravity **34**, 064003

Citations: 142

– Covered by AAS Press

## Highlighted Contributed Papers .....

**Inferring Interference: Identifying a Perturbing Tertiary with Eccentric Gravitational Wave Burst Timing** 2022

I. Romero-Shaw, N. Loutrel, [M. Zevin](#)

The Astrophysical Journal (submitted), arxiv:2211.07278

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<sup>3</sup>[M. Zevin](#): Chair of paper-writing team and analysis lead

Citations: 0

- The Missing Link Between Black Holes in High-Mass X-ray Binaries and Gravitational-Wave Sources: Observational Selection Effects** 2022  
*C. Liotine, M. Zevin, C. Berry, Z. Doctor, V. Kalogera*  
The Astrophysical Journal (submitted), arxiv:2210.01825  
Citations: 1
- Cosmologically coupled compact objects: a single parameter model for LIGO–Virgo mass and redshift distributions** ApJL 2021  
*K. Croker, M. Zevin, D. Farrah, K. Nishimura, G. Tarle*  
The Astrophysical Journal Letters **922**, L22  
Citations: 7
- The Impact of Mass-Transfer Physics on the Observable Properties of Field Binary Black Hole Populations** A&A 2021  
*S. Bavera, T. Fragos, M. Zevin, et al.*  
Astronomy & Astrophysics **647**, 153  
Citations: 74
- Approximations to the spin of close Black-hole–Wolf-Rayet binaries** RNAAS 2021  
*S. Bavera, M. Zevin, T. Fragos*  
Research Notes of the American Astronomical Society **5** 127  
Citations: 10
- GW190412: Observation of a Binary-Black-Hole Coalescence with Asymmetric Masses** PRD 2020  
The LIGO Scientific Collaboration and Virgo Collaboration<sup>4</sup>  
Physical Review D **102**, 043015  
Citations: 433
- COSMIC Variance in Binary Population Synthesis** ApJ 2019  
*K. Breivik, S. Coughlin, M. Zevin, et al.*  
The Astrophysical Journal **898**, 71  
Citations: 130
- Black Holes: The Next Generation** PRD 2019  
*C. Rodriguez, M. Zevin, P. Amaro-Seoane, S. Chatterjee, K. Kremer, F. A. Rasio, C. S. Ye*  
Physical Review D **100**, 043027  
Citations: 182
- Illuminating Black Hole Binary Formation Channels with Spins in Advanced LIGO** ApJL 2016  
*C. Rodriguez, M. Zevin, C. Pankow, V. Kalogera, F. A. Rasio*  
The Astrophysical Journal Letters **832**, L2  
Citations: 213

## Contributed Papers (with links).....

- Data quality up to the third observing run of Advanced LIGO: Gravity Spy glitch classifications** 2022  
*J. Glanzer, S. Banagiri, S. Coughlin, S. Soni, C. Berry, M. Zevin, et al.*  
Classical and Quantum Gravity (submitted), arXiv: 2208.12849
- Intermediate-mass Black Holes on the Run from Young Star Clusters** 2022  
*E. Gonzalez, K. Kremer, G. Fragione, M. Martinez, N. Weatherford, M. Zevin, F. Rasio*  
The Astrophysical Journal (submitted), arXiv: 2208.07881
- Discriminative Dimensionality Reduction using Deep Neural Networks for Clustering of LIGO Data** 2022  
*S. Baahadini, Y. Wu, S. Coughlin, M. Zevin, A. Katsaggelos*  
IEEE Transactions on Neural Networks and Learning Systems (submitted), arXiv: 2205.13672
- Short GRB Host Galaxies II: A Legacy Sample of Redshifts, Stellar Population Properties, and Implications for their Neutron Star Merger Origins** 2022  
*A. Nugent, W.-f. Fong, Y. Dong, J. Leja, E. Berger, M. Zevin, et al.*

<sup>4</sup>M. Zevin: Paper-writing team, populations and astrophysical implications lead

The Astrophysical Journal (accepted), arXiv: 2206.01764

**Black hole - black hole total merger mass and the origin of LIGO/Virgo sources**  
*K. Belczynski, Z. Doctor, [M. Zevin](#), A. Olejak, S. Banerjee, D. Chattopadhyay* 2022  
The Astrophysical Journal **935**, 126

**The  $\chi_{\text{eff}} z$  correlation of field binary black hole mergers and how 3G gravitational-wave detectors can constrain it**  
*S.S. Bavera, M. Fishbach, [M. Zevin](#), E. Zapartas, T. Fragos* 2022  
Astronomy & Astrophysics **665**, A59

**POSYDON: A General-Purpose Population Synthesis Code with Detailed Binary-Evolution Simulations**  
*T. Fragos, J.J. Andrews, S.S. Bavera, . . . , [M. Zevin](#)* 2021  
The Astrophysical Journal Supplements (submitted)  
arXiv: 2202.05892

**Stochastic gravitational-wave background as a tool to investigate multi-channel astrophysical and primordial black-hole mergers** A&A 2022  
*S. Bavera, G. Franciolini, G. Cusin, A. Riotto, [M. Zevin](#), T. Fragos*  
Astronomy & Astrophysics **660**, 26

**Probing the progenitors of spinning binary black-hole mergers with long gamma-ray bursts** A&A 2022  
*S. Bavera, T. Fragos, E. Zapartas, E. Ramirez-Ruiz, P. Marchant, L. Kelley, [M. Zevin](#), et al.*  
Astronomy & Astrophysics Letters **657**, L8

**Evidence for Hierarchical Black Hole Mergers in the Second LIGO–Virgo Gravitational-Wave Catalog** ApJL 2020  
*C. Kimball, C. Talbot, C. Berry, [M. Zevin](#), E. Thrane, V. Kalogera, et al.*  
The Astrophysical Journal Letters **915**, L35

**The Impact of Mass-Transfer Physics on the Observable Properties of Field Binary Black Hole Populations** A&A 2021  
*S. Bavera, T. Fragos, [M. Zevin](#), C. Berry, P. Marchant, J. Andrews, S. Coughlin, A. Dotter, et al.*  
Astronomy & Astrophysics **647**, 153

**Black hole genealogy: Identifying hierarchical mergers with gravitational waves** ApJ 2020  
*C. Kimball, C. Talbot, C. Berry, M. Carney, [M. Zevin](#), E. Thrane, V. Kalogera*  
The Astrophysical Journal **900**, 177

**Black Hole Mergers from Hierarchical Triples in Dense Star Clusters** ApJ 2020  
*M. Martinez, G. Fragione, K. Kremer, . . . , [M. Zevin](#), S. Naoz, F. A. Rasio*  
The Astrophysical Journal **903**, 67

**Teaching Citizen Scientists to Categorize Glitches using Machine Learning Guided Training** CHB 2020  
*C. Jackson, C. Østerlund, K. Crowston, . . . , [M. Zevin](#)*  
Computers in Human Behavior **105**, 106198

**The Missing Link in Gravitational-Wave Astronomy: Discoveries waiting in the decihertz range** CQG 2020  
*M. Arca Sedda, C. Berry, K. Jani, . . . , [M. Zevin](#)*  
Classical and Quantum Gravity **37**, 215011 (ESA's Voyage 2050 White Paper)

**Knowledge Tracing to Model Learning in Online Citizen Science Projects** IEEE TLT 2019  
*K. Crowston, C. Østerlund, T. Lee, . . . , [M. Zevin](#)*  
IEEE Transactions on Learning Technologies **13**, 1

**Classifying the Unknown: Discovering Novel Gravitational-Wave Detector Glitches using Similarity Learning** PRD 2019  
*S. Coughlin, S. Bahaadini, N. Rohani, [M. Zevin](#), et al.*  
Physical Review D **99**, 082002

**Post-Newtonian Dynamics in Dense Star Clusters: Binary Black Holes in the LISA Band** PRD 2019  
*K. Kremer, C. L. Rodriguez, . . . , [M. Zevin](#)*  
Physical Review D **99**, 063003

**Post-Newtonian Dynamics in Dense Star Clusters: Formation, Masses, and Merger Rates of Highly-Eccentric Black Hole Binaries** PRD 2018  
*C. L. Rodriguez, P. Amaro-Seoane, S. Chatterjee, K. Kremer, F. A. Rasio, J. Samsing, C. S. Ye, [M. Zevin](#)*

- DIRECT: Deep Discriminative Embedding for Clustering of LIGO Data** **ICIP**  
*S. Bahaadini, V. Noroozi, N. Rohani, S. Coughlin, [M. Zevin](#), V. Kalogera, A. K. Katsaggelos* **2018**  
 25th IEEE International Conference on Image Processing Proceedings
- Machine Learning for Gravity Spy: Glitch Classification and Dataset** **ISJ**  
*S. Bahaadini, V. Noroozi, N. Rohani, S. Coughlin, [M. Zevin](#), J. R. Smith, V. Kalogera, A. K. Katsaggelos* **2018**  
 Information Sciences Journal **444**, 172
- Improvements in Gravitational-wave Sky Localization with Expanded Networks of Interferometers** **ApJL**  
*C. Pankow, E. A. Chase, S. Coughlin, [M. Zevin](#), V. Kalogera* **2018**  
 The Astrophysical Journal Letters **854**, L25
- Deep Multi-view Models for Glitch Classification** **ICASSP**  
*S. Bahaadini, N. Rohani, S. Coughlin, [M. Zevin](#), V. Kalogera, A. K. Katsaggelos* **2018**  
 IEEE International Conference on Acoustics, Speech, and Signal Processing Proceedings
- Incorporating Current Research into Formal Higher Education Settings using Astrobites** **AJP**  
*N. E. Sanders, S. Kohler, C. Faesi, A. Villar, [M. Zevin](#)* **2017**  
 American Journal of Physics **85**, 741
- Astrophysical Prior Information and Gravitational-Wave Parameter Estimation** **APJ**  
*C. Pankow, L. Sampson, L. Perri, E. A. Chase, S. Coughlin, [M. Zevin](#), V. Kalogera* **2017**  
 The Astrophysical Journal **834**, 154

## Collaboration Papers as part of the LIGO Scientific Collaboration (2015–Present) .....

papers with significant contributions from M. Zevin are marked with footnotes

- All-sky, all-frequency directional search for persistent gravitational waves from Advanced LIGO’s and Advanced Virgo’s first three observing runs
- First joint observation by the underground gravitational-wave detector KAGRA with GEO 600
- Narrowband Searches for Continuous and Long-duration Transient Gravitational Waves from Known Pulsars in the LIGO-Virgo Third Observing Run
- Search for continuous gravitational wave emission from the Milky Way center in O3 LIGO–Virgo data
- Search of the early O3 LIGO data for continuous gravitational waves from the Cassiopeia A and Vela Jr. supernova remnants
- Search for Gravitational Waves Associated with Gamma-Ray Bursts Detected by Fermi and Swift during the LIGO–Virgo Run O3b
- Search for Gravitational Waves Associated with Fast Radio Bursts Detected by CHIME/FRB During the LIGO–Virgo Observing Run O3a
- Constraints on dark photon dark matter using data from LIGO’s and Virgo’s third observing run
- Search for intermediate-mass black hole binaries in the third observing run of Advanced LIGO and Advanced Virgo
- Search for gravitational waves from Scorpius X-1 with a hidden Markov model in O3 LIGO data
- All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO and Advanced Virgo O3 data
- Narrowband searches for continuous and long-duration transient gravitational waves from known pulsars in the LIGO–Virgo third observing run
- Tests of General Relativity with GWTC-3
- All-sky search for short gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run
- Search for Lensing Signatures in the Gravitational-Wave Observations from the First Half of LIGO–Virgo’s Third Observing Run
- All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in LIGO O3 data
- Searches for Gravitational Waves from Known Pulsars at Two Harmonics in the Second and Third LIGO–Virgo Observing Runs
- The population of merging compact binaries inferred using gravitational waves through GWTC-3<sup>5</sup>

<sup>5</sup>[M. Zevin](#): Astrophysical interpretation review lead, code reviewer for high-mass injection set

- GWTC-3: Compact Binary Coalescences Observed by LIGO and Virgo During the Second Part of the Third Observing Run<sup>6</sup>
  - Constraints on the cosmic expansion history from GWTC-3
  - All-sky search for long-duration gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run
  - Constraints from LIGO O3 Data on Gravitational-wave Emission Due to R-modes in the Glitching Pulsar PSR J0537-6910
- Searches for Continuous Gravitational Waves from Young Supernova Remnants in the Early Third Observing Run of Advanced LIGO and Virgo
  - All-sky search for continuous gravitational waves from isolated neutron stars in the early O3 LIGO data
  - Search for subsolar-mass binaries in the first half of Advanced LIGO and Virgo’s third observing run
  - Search for continuous gravitational waves from 20 accreting millisecond X-ray pulsars in O3 LIGO data
- GWTC-2.1: Deep Extended Catalog of Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run
  - Search for anisotropic gravitational-wave backgrounds using data from Advanced LIGO and Advanced Virgo’s first three observing runs
  - Upper limits on the isotropic gravitational-wave background from Advanced LIGO and Advanced Virgo’s third observing run
  - Observation of Gravitational Waves from Two Neutron Star-Black Hole Coalescences
  - Search for Gravitational Waves Associated with Gamma-Ray Bursts Detected by Fermi and Swift During the LIGO-Virgo Run O3a
  - Constraints on Cosmic Strings Using Data from the Third Advanced LIGO-Virgo Observing Run
  - Tests of general relativity with binary black holes from the second LIGO-Virgo gravitational-wave transient catalog
  - Diving below the Spin-down Limit: Constraints on Gravitational Waves from the Energetic Young Pulsar PSR J0537-6910
  - Population Properties of Compact Objects from the Second LIGO-Virgo Gravitational-Wave Transient Catalog
  - Tests of General Relativity with Binary Black Holes from the second LIGO-Virgo Gravitational-Wave Transient Catalog
- GWTC-2: Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run
  - Gravitational-wave Constraints on the Equatorial Ellipticity of Millisecond Pulsars
  - GW190521: A Binary Black Hole Merger with a Total Mass of 150  $M_{\odot}$
  - Prospects for observing and localizing gravitational-wave transients with Advanced LIGO, Advanced Virgo and KAGRA
  - Properties and Astrophysical Implications of the 150  $M$  Binary Black Hole Merger GW190521
  - GW190814: Gravitational Waves from the Coalescence of a 23 Solar Mass Black Hole with a 2.6 Solar Mass Compact Object
  - Optically targeted search for gravitational waves emitted by core-collapse supernovae during the first and second observing runs of advanced LIGO and advanced Virgo
  - GW190412: Observation of a binary-black-hole coalescence with asymmetric masses<sup>7</sup>
  - A Joint Fermi-GBM and LIGO/Virgo Analysis of Compact Binary Mergers from the First and Second Gravitational-wave Observing Runs
  - A guide to LIGO-Virgo detector noise and extraction of transient gravitational-wave signals
  - Model comparison from LIGO-Virgo data on GW170817’s binary components and consequences for the merger remnant
  - Search for gravitational waves from Scorpius X-1 in the second Advanced LIGO observing run with an improved hidden Markov model
  - Open data from the first and second observing runs of Advanced LIGO and Advanced Virgo
  - Tests of general relativity with the binary black hole signals from the LIGO-Virgo catalog GWTC-1
  - Search for Gravitational-wave Signals Associated with Gamma-Ray Bursts during the Second Observing Run of Advanced LIGO and Advanced Virgo
  - Search for Subsolar Mass Ultracompact Binaries in Advanced LIGO’s Second Observing Run
  - Search for Eccentric Binary Black Hole Mergers with Advanced LIGO and Advanced Virgo during Their First and Second Observing Runs

<sup>6</sup>M. Zevin: Parameter estimation section review lead

<sup>7</sup>M. Zevin: Paper-writing team, populations and astrophysical implications lead, education and public outreach liaison



- Search for intermediate mass black hole binaries in the first and second observing runs of the Advanced LIGO and Virgo network<sup>8</sup>
- Directional limits on persistent gravitational waves using data from Advanced LIGO’s first two observing runs
- Search for the isotropic stochastic background using data from Advanced LIGO’s second observing run
- Binary Black Hole Population Properties Inferred from the First and Second Observing Runs of Advanced LIGO and Advanced Virgo<sup>9</sup>
- A gravitational-wave measurement of the Hubble constant following the second observing run of Advanced LIGO and Virgo
- GWTC-1: A Gravitational-Wave Transient Catalog of Compact Binary Mergers Observed by LIGO and Virgo during the First and Second Observing Runs
- Tests of General Relativity with GW170817
- All-sky search for short gravitational-wave bursts in the second Advanced LIGO and Advanced Virgo run
- All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO O2 data
- Searches for Gravitational Waves from Known Pulsars at Two Harmonics in 2015–2017 LIGO Data
- Narrow-band search for gravitational waves from known pulsars using the second LIGO observing run
- All-sky search for long-duration gravitational-wave transients in the second Advanced LIGO observing run
- First Measurement of the Hubble Constant from a Dark Standard Siren using the Dark Energy Survey Galaxies and the LIGO/Virgo Binary-Black-hole Merger GW170814
- Low-latency Gravitational-wave Alerts for Multimessenger Astronomy during the Second Advanced LIGO and Virgo Observing Run
- Search for Gravitational Waves from a Long-lived Remnant of the Binary Neutron Star Merger GW170817
- Searches for Continuous Gravitational Waves from 15 Supernova Remnants and Fomalhaut b with Advanced LIGO
- Search for Transient Gravitational-wave Signals Associated with Magnetar Bursts during Advanced LIGOs Second Observing Run
- Constraining the p-Mode–g-Mode Tidal Instability with GW170817
- Properties of the Binary Neutron Star Merger GW170817
- A Fermi Gamma-Ray Burst Monitor Search for Electromagnetic Signals Coincident with Gravitational-wave Candidates in Advanced LIGO’s First Observing Run
- Search for Multimessenger Sources of Gravitational Waves and High-energy Neutrinos with Advanced LIGO during Its First Observing Run, ANTARES, and IceCube
- Search for Substellar-Mass Ultracompact Binaries in Advanced LIGO’s First Observing Run
- GW170817: Measurements of Neutron Star Radii and Equation of State
- Search for Tensor, Vector, and Scalar Polarizations in the Stochastic Gravitational-Wave Background
- Full band all-sky search for periodic gravitational waves in the O1 LIGO data
- Constraints on cosmic strings using data from the first Advanced LIGO observing run
- Prospects for observing and localizing gravitational-wave transients with Advanced LIGO, Advanced Virgo and KAGRA
- GW170817: Implications for the Stochastic Gravitational-Wave Background from Compact Binary Coalescences
- Effects of data quality vetoes on a search for compact binary coalescences in Advanced LIGOs first observing run
- All-sky search for long-duration gravitational wave transients in the first Advanced LIGO observing run
- First Search for Nontensorial Gravitational Waves from Known Pulsars
- First narrow-band search for continuous gravitational waves from known pulsars in advanced detector data
- First low-frequency Einstein@Home all-sky search for continuous gravitational waves in Advanced LIGO data
- GW170608: Observation of a 19 Solar-mass Binary Black Hole Coalescence
- Search for Post-merger Gravitational Waves from the Remnant of the Binary Neutron Star Merger GW170817
- Estimating the Contribution of Dynamical Ejecta in the Kilonova Associated with GW170817
- Search for High-energy Neutrinos from Binary Neutron Star Merger GW170817 with ANTARES, IceCube, and the Pierre Auger Observatory
- On the Progenitor of Binary Neutron Star Merger GW170817<sup>10</sup>
- A gravitational-wave standard siren measurement of the Hubble constant
- Gravitational Waves and Gamma-Rays from a Binary Neutron Star Merger: GW170817 and GRB 170817A
- Multi-messenger Observations of a Binary Neutron Star Merger

<sup>8</sup>M. Zevin: Parameter estimation lead for highest-significance IMBH trigger

<sup>9</sup>M. Zevin: Education and public outreach liaison

<sup>10</sup>M. Zevin: Paper-writing chair and analysis lead

- GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral<sup>11</sup>
- GW170814: A Three-Detector Observation of Gravitational Waves from a Binary Black Hole Coalescence
- All-sky search for periodic gravitational waves in the O1 LIGO data
- Upper Limits on Gravitational Waves from Scorpius X-1 from a Model-based Cross-correlation Search in Advanced LIGO Data
- Search for high-energy neutrinos from gravitational wave event GW151226 and candidate IVT151012 with ANTARES and IceCube
- Search for intermediate mass black hole binaries in the first observing run of Advanced LIGO
- GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2
- Search for gravitational waves from Scorpius X-1 in the first Advanced LIGO observing run with a hidden Markov model
- Search for Gravitational Waves Associated with Gamma-Ray Bursts during the First Advanced LIGO Observing Run and Implications for the Origin of GRB 150906B
- Effects of waveform model systematics on the interpretation of GW150914
- Search for continuous gravitational waves from neutron stars in globular cluster NGC 6544
- First Search for Gravitational Waves from Known Pulsars with Advanced LIGO
- Directional Limits on Persistent Gravitational Waves from Advanced LIGO's First Observing Run
- Upper Limits on the Stochastic Gravitational-Wave Background from Advanced LIGO's First Observing Run
- Calibration of the Advanced LIGO detectors for the discovery of the binary black-hole merger GW150914
- All-sky search for short gravitational-wave bursts in the first Advanced LIGO run
- Exploring the sensitivity of next generation gravitational wave detectors
- The basic physics of the binary black hole merger GW150914
- Supplement: The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914 (2016, ApJL, 833, L1)
- The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914
- Upper Limits on the Rates of Binary Neutron Star and Neutron Star-Black Hole Mergers from Advanced LIGO's First Observing Run
- Results of the deepest all-sky survey for continuous gravitational waves on LIGO S6 data running on the Einstein@Home volunteer distributed computing project
- First targeted search for gravitational-wave bursts from core-collapse supernovae in data of first-generation laser interferometer detectors
- Binary Black Hole Mergers in the First Advanced LIGO Observing Run
- Improved Analysis of GW150914 Using a Fully Spin-Precessing Waveform Model
- Directly comparing GW150914 with numerical solutions of Einstein's equations for binary black hole coalescence
- Comprehensive all-sky search for periodic gravitational waves in the sixth science run LIGO data
- Characterization of transient noise in Advanced LIGO relevant to gravitational wave signal GW150914
- Supplement: Localization and Broadband Follow-up of the Gravitational-wave Transient GW150914 (2016, ApJL, 826, L13)
- Localization and Broadband Follow-up of the Gravitational-wave Transient GW150914
- GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence
- Properties of the Binary Black Hole Merger GW150914
- Tests of General Relativity with GW150914
- High-energy neutrino follow-up search of gravitational wave event GW150914 with ANTARES and IceCube
- Search for transient gravitational waves in coincidence with short-duration radio transients during 2007-2013
- Observing gravitational-wave transient GW150914 with minimal assumptions
- GW150914: First results from the search for binary black hole coalescence with Advanced LIGO
- GW150914: The Advanced LIGO Detectors in the Era of First Discoveries
- GW150914: Implications for the Stochastic Gravitational-Wave Background from Binary Black Holes
- All-sky search for long-duration gravitational wave transients with initial LIGO
- Astrophysical Implications of the Binary Black-hole Merger GW150914
- Observation of Gravitational Waves from a Binary Black Hole Merger
- Prospects for Observing and Localizing Gravitational-Wave Transients with Advanced LIGO and Advanced Virgo

<sup>11</sup>M. Zevin: Education and public outreach liaison



## Presentations

### Invited Talks .....

<b>CITA Seminar</b> <i>Deciphering the Biography of Massive Stars: Compact Object Mergers as a Rosetta Stone</i>	Toronto, CA November 2022
<b>AAS HEAD Meeting</b> <i>One Channel to Rule Them All? Deciphering the Formation Pathways of Compact Object Mergers</i>	Pittsburgh, PA March 2022
<b>Caltech/MIT LIGO–GRITTS Seminar</b> <i>Deciphering the Biography of Massive Stars: Compact Object Mergers as a Rosetta Stone</i>	Virtual June 2021
<b>Fermi Lab Cosmic Physics Center Seminar</b> <i>Deciphering the Biography of Massive Stars: Compact Object Mergers as a Rosetta Stone</i>	Virtual May 2021
<b>Yale Astronomy Colloquium</b> <i>Deciphering the Biography of Massive Stars: Compact Object Mergers as a Rosetta Stone</i>	Virtual April 2021
<b>University of Chicago Astro Lunch Seminar</b> <i>Unveiling the Lives and Deaths of Stars through Compact Object Mergers</i>	Virtual January 2021
<b>Zooniverse Transient Workshop</b> <i>Gravity Spy: Leveling Up &amp; Training Volunteers using Machine Learning</i>	Virtual November 2020
<b>CE Explorer Panel</b> <i>Binary Formation, panelist</i>	Virtual October 2020
<b>Perimeter Institute Strong Gravity Seminar</b> <i>Deciphering the Landscape of Compact Binary Formation Channels</i>	Waterloo, ON December 2019
<b>AEI Seminar</b> <i>Deciphering the Landscape of Compact Binary Formation Channels</i>	Postdam, DE December 2019
<b>Caltech TAPIR Seminar</b> <i>Deciphering the Landscape of Compact Binary Formation Channels</i>	Pasadena, CA November 2019
<b>UCLA Lunch Talk</b> <i>Deciphering the Landscape of Compact Binary Formation Channels</i>	Los Angeles, CA November 2019
<b>UCSC FLASH Seminar</b> <i>Deciphering the Landscape of Compact Binary Formation Channels</i>	Santa Cruz, CA November 2019
<b>UCSB Astro Lunch</b> <i>Deciphering the Landscape of Binary Black Hole Formation Channels</i>	Santa Barbara, CA November 2019
<b>Colombia Astronomy Seminar</b> <i>Getting the boot: Lonely GRBs, enigmatic r-process, and the birth of neutron stars</i>	New York, NY October 2019
<b>MIT GRITTS Seminar</b> <i>Unveiling the Lives and Deaths of Stars through Compact Object Mergers</i>	Cambridge, MA October 2019
<b>CfA High Energy Astrophysics Seminar</b> <i>Deciphering the Landscape of Binary Black Hole Formation Channels</i>	Cambridge, MA October 2019
<b>CGCA Seminar</b> <i>Unveiling the Lives and Deaths of Stars through Compact Object Mergers</i>	Milwaukee, WI March 2019
<b>IGC Seminar</b> <i>From the Detected to the Detectors: Using Gravitational Waves to Enable Insights from the Stellar Graveyard &amp; the Next Generation of Citizen Science</i>	Portsmouth, UK March 2018
<b>SPI-MAX Seminar</b> <i>From the Detected to the Detectors: Using Gravitational Waves to Enable Insights from the Stellar Graveyard &amp; the Next Generation of Citizen Science</i>	Oxford, UK February 2018

<b>Contributed Talks &amp; Posters</b> .....	
<b>NHFP Symposium (Talk)</b> <i>Lessons learned from the galactic hosts of short gamma-ray bursts</i>	Baltimore, MD September 2022
<b>Post-PAX Meeting (Talk)</b> <i>Formation Channels of Binary Black Holes: Open Questions</i>	Cambridge, MA August 2022
<b>Intermediate-Mass Black Holes: New Science from Stellar Evolution to Cosmology (Talk)</b> <i>The growth of intermediate-mass black holes through hierarchical mergers: implications for ground-based gravitational-wave detections</i>	San Juan, PR April 2022
<b>APS April Meeting (Talk)</b> <i>Lessons learned from the galactic hosts of short gamma-ray bursts</i>	New York, NY April 2022
<b>Aspen Winter Conference (Talk)</b> <i>Growing Black Holes: The Impact of Retention Efficiency on Hierarchical Mergers and the BBH Mass Spectrum</i>	Aspen, CO January 2022
<b>NHFP Symposium (Talk)</b> <i>Constraining dynamical formation channels of binary black holes with eccentric observations</i>	Virtual September 2021
<b>Amaldi 14 (Talk)</b> <i>Constraining dynamical formation channels of binary black holes with eccentric observations</i>	Virtual July 2021
<b>NHFP Symposium (Talk)</b> <i>Research Overview</i>	Virtual September 2020
<b>Aspen Winter Conference (Talk)</b> <i>Eccentric Black Hole Mergers in Dense Star Clusters: Post-Newtonian Effects &amp; Higher Multiplicity Encounters</i>	Aspen, CO February 2019
<b>AAS 233 (Talk)</b> <i>Eccentric Black Hole Mergers in Dense Star Clusters: The Role of Binary-Binary Encounters</i>	Seattle, WA January 2019
<b>NSF Research Traineeship Annual Meeting (Poster)</b> <i>Gravity Spy: Integrating Gravitational-Wave Astrophysics, Machine Learning, and Citizen Sciences</i>	Washington, DC September 2018
<b>MODEST-18 (Talk)</b> <i>The Role of Binary-Binary Interactions in Inducing Eccentric Black Hole Mergers</i>	Santorini, Greece June 2018
<b>APS April Meeting (Talk)</b> <i>On the Progenitor of Binary Neutron Star Merger GW170817</i>	Columbus, OH April 2018
<b>Detecting the Unexpected: Discovery in the Era of Astronomically Big Data (Talk)</b> <i>The Future of Citizen Science: Coupling Crowdsourcing and Machine Learning</i>	Baltimore, MD March 2017
<b>APS April Meeting (Talk)</b> <i>Discriminating Formation Channels of Binary Black Hole Systems with Advanced LIGO</i>	Washington, DC January 2017
<b>AAS 229 (Talk)</b> <i>Discriminating Formation Channels of Binary Black Hole Systems with Advanced LIGO</i>	Grapevine, TX January 2017
<b>AAS 229 (Workshop &amp; Poster)</b> <i>Astrobites: Engaging Undergraduate Science Majors with Current Astrophysical Research</i>	Grapevine, TX January 2017
<b>AAS 228 (Talk)</b> <i>Gravity Spy: Integrating aLIGO detector characterization, machine learning, and citizen science</i>	San Diego, CA June 2016
<b>Northwestern Computational Research Exposition (Poster)</b> <i>Integrating aLIGO detector characterization, machine learning, and citizen science</i> – Awarded first prize in poster competition	Evanston, IL April 2016
<b>Midwest Relativity Meeting (Talk)</b> <i>LIGO glitch classification through the combination of machine learning and citizen science</i>	Evanston, IL September 2015

## Outreach & Public Engagement

### Science Communication & Outreach.....

- Gravity Spy** **Citizen Science**  
*Researcher, Developer* *2015–Present*  
 – Developed Zooniverse citizen science project to classify and characterize LIGO–Virgo detector data, as part of a team of gravitational wave, machine learning, Zooniverse, and social scientists  
 – Led construction of user interface on the Zooniverse Lab platform, point person for communication between the Zooniverse volunteers and science team  
 – Project has accumulated over 7,000,000 classifications from over 30,000 registered users (December 2022)
- Lifelong Learning** **Talk Series**  
*Organizer* *2021–2022*  
 – Public talk series for seniors, based in public libraries and senior centers in the Chicago-land area.
- Astrobiters** **Blog**  
*Author, Administrator, & Leadership Team* *2014–2020*  
 – Astronomy blog partnered with the AAS, provides daily summaries of recent astronomy research articles  
 – Initiated the “Beyond” series, which covers topics on career advice, graduate school applications, and diversity, equity, and inclusivity in astronomy
- ComSciCon** **Workshop**  
*Organizer, Attendee* *2017–2020*  
 – National graduate-student run science communication workshop for graduate students in STEM fields
- Astronomy on Tap** **Public Event**  
*Co-founder, organizer, host, speaker* *2015–2020*  
 – Co-founded the Chicago branch of Astronomy on Tap, which hosts astronomy talks and space-based trivia at bars and breweries in the Chicago-land area
- Rapid Fire Research** **Departmental Event**  
*Founder, Chair* *2016–2019*  
 – Annual research presentation event for graduate and undergraduate students in Northwestern Department of Physics and Astronomy
- Machine Learning Meetups** **Public Event**  
*Organizer, Host* *2016–2018*  
 – Quarterly interdisciplinary colloquia on data science and machine learning topics
- Chicagoland Science Penpals** **Event**  
*Participant* *2017*  
 – Correspondence with students in Chicago public schools about scientific research and science as a profession, using handwritten letters

### Public Talks & Lectures .....

- Astronomer Conversations** **Lecture Series**  
*Adler Planetarium, Space Visualization Laboratory* *2014–present*  
 – Public presentations at the Adler Planetarium for museum guests
- Lifelong Learning: JWST** **Lecture Series**  
*Remote* *November 2022*
- Art of Science** **Invited Speaker**  
*Chicago, IL* *October 2022*
- Hinsdale Social Studies Circle: Uncovering the Universe’s Symphony** **Invited Speaker**  
*Virtual* *January 2022*
- Finding Genius Podcast** **Invited Speaker**  
*Virtual* *December 2021*

<b>Lifelong Learning: Gravitational Waves</b> <i>Remote</i>	<b>Lecture Series</b> <i>November 2021</i>
<b>Lifelong Learning: Gravitational Waves</b> <i>Remote</i>	<b>Lecture Series</b> <i>March 2021</i>
<b>UBS Investment Banking: Gravity Spy and LIGO</b> <i>Virtual</i>	<b>Invited Speaker</b> <i>September 2020</i>
<b>Astronomer Evenings</b> <i>Northwestern University, Dearborn Observatory</i> – Presentations during public observing hours at the Dearborn Observatory	<b>Lecture Series</b> <i>2016–2019</i>
<b>Chipping Norton Amateur Astronomy Group</b> <i>Chipping Norton, UK</i>	<b>Keynote Lecture</b> <i>February 2018</i>
<b>Take Our Children to Work Day</b> <i>Northwestern University</i>	<b>Lecture</b> <i>April 2016, 2018</i>
<b>Haven Midde School</b> <i>Evanston, IL</i>	<b>Invited Speaker</b> <i>April 2017, 2018</i>
<b>Chicago Astronomical Society</b> <i>Adler Planetarium</i>	<b>Keynote Lecture</b> <i>May 2017</i>
<b>Avery Coonley School</b> <i>Downers Grove, IL</i>	<b>Invited Speaker</b> <i>May 2017</i>
<b>Seven Minutes of Science: An Interdisciplinary Symposium</b> <i>Northwestern University</i>	<b>Public Talk</b> <i>April 2017</i>
<b>Highcrest Elementary</b> <i>Wilmette, IL</i>	<b>Invited Speaker</b> <i>March 2017</i>
<b>Einstein Evenings</b> <i>Northwestern University, Dearborn Observatory</i> – Monthly presentations during observing hours on LIGO discoveries in celebration of the 100th anniversary of General Relativity	<b>Lecture Series</b> <i>2015–2016</i>
<b>Nettlehorst Elementary</b> <i>Chicago, IL</i>	<b>Invited Speaker</b> <i>February 2016</i>

## Publications .....

<b>Astrobits</b> <i>Authored over 20 blog posts on current research in astrophysics (<a href="#">Link</a>)</i>	<b>Blog</b> <i>2014–2020</i>
<b>LIGO Science Summary</b> <i>Companion science summary to the LIGO–Virgo O2 Populations paper (<a href="#">Link</a>)</i> <i>Companion science summary to the GW170817 Detection paper (<a href="#">Link</a>)</i>	<b>Article</b> <i>November 2018</i> <i>October 2017</i>
<b>LIGO Magazine</b> <i>The Gravity Spy Project — Machine Learning and Citizen Science (<a href="#">Link</a>)</i>	<b>Magazine Article</b> <i>March 2017</i>
<b>Helix Magazine</b> <i>The Legacy of Scientific Discovery (<a href="#">Link</a>)</i>	<b>Magazine Article</b> <i>March 2017</i>

## Teaching & Work Experience

<b>University of Chicago</b> <i>Graduate Level Stellar Astrophysics</i>	<b>Guest Lecturer</b> <i>2022–Present</i>
<b>Northwestern University</b> <i>Introduction to Astronomy, Stellar Astrophysics, Data-Driven Research in Astronomy</i> – Guest lectured, developed assignments, graded, and ran telescope observing sessions	<b>Lecturer/TA</b> <i>2015–2017</i>

<b>GK12 Fellowship</b> <i>Reach for the Stars</i> ; Evanston, IL	<b>Teaching</b> 2017–2018
– Co-taught astronomy classes at Evanston Township High School	
– Developed curriculum, coding-based lessons, and visualizations for high-school students	
<b>Kids Science Labs</b> <i>Lead Teacher</i> ; Chicago, IL	<b>Teaching</b> 2013–2015
– Taught classes of 3-12 year old students in hands-on, experiential science classes	
– Designed curriculum for science summer camps	
<b>Adler Planetarium</b> <i>Science Leadership Corps Instructor, Mission Specialist</i> ; Chicago, IL	<b>Museum Education</b> 2012–2014
– Designed educational programming	
– Facilitated exhibits, performed experiments, and gave astronomy talks to the public	
– Led under-represented students in designing experiments for high-altitude balloon launches	

## Students Mentored .....

<b>Aditya Vijaykumar</b> <i>Evolution of binary neutron stars in cosmological simulations</i> ; KICP Visiting Graduate Student	<b>Graduate</b> 2022–present
<b>Anyu Nugent</b> <i>Host demographics and progenitors of short GRBs</i> ; CIERA Graduate Student	<b>Graduate</b> 2021–present
<b>Amanda Farah</b> <i>Cosmology from evolving non-parametric mass distribution</i> ; University of Chicago Graduate Student	<b>Graduate</b> 2021–present
<b>Camille Liotine</b> <i>HMXB Progenitors to Binary Black Hole Mergers</i> ; CIERA Graduate Student	<b>Graduate</b> 2020–present
<b>Michael Kurkowski</b> <i>Pair Instability Supernova Prescriptions in Binary Population Synthesis</i> ; CIERA REU Student	<b>Undergraduate</b> 2019
<b>Jared Machtinger</b> <i>Population properties of binary black holes detected by LIGO</i> ; CIERA Summer Student	<b>High School</b> 2019
<b>Danai Avdela</b> <i>Population properties of binary black holes detected by LIGO</i> ; CIERA Summer Student	<b>High School</b> 2019
<b>Isaac Rivera</b> <i>Offset distributions of short gamma-ray bursts</i> ; CIERA REU Student	<b>Undergraduate</b> 2018
<b>Grace Kern</b> <i>Optimization of Gravity Spy image retirement</i> ; CIERA Summer Student	<b>High School</b> 2018
<b>Hannah Stein</b> <i>Optimization of Gravity Spy image retirement</i> ; CIERA Summer Student	<b>High School</b> 2018
<b>Yuqi Yun</b> <i>Gaussian Process regression of black hole mass distributions</i> ; CIERA REU Student	<b>Undergraduate</b> 2016
<b>Sophie Haight</b> <i>Gaussian Process regression of binary stellar evolution sequences</i> ; CIERA Summer Student	<b>High School</b> 2016

## Awards & Honors

▷ Avery Coonley School, Graduate Keynote Speaker	June 2018
▷ American Astronomical Society, Media Intern	June 2016
▷ Breakthrough Prize in Fundamental Physics (as part of the LIGO-Virgo Collaboration)	May 2016
▷ Gruber Cosmology Prize (as part of the LIGO-Virgo Collaboration)	May 2016
▷ National Science Foundation Graduate Research Fellowship (honorable mention)	April 2016



- ▷ **First Place, Poster Competition** (*Computational Research Day, Northwestern University*) April 2016
- ▷ **High Distinction in Physics** (*University of Illinois Urbana-Champaign*) May 2012

## Affiliations & Leadership Positions

- ▷ **NHFP DEI Working Group:** Statistics Co-Lead 2020–present
- ▷ **GWPAW Conference:** Scientific Organizing Committee 2022
- ▷ **NHFP Symposium:** Scientific Organizing Committee 2022
- ▷ **Lifelong Learning:** Organizer 2021–2022
- ▷ **Astrobites:** Administrator, Author 2014–2020
- ▷ **ComSciCon National:** Organizer 2017–2020
- ▷ **LIGO Scientific Collaboration:** Member 2015–Present
- ▷ **American Astronomical Society:** Junior Member 2016–Present
- ▷ **American Physical Society:** Member 2016–Present
- ▷ **CIERA Compact Objects Coffee:** Founder, chair 2018–2020
- ▷ **Chicago Metropolitan Symphony Orchestra:** Double Bassist 2014–Present
- ▷ **Physics and Astronomy Graduate Student Council:** Quality of Life Chair 2016–2018
- ▷ **Rapid Fire Research:** Founder, chair 2016–2018

## Service Work

- Served on NSF panel** 2021
- Peer Reviewer for:** 2017–Present
- *The Astrophysical Journal*
  - *The Astrophysical Journal Letters*
  - *Astronomy and Astrophysics*
  - *Monthly Notices of the Royal Astronomical Society*
  - *Nature Astronomy*
  - *Physical Review D*
  - *Physical Review Letters*