Richard O'Shaughnessy

Center for Computational Relativity and Gravitation
Rochester Institute of Technology
170 Lomb Memorial Drive
Rochester, NY 14623-5604
Office: 74-2068
ORCid: 0000-0001-5832-8517

E-mail: richard.oshaughnessy@ligo.org
Office: 585.475.5965
Fax: 585.475.7340

http://ccrg.rit.edu/~oshaughn

RESEARCH INTERESTS

Gravitational wave astrophysics
Strong field gravity, numerically and analytically
Theoretical physics

EDUCATION

Ph. D. in Physics	Advisor: Kip Thorne	California Institute of Technology	1996-2003
B.A. in Astronomy	*summa cum laude*	Cornell University	1992-1996

POSITIONS

Rochester Institute of Technology	Associate Professor	2020-
-	Assistant Professor	2014-2020
University of Wisconsin-Milwaukee Bradley Foundation Fellowship (2011-12)	Research Associate	2010-2014
Penn State University	Research Associate	2007-2010
Northwestern University	Postdoctoral Fellow	2003-2007
California Institute of Technology	Graduate student and Teaching assistant	1996-2002
Cornell University PIs: Profs. Shapiro and Teukolsky	Relativity visualization REU group	1995-1996

TEACHING AND MENTORING

Postdoc projects

- E. Holmbeck, RIT (arxiv:2110.06432 + ...)
  Multimessenger Observational constraints on r-process nucleosynthesis
- A. Williamson, RIT (PRD 96 404 2017 + ...)
  Systematic errors in measuring parameters of precessing BH binaries
- A. Lundgren, Syracuse University and AEI-Hannover, (PRD 86 4020,2013; arXiv:1304.3332; ...)
  Analytic waveforms for precessing BH-NS binaries
- L. Pekowsky and J. Healy (both with D. Shoemaker), Georgia Tech (PRD 88 4040, 2013+ ...)
  Interpreting simulations of BH-BH binaries
- E. Ochsner, U. Wisconsin-Milwaukee (PRD 86 4037, 2012)
  Analytic methods to reconstruct binary dynamics from outgoing radiation

Graduate student projects

- K. Daningburg (PRD 106 4020 2022)
  Acquisition and approximation strategies to enable astrophysical inference
- A. Jan, RIT (PRD 102 4069 2020)
  Implications of model sytematics for compact binary mergers with black holes
- A. Yelikar, RIT
  Marginalizing over model sytematics for compact binary mergers

- M. Ristic, RIT (arXiv:2105.11543)
  Surrogate models for and inference with kilonova light curves
- V. Delfavero, RIT (arXiv:2107.13082+...)
  Constraining isolated binary evolution with gravitational waves
- Matteo Breschi, Pisa (...)
  Inspiral-merger consistency tests of general relativity with higher modes in LIGO's O2 run
- Daniel Wysocki, RIT (arXiv:1709.01943+...)
  Inferring the distribution of merging binary BH masses and spins
- Jacob Lange, RIT
  Parameter estimation via numerical relativity templates (arxiv:1606.01262+...)
  Parameter estimation via iterative inference (RIFT) (arxiv:1805.10457+...)
  2021 RIT PhD Dissertation award
- D. Trifiro, Pisa (PRD 93 044071,2016 +...)
  Parameter estimation with post-Newtonian resonances
- P. Nepal, U. Wisconsin-Milwaukee (arxiv:1509.06581)
  Semianalytic Fisher matrix for precessing BH-NS binaries
- H. Qi (with P. Brady), U. Wisconsin-Milwaukee (PRD 103 084006, 2021)
  Probing strong-field gravity with galactic center orbits
- B. Farr (with E. Ochsner), Northwestern (PRD 89 102005, 2014 + ...)
  Parameter estimation of black hole-neutron star binaries
- D. Gerosa (with E. Berti, M. Kesden, U. Sperhake), U. Miss. (PRD 87 4028, 2013 +...)
  Post-Newtonian spin resonances enable unexpected compact binary astrophysics
- L. London (with D. Shoemaker, L. Pekowsky, J. Healy), Georgia Tech (PRD 87 4038, 2013+...)
  Investigating precessing binary black hole simulations
- H.S. Cho (with CH Lee, C. Kim, E. Ochsner), KISTI and UWM (PRD 87 2400, 2013+...)
  Impact of amplitude corrections and spin on parameter estimation for BH-NS binaries in LIGO
- D. Clausen (with R. Wade, R. Kopparapu), Pennsylvania State University (ApJ 746 186, 2012)
  Population synthesis of hot subdwarf binaries: hidden populations and new constraints

Undergraduate and MS research projects

- Elizabeth Champion (2018–2021), RIT BS: Rapid Monte Carlo integration for GW parameter inference
- Vera Delfavero (2018–), RIT BS/MS: Gaussian process interpolation for GW parameter inference
- Monica Rizzo (2015–2018), RIT: Estimating the tidal deformability of neutron stars (GW170817)
- Thomas Kilmer (2016–2017), RIT: Subtracting astrophysical stochastic GW foregrounds
- Jackson Henry (2014–), RIT: Higher harmonics and parameter estimation of binary black holes
- Brandon Miller (2014-2015), RIT: Fast versus accurate inference of inspiral (PRD 92 4056, 2015)
- Z. Meeks (2011), Georgia Tech: Orientation-dependent emission from mergers (PRD 85,084003)
- C. Schmidt (2007-2008), Penn State: Metadata for numerical relativity waveforms.
- E. Damashek (2007), high school: Strong gravitational lensing close to binary black holes
- A. Saleem (2005-2006), Northwestern: Classify progenitors of merging compact binaries.
- J. Kaplan (2004), Northwestern: Spinup of black holes in binaries (ApJ 632 1035, 2005)
- R. O'Leary (2004-2006), Northwestern: Clusters (PRD 76 061504; ApJ 637 937)
- D. Jones (2003-2004), Northwestern: Prototype search code for gravitational waves.

Summer school lectures

- Caltech Gravitational Wave Astrophysics Summer school (2013)

Structured classroom

- *Professor* (RIT)
  Math 182, Project-based calculus II (Fall 2014, Fall 2020)
  Statistics 435, Statistics of linear models (Spring 2015)
  Math 251, Probability and Statistics I (Fall 2015-2019, 2021; Spring 2018,2022,2024)
  Math 252, Probability and Statistics II (Spring 2017)
  Astro 611, Statistical methods for astrophysics (Spring 2016)
  Astro 831, Stellar evolution and environments (Spring 2018)
  Astro 609, Fundamentals of Astrophysics II (Spring 2019-2021 with A. Robinson)
  Astro 619, Fundamentals of Theoretical Astrophysics 2 (Fall 2023)
- *Instructor* (UWM)
  Astronomy 103, Survey of Astronomy (Spring 2012)

PROFESSIONAL AFFILIATIONS AND SERVICE

- Member of the LIGO Scientific Collaboration (2000–);
  Co-chair of the Publications and Presentations Committee (2018–)
- Served as referee for Nature; Physical Review Letters; the Monthly Notices of the Royal Astronomical Society; the Astrophysical Journal (regular and letters); Astronomy and Astrophysics; Classical and Quantum Gravity; and the New Journal of Physics.
- Proposal review for NSF and NWO (Netherlands).
- Member of the American Physical Society (APS), the American Astronomical Society (AAS), and the International Astronomical Union (IAU)
- Midwest Relativity Meeting organizing committee (2013)

RESEARCH PUBLICATIONS

Selected recent small collaboration results

1. Chris L. Fryer, Aimee L. Hungerford, Ryan T. Wollaeger, Jonah M. Miller, Soumi De, Christopher J. Fontes, Oleg Korobkin, Atul Kedia, Marko Ristic, and Richard O'Shaugnessy.
   The Effect of the Velocity Distribution on Kilonova Emission.
   arXiv e-prints, art. arXiv:2311.05005, November 2023.
2. Tousif Islam, Avi Vajpeyi, Feroz H. Shaik, Carl-Johan Haster, Vijay Varma, Scott E. Field, Jacob Lange, **R. O'Shaughnessy**, and Rory Smith.
   Analysis of GWTC-3 with fully precessing numerical relativity surrogate models.
   arXiv e-prints, art. arXiv:2309.14473, September 2023.
3. Marko Ristić, Richard O'Shaughnessy, V. Ashley Villar, Ryan T. Wollaeger, Oleg Korobkin, Chris L. Fryer, Christopher J. Fontes, and Atul Kedia.
   Interpolated kilonova spectra models: Examining the effects of a phenomenological, blue component in the fitting of AT2017gfo spectra.
   Physical Review Research, 5(4):043106, November 2023a.
4. Vera Delfavero, Richard O'Shaughnessy, Krzysztof Belczynski, Paweł Drozda, and Daniel Wysocki.
   Iteratively Comparing Gravitational-Wave Observations to the Evolution of Massive Stellar Binaries.
   Phys. Rev. D, 108:043023, Aug 2023. (link).
5. A. B. Yelikar, V. Delfavero, and **R. O'Shaughnessy**.
   Low-latency parameter inference enabled by a Gaussian likelihood approximation for RIFT.
   arXiv e-prints, art. arXiv:2301.01337, January 2023.

6. Atul Kedia, Marko Ristic, Richard O'Shaughnessy, Anjali B. Yelikar, Ryan T. Wollaeger, Oleg Korobkin, Eve A. Chase, Christopher L. Fryer, and Christopher J. Fontes.
Surrogate light curve models for kilonovae with comprehensive wind ejecta outflows and parameter estimation for AT2017gfo.
Physical Review Research, 5(1):013168, March 2023.

7. V. Gayathri, Daniel Wysocki, Y. Yang, Vera Delfavero, **R. O'Shaughnessy**, Z. Haiman, H. Tagawa, and I. Bartos.
Gravitational Wave Source Populations: Disentangling an AGN Component.
Astroph. J. Letters, 945(2):L29, March 2023.

8. J. Wofford, A. B. Yelikar, Hannah Gallagher, E. Champion, D. Wysocki, V. Delfavero, J. Lange, C. Rose, V. Valsan, S. Morisaki, J. Read, C. Henshaw, and **R. O'Shaughnessy**.
Improving performance for gravitational-wave parameter inference with an efficient and highly-parallelized algorithm.
Phys. Rev. D, 107(2):024040, January 2023.

9. H. L. Iglesias, J. Lange, I. Bartos, S. Bhaumik, R. Gamba, V. Gayathri, A. Jan, R. Nowicki, **R. O'Shaughnessy**, D. Shoemaker, R. Venkataramanan, and K. Wagner.
Reassessing candidate eccentric binary black holes: Results with a model including higher-order modes.
arXiv e-prints, art. arXiv:2208.01766, August 2022.

10. Marko Ristić, Erika M. Holmbeck, Ryan T. Wollaeger, Oleg Korobkin, Elizabeth Champion, Richard O'Shaughnessy, Chris L. Fryer, Christopher J. Fontes, Matthew R. Mumpower, and Trevor M. Sprouse.
Constraining Inputs to Realistic Kilonova Simulations through Comparison to Observed r-process Abundances.
Astroph. J., 956(1):64, October 2023b.

11. Karl Daningburg and Richard O'Shaughnessy.
Cost minimization in acquisition for gravitational wave surrogate modeling.
Phys. Rev. D, 106(8):084020, October 2022.

12. V. Delfavero, **R. O'Shaughnessy**, D. Wysocki, and A. Yelikar.
Compressed parametric and non-parametric approximations to the gravitational wave likelihood.
Submitted to PRD, 2022. (link).

13. Chad Henshaw, Richard O'Shaughnessy, and Laura Cadonati.
Implementation of a generalized precession parameter in the RIFT parameter estimation algorithm.
Classical and Quantum Gravity, 39(12):125003, June 2022.

14. Federico G. Lopez Armengol, Zachariah B. Etienne, Scott C. Noble, Bernard J. Kelly, Leonardo R. Werneck, Brendan Drachler, Manuela Campanelli, Federico Cipolletta, Yosef Zlochower, Ariadna Murguia-Berthier, Lorenzo Ennoggi, Mark Avara, Riccardo Ciolfi, Joshua Faber, Grace Fiacco, Bruno Giacomazzo, Tanmayee Gupte, Trung Ha, Julian H. Krolik, Vassilios Mewes, Richard O'Shaughnessy, Jesús M. Rueda-Becerril, and Jeremy Schnittman.
Handing off the outcome of binary neutron star mergers for accurate and long-term postmerger simulations.
Phys. Rev. D, 106(8):083015, October 2022.

15. Erika M. Holmbeck, Richard O'Shaughnessy, Vera Delfavero, and Krzysztof Belczynski.
A Nuclear Equation of State Inferred from Stellar r-process Abundances.
Astroph. J., 926(2):196, February 2022.

16. Vera Delfavero, Richard O'Shaughnessy, Daniel Wysocki, and Anjali Yelikar.
Normal Approximate Likelihoods to Gravitational Wave Events.
arXiv e-prints, art. arXiv:2107.13082, July 2021.

17. B. McKernan, K. E. S. Ford, T. Callister, W. M. Farr, **R. O'Shaughnessy**, R. Smith, E. Thrane, and A. Vajpeyi.
LIGO-Virgo correlations between mass ratio and effective inspiral spin: testing the active galactic

nuclei channel.
MNRAS, 514(3):3886–3893, August 2022.

18. Ariadna Murguia-Berthier, Scott C. Noble, Luke F. Roberts, Enrico Ramirez-Ruiz, Leonardo R. Werneck, Michael Kolacki, Zachariah B. Etienne, Mark Avara, Manuela Campanelli, Riccardo Ciolfi, Federico Cipolletta, Brendan Drachler, Lorenzo Ennoggi, Joshua Faber, Grace Fiacco, Bruno Giacomazzo, Tanmayee Gupte, Trung Ha, Bernard J. Kelly, Julian H. Krolik, Federico G. Lopez Armengol, Ben Margalit, Tim Moon, Richard O'Shaughnessy, Jesús M. Rueda-Becerril, Jeremy Schnittman, Yossef Zenati, and Yosef Zlochower.
HARM3D+NUC: A New Method for Simulating the Post-merger Phase of Binary Neutron Star Mergers with GRMHD, Tabulated EOS, and Neutrino Leakage.
Astroph. J., 919(2):95, October 2021.

19. R. T. Wollaeger, C. L. Fryer, E. A. Chase, C. J. Fontes, M. Ristic, A. L. Hungerford, O. Korobkin, **R. O'Shaughnessy**, and A. M. Herring.
A Broad Grid of 2D Kilonova Emission Models.
Astroph. J., 918:arXiv:2105.11543, August 2021.

20. M. Ristic, E. Champion, **R. O'Shaughnessy**, R. Wollaeger, O. Korobkin, E. A. Chase, C. L. Fryer, A. L. Hungerford, and C. J. Fontes.
Interpolating detailed simulations of kilonovae: Adaptive learning and parameter inference applications.
Physical Review Research, 4(1):013046, January 2022. (link).

21. A. Z. Jan, A. B. Yelikar, J. Lange, and **R. O'Shaughnessy**.
Assessing and marginalizing over compact binary coalescence waveform systematics with RIFT.
Phys. Rev. D, 102(12):124069, December 2020.

22. Hong Qi, Richard O'Shaughnessy, and Patrick Brady.
Testing the black hole no-hair theorem with Galactic Center stellar orbits.
Phys. Rev. D, 103(8):084006, April 2021.

23. Mohammad Al-Mamun, Andrew W. Steiner, Joonas Nättilä, Jacob Lange, Richard O'Shaughnessy, Ingo Tews, Stefano Gandolfi, Craig Heinke, and Sophia Han.
Combining Electromagnetic and Gravitational-Wave Constraints on Neutron-Star Masses and Radii.
Phys. Rev. Lett., 126(6):061101, February 2021.

24. P. Drozda, K. Belczynski, **R. O'Shaughnessy**, T. Bulik, and C. L. Fryer.
Black hole-neutron star mergers: The first mass gap and kilonovae.
A&A, 667:A126, November 2022.

25. V. Gayathri, J. Healy, J. Lange, B. O'Brien, M. Szczepańczyk, Imre Bartos, M. Campanelli, S. Klimenko, C. O. Lousto, and **R. O'Shaughnessy**.
Eccentricity estimate for black hole mergers with numerical relativity simulations.
Nature Astronomy, art. arXiv:2009.05461, January 2022. (link).

26. D Wysocki, **R. O'Shaughnessy**, L. Wade, and J. Lange.
Inferring the neutron star equation of state simultaneously with the population of merging neutron stars.
Submitted to PRD; available as arxiv:2001.01747, January 2020. (link).

27. K. Belczynski, R. Hirschi, E. A. Kaiser, Jifeng Liu, J. Casares, Youjun Lu, **R. O'Shaughnessy**, A. Heger, and S. Justham.
The Formation of a 70 Msun Black Hole at High Metallicity.
arXiv e-prints, art. arXiv:1911.12357, Nov 2019.

28. Z. Doctor, D. Wysocki, **R. O'Shaughnessy**, D. E. Holz, and B. Farr.
Black Hole Coagulation: Modeling Hierarchical Mergers in Black Hole Populations.
Astroph. J., 893(1):35, April 2020.

29. F Shaik, J. Lange, S. Field, **R. O'Shaughnessy**, V Varma, and et al.
Impact of subdominant modes on the interpretation of gravitational-wave signals from heavy binary

black hole systems.
Phys. Rev. D, 101:124054, July 2020. (link).

30. Y. Yang, I. Bartos, V. Gayathri, S. Ford, Z. Haiman, S. Klimenko, B. Kocsis, S. Márka, Z. Márka, B. McKernan, and R. O'Shaugnessy.
Hierarchical Black Hole Mergers in Active Galactic Nuclei.
Phys. Rev. Lett., 123:181101, November 2019.
URL (link).

31. B. McKernan, K. E. S. Ford, R. O'Shaugnessy, and D. Wysocki.
Monte Carlo simulations of black hole mergers in AGN discs: Low χ_{eff} mergers and predictions for LIGO.
MNRAS, 494(1):1203–1216, May 2020.

32. K. Belczynski, T. Bulik, A. Olejak, M. Chruslinska, N. Singh, N. Pol, L. Zdunik, **R. O'Shaughnessy**, M. McLaughlin, D. Lorimer, O. Korobkin, E. P. J. van den Heuvel, M. B. Davies, and D. E. Holz.
Binary neutron star formation and the origin of GW170817.
Available as arxiv:1812.10065, December 2018.

33. D. Wysocki, J. Lange, and **R. O'Shaughnessy**.
Reconstructing phenomenological distributions of compact binaries via gravitational wave observations.
Phys. Rev. D, 100:3012, August 2019. (link).

34. J. Lange, **R. O'Shaughnessy**, and M. Rizzo.
Rapid and accurate parameter inference for coalescing, precessing compact binaries.
Submitted to PRD; available at arxiv:1805.10457, 2018.

35. M. W. Coughlin, T. Dietrich, Z. Doctor, D. Kasen, S. Coughlin, A. Jerkstrand, G. Leloudas, O. McBrien, B. D. Metzger, **R. O'Shaughnessy**, and S. J. Smartt.
Constraints on the neutron star equation of state from AT2017gfo using radiative transfer simulations.
MNRAS, 480:3871–3878, November 2018.

36. D. Wysocki, D. Gerosa, **R. O'Shaughnessy**, K. Belczynski, W. Gladysz, E. Berti, M. Kesden, and D. E. Holz.
Explaining LIGO's observations via isolated binary evolution with natal kicks.
Phys. Rev. D, 97(4):043014, February 2018. (link).

37. K. Belczynski, J. Klencki, C. E. Fields, A. Olejak, E. Berti, G. Meynet, C. L. Fryer, D. E. Holz, **R. O'Shaughnessy**, D. A. Brown, T. Bulik, S. C. Leung, K. Nomoto, P. Madau, R. Hirschi, S. Jones, S. Mondal, M. Chruslinska, P. Drozda, D. Gerosa, Z. Doctor, M. Giersz, S. Ekstrom, C. Georgy, A. Askar, D. Wysocki, T. Natan, W. M. Farr, G. Wiktorowicz, M. Coleman Miller, B. Farr, and J. P. Lasota.
Evolutionary roads leading to low effective spins, high black hole masses, and O1/O2 rates for LIGO/Virgo binary black holes.
A&A, 636:A104, April 2020. (link).

38. R. O'Shaughnessy, G. Gerosa, and D. Wysocki.
Inferences about supernova physics from gravitational-wave measurements: GW151226 spin misalignment as an indicator of significant black-hole natal kick.
Phys. Rev. Lett., page 011101, Jul 2017. (link).

39. K. Belczynski, A. Heger, A. Ruiter, S. Woosley, G. Wiktorowicz, H.-Y. Chen, T. Bulik, **R. O'Shaughnessy**, D.E. Holz, C.L. Fryer, and E. Berti.
The Effect of Pair-Instability Mass Loss on Black Hole Mergers.
A&A, 594:A97, 2016a.

40. K. Belczynski, D. Holz, T. Bulik, and **R. O'Shaughnessy**.
The origin and evolution of LIGOs first gravitational-wave source.
Nature, 534:512, June 2016b.
URL (link).

41. M. Dominik, E. Berti, **R. O'Shaughnessy**, I. Mandel, K. Belczynski, C. Fryer, D. E. Holz, T. Bulik, and F. Pannarale.
Double Compact Objects III: Gravitational-wave Detection Rates.
Astroph. J., 806:263, June 2015. (link).

Gravitational wave observations in O3

42. B. P. Abbott, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, C. Adams, R. X. Adhikari, V. B. Adya, C. Affeldt, and et al.
GW190425: Observation of a Compact Binary Coalescence with Total Mass $\sim 3.4\ M_\odot$.
Astroph. J. Letters, 892(1):L3, March 2020.

43. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, C. Adams, V. B. Adya, and et al.
GW190412: Observation of a Binary-Black-Hole Coalescence with Asymmetric Masses.
Phys. Rev. D, 102(4):043015, August 2020a.

44. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, C. Adams, V. B. Adya, and et al.
GW190814: Gravitational Waves from the Coalescence of a 23 Solar Mass Black Hole with a 2.6 Solar Mass Compact Object.
Astroph. J. Letters, 896(2):L44, June 2020b.

45. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, C. Adams, V. B. Adya, and et al.
GW190521: A Binary Black Hole Merger with a Total Mass of 150 Msun.
Phys. Rev. Lett., 125(10):101102, September 2020c.

46. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, C. Adams, V. B. Adya, and et al.
Properties and Astrophysical Implications of the $150\ M_\odot$ Binary Black Hole Merger GW190521.
Astroph. J. Letters, 900(1):L13, September 2020d.

47. The LIGO Scientific Collaboration, the Virgo Collaboration, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, A. Adams, C. Adams, R. X. Adhikari, V. B. Adya, C. Affeldt, and et al.
GWTC-2: Compact Binary Coalescences Observed by LIGO and Virgo during the First Half of the Third Observing Run.
Physical Review X, 11(2):021053, April 2021a.

48. The LIGO Scientific Collaboration, the Virgo Collaboration, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, A. Adams, C. Adams, V. B. Adya, and et al.
Population Properties of Compact Objects from the Second LIGO-Virgo Gravitational-Wave Transient Catalog.
Astroph. J. Letters, 913(1):L7, May 2021b.

49. The LIGO Scientific Collaboration, the Virgo Collaboration, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, N. Adhikari, R. X. Adhikari, V. B. Adya, and et al.
GWTC-2.1: Deep Extended Catalog of Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run.
PRD in press, art. arXiv:2108.01045, August 2021c.

50. R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, A. Adams, C. Adams, R. X. Adhikari, V. B. Adya, C. Affeldt, and et al.
Observation of Gravitational Waves from Two Neutron Star-Black Hole Coalescences.
Astroph. J. Letters, 915(1):L5, July 2021.

51. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, N. Adhikari, R. X. Adhikari, and et al.
GWTC-3: Compact Binary Coalescences Observed by LIGO and Virgo During the Second Part of the Third Observing Run.
Available as arXiv:2111.03606, art. arXiv:2111.03606, November 2021d.

52. The LIGO Scientific Collaboration, the Virgo Collaboration, and the KAGRA Collaboration. Constraints on the cosmic expansion history from GWTC-3. *Available as arXiv:2111.03604*, art. arXiv:2111.03604, November 2021e.

53. The LIGO Scientific Collaboration, The Virgo Collaboration, The KAGRA Scientific Collaboration, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, N. Adhikari, R. X. Adhikari, and et al. The population of merging compact binaries inferred using gravitational waves through GWTC-3. *Phys. Rev. X*, 13:011048, Mar 2023. (link).

Discovery of gravitational waves from coalescing binary black holes and neutron stars

54. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Observation of Gravitational Waves from a Binary Black Hole Merger. *Phys. Rev. Lett.*, 116:061102–+, February 2016a.

55. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Properties of the binary black hole merger GW150914. *Phys. Rev. Lett.*, 116:241102, Jun 2016b. (link).

56. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Astrophysical Implications of the Binary Black-hole Merger GW150914. *Astroph. J. Letters*, 818:L22, February 2016c. (link).

57. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914. *Astroph. J. Letters*, 833:1, February 2016d. (link).

58. Supplement: The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914. *Astroph. J. Supp.*, 227:14, June 2016.

59. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Directly comparing GW150914 with numerical solutions of Einstein's equations for binary black hole coalescence. *Phys. Rev. D*, 94:064035, Sep 2016e. (link).

60. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Improved analysis of GW150914 using a fully spin-precessing waveform model. *Phys. Rev. X*, 6:041014, October 2016. (link).

61. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Tests of general relativity with GW150914. *Phys. Rev. Lett.*, 116:221101, May 2016a. (link).

62. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). GW150914: First results from the search for binary black hole coalescence with Advanced LIGO. *Phys. Rev. D*, 93(12):122003, June 2016b.

63. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Observing gravitational-wave transient GW150914 with minimal assumptions. *Phys. Rev. D*, 93(12):122004, June 2016c.

64. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). GW150914: Implications for the Stochastic Gravitational-Wave Background from Binary Black Holes. *Phys. Rev. Lett.*, 116(13):131102, April 2016d. (link).

65. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration). Localization and broadband follow-up of the gravitational-wave transient GW150914. *Astroph. J. Letters*, 826:L13, July 2016e. (link).

66. B. Abbott et al. (ANTARES Collaboration, IceCube Collaboration, The LIGO Scientific Collaboration and the Virgo Collaboration).

High-energy neutrino follow-up search of the first Advanced LIGO gravitational wave event with IceCube and ANTARES .
Phys. Rev. D, 93:122010, Jun 2016. (link).

67. B.P. Abbott et al (The LIGO Scientific Collaboration and the Virgo Collaboration).
Characterization of transient noise in Advanced LIGO relevant to gravitational wave signal GW150914.
Classical and Quantum Gravity, 33(13):134001, July 2016. (link).

68. B. P. Abbott, R. Abbott, T. D. Abbott, M. R. Abernathy, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, and et al.
GW150914: The Advanced LIGO Detectors in the Era of First Discoveries.
Phys. Rev. Lett., 116(13):131103, April 2016.

69. The LIGO Scientific Collaboration and the Virgo Collaboration.
Characterization of transient noise in Advanced LIGO relevant to gravitational wave signal GW150914.
CQG, 33(13):134001, 2016. (link).

70. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
The basic physics of the binary black hole merger GW150914.
Annalen der Physik, October 2016. (link).

71. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
GW151226: Observation of Gravitational Waves from a 22 Solar-mass Binary Black Hole Coalescence.
Phys. Rev. Lett., 116:241103, June 2016a.

72. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
Binary black hole mergers in the First Advanced LIGO observing run.
Phys. Rev. X, 6:041015, October 2016b.
URL (link).

73. B. P. Abbott et al (The LIGO Scientific Collaboration and the Virgo Collaboration).
Upper limits on the rates of binary neutron star and neutron-star–black-hole mergers from Advanced LIGO's first observing run.
Astroph. J. Letters, 832:L21, December 2016. (link).

74. C. Biwer, D. Barker, J. C. Batch, J. Betzwieser, R. P. Fisher, E. Goetz, S. Kandhasamy, S. Karki, J. S. Kissel, A. P. Lundgren, D. M. Macleod, A. Mullavey, K. Riles, J. G. Rollins, K. A. Thorne, E. Thrane, T. D. Abbott, B. Allen, D. A. Brown, P. Charlton, S. G. Crowder, P. Fritschel, J. B. Kanner, M. Landry, C. Lazzaro, M. Millhouse, M. Pitkin, R. L. Savage, P. Shawhan, D. H. Shoemaker, J. R. Smith, L. Sun, J. Veitch, S. Vitale, A. J. Weinstein, N. Cornish, R. C. Essick, M. Fays, E. Katsavounidis, J. Lange, T. B. Littenberg, R. Lynch, P. M. Meyers, F. Pannarale, R. Prix, **R. O'Shaughnessy**, and D. Sigg.
Validating gravitational-wave detections: The Advanced LIGO hardware injection system.
Phys. Rev. D, 95(6):062002, March 2017.

75. B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, and et al.
GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2.
Phys. Rev. Lett., 118(22):221101, June 2017.

76. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, and et al.
GW170814: A Three-Detector Observation of Gravitational Waves from a Binary Black Hole Coalescence.
Phys. Rev. Lett., 119(14):141101, October 2017a.

77. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, and et al.
GW170608: Observation of a 19 Solar-mass Binary Black Hole Coalescence.
Astroph. J. Letters, 851:L35, December 2017b.

78. The LIGO Scientific Collaboration, The Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
GWTC-1: A Gravitational-Wave Transient Catalog of Compact Binary Mergers Observed by LIGO and Virgo during the First and Second Observing Runs.
Phys. Rev. X, 9(3):031040, July 2019a.

79. The LIGO Scientific Collaboration, The Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
Binary Black Hole Population Properties Inferred from the First and Second Observing Runs of Advanced LIGO and Advanced Virgo.
Astroph. J. Letters, 882(2):L24, Sep 2019b.

80. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
GW170817: Observation of gravitational waves from a binary neutron star inspiral.
Phys. Rev. Lett., 119:161101, October 2017c.

81. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
Multi-messenger Observations of a Binary Neutron Star Merger.
Astroph. J. Letters, October 2017d.

82. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
Gravitational Waves and Gamma Rays from a Binary Neutron Star Merger: GW170817 and GRB 170817A.
Astroph. J. Letters, October 2017e.

83. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
Estimating the Contribution of Dynamical Ejecta in the Kilonova Associated with GW170817.
Astroph. J. Letters, 850:L39, December 2017f.

84. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
Search for Post-merger Gravitational Waves from the Remnant of the Binary Neutron Star Merger GW170817.
Astroph. J. Letters, 851:L16, December 2017g.

85. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
A standard siren measurement of the Hubble constant.
Nature, 551:85–88, November 2017h.

86. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
On the Progenitor of Binary Neutron Star Merger GW170817.
Astroph. J. Letters, 850:L40, December 2017i.

87. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
GW170817: Implications for the Stochastic Gravitational-Wave Background from Compact Binary Coalescences.
Phys. Rev. Lett., 120(9):091101, March 2018a.

88. The ANTARES, IceCube, Pierre Auger, LIGO Scientific, and Virgo Collaborations.
Search for High-energy Neutrinos from Binary Neutron Star Merger GW170817 with ANTARES, IceCube, and the Pierre Auger Observatory.
Astroph. J. Letters, 850:L35, December 2017.

89. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
Properties of the Binary Neutron Star Merger GW170817.
Physical Review X, 9(1):011001, January 2019c.

90. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, and et al.
GW170817: Measurements of neutron star radii and equation of state.
Phys. Rev. Lett., 121:161101, October 2018b.

91. B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, and et al.
Constraining the p -Mode-g -Mode Tidal Instability with GW170817.
Physical Review Letters, 122(6):061104, February 2019.

92. The LIGO Scientific Collaboration, the Virgo Collaboration, B. P. Abbott, R. Abbott, T. D. Abbott, and et al.
Model comparison from LIGO-Virgo data on GW170817's binary components and consequences for the merger remnant.
Classical and Quantum Gravity, 37(4):045006, February 2020.

General relativity and GW parameter inference

93. James Healy, Carlos O. Lousto, Jacob Lange, and Richard O'Shaughnessy.
Application of the third RIT binary black hole simulations catalog to parameter estimation of gravitational-wave signals from the LIGO-Virgo O1 and O2 observational runs.
Phys. Rev. D, 102(12):124053, December 2020.

94. Richard Udall, Karan Jani, Jacob Lange, Richard O'Shaughnessy, James Clark, Laura Cadonati, Deirdre Shoemaker, and Kelly Holley-Bockelmann.
Inferring parameters of the loudest intermediate mass black hole trigger in LIGO's O1/O2 data.
Astroph. J., 900(1):80, September 2020.

95. Jam Sadiq, Yosef Zlochower, Richard O'Shaughnessy, and Jacob Lange.
Hybrid waveforms for generic precessing binaries for gravitational-wave data analysis.
Phys. Rev. D, 102(2):024012, July 2020.

96. D. Wysocki, **R. O'Shaughnessy**, J. Lange, and Y.-L. L. Fang.
Accelerating parameter inference with graphics processing units.
Phys. Rev. D, 99(8):084026, April 2019.

97. R. Udall, J. Brandt, G. Manchanda, A. Arulanandan, J. Clark, J. Lange, **R. O'Shaughnessy**, and L. Cadonati.
RUNMON-RIFT: Adaptive Configuration and Healing for Large-Scale Parameter Inference.
Astronomy and Computing, page 100664, 2022.
ISSN 2213-1337. (link).

98. D. Gerosa, A. Lima, E. Berti, U. Sperhake, M. Kesden, and **R. O'Shaughnessy**.
Wide nutation: binary black-hole spins repeatedly oscillating from full alignment to full anti-alignment.
Classical and Quantum Gravity, 36(10):105003, May 2019a. (link).

99. A. C. Jenkins, **R. O'Shaughnessy**, M. Sakellariadou, and D. Wysocki.
Anisotropies in the Astrophysical Gravitational-Wave Background: The Impact of Black Hole Distributions.
Physical Review Letters, 122(11):111101, March 2019. (link).

100. K. Chatziioannou, R. Cotesta, S. Ghonge, J. Lange, K. K.-Y. Ng, J. Calderon Bustillo, J. Clark, C.-J. Haster, S. Khan, M. Puerrer, V. Raymond, S. Vitale, N. Afshari, S. Babak, K. Barkett, J. Blackman, A. Bohe, M. Boyle, A. Buonanno, M. Campanelli, G. Carullo, T. Chu, E. Flynn, H. Fong, A. Garcia, M. Giesler, M. Haney, M. Hannam, I. Harry, J. Healy, D. Hemberger, I. Hinder, K. Jani, B. Khamersa, L. E. Kidder, P. Kumar, P. Laguna, C. O. Lousto, G. Lovelace, T. B. Littenberg, L. London, M. Millhouse, L. K. Nuttall, F. Ohme, **R. O'Shaughnessy**, S. Ossokine, F. Pannarale, P. Schmidt,

H. P. Pfeiffer, M. A. Scheel, L. Shao, D. Shoemaker, B. Szilagyi, A. Taracchini, S. A. Teukolsky, and Y. Zlochower.
On the properties of the massive binary black hole merger GW170729.
Phys. Rev. D, 100:104015, November 2019.

101. M. Breschi, **R. O'Shaughnessy**, O. Birnholz, and J. Lange.
IMR Consistency Tests with Higher Modes on O2 events.
Master's thesis, U. Pisa; Available as LIGO-L1800348 and arxiv:1903.05982, 2018.

102. D. Gerosa, S. Ma, K. W. K. Wong, E. Berti, **R. O'Shaughnessy**, Y. Chen, and K. Belczynski.
Multiband gravitational-wave event rates and stellar physics.
Phys. Rev. D, 99(10):103004, May 2019b.

103. J. Healy, J. Lange, **R. O'Shaughnessy**, C. O. Lousto, M. Campanelli, A. R. Williamson, Y. Zlochower, J. Calderón Bustillo, J. A. Clark, C. Evans, D. Ferguson, S. Ghonge, K. Jani, B. Khamesra, P. Laguna, D. M. Shoemaker, M. Boyle, A. García, D. A. Hemberger, L. E. Kidder, P. Kumar, G. Lovelace, H. P. Pfeiffer, M. A. Scheel, and S. A. Teukolsky.
Targeted numerical simulations of binary black holes for GW170104.
Phys. Rev. D, 97(6):064027, March 2018.

104. A.R. Williamson, J. Lange, **R. O'Shaughnessy**, J. Clark, P. Kumar, J.C. Bustillo, and J. Veitch.
Inferring parameters of potentially rapidly precessing binary black holes: Systematic challenges for future graviational wave measurements.
Phys. Rev. D, 96:124041, December 2017.
URL (link).

105. G. Lovelace, C. O. Lousto, J. Healy, M. A. Scheel, A. Garcia, **R. O'Shaughnessy**, M. Boyle, M. Campanelli, D. A. Hemberger, L. E. Kidder, H. P. Pfeiffer, B. Szilágyi, S. A. Teukolsky, and Y. Zlochower.
Modeling the source of GW150914 with targeted numerical-relativity simulations.
Classical and Quantum Gravity, 33(24):244002, December 2016. (link).

106. J. Lange, **R. O'Shaughnessy**, M. Boyle, J. Calderón Bustillo, M. Campanelli, T. Chu, J. A. Clark, N. Demos, H. Fong, J. Healy, D. A. Hemberger, I. Hinder, K. Jani, B. Khamesra, L. E. Kidder, P. Kumar, P. Laguna, C. O. Lousto, G. Lovelace, S. Ossokine, H. Pfeiffer, M. A. Scheel, D. M. Shoemaker, B. Szilagyi, S. Teukolsky, and Y. Zlochower.
Parameter estimation method that directly compares gravitational wave observations to numerical relativity.
Phys. Rev. D, 96(10):104041, November 2017.

107. **R. O'Shaughnessy**, J. Blackman, and S. Field.
An architecture for efficient multimodal parameter estimation with linear surrogate models.
CQG, June 2017. (link).

108. C. Pankow, P. Brady, E. Ochsner, and **R. O'Shaughnessy**.
Novel scheme for rapid parallel parameter estimation of gravitational waves from compact binary coalescences.
Phys. Rev. D, 92(2):023002, July 2015. (link).

109. J. Veitch, V. Raymond, B. Farr, W. M. Farr, P. Graff, S. Vitale, B. Aylott, K. Blackburn, N. Christensen, M. Coughlin, W. D. Pozzo, F. Feroz, J. Gair, C. Haster, V. Kalogera, T. Littenberg, I. Mandel, **R. O'Shaughnessy**, M. Pitkin, C. Rodriguez, C. Röver, T. Sidery, R. Smith, M. V. D. Sluys, A. Vecchio, W. Vousden, and L. Wade.
Robust parameter estimation for compact binaries with ground-based gravitational-wave observations using LALInference.
Phys. Rev. D, 91:042003, Feb 2015. (link).

110. **R. O'Shaughnessy**, P. Nepal, and A. Lundgren.
A semianalytic fisher matrix for precessing binaries with a single significant spin.
CQG, May 2020. (link).

111. B. Miller, **R. O'Shaughnessy**, B. Farr, and T. Littenberg.
Rapid gravitational wave parameter estimation with a single spin: Systematic uncertainties in parameter estimation with the SpinTaylorF2 approximation.
Phys. Rev. D, 92:4056, August 2015. (link).

112. D. Gerosa, M. Kesden, **R. O'Shaughnessy**, A. Klein, E. Berti, U. Sperhake, and D. Trifiro.
Precessional instability in binary black holes with aligned spins.
Phys. Rev. Lett., 115:141102, Oct 2015a. (link).

113. D. Trifiro, **R. O'Shaughnessy**, D. Gerosa, E. Berti, M. Kesden, T. Littenberg, and U Sperhake.
Distinguishing black-hole spin-orbit resonances via gravitational waves II: Full parameter estimation.
Phys. Rev. D, 93:044071, Feb 2016. (link).

114. D. Gerosa, M. Kesden, U. Sperhake, E. Berti, and **R. O'Shaughnessy**.
A multi-timescale analysis of phase transitions in precessing black-hole binaries.
Phys. Rev. D, 92:064016, Sep 2015b. (link).

115. Michael Kesden, Davide Gerosa, **R. O'Shaughnessy**, E. Berti, and U. Sperhake.
Effective potentials and morphological transitions for binary black hole spin precession.
Phys. Rev. Lett., 114:081103, Feb 2015. (link).

116. E. A. Huerta, P. Kumar, S. T. McWilliams, **R. O'Shaughnessy**, and N. Yunes.
Accurate and efficient waveforms for compact binaries on eccentric orbits.
Phys. Rev. D, 90:084016, 2014. (link).

117. D. Gerosa, **R. O'Shaughnessy**, M. Kesden, E. Berti, and U. Sperhake.
Distinguishing the rival families of black-hole spin-orbit resonances by their gravitational-wave signatures.
Phys. Rev. D, 89:124025+, July 2014.

118. B. Farr, E. Ochsner, W. M. Farr, and **R. O'Shaughnessy**.
A more effective coordinate system for parameter estimation of precessing compact binaries from gravitational waves.
Phys. Rev. D, 90(2):024018, July 2014. (link).

119. **R. O'Shaughnessy**, B. Farr, E. Ochsner, Hee-Suk Cho, V. Raymond, C. Kim, and Chang-Hwan Lee.
Parameter estimation of gravitational waves from precessing black hole-neutron star inspirals with higher harmonics.
Phys. Rev. D, 89:102005, May 2014a. (link).

120. **R. O'Shaughnessy**, B. Farr, E. Ochsner, H.-S. Cho, C. Kim, and C.-H. Lee.
Parameter estimation of gravitational waves from nonprecessing black hole-neutron star inspirals with higher harmonics: Comparing Markov-chain Monte Carlo posteriors to an effective Fisher matrix.
Phys. Rev. D, 89(6):064048, March 2014b. (link).

121. A. Lundgren and **R. O'Shaughnessy**.
Single-spin precessing gravitational waveform in closed form.
Phys. Rev. D, 89:044021, Feb 2014. (link).

122. D. Gerosa, M. Kesden, E. Berti, **R. O'Shaughnessy**, and U. Sperhake.
Resonant-plane locking and spin alignment in stellar-mass black-hole binaries: a diagnostic of compact-binary formation.
Phys. Rev. D, 87(10):104028, May 2013. (link).

123. H.S. Cho, E. Ochsner, **R. O'Shaughnessy**, C. Kim, and C.H. Lee.
Gravitational waves from BH-NS binaries: Phenomenological Fisher matricies and parameter estimation using higher harmonics.
Phys. Rev. D, 87:02400–+, January 2013. (link).

124. L. Pekowsky, **R. O'Shaughnessy**, J. Healy, and D. Shoemaker.
Comparing gravitational waves from nonprecessing and precessing black hole binaries in the corotating frame.
Phys. Rev. D, 88:024040, Jul 2013. (link).

125. **R. O'Shaughnessy**, L. London, J. Healy, and D. Shoemaker.
Precession during merger: Strong polarization changes are observationally accessible features of strong-field gravity during binary black hole merger.
Phys. Rev. D, 87(4):044038, February 2013. (link).

126. E. Ochsner and **R. O'Shaughnessy**.
Asymptotic frame selection for binary black hole spacetimes: Post-Newtonian limit.
Phys. Rev. D, 86(10):104037, November 2012. (link).

127. D. A. Brown, A. Lundgren, and **R. O'Shaughnessy**.
Nonspinning searches for spinning black hole-neutron star binaries in ground-based detector data: Amplitude and mismatch predictions in the constant precession cone approximation.
Phys. Rev. D, 86(6):064020, September 2012. (link).

128. **R. O'Shaughnessy**, J. Healy, L. London, Z. Meeks, and D. Shoemaker.
Is J enough? Comparison of gravitational waves emitted along the total angular momentum direction with other preferred orientations.
Phys. Rev. D, 85(8):084003, April 2012. (link).

129. **R. O'Shaughnessy**, B. Vaishnav, J. Healy, Z. Meeks, and D. Shoemaker.
Efficient asymptotic frame selection for binary black hole spacetimes using asymptotic radiation.
Phys. Rev. D, 84(12):124002, December 2011. (link).

130. **R. O'Shaughnessy**, B. Vaishnav, J. Healy, and D. Shoemaker.
Intrinsic selection biases of ground-based gravitational wave searches for high-mass BH-BH mergers.
Phys. Rev. D, 82(10):104006, Nov 2010. (link).

131. N. Yunes, **R. O'Shaughnessy**, B. J. Owen, and S. Alexander.
Testing gravitational parity violation with coincident gravitational waves and short gamma-ray bursts.
Phys. Rev. D, 82(6):064017, 2010. (link).

132. **R. O'Shaughnessy**.
Geometrical optics analysis of the short-time stability properties of the Einstein evolution equations.
Phys. Rev. D, 68(8):084024, October 2003a. (link).

133. **R. O'Shaughnessy**.
Transition from inspiral to plunge for eccentric equatorial Kerr orbits.
Phys. Rev. D, 67(4):044004, February 2003b. (link).

Supermassive black holes and electromagnetic counterparts

134. **R. O'Shaughnessy**, D. L. Kaplan, A. Sesana, and A. Kamble.
Blindly detecting orbital modulations of jets from merging supermassive black holes.
Astroph. J., 743(2):136, December 2011. (link).

135. D. L. Kaplan, **R. O'Shaughnessy**, A. Sesana, and M. Volonteri.
Blindly Detecting Merging Supermassive Black Holes with Radio Surveys.
Astroph. J. Letters, 734:L37+, June 2011. (link).

Compact binaries and short gamma ray bursts

136. D. Gerosa, E. Berti, **R. O'Shaughnessy**, K. Belczynski, M. Kesden, D. Wysocki, and W. Gladysz.
Spin orientations of merging black holes formed from the evolution of stellar binaries.
Phys. Rev. D, 98(8):084036, October 2018.

137. S. Chakrabarti, P. Chang, **R. O'Shaughnessy**, A. M. Brooks, S. Shen, J. Bellovary, W. Gladysz, and C. Belczynski.
The Contribution of Outer H I Disks to the Merging Binary Black Hole Population.
Astroph. J. Letters, 850:L4, November 2017.

138. **R. O'Shaughnessy**, J. Bellovary, A. Brooks, S. Shen, F. Governato, and C. Christensen.
The effects of host galaxy properties on merging compact binaries detectable by ligo.
MNRAS, 464:2831–2839, August 2017.
URL (link).

139. K. Belczynski, S. Repetto, D. Holz, **R. O'Shaughnessy**, T. Bulik, E. Berti, C. Fryer, and M. Dominik.
Compact Binary Merger Rates: Comparison with LIGO/Virgo Upper Limits.
Astroph. J., 819:108, March 2016. (link).

140. **R. O'Shaughnessy**.
Data-driven methods to explore a large space of computationally costly compact binary progenitor models.
Phys. Rev. D, 88(8):084061, October 2013. (link).

141. M. Dominik, K. Belczynski, C. Fryer, D. E. Holz, E. Berti, T. Bulik, I. Mandel, and **R. O'Shaughnessy**.
Double Compact Objects. II. Cosmological Merger Rates.
Astroph. J., 779:72, December 2013. (link).

142. M. Dominik, K. Belczynski, C. Fryer, D. Holz, B. Berti, T. Bulik, I. Mandel, and **R. O'Shaughnessy**.
Double compact objects I: The significance of the common envelope on merger rates.
Astroph. J., 759:52, November 2012. (link).

143. D. Clausen, R. A Wade, R. K. Kopparapu, and **R. O'Shaughnessy**.
Population Synthesis of Hot Subdwarfs: A Parameter Study.
Astroph. J., 746:186, January 2012. (link).

144. K. Belczynski, M. Dominik, T. Bulik, **R. O'Shaughnessy**, C. L. Fryer, and D. E. Holz.
The effect of metallicity on the detection prospects for gravitational waves.
Astroph. J. Letters, 715:L138–L141, June 2010. (link).

145. **R. O'Shaughnessy**, V. Kalogera, and K. Belczynski.
Binary Compact Object Coalescence Rates: The Role of Elliptical Galaxies.
Astroph. J., 716:615–633, June 2010. (link).

146. **R. O'Shaughnessy** and C. Kim.
Pulsar Binary Birthrates with Spin-opening Angle Correlations.
Astroph. J., 715:230–241, May 2010. (link).

147. **R. O'Shaughnessy**, R. Kopparapu, and K. Belczynski.
Impact of star formation inhomogeneities on merger rates and interpretation of LIGO results.
CQG, 29:145011, 2012. (link).

148. K. Belczynski, **R. O'Shaughnessy**, V. Kalogera, F. Rasio, R. E. Taam, and T. Bulik.
The Lowest-Mass Stellar Black Holes: Catastrophic Death of Neutron Stars in Gamma-Ray Bursts.
Astroph. J. Letters, 680:L129–L132, June 2008. (link).

149. **R. O'Shaughnessy**, V. Kalogera, and C. Belczynski.
Short Gamma-Ray Bursts and Binary Mergers in Spiral and Elliptical Galaxies: Redshift Distribution and Hosts.
Astroph. J., 675:566-585, March 2008a.

150. **R. O'Shaughnessy**, C. Kim, V. Kalogera, and K. Belczynski.
Constraining population synthesis models via observations of compact-object binaries and supernovae.
Astroph. J., 672:479, January 2008b. (link).

151. **R. O'Shaughnessy**, V. Kalogera, and K. Belczynski.
Mapping population synthesis event rates on model parameters II: Convergence and accuracy of multidimensional fits.
Astroph. J., 667:1048, October 2007. (link).

152. **R. O'Shaughnessy**, J. Kaplan, V. Kalogera, and K. Belczynski.
Bounds on Expected Black Hole Spins in Inspiraling Binaries.
Astroph. J., 632:1035–1041, October 2005a. (link).

153. **R. O'Shaughnessy**, C. Kim, T. Fragos, V. Kalogera, and K. Belczynski.
Constraining Population Synthesis Models via the Binary Neutron Star Population.
Astroph. J., 633:1076–1084, November 2005b. (link).

154. **R. O'Shaughnessy**, V. Kalogera, and K. Belczynski.
Mapping inspiral rates on population synthesis parameters.
Astroph. J., 620:385–389, February 2005c. (link).

Black hole mergers in clusters

155. A. Sadowski, K. Belczynski, T. Bulik, N. Ivanova, F. A. Rasio, and **R. O'Shaughnessy**.
The Total Merger Rate of Compact Object Binaries in the Local Universe.
Astroph. J., 676:1162–1169, April 2008. (link).

156. R. M. O'Leary, **R. O'Shaughnessy**, and F. A. Rasio.
Dynamical Interactions and the Black Hole Merger Rate of the Universe.
Phys. Rev. D, 76:061504, October 2007. (link).

157. R. M. O'Leary, F. A. Rasio, J. M. Fregeau, N. Ivanova, and **R. O'Shaughnessy**.
Binary Mergers and Growth of Black Holes in Dense Star Clusters.
Astroph. J., 637:937–951, February 2006. (link).

158. J. M. Fregeau, S. L. Larson, M. C. Miller, **R. O'Shaughnessy**, and F. A. Rasio.
Observing IMBH-IMBH Binary Coalescences via Gravitational Radiation.
Astroph. J., 646:L135–L138, August 2006. (link).

Interferometer design

159. **R. O'Shaughnessy**.
Coating thermal noise for arbitrary shaped beams.
CQG, 23:7627–7630, July 2006. (link).

160. **R. O'Shaughnessy**, S. Strigin, and S. Vyatchanin.
The implications of Mexican-hat mirrors: calculations of thermoelastic noise and interferometer sensitivity to perturbation for the Mexican-hat-mirror proposal for advanced LIGO.
(gr-qc/0409050), July 2004. (link).

161. E. D'Ambrosio, **R. O'Shaughnessy**, S. Strigin, K. S. Thorne, and S. Vyatchanin.
Reducing Thermoelastic Noise in Gravitational-Wave Interferometers by Flattening the Light Beams.
LIGO-T030009-00-R (gr-qc/0409075), July 2004. (link).

Selected publications with the LSC

Compact binary mergers (including multimessenger astrophysics and cosmology)

162. B. P. Abbott, R. Abbott, T. D. Abbott, S. Abraham, F. Acernese, K. Ackley, C. Adams, R. X. Adhikari, V. B. Adya, C. Affeldt, and et al.
Low-latency Gravitational-wave Alerts for Multimessenger Astronomy during the Second Advanced LIGO and Virgo Observing Run.
Astroph. J., 875(2):161, April 2019.

163. The DES Collaboration, the LIGO Scientific Collaboration, the Virgo Collaboration, M. Soares-Santos, A. Palmese, W. Hartley, J. Annis, J. Garcia-Bellido, O. Lahav, Z. Doctor, and et al.
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.
Astroph. J. Letters, 876:L7, May 2019.

164. B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, and et al.
Search for Subsolar-Mass Ultracompact Binaries in Advanced LIGO's First Observing Run.
Phys. Rev. Lett., 121(23):231103, December 2018.

165. B. P. Abbott, R. Abbott, T. D. Abbott, M. R. Abernathy, K. Ackley, C. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, C. Affeldt, and et al.
Exploring the sensitivity of next generation gravitational wave detectors.
Classical and Quantum Gravity, 34(4):044001, February 2017a. (link).

166. B. P. Abbott, R. Abbott, T. D. Abbott, M. R. Abernathy, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, and et al.

Effects of waveform model systematics on the interpretation of GW150914.
Classical and Quantum Gravity, 34(10):104002, May 2017b. (link).

167. B. Abbott et al (LIGO Scientific Collaboration and the Virgo Collaboration).
Prospects for Localization of Gravitational Wave Transients by the Advanced LIGO and Advanced Virgo Observatories.
Living Reviews in Relativity, 19, February 2016.

168. J. Abadie et al (The LIGO Scientific Collaboration and the Virgo collaboration).
Predictions for the Rates of Compact Binary Coalescences Observable by Ground-based Gravitational-wave Detectors.
CQG, 27(17):173001–+, September 2010. (link).

169. J. Abadie et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
Search for Gravitational Waves from Intermediate Mass Binary Black Holes.
Phys. Rev. D, 85:102004, January 2012.

170. J. Aasi et al. (LIGO Scientific Collaboration, the Virgo Collaboration, and the NINJA-2 Collaboation).
The NINJA-2 project: detecting and characterizing gravitational waveforms modelled using numerical binary black hole simulations.
CQG, 31(11):115004, June 2014. (link).

Searches motivated by and for transient electromagnetically-active phenomena

171. B. Abbott et al. (The LIGO Scientific Collaboration, the Virgo Collaboration, and the IPN Collaboration).
EM Follow-up: What do the estimates provided about the nature of the source mean, and how should you use them?
Available as https://dcc.ligo.org/LIGO-T1600571/public, January 2017a. (link).

172. B. Abbott et al. (The LIGO Scientific Collaboration, the Virgo Collaboration, and the IPN Collaboration).
Search for Gravitational Waves Associated with Gamma-Ray Bursts during the First Advanced LIGO Observing Run and Implications for the Origin of GRB 150906B.
Astroph. J., 841:89, June 2017b. (link).

173. P. A. Evans et al.
Swift Follow-up Observations of Candidate Gravitational-wave Transient Events.
Astroph. J. Supp., 203:28, December 2012.

174. J. Abadie et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
Search for Gravitational Waves Associated with Gamma-Ray Bursts during LIGO Science Run 6 and Virgo Science Runs 2 and 3.
Astroph. J., 760:12, November 2012a.

175. B. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
Search for gravitational-wave inspiral signals associated with short Gamma-Ray Bursts during LIGO's fifth and Virgo's first science run.
Astroph. J., 715:1453–1461, 2010. (link).

176. J. Abadie et al. (The LIGO Scientific Collaboration).
Implications for the Origin of GRB 051103 from LIGO Observations.
Astroph. J., 755:2, August 2012.

177. J. Abadie et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
Implementation and testing of the first prompt search for gravitational wave transients with electromagnetic counterparts.
A&A, 540:A124, April 2012b. (link).

178. LIGO Scientific Collaboration, S. Barthemly, N. Gehrels, K. Hurley, and D. Palmer.
Search for Gravitational-Wave Bursts from Soft Gamma Repeaters.
Phys. Rev. Lett., 101(21):211102–+, November 2008.

179. B. Abbott et al. (The LIGO Scientific Collaboration).
Stacked Search for Gravitational Waves from the 2006 SGR 1900+14 Storm.
Astroph. J. Letters, 701:L68–L74, August 2009. (link).

180. Abbott et al. (The LIGO Scientific Collaboration).
Search for gravitational wave radiation associated with the pulsating tail of the SGR 1806-20 hyperflare of 27 December 2004 using LIGO.
Phys. Rev. D, 95:062003, 2007. (link).

181. B. Abbott et al. (The LIGO Scientific Collaboration).
Implications for the Origin of GRB 070201 from LIGO Observations.
Astroph. J., 681:1419, 2008. (link).

182. B. Abbott et al. (The LIGO Scientific Collaboration).
Search for gravitational-wave bursts associated with gamma-ray bursts using data from LIGO Science Run 5 and Virgo Science Run 1.
Astroph. J., 715:1438, 2010. (link).

Other searches

183. J. Aasi et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
An all-sky search for long-duration gravitational wave transients with LIGO.
Phys. Rev. D, 93(4):042006, February 2016a. (link).

184. Aasi et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
First low frequency all-sky search for continuous gravitational wave signals.
Phys. Rev. D, 93(4):042007, February 2016b. (link).

185. J. Abadie et al. (The LIGO Scientific Collaboration and the Virgo collaboration).
All-sky Search for Periodic Gravitational Waves in the Full S5 LIGO Data.
Phys. Rev. D, 85(2):022001, January 2012. (link).

186. B. Abbott et al. (The LIGO Scientific Collaboration).
Searches for gravitational waves from known pulsars with S5 LIGO data.
Astroph. J., 713:671, 2010. (link).

187. J. Abadie et al. (The LIGO Scientific Collaboration and the Virgo Collaboration).
Beating the Spin-down Limit on Gravitational Wave Emission from the Vela Pulsar.
Astroph. J., 737:93, August 2011.

188. B. Abbott et al. (The LIGO Scientific Collaboration).
First LIGO search for gravitational wave bursts from cosmic (super)strings.
Phys. Rev. D, 80(6):062002, 2009a. (link).

189. B. Abbott et al. (The LIGO Scientific Collaboration).
An upper limit on the stochastic gravitational-wave background of cosmological origin.
Nature, 460:990–994, August 2009b.

Research supporting LIGO analysis of electromagnetic counterparts to GW events

190. T. Sidery, B. Aylott, N. Christensen, B. Farr, W. Farr, F. Feroz, J. Gair, K. Grover, P. Graff, C. Hanna, V. Kalogera, I. Mandel, **R. O'Shaughnessy**, M. Pitkin, L. Price, V. Raymond, C. Röver, L. Singer, M. van der Sluys, R. J. E. Smith, A. Vecchio, J. Veitch, and S. Vitale.
Reconstructing the sky location of gravitational-wave detected compact binary systems: Methodology for testing and comparison.
Phys. Rev. D, 89(8):084060, April 2014.

191. R. K. Kopparapu, C. R. Hanna, V. Kalogera, **R. O'Shaughnessy**, G. Gonzalez, P. R. Brady, and S. Fairhurst.
Host Galaxies Catalog Used in LIGO Searches for Compact Binary Coalescence Events.
Astroph. J., 675:1459–1467, March 2008. (link).

WHITE PAPERS, REVIEW ARTICLES, DESIGN STUDIES, AND CONFERENCE PROCEEDINGS

192. B. Abbott, R. Abbott, R. Adhikari, P. Ajith, B. Allen, G. Allen, R. Amin, S. B. Anderson, W. G. Anderson, M. A. Arain, and et al. Astrophysically triggered searches for gravitational waves: status and prospects. *CQG*, 25(11):114051–+, June 2008.

193. M. Abernathy and et al. Einstein gravitational wave Telescope: Conceptual Design Study. *(available from European Gravitational Observatory, document number ET-0106A-10)*, 2011.

194. B. Berti, E. Barausse, V. Cardoso, L. Gualtieri, P. Pani, U. Sperhake, L. C. Stein, N. Wex, K. Yagi, T. Baker, C. P. Burgess, F. S. Coelho, D. Doneva, A. De Felice, P. G. Ferreira, P. C. C. Freire, J. Healy, C. Herdeiro, M. Horbatsch, B. Kleihaus, A. Klein, K. Kokkotas, J. Kunz, P. Laguna, R. N. Lang, T. G. F. Li, T. Littenberg, A. Matas, S. Mirshekari, H. Okawa, E. Radu, R. O'Shaughnessy, B. S. Sathyaprakash, C. Van Den Broeck, H. A. Winther, H. Witek, M. Emad Aghili, J. Alsing, B. Bolen, L. Bombelli, S. Caudill, L. Chen, J. C. Degollado, R. Fujita, C. Gao, D. Gerosa, S. Kamali, H. O. Silva, J. G. Rosa, L. Sadeghian, M. Sampaio, H. Sotani, and M. Zilhao. Testing General Relativity with Present and Future Astrophysical Observations. *Classical and Quantum Gravity*, 32(24):243001, December 2015.

195. A. Corsi, D. A. Frail, B. J. Owen, D. J. Sand, R. O'Shaughnessy, and E. J. Murphy. Host galaxies and relativistic ejecta of compact binary mergers in the ngVLA era. *ArXiv e-prints*, November 2017.

196. Hild, S. et al. Sensitivity studies for third-generation gravitational wave observatories. *Classical and Quantum Gravity*, 28(9):094013–+, May 2011.

197. V. Kalogera, K. Belczynski, C. Kim, R. O'Shaughnessy, and B. Willems. Formation of double compact objects. *Physics Reports*, 442:75–108, April 2007.

198. M. Punturo et al. The Einstein Telescope: a third-generation gravitational wave observatory. *Classical and Quantum Gravity*, 27(19):194002–+, October 2010.

199. I. Mandel, V. Kalogera, and R. O'Shaughnessy. Unraveling Binary Evolution from Gravitational-Wave Signals and Source Statistics. *Proceedings of Marcel Grossman 12 (available as arXiv:1001.2583)*, January 2010.

200. I. Mandel and R. O'Shaughnessy. Compact binary coalescences in the band of ground-based gravitational-wave detectors. *Classical and Quantum Gravity*, 27(11):114007–+, June 2010.

201. B. Sathyaprakash, M. Abernathy, F. Acernese, P. Ajith, B. Allen, P. Amaro-Seoane, N. Andersson, S. Aoudia, K. Arun, P. Astone, and et al. Scientific objectives of Einstein Telescope. *Classical and Quantum Gravity*, 29(12):124013, June 2012.

202. R. A. Wade, D. R. Clausen, R. K. Kopparapu, R. O'Shaughnessy, M. A. Stark, and M. J. Walentosky. A Hidden Population of Hot Subdwarf Stars in Close Binaries. In V. Kologera & M. van der Sluys, editor, *American Institute of Physics Conference Series*, volume 1314 of *American Institute of Physics Conference Series*, pages 73–78, December 2010.

203. R. A. Wade, R. K. Kopparapu, and R. O'Shaughnessy. Testing Binary Population Synthesis Models with Hot Subdwarfs. In M. E. van Steenberg, G. Sonneborn, H. W. Moos, & W. P. Blair, editor, *American Institute of Physics Conference Series*, volume 1135 of *American Institute of Physics Conference Series*, pages 231–233, May 2009.

UNPUBLISHED TALKS AND SEMINARS

1. Reducing Thermoelastic Noise by Reshaping the Light Beams and Test Masses. *LIGO Scientific Collaboration general meeting*, August 2001.

2. Reducing thermoelastic noise in LIGO mirrors. *17th Pacific Coast Gravity Meeting, ITP, UC Santa Barbara*, March 2001.

3. Mexican Hat (Flat-Topped) Beams for Advanced LIGO. *LIGO Scientific Collaboration general meeting*, August 2003.

4. Constraints on binary black hole inspiral rates via population synthesis and binary neutron stars . *17th International Conference on General Relativity and Gravitation*, December 2004.

5. Population synthesis and binary black hole merger rates. *LIGO Scientific Collaboration general meeting*, August 2004.
6. Population synthesis and binary black hole merger rates. *Midwest Relativity Meeting*, October 2004.
7. Constraints on compact-object merger rates via (EM) NS-NS observations. *9th annual Gravitational Wave Data Analysis Workshop*, December 2004.
8. Phase steps: Nonparametric extensions to inspiral template families. *9th annual Gravitational Wave Data Analysis Workshop*, December 2004.
9. Expected compact-object merger rates. *LIGO Scientific Collaboration general meeting*, March 2005.
10. Black hole mergers via interactions in dense clusters **(Invited talk)**. *MODEST-6 Meeting, Northwestern University*, August 2005.
11. Delayed mergers: The contribution of ellipticals, globular clusters, and protoclusters to the LIGO detection rate. *LIGO Scientific Collaboration general meeting*, August 2005.
12. Updated merger rates BH-BH, BH-NS, NS-NS rates via best-constrained population synthesis. *LIGO Scientific Collaboration general meeting*, August 2005.
13. Binary models for short gamma ray bursts **(Invited talk)**. *New Views of the Universe, KICP Inaugural Symposium, Kavli Institute, Chicago*, December 2005.
14. Compact object merger rates. *10th annual Gravitational Wave Data Analysis Workshop*, December 2005.
15. Critically assessing Binary mergers as short hard GRBs **(Invited talk)** . *LIGO-Caltech*, March 2006.
16. Compact object merger rates: Predictions and Constraints (including short GRBs). *LIGO Scientific Collaboration general meeting*, March 2006.
17. Detecting binary mergers with gravitational waves (or, *Why LIGO is needed to understand short GRBs*) **(Invited talk)**. *Argonne National Lab, High Energy Physics/Astrophysics seminar*, November 2006.
18. Constraining binary evolution with event rates: Predicted merger rates of and astrophysical constraints on BH-NS and NS-NS mergers, including short GRBs. *23rd Texas Symposium, Melbourne, Australia*, December 2006.
19. Gravitational wave astronomy: A new window on the universe **(Invited talk)**. *Georgia Tech Physics Colloquium, Atlanta, GA*, January 2007.
20. Astrophysical constraints on BH-NS and NS-NS mergers and the short GRB redshift distribution **(Invited talk)**. *KICP Lunch Colloquium, Chicago, IL*, February 2007.
21. Astrophysical constraints on BH-NS and NS-NS mergers and the short GRB redshift distribution **(Invited talk)**. *UIUC Physics Colloqium, Champaign, IL*, 2007.
22. Comparing the known (astrophysical constraints on BH-NS and NS-NS mergers) and the unknown (short GRBs) **(Invited talk)**. *Ringberg short GRB workshop, Munich, Germany*, 2007.
23. Unravelling short GRBs with LIGO, Swift, and GLAST. *Argonne GLAST workshope, Argonne National Lab, Chicago, USA*, 2007.
24. Short GRBs and Mergers: Astrophysical constraints on a BH-NS and NS-NS origin. *APS, Jacksonville, USA*, 2007.
25. Short GRBs and Mergers: Astrophysical constraints on a BH-NS and NS-NS origin. *Penn State University, USA*, May 2007.
26. The probability of compact binary coalescence detection with enhanced LIGO. *Boston, MA*, December 2007.
27. Can short GRBs be NS mergers? *APS April meeting*, April 2008.
28. Astrophysics with LIGO **(Invited talk)**. *Columbia University Particle Physics Seminar*, 2008.
29. Astrophysics with LIGO: Constraining binary populations. *East Coast Gravity Meeting*, May 2008.

30. Ground-based gravitational-wave astronomy and compact objects in clusters **(Invited talk)**. *UCSB KITP globular cluster program*, 2009.
31. Astrophysics with gravitational-wave measurements of binary compact object mass distributions. *APS April Meeting*, May 2009.
32. Gravitational wave emission from (short) GRBs **(Invited talk)**. *Multi-messenger astrophysics conference: Center for relativistic astrophysics, Georgia Tech*, May 2009.
33. Gravitational wave signatures of binary evolution **(Invited talk)** . *Syracuse university gravitational wave group*, May 2009.
34. Astrophysics with gravitational-wave measurements of binary compact object mass distributions. *8th Amaldi meeting*, May 2009.
35. Binary neutron star astrophysics **(Invited talk)**. *Numerical relativity and data analysis conference; AEI, Potsdam*, 2009.
36. Opening a new window on the universe: Gravitational wave astronomy with compact binaries **(Invited talk)**. *TAMU Commerce, Commerce, TX*, 2010.
37. Using short GRBs to limit birefringence in Chern-Simons modified gravity. *Workshop on gravitational wave tests of alternative theories of gravity in the advanced detector era; UWM, Milwaukee*, May 2010.
38. Testing GR using Externally Triggered Searches: Astrophysical challenges. *Workshop on gravitational wave tests of alternative theories of gravity in the advanced detector era; UWM, Milwaukee*, May 2010.
39. Selection biases of nonspinning searches for spinning binaries in ground-based detector data. *Midwest relativity meeting; Guelph, Canada*, November 2010.
40. Choosing precessing black hole binary simulations that cover the waveform space. *APS April Meeting; Anaheim, CA*, 2011.
41. Microphysics to macrophysics: Astrophysics and gravitational wave science targets in the advanced detector era and beyond. *Microphysics in Computational Relativistic Astrophysics: 2011; Perimeter Institute*, 2011.
42. Low metallicity star formation: a nursery for compact binary mergers? (**Invited talks**). *Perimeter and CITA, Toronto*, October 2011.
43. Low metallicity star formation: a nursery for compact binary mergers? **(Invited talk)**. *Center for Relativistic Astrophysics, Georgia Tech*, February 2012.
44. Distinguishing between merging black hole binaries, with orientation-dependent emission. *APS April Meeting; Atlanta, GA*, April 2012.
45. Gravitational wave source populations **(Invited talk)**. *Connecting the Gravitational Wave and Electromagnetic Skies in the Era of Advanced LIGO, Princeton, NJ*, May 2012.
46. Precession during merger: Strong polarization changes are observationally accessible features of strong-field gravity during binary black hole merger. *Rattle and Shine: Gravitational Wave and Electromagnetic Studies of Compact Binary Mergers, KITP, Santa Barbara [July]; and Midwest Relativity Meeting, Chicago, IL [Sept]*, July 2012.
47. Gravitational wave astronomy of merging compact binaries **(Invited talk)**. *Workshop on Outstanding Problems in Massive Star Research – the final stages; St. Paul, MN*, October 2012.
48. Interpreting the complex gravitational wave symphony from merging, precessing black hole binaries. *Physics colloquium, Department of Physics, U. of Mississippi* **(Invited talk)**, November 2012.
49. Low metallicity star formation: a nursery for compact binary mergers? *Theoretical Astrophysics and Relativity Seminar, Caltech*, January 2013.
50. Gravitational wave astrophysics with merging compact binaries **(Invited talk)**. *Theoretical astrophysics seminar, U. Illinois (Urbana)*, February 2013.
51. Interpreting the complex gravitational wave symphony from merging, precessing black hole binaries (**Invited talk)**. *Princeton [March] and RIT [June]*, March 2013.

52. Using a corotating frame to model and interpret gravitational waves from strong-field binary black hole merger. *APS Meeting, Denver, CO*, April 2013.
53. Gravitational wave source populations. *Caltech Gravitational Wave Astrophysics summer school*, July 2013.
54. A closed-form model for gravitational waves from precessing BH-NS binaries. *23rd Midwest Relativity Meeting, Milwaukee, WI*, October 2013.
55. Disentangling astrophysics from gravity. *Testing General Relativity with Astrophysical Observations, Oxford MS*, January 2014.
56. Astrophysical inferences from gravitational wave detections. *SMS colloquium, Rochester Institute of Technology [February]; Physics colloquium, U. Mississippi [March]*, 2014.
57. Estimating parameters of BH-NS binaries with gravitational waves. *APS April meeting, Savanna, GA*, April 2014.
58. Efficient high-mass parameter estimation. *NARDA 2014, Fullerton, CA*, August 2014.
59. Understanding and evolving precessing black hole binaries. *Aspen Center for Physics*, January 2015.
60. A semianalytic Fisher matrix for precessing BH-NS binaries. *APS April Meeting, Baltimore, MD*, April 2015.
61. Efficient high-mass parameter estimation. *Cornell University relativity seminar, Ithaca, NY*, May 2015.
62. Efficient high-mass parameter estimation. *2015 East Coast Gravity Meeting, Rochester, NY*, May 2015.
63. New perspectives on the dynamics of precessing binary black holes. *CITA (U. Toronto)*, October 2015.
64. GR@100++: Beyond Gravitational Wave Detection (invited panelist). *Princeton University, Center for Theoretical Science*, April 2016.
65. Directly comparing GW150914 with Numerical Relativity. *APS April Meeting, Salt Lake City*, April 2016.
66. Directly comparing GW150914 with Numerical Relativity. *Gravitational Wave Physics and Astronomy Workshop*, July 2016.
67. Will LIGO infer formation scenarios of binary BH mergers **(Invited talk)**. *KITP Rapid Response Workshop: Astrophysics from LIGO's First Black Holes*, August 2016.
68. Data analysis for the future (Roundtable). *GW161212: The Universe through gravitational waves, Simons Center for Geometry and Physics, Stony Brook NY*, December 2016.
69. An architecture for efficient multimodal parameter estimation with linear surrogate models. *APS April Meeting, Washington DC*, January 2017.
70. Numerical relativity and gw data. *The Dawning Era of Gravitational-Wave Astrophysics, Aspen Center for Physics*, January 2017.
71. Measuring the imprint of spin in the strong field. *Strong Gravity and Binary Dynamics*, February 2017.
72. Inferences about supernova physics from gravitational-wave measurements of gw151226. June 2017.
73. How much does galaxy assembly history impact the population of merging compact binaries? (**Invited talk**). *Texas Tech University*, June 2017.
74. Forming ligos merging bh-bh binaries via isolated binary evolution. *Aspen Center for Physics*, July 2017.
75. Gravitational waves: opening a new window on the universe. November 2017.
76. Compact object astrophysics and gravitational wave astronomy (**invited talk**). *NY section APS meeting*, November 2017.

77. Inferring tidal distortion of coalescing neutron star binaries. *231st American Astronomical Society Meeting, Washington DC*, January 2018.
78. Constraining the nuclear equation of state with multiple observational channels. *April APS meeting, Columbus OH*, April 2018.
79. Illuminating a dark world: Gravitational wave astrophysics with binary black holes. *Physics colloquium, U. Tennessee-Knoxville*, 2018.
80. The observed population of compact mergers. *Aspen Center for Physics, GWPop 2019*, February 2019.
81. Primer on Gravitational Wave Observables (**Invited talk**). *Workshop on Stellar Mass black hole mergers in AGN disks, Center for Computational Astrophysics, Flatiron Institute, NY*, March 2019.
82. Astrophysics with gravitational wave populations (**Invited talk**). *Columbia University, NYC, NY*, April 2019.
83. Gravitational Wave Parameter and Population Inference. *Inference in Multimessenger Astrophysics Workshop, UC Berkeley, CA*, May 2019.
84. Update on LIGO Astrophysics. *Advancing Computational Methods to understand the dynamics of ejection, Accretion, Winds and Jets in Neutron Star Mergers workshop, RIT, Rochester, NY*, 2019.
85. Dynamical environments are interesting iii. *KITP Program: The New Era of Gravitational-Wave Physics and Astrophysics, Santa Barbara, CA*, July 2019.
86. Simultaneous inference of the neutron star population and equation of state. *APS April Meeting*, 2020.
87. What can we learn about NS in binaries with gravitational waves? *Advancing Computational Methods to understand the dynamics of ejection, Accretion, Winds and Jets in Neutron Star Mergers workshop, RIT, Rochester, NY*, July 2020.
88. LIGO O3: the story so far (**Invited talk**). *AGN Disks: Where the Wild Things Are, Center for Computational Astrophysics, Flatiron Institute, NY*, October 2020.
89. Multimessenger and multiobject parameter inference. *The r-process and the nuclear EOS after LIGO-Virgo's third observing run, Institute for Nuclear Theory, University of Washington, Seattle, WA*, 2022.
90. Iteratively interpreting Gravitational wave sources and populations. *Physics colloquium, CSU Fullerton*, August 2022.

AWARDS AND HONORS

Bruno Rossi Prize (2017, with Gaby Gonzalez as part of the LIGO Scientific Collaboration)
Princess of Asturias Award for Scientific and Technical Research (2017, as part of the LIGO Scientific Collaboration)
Einstein Medal (2017, as part of the LIGO Scientific Collaboration)
Special Breakthrough Prize in Fundamental Physics (2016, as part of the LIGO Scientific Collaboration)
2016 Gruber Cosmology Prize (as part of the LIGO Scientific Collaboration)