# Justin L. Ripley

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## Academic Employment

**Research Associate**, Department of Physics, University of Illinois, Urbana-Champaign **August 2022-present**

**Research Associate**, DAMTP, University of Cambridge **October 2020-June 2022**

**Research and Teaching Assistant**, Princeton University **September 2014-July 2020**

## Education

**PhD, Physics**, Princeton University **September 2014-July 2020**
Advisor: Frans Pretorius

**BA, Physics**, Columbia University **September 2010-May 2014**
Minor in Mathematics
Departmental honors in Physics, *summa cum laude*, Phi Beta Kappa

## Awards/Grants

**Hartle award** **December 2019**
International Society on General Relativity and Gravitation (GR 22/Amaldi 13 conference)

**Erwin H. Leiwant Scholarship** **September 2013-May 2014**
Columbia University

**John Jay Scholar** **September 2010-May 2014**
Columbia University

## Computational Experience

My Github account: JLRipley314, lists some of the individual computational projects I have worked on. I have also done some work for the GRChombo collaboration, which works on an open-source numerical relativity code.

## Teaching and Mentorship

**Mentorship of PhD students**

Daniel Caballero (University of Illinois, Urbana-Champaign) **2023-present**
*Abhishek Hegade K. R. (University of Illinois, Urbana-Champaign) **2022-present**
*Hengrui Zhu (Princeton University) **2022-present**
*Maxence Corman (Perimenter Institute for Theoretical Physics) **2021-2022**
*Alex Pandya (Princeton University) **2021-2022**
*Tamara Evstafyeva (University of Cambridge) **2021-2022**

*Led to publication.

**Mentorship of undergraduate students**

Shikhar Kumar (University of Cambridge) **Summer 2021**
Adam Wills (University of Cambridge) **Summer 2021**

**Assistant Instructor, Princeton University**

EGR/PHY 191, An integrated introduction to engineering, math, physics **Fall 2019**
PHY 103/105, General Physics I Lab **Fall 2018**
PHY 304, Advanced Electromagnetism **Spring 2018**
AST 203, The Universe **Spring 2017,2018**
PHY 523, General Relativity (graduate course) **Fall 2017**
AST 204, Topics in Modern Astronomy **Spring 2016**
PHY 301, Thermal Physics **Fall 2015, Spring 2016**

## Professional Activities

**University of Illinois, Urbana-Champaign**
University of Chicago - UIUC joint meetings co-organizer **September 2023-present**

**University of Cambridge, DAMTP**
Friday general relativity seminar co-organizer **October 2020-June 2022**
General relativity journal club co-organizer **October 2020-June 2022**

**Princeton University Department of Physics**
Member on the Climate and Inclusion Committee **September 2019-May 2020**

**External PhD thesis reader**
External thesis reader and committee member for Thanassis Giannakoupoulos (University of Lisbon) **September 2022**

**Referee**
Physical Review D, Physical Review Letters, Classical and Quantum Gravity

## Outreach

**Princeton citizen scientists**

The Princeton Citizen Scientists is a graduate student led group at Princeton University that is dedicated to science policy and outreach at the local, state, and federal level.

President **June 2018–July 2019**
Co-organizer for science advocacy trip to Washington, D.C. (article) **December 2018**
Co-organizer for science and intersectionality workshop (link to schedule) **February 2018**
Co-organizer for science "teach-in" event at Princeton public library (article) **October 2017**

**Open labs**

Open labs is a graduate student group at Princeton University that organizes "science cafes" where local high and middle school students hear talks given by graduate students about their research.

Treasurer and presenter **May 2018–February 2019**

**Department of physics, Princeton University**

I participated in several science outreach events organized through the department of physics at Princeton University throughout my time as a graduate student. events where I helped plan/organize some of programming are listed below.

Trenton science summer camp (helped plan and run several lessons over 2 weeks) **July 2018**

**Interviews on "these vibes are too cosmic"**

These vibes are too cosmic is a radio program run through Princeton University.
Interview about exotic compact objects **January 2019**
Interview about antigravity **March 2016**

## Refereed Publications

Link to all papers, including preprints: InSpire Hep

23. Hengrui Zhu, **Justin L. Ripley**, Alejandro Cárdenas-Avendanño, Frans Pretorius, *Challenges in quasinormal mode extraction: Perspectives from numerical solutions to the Teukolsky equation.* Phys.Rev.D 109 (2024) 4, 044010 arXiv:2309.13204

22. **Justin L. Ripley**, Abhishek Hegade K.R., Nicolás Yunes, *Probing internal dissipative processes of neutron stars with gravitational waves during the inspiral of neutron star binaries.* Phys. Rev. D 108 (2023) 10, 103037 arXiv:2306.15633

21. Abhishek Hegade K.R., **Justin L. Ripley**, Nicolás Yunes, *Nonrelativistic limit of first-order relativistic viscous fluids.* Phys.Rev.D 107 (2023) 12, 124029 arXiv:2305.09725

20. Tamara Evstafyeva, Michalis Agathos, **Justin L. Ripley**, *Measuring the ringdown scalar polarization of gravitational waves in Einstein-scalar-Gauss-Bonnet gravity.* Phys. Rev. D 107 (2023), 124010 arXiv:2212.11359

19. Abhishek Hegade K.R., **Justin L. Ripley**. Nicolás Yunes, *Where and why does Einstein-scalar-Gauss-Bonnet theory break down?.* Phys.Rev.D 107 (2023) 4, 044044. arXiv:2211.08477

18. Maxence Corman, **Justin L. Ripley**, William E. East, *Nonlinear studies of binary black hole mergers in Einstein-scalar-Gauss-Bonnet gravity.* Phys.Rev.D 107 (2023) 2, 024014. arXiv:2210.09235

17. Alex Pandya, **Justin L. Ripley**. *Dynamics of a nonminimally coupled scalar field in asymptotically $AdS_4$ spacetime.* Class.Quant.Grav. 39 (2022) 21, 215018. arXiv:2206.08854

16. **Justin L. Ripley**. *Numerical relativity for Horndeski gravity.* IJMPD 31(13):2230017, 2022. arXiv:2207.13074

15. Maxence Corman, William E. East, **Justin L. Ripley**. *Evolution of black holes through a nonsingular cosmological bounce.* JCAP 09 (2022) 063 arXiv:2206.08466

14. **Justin L. Ripley**. *Computing the quasinormal modes and eigenfunctions for the Teukolsky equation using horizon penetrating, hyperboloidally compactified coordinates.* Class. Quantum Grav. 39 (14) 145009 (2022). arXiv:2202.03837

13. William E. East, **Justin L. Ripley**. *Dynamics of Spontaneous Black Hole Scalarization and Mergers in Einstein-Scalar-Gauss-Bonnet Gravity.* Phys. Rev. Lett. 127, 101102 (2021). arXiv:2105.08571

12. **Justin L. Ripley**. *A symmetric hyperbolic formulation of the vacuum Einstein equations in affine-null coordinates.* Journal of Mathematical Physics 62, 062501 (2021). arXiv:2104.09972

11. **Justin L. Ripley**, Nicholas Loutrel, Elena Giorgi, and Frans Pretorius. *Numerical computation of second-order vacuum perturbations of Kerr black holes.* Phys. Rev. D 103 (10), 104018 (2021). arXiv:2010.00162

10. Nicholas Loutrel, **Justin L. Ripley**, Elena Giorgi, and Frans Pretorius. *Second Order Perturbations of Kerr Black Holes: Reconstruction of the Metric.* Phys. Rev. D 103, 104017 (2021). arXiv:2008.11770

9. William E. East, **Justin L. Ripley**. *Evolution of Einstein-scalar-Gauss-Bonnet gravity using a modified harmonic formulation.* Phys.Rev.D 103 4, 044040 (2021). arXiv:2011.03547

8. **Justin L. Ripley**, Frans Pretorius. *Dynamics of a $\mathbb{Z}_2$ symmetric EdGB gravity in spherical symmetry.* Class. Quantum Grav. 37 (15), 155003 (2020). arXiv:2005.05417

7. **Justin L. Ripley**, Frans Pretorius. *Scalarized black hole dynamics in Einstein-dilaton-Gauss-Bonnet gravity.* Phys. Rev. D 101 (4), 044015 (2019). arXiv:1911.11027

6. **Justin L. Ripley**. *Excision and avoiding the use of boundary conditions in numerical relativity.* Class. Quantum Grav. 36 (23) 237001 (2019). arXiv:1908.04234

5. **Justin L. Ripley**, Frans Pretorius. *Gravitational collapse in Einstein dilaton Gauss-Bonnet gravity* Class. Quantum Grav. 36 (13) 134001 (2019). arXiv:1903.07543

4. **Justin L. Ripley**, Frans Pretorius. *Hyperbolicity in Spherical Collapse of a Horndeski Theory.* Phys. Rev. D 99 (8), 084014 (2019). arXiv:1902.01468

3. **Justin L. Ripley**, Kent Yagi. *Black hole perturbation under a 2+2 decomposition in the action.* Phys. Rev. D 97 (2), 024009 (2017). arXiv:1705.03068

2. Anna Ijjas, **Justin L. Ripley**, Paul J. Steinhardt. *NEC violation in mimetic cosmology revisited.* Phys.Lett. B760 132-138 (2016). arXiv:1604.08586

1. **Justin L. Ripley**, Brian D. Metzger, Almudena Arcones, and Gabriel Martinez-Pinedo. *X-ray Decay Lines from Heavy Nuclei in Supernova Remnants as a Probe of the r-Process Origin and the Birth Periods of Magnetars.* Mon. Not. Roy. Astron. Soc. 438 (4), 3243-3254 (2013). arXiv:1310.2950

**GRChombo collaboration papers:** For contributions to the GRChombo collaboration numerical relativity code.

2. Radia et al., *Lessons for adaptive mesh refinement in numerical relativity.* Class. Quant. Grav. 39 (13) 135006 (2022). arXiv:2112.10567

1. Andrade et al., *GRChombo: An adaptable numerical relativity code for fundamental physics.* J. Open Source Softw. 6 (2021) 3703. arXiv:2201.03458

## Colloquia, Seminars, and Conferences

### Colloquia

1. Oregon State University, Corvallis, OR **November 2023**
   *Neutron stars: a window into dense nuclear matter*

### Invited conference talks/seminars

21. University of Illinois, Urbana-Champaign, Urbana, IL **February 2024**
    *Probing the internal dynamics of neutron stars with gravitational waves*

20. Infinity seminar (online) **December 2023**
    *Measuring quasinormal modes in hyperboloidal slicings of Kerr*

19. University of Oregon, Eugene, OR **November 2023**
    *Probing the internal dynamics of neutron stars with gravitational waves*

18. University of Mississippi, Oxford, MS (online) **October 2023**
    *Probing internal dissipative processes of neutron stars with gravitational waves*

17. California Institute of Technology, Pasadena, CA **August 2023**
    *Probing internal dissipative processes of neutron stars with gravitational waves*

16. University of Illinois, Urbana-Champaign, Urbana, IL **September 2022**
    *Modeling black hole binaries in modified theories of gravity*

15. Black Hole Initiative, Harvard University, Cambridge, MA (online) **March 2022**
    *Numerical Relativity and testing General Relativity with gravitational waves: Parts I&II*

14. University of Tübingen, Tübingen, DE (online) **February 2022**
    *Evolution of binary black hole systems in scalar Gauss-Bonnet gravity*

13. Albert Einstein Institute, Potsdam, DE (online) **November 2021**
    *Evolution of binary black hole systems in scalar Gauss-Bonnet gravity*

12. Sapienza University of Rome, Rome, IT (online) **May 2021**
    *Computing the second order gravitational perturbation of Kerr black holes*

11. University of Oxford, Oxford, UK (online) **February 2021**
    *The classical evolution of binary black hole systems in scalar-tensor theories*

10. University of Virginia, Charlottesville, VA (online) **February 2021**
    *The classical evolution of binary black hole systems in scalar-tensor theories*

9. Kyoto University, Kyoto, JP (online) **February 2021**
   *The classical evolution of binary black hole systems in scalar-tensor theories*

8. University of Southampton, Southampton, UK (online) **January 2021**
   *The classical evolution of binary black hole systems in scalar-tensor theories*

7. University of Cambridge, Cambridge, UK (online) **November 2020**
   *Computing the second order gravitational perturbation of Kerr black holes*

6. Johns Hopkins University, Baltimore, MD (online) **November 2020**
   *Numerical computation of second order vacuum perturbations of Kerr black holes*

5. Princeton University, Princeton, NJ (online) **October 2020**
   *Classical modifications to Einstein's General Relativity around black holes*

4. Perimeter Institute, Waterloo, ON (online) **April 2020**
   *Exploring the nonlinear dynamics of Einstein dilaton Gauss-Bonnet gravity*

3. University of Illinois, Urbana, IL **January 2020**
   *Testing General Relativity and the nonlinear dynamics of modified gravity theories*

2. Massachusetts Institute of Technology, Cambridge, MA **December 2019**
   *Second order vacuum perturbation of a Kerr black hole*

1. Black Hole Initiative, Harvard University, Cambridge, MA **December 2019**
   *Nonlinear dynamics of Horndeski theories in spherical collapse*

**Contributed conference talks/seminars**

12. Midwest Relativity Meeting, Chicago, IL **Nov 2023**
    *Probing internal dissipative processes of neutron stars with gravitational waves during the inspiral*

11. Amaldi 15 (Online) **July 2023**
    *Probing internal dissipative processes of neutron stars with gravitational waves*

10. APS April Meeting, Minneapolis, MN **April 2023**
    *Impact of viscosity on the orbital dynamics of neutron star binaries*

9. GR23 (online) **July 2022**
   *Evolution of binary scalar-hairy black holes*

8. EPS-HEP2021 Conference (online) **July 2021**
   *Modeling black hole binaries in scalar-tensor theories of gravity*

7. APS April Meeting, Sacramento, CA (online) **April 2021**
   *Application of the modified generalized harmonic formulation to scalar-tensor gravity theories*

6. BritGrav21, UCD, Dublin, Ireland (online) **April 2021**
   *Computing the second order vacuum perturbation of Kerr black holes*

5. XIII Black Holes Workshop, IST, Lisbon, PT (online) **December 2020**
   *Computing the second order vacuum perturbation of a Kerr black hole*

4. APS April Meeting, Washington, DC (online) **April 2020**
   *Second order perturbation of a Kerr black hole*

3. GR 22/Amaldi 13, Valencia, Spain **July 2019**
   *Nonlinear dynamics of Horndeski theories in spherical collapse*

2. APS April Meeting, Denver, CO **April 2019**
   *Hyperbolicity in gravitational collapse in a modified gravity theory*

1. Numerical Relativity beyond General Relativity, Benasque, Spain **June 2018**
   *Gravitational collapse in a modified gravity theory*