Justin L. Ripley

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Employment

Research Associate

- DAMTP, University of Cambridge **October 2020–present**

Graduate student Research Assistant and Assistant Instructor

- Department of Physics, Princeton University **September 2014– July 2020**

Education

Princeton University **2014–2020**

- Advisor: Frans Pretorius
- PhD Physics, 2020
- M.A. Physics, 2016

Columbia University **2010–2014**

- B.A. Physics, 2014

Research Interests

General relativity (GR), and modeling of astrophysical and cosmological phenomena which can be used to test and increase our understanding of the dynamics of GR and the Standard Model of particle physics. This research program includes work in the mathematics of GR and of modified gravity theories, to better understand the self-consistency of modeling used to compare theory to observation and experiment. I am also interested in numerical relativity, numerical analysis, and scientific visualization.

Awards/Grants

International Society on General Relativity and Gravitation

- Hartle award for best talk by a student (GR 22/Amaldi 13 conference) **December 2019**

National Science Foundation

- GRFP honorable mention **March 2015**

Columbia University

- *summa cum laude*, Phi Beta Kappa, Departmental honors in physics **May 2014**
- Erwin H. Leiwant Scholarship **September 2013–May 2014**
- John Jay Scholar **September 2010–May 2014**

Refereed Publications

8. **Justin L. Ripley**, Frans Pretorius *Dynamics of a $\mathbb{Z}_2$ symmetric EdGB gravity in spherical symmetry.* Class. Quant. Grav. 37 (15), 155003. 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. arXiv:1911.11027

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

5. **Justin L. Ripley**, Frans Pretorius, *Gravitational collapse in Einstein dilaton Gauss-Bonnet gravity* Class. Quantum Grav. 36 (13) 134001. arXiv:1903.07543 (Invited to Focus Issue on Numerical Relativity Beyond General Relativity)

4. **Justin L. Ripley**, Frans Pretorius, *Hyperbolicity in Spherical Collapse of a Horndeski Theory.* Phys. Rev. D 99 (8), 084014. 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. arXiv:1705.03068

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

1. **Justin L. Ripley**, Brian D. Metzger, Almudena Arcones, and Gabriel Martnez-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. arXiv:1310.2950

Invited Talks

- Perimeter Institute, Waterloo, ON (virtual talk) **April 2020**
  Exploring the nonlinear dynamics of Einstein dilaton Gauss-Bonnet gravity
- University of Illinois, Urbana-Champaign, IL **January 2020**
  Testing General Relativity and the nonlinear dynamics of modified gravity theories
- Black Hole Initiative, Harvard University, Cambridge, MA **December 2019**
  Nonlinear dynamics of Horndeski theories in spherical collapse

Seminars/Contributed Talks

- APS April Meeting (virtual talk) **April 2020**
  Second order perturbation of a Kerr black hole
- Princeton University, Princeton, NJ **March 2020**
  Modeling the 'ringdown' of a Kerr black hole
- Massachusetts Institute of Technology, Cambridge, MA **December 2019**
  Second order vacuum perturbation of a Kerr black hole
- GR 22/Amaldi 13, Valencia, Spain **July 2019**
  Nonlinear dynamics of Horndeski theories in spherical collapse
- APS April Meeting, Denver, CO **April 2019**
  Hyperbolicity in gravitational collapse in a modified gravity theory
- Numerical Relativity beyond General Relativity, Benasque, Spain **June 2018**
  Gravitational collapse in a modified gravity theory

Computational Experience

- Languages: C/C++, Fortran, Mathematica, Python
- Link to my Github account, which contains open-source code for some of the projects I have worked on.

Professional Activities

Committees

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

Seminar Organizer

- Friday GR seminar,
  DAMTP, University of Cambridge **October 2020-present**

Journal Referee

- Physical Review D, Physical Review Letters **April 2020-present**

Professional Organizations

- Member of American Physical Society **2018-present**

Teaching and Mentorship

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 **Fall 2017**
- AST 204, Topics in Modern Astronomy **Spring 2016**
- PHY 301, Thermal Physics **Fall 2015, Spring 2016**

Teaching Assistant, Columbia University

- Math V2000, Introduction to higher mathematics **Spring 2014**

Outreach

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 active member **May 2018–February 2019**

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;
  see this article in the Daily Princetonian **December 2018**
- Co-organizer for science "teach-in" event at Princeton Public Library;
  see this article in the Daily Princetonian **October 2017**

Interviews on "These Vibes are Too Cosmic"

These Vibes are Too Cosmic is a radio program run through Princeton University.

- Interview on exotic compact objects **January 2019**
- Interview on antigravity **March 2016**