

# Justin L. Ripley

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## Academic Employment

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**Research Associate**, DAMTP, University of Cambridge **October 2020-present**

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

## Education

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**PhD, Physics**, Princeton University **September 2014-July 2020**

Advisor: Frans Pretorius

**B.A., Physics**, Columbia University **September 2010-May 2014**

Minor in Mathematics

Departmental honors in Physics, *summa cum laude*, Phi Beta Kappa

## Research Interests

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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

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**Hartle award for best talk by a student**, ISGRG **December 2019**

Awarded for GR 22/Amaldi 13 conference

**GRFP honorable mention**, NSF **March 2015**

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

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

## Refereed Publications

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Link to preprints: InSpire Hep

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 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. arXiv:1310.2950

## Invited Talks

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| 4. Princeton University, Princeton, NJ (virtual talk)<br><i>Classical modifications to Einstein's General Relativity around black holes</i>  | <b>October 2020</b>  |
| 3. Perimeter Institute, Waterloo, ON (virtual talk)<br><i>Exploring the nonlinear dynamics of Einstein dilaton Gauss-Bonnet gravity</i>      | <b>April 2020</b>    |
| 2. University of Illinois, Urbana-Champaign, IL<br><i>Testing General Relativity and the nonlinear dynamics of modified gravity theories</i> | <b>January 2020</b>  |
| 1. Black Hole Initiative, Harvard University, Cambridge, MA<br><i>Nonlinear dynamics of Horndeski theories in spherical collapse</i>         | <b>December 2019</b> |

## Seminars/Contributed Talks

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| 5. APS April Meeting, Washington, DC (virtual talk)<br><i>Second order perturbation of a Kerr black hole</i>                     | <b>April 2020</b>    |
| 4. Massachusetts Institute of Technology, Cambridge, MA<br><i>Second order vacuum perturbation of a Kerr black hole</i>          | <b>December 2019</b> |
| 3. GR 22/Amaldi 13, Valencia, Spain<br><i>Nonlinear dynamics of Horndeski theories in spherical collapse</i>                     | <b>July 2019</b>     |
| 2. APS April Meeting, Denver, CO<br><i>Hyperbolicity in gravitational collapse in a modified gravity theory</i>                  | <b>April 2019</b>    |
| 1. Numerical Relativity beyond General Relativity, Benasque, Spain<br><i>Gravitational collapse in a modified gravity theory</i> | <b>June 2018</b>     |

## Computational Experience

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See my Github account, JLRipley314, for some of the computational projects I have worked on/am working on.

## Professional Activities

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### COMMITTEES

<b>Climate and Inclusion Committee</b> Department of Physics, Princeton University	<b>September 2019-May 2020</b>
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### SEMINAR ORGANIZER

<b>Friday GR seminar</b> DAMTP, University of Cambridge	<b>October 2020-present</b>
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### JOURNAL REFEREE

Physical Review D, Physical Review Letters	<b>April 2020-present</b>
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## PROFESSIONAL ORGANIZATIONS

Member of American Physical Society

2018-present

## Teaching and Mentorship

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### 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
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## Outreach

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### PRINCETON CITIZEN SCIENTISTS

The Princeton Citizen Scientists (PCS) is a graduate student led group at Princeton University that is dedicated to science policy and outreach at the local, state, and federal level. Throughout my time at PCS I helped organize (and participated in) multiple projects, trips, and conferences; below I list the events I directly led/co-led.

<b>President</b>	June 2018–July 2019
<b>Co-organizer for science advocacy trip to Washington, D.C</b> Article in Daily Princetonian	December 2018
<b>Co-organizer for science “teach-in” event at Princeton Public Library</b> Article in Daily Princetonian	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.

<b>Treasurer and presenter</b>	May 2018–February 2019
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### 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