

# Ryan Unger

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runger@berkeley.edu  
website

## APPOINTMENTS

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### University of California, Berkeley

*Miller Fellow*

*July 2025 – ongoing*

### Stanford University

*NSF Postdoctoral Fellow*

*July 2024 – July 2025*

## EDUCATION

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### Princeton University

*Ph.D. in Mathematics*

*September 2019 – May 2024*

Advisor: Mihalis Dafermos

Thesis: **The extremal collapse threshold and the third law of black hole thermodynamics**

### University of Cambridge

*Visiting Ph.D. student in DPMMS*

*October 2022 – June 2023*

### University of Tennessee, Knoxville

*B.S. in Mathematics, summa cum laude*

*September 2015 – May 2019*

Advisor: Alexandre Freire

Thesis: **Some problems in scalar curvature geometry**

## RESEARCH INTERESTS

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General relativity, nonlinear wave equations, and geometric analysis.

## PAPERS

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- Y. Angelopoulos, C. Kehle, and R. Unger. *The moduli space of dynamical spherically symmetric black hole spacetimes and the extremal threshold*.  
In preparation.
- Y. Angelopoulos and R. Unger. *Semilinear wave equations on extremal Reissner–Nordström black holes revisited*.  
*Commun. Math. Phys.* **406** (2025). arXiv:2502.00210.
- Y. Angelopoulos, C. Kehle, and R. Unger. *Nonlinear stability of extremal Reissner–Nordström black holes in spherical symmetry*.  
To appear in *Forum of Math., Pi*, arXiv:2410.16234 (2024).
- J. Jauregui, D. A. Lee, and R. Unger. *A note on Huisken’s isoperimetric mass*.  
*Lett. Math. Phys.* **114** (2024). arXiv:2408.08871.
- C. Kehle and R. Unger. *Extremal black hole formation as a critical phenomenon*.  
arXiv:2402.10190 (2024).
- C. Kehle and R. Unger. *Event horizon gluing and black hole formation in vacuum: the very slowly rotating case*.  
*Adv. in Math.* **452** (2024). arXiv:2304.08455.

- C. Kehle and R. Unger. *Gravitational collapse to extremal black holes and the third law of black hole thermodynamics*. *J. Eur. Math. Soc.* (2025). arXiv:2211.15742.
- D. A. Lee, M. Lesourd, and R. Unger. *Noncompact fill-ins of Bartnik data*. *J. Geom. Anal.* **34**:102 (2024). arXiv:2211.06280.
- D. A. Lee, M. Lesourd, and R. Unger. *Density and positive mass theorems for incomplete manifolds*. *Calc. Var. Partial Differential Equations* **62** (2023). arXiv:2201.01328.
- D. A. Lee, M. Lesourd, and R. Unger. *Density and positive mass theorems for initial data sets with boundary*. *Commun. Math. Phys.* **395** (2022). arXiv:2112.12017.
- M. Lesourd, R. Unger, and S.-T. Yau. *The positive mass theorem with arbitrary ends*. *J. Differential Geom.* **128**.1 (2024). arXiv:2103.02744.
- M. Lesourd, R. Unger, and S.-T. Yau. *Positive scalar curvature on noncompact manifolds and the Liouville theorem*. *Comm. Anal. Geom.* **32**.5 (2024). arXiv:2009.12618.

Undergraduate research:

- J. L. Bishop, R. Unger, A. M. Faiia, A. Szyrkiewicz, J. D. Auxier II, H. L. Hall, and M. Lang. *Thermal signatures of Cu metal revealed through oxygen isotope fractionation*. *J. Radioanal. Nucl. Chem.* **326** (2020).

## INVITED TALKS

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| London PDE seminar                                 | October 2025  |
| Berkeley geometry seminar                          | October 2025  |
| Stony Brook analysis seminar                       | April 2025    |
| Perimeter Institute strong gravity seminar         | April 2025    |
| 2025 APS meeting, mathematical GR session          | March 2025    |
| Southern California geometric analysis seminar     | February 2025 |
| Caltech analysis seminar                           | February 2025 |
| Princeton/IAS joint analysis seminar               | October 2024  |
| Penn State PDE seminar                             | October 2024  |
| Cambridge PDE seminar                              | October 2024  |
| Stanford Analysis & PDE seminar                    | October 2024  |
| Oberwolfach workshop on general relativity         | August 2024   |
| UTK geometric analysis seminar                     | April 2024    |
| Harvard BHI foundations seminar                    | March 2024    |
| MIT strings/gravity seminar                        | February 2024 |
| Oberwolfach workshop on scalar curvature geometry  | February 2024 |
| EPFL analysis seminar                              | February 2024 |
| Columbia analysis seminar                          | November 2023 |
| Cretan waves conference                            | October 2023  |
| Virtual mathematical GR and hyperbolic PDE seminar | July 2023     |
| University of Crete Center for Theoretical Physics | May 2023      |
| Edinburgh analysis seminar                         | April 2023    |
| Oxbridge PDE conference                            | March 2023    |

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| Rutgers hyperbolic and dispersive PDE seminar                                 | February 2023 |
| Berkeley analysis seminar   | February 2023 |
| Vanderbilt analysis seminar   | February 2023 |
| Harvard BHI colloquium  | February 2023 |
| Cambridge Friday GR seminar   | January 2023  |
| Zürich mathematical physics & PDE seminar                                     | December 2022 |
| Imperial College London junior analysis seminar                               | November 2022 |
| YMNCGA Texas A&M  | August 2022   |
| Cambridge analysis student seminar  | June 2022     |
| Harvard CMSA workshop on scalar curvature and minimal surfaces                | May 2022      |
| Joint Mathematics Meeting special session on scalar curvature and convergence | April 2022    |
| Princeton graduate student seminar  | October 2021  |
| Johns Hopkins analysis seminar  | April 2021    |
| Harvard CMSA general relativity seminar                                       | April 2021    |
| Princeton junior general relativity seminar                                   | March 2021    |
| Princeton graduate student seminar  | October 2019  |

## TEACHING EXPERIENCE

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|   |                             |
|---|-----------------------------|
| Part II Differential Geometry supervisions                              | Lent 2023 (Cambridge)       |
| Part III Analysis of PDEs examples class instructor                     | Michaelmas 2022 (Cambridge) |
| Part III General Relativity examples class instructor                   | Michaelmas 2022 (Cambridge) |
| Calculus I precept instructor   | Spring 2022 (Princeton)     |
| Teaching assistant for Calculus III, Linear Algebra, Real Analysis, PDE | (Princeton)                 |

## AWARDS AND HONORS

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|   |            |
|---|------------|
| Jürgen Ehlers thesis prize  | 2025       |
| NSF Postdoctoral Fellowship DMS 2401966   | 2024       |
| Miller Fellowship, UC Berkeley Miller Institute for Basic Research in Science         | 2024       |
| Porter Ogden Jacobus Fellowship   | 2023       |
| – Princeton University’s highest honor for graduate students in their final year      |            |
| John H. Barrett Memorial Scholarship  | 2019       |
| – UTK Department of Mathematics’ highest honor for undergraduates in their final year |            |
| James A. Cooley Memorial Scholarship  | 2018       |
| UTK Office of Undergraduate Research Grant  | 2017       |
| Pi Mu Epsilon Tennessee Delta Chapter   | 2017       |
| Cooper D. Schmitt Memorial Scholarship  | 2017, 2018 |
| Lucile and Herbert E. Lee Memorial Scholarship  | 2017       |
| UTK Nuclear Engineering Top Freshman Academic Award                                   | 2016       |
| Tennessee Volunteer Scholarship   | 2015-2019  |

## SERVICE

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Referee for:

*Annales Henri Poincaré, Classical and Quantum Gravity, Communications in Mathematical Physics, Communications on Pure and Applied Mathematics, Geometry & Topology, Mathematische Annalen, Transactions of the American Mathematical Society*

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| Berkeley Analysis & PDE Seminar organizer | Fall 2025 – ongoing     |
| Stanford Analysis & PDE seminar organizer | Fall 2024 – Spring 2025 |

Princeton Graduate Student Seminar organizer  
Princeton First Year Student Seminar organizer

Fall 2020 – Spring 2021  
Fall 2019 – Spring 2020

## MISCELLANEOUS

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Languages: English (native), German (fluent)  
Citizenship: USA