Carolyn Raithel

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Research Interests

Theoretical astrophysics, multi-messenger astronomy, neutron stars, the dense-matter equation of state, gravitational waves, compact object mergers

Employment

Joint Postdoctoral Fellowship:

Institute for Advanced Study, Princeton, NJ, USA — 2020 –
John N. Bahcall Fellow

Princeton University, Princeton, NJ, USA — 2020 –
Postdoctoral fellow at the Princeton Gravity Initiative (PGI) and Princeton Center for Theoretical Science (PCTS, 2020-2023)

Education

University of Arizona, Tucson, AZ, USA — 2015 – 2020
Ph.D., Astronomy & Astrophysics
Advisor: Dr. Feryal Özel

Carleton College, Northfield, MN, USA — 2011 – 2015
B.A., Physics, *Magna cum laude*

Select Honors and Awards

- University of Arizona Department of Astronomy Outstanding Teaching Award, 2020
- Dr. Pliny A. and Margaret H. Price Prize, Center for Cosmology and AstroParticle Physics, The Ohio State University, 2019
- Philanthropic Education Organization (P.E.O.) Scholar Award, 2018
- University of Arizona College of Science Outstanding Research Award, 2018
- University of Arizona Department of Astronomy Outstanding Research Award, 2018
- University of Arizona Roy P. Drachman Galileo Circle Scholarship, 2018
- NSF Graduate Research Fellowship, 2016 – 2020
- American Physical Society Leroy Apker Award Finalist, 2015
- Barry M. Goldwater Scholar, 2014

Teaching Experience

Princeton University Teaching Transcript Program – *In progress.*
Includes 5 pedagogy workshops, online course and orientation for new academic instructors, one guest lecture and class observation, and the development of an original syllabus.
Estimated completion date: Fall 2024

PhD School for the 19th International Conference on QCD in Extreme Conditions
Coimbra, Portugal. July 2023. 3×90 minute original lectures on the following subjects:
1. Introduction to the Physics of Neutron Stars
2. Masses, Radii, and the Neutron Star Equation of State
3. Gravitational Wave Astronomy: A New Window into Neutron Star Interiors

Teaching Assistant, Astronomy Department, University of Arizona
- *The Physical Universe*, Introductory astronomy class. Fall 2018.
- *Great Debates in Astronomy*, Second tier introductory astronomy class. Spring 2019.

Mentoring of research students
- Josef Zimmerman, Princeton University graduate student, February 2022 - present.
- Tesla Holman, University of Wisconsin Milwaukee 3rd-year undergraduate, Summer 2023.

- Heidi Gubser, Princeton High School junior/senior, Summer 2021 and Fall 2022 - Summer 2023.
- Lawrence Edmond IV, NSBP-Simons Foundation Scholar, January - August 2022.

Leadership and Service

- Co-organizer of the Institute for Nuclear Theory Workshop "EOS measurements with next-generation gravitational-wave detectors", August 2024.
- Co-organizer of the Princeton Gravity Initiative (PGI) Seminar Series, 2022−2023.
- Co-organizer of the Princeton Center for Theoretical Science (PCTS) and PGI Workshop "Multi-Messenger Modeling of Neutron Star Mergers", May 2023.
- Co-organizer of the PCTS/PGI Workshop "Weather and Climate on Neutron Stars: Connecting Surface Flow Theory and Observations", April 2022.
- Co-organizer of the Institute for Advanced Study/Princeton University joint Astrophysics Colloquium Series, 2021−2022.
- Referee: *The Astrophysical Journal Letters; Monthly Notices of the Royal Astronomical Society; Physical Review D, X, and Letters.*
- Graduate Student Representative on the Steward Observatory Committee for Diversity and Inclusivity, May 2017 − August 2019.
- Graduate Student Representative on the Graduate Admissions Committee for Steward Observatory, Winter 2017/2018.
- Volunteer judge for Astronomy, Physics, and Math projects at the Southern Arizona Research, Science, and Engineering Foundation Science Fair, March 2017, 2018, and 2019.
- Carleton College Women in Physics Society, Co-President, 2014 −2015.

Invited Talks

Wayne State University, April 2023.	Physics Colloquium
MIT, March 2023.	Astro. Colloquium
University of Milwaukee, February 2023.	Physics Colloquium
University of Chicago, February 2023.	Astro. Colloquium
The Ohio State University, January 2023.	Astro. Colloquium
Swarthmore College, January 2023.	Physics Colloquium
MIT, December 2022.	CTP Seminar
Wellesley College, November 2022.	Astro. Colloquium
Johns Hopkins University, October 2022.	Theory Seminar
Harvard Institute for Theory and Computation, September 2022.	Colloquium
Aspen Center for Physics, July 2022.	Colloquium
TU Darmstadt, June 2022.†	Theory Seminar
West Virginia University, April 2022.†	Physics & Astro. Colloquium
Intl. Research Network for Nuclear Astrophysics, April 2022.†	Online Seminar
Max-Planck Institute for Gravitational Physics, March 2022.†	Computational Astro. Seminar
Penn State University, October 2021.	Fundamental Physics Seminar
UC Berkeley, August 2021.†	N3AS Seminar
Arizona State University, June 2021.†	Theoretical Physics Colloquium
Cornell University, April 2021.†	Astronomy Colloquium
Institute for Advanced Study, February 2021.†	Astrophysics Seminar
Princeton Gravity Initiative, November 2020.†	PGI Seminar
UW-Milwaukee, April 2020.†	CGCA Seminar
Los Alamos National Lab, March 2020.	Astrophysics Seminar
University of Arizona, February 2020.	Steward/NSF-OIR Colloquium
UC Berkeley, September 2019.	Theoretical Astrophysics Seminar
Michigan State University, September 2019.	JINA-CEE Seminar
CCAPP, The Ohio State University, August 2019.	Price Prize Seminar
Center for Nuclear Research, Kent State, January 2019.	Nuclear Theory Seminar

† Indicates remote presentation.

Select Conferences

NuSym23 International Symposium, GSI, Darmstadt, Germany. Sept. 2023.	Invited Talk
Werner Israel Memorial Symposium, Hybrid. May 2023.	Invited Talk
PAX: Next-Generation Gravitational Wave Detectors, MIT. August 2022.	Panelist
Strangeness in Quark Matter, Online (South Korea). June 2022.	Invited Plenary
Nuclear EoS and R-process Workshop, INT, Seattle, WA. May 2022.	Contributed Talk
APS April Meeting - DAP/DGRAV, NYC. April 2022.	Invited Talk
APS April Meeting - DNP Mini-Symposium, NYC. April 2022.	Invited Talk
TCAN Meeting on Compact Binaries, Online. July 2021.	Invited Talk
APS April Meeting, Online. April 2021.	Contributed Talk
AAS 235 Meeting, Honolulu, HI. January 2020.	Dissertation Talk
APS Division of Nuclear Physics Meeting, Crystal City, VA. October 2019.	Invited Talk
APS April Meeting, Denver, CO. April 2019.	Invited Talk
Ohio Section APS meeting, Toledo, OH. September 2018.	Invited Plenary
COSPAR Annual Assembly, Pasadena, CA. July 2018.	Contributed Talk
First Observations of a Neutron Star Merger, INT, Seattle, WA. March 2018.	Contributed Talk
50 Years of Pulsars, IAU Symposium, Jodrell Bank, UK. September 2017.	Poster
Phases of Dense Matter Workshop, INT, Seattle, WA. July 2016.	Contributed Talk

First-Author Publications

18. C. A. Raithel and V. Paschalidis. Influence of Stellar Compactness on Finite-Temperature Effects in Neutron Star Merger Simulations. arXiv:2306.13144, 2023.
17. C. A. Raithel and E. R. Most. Degeneracy in the Inference of Phase Transitions in the Neutron Star Equation of State from Gravitational Wave Data. Phys Rev Letters, Volume 130, Issue 20, 2023.
16. C. A. Raithel and E. R. Most. Tidal Deformability Doppelgangers: Implications of a low-density phase transition in the neutron star equation of state. Phys Rev D, Volume 108, Issue 2, 2023.
15. C. A. Raithel and E. R. Most. Characterizing the Breakdown of Quasi-Universality in the Post-Merger Gravitational Waves from Binary Neutron Star Mergers. ApJ Letters, Volume 933, L39, 2022.
14. C. A. Raithel, P. Espino, and V. Paschalidis. Finite-temperature effects in dynamical-spacetime binary neutron star merger simulations: Validation of the parametric approach. MNRAS, Volume 516, Issue 4, 2022.
13. C. A. Raithel and V. Paschalidis. Improving the convergence order of binary neutron star merger simulations in the BSSN formulation. Phys Rev D, Volume 106, Issue 2, 2022.
12. E. R. Most and C. A. Raithel. [Equal author contribution]. Impact of the Nuclear Symmetry Energy on the Post-Merger Phase of a Binary Neutron Star Coalescence. Phys Rev D, Volume 104, Issue 12, 2021.
11. C. A. Raithel, V. Paschalidis, and F. Özel. Realistic Finite-Temperature Effects in Neutron Star Merger Simulations. Phys Rev D, Vol 104, Issue 6, 2021.
10. C. A. Raithel, F. Özel, and D. Psaltis. Optimized Statistical Approach for Comparing Multi-Messenger Neutron Star Data. ApJ, Volume 908, Issue 1, article id. 103 (10pp), 2021.
9. C. A. Raithel and F. Özel. Measurement of the Nuclear Symmetry Energy Parameters from Gravitational Wave Events. ApJ, Volume 885, Issue 2, article id. 121 (9pp), 2019.
8. C. A. Raithel. Constraints on the Neutron Star Equation of State from GW170817. Invited review for the EpJA Topical Issue on The First Neutron Star Merger Observation, 2019. EPJA, Volume 55, 80 (11pp), 2019.
7. C. A. Raithel, F. Özel, and D. Psaltis. Finite-Temperature Extension for Cold Neutron Star Equations of State. ApJ, Volume 875, Issue 1, article id. 12 (18pp), 2019.
6. C. A. Raithel, F. Özel, and D. Psaltis. Tidal Deformability from GW170817 as a Direct Probe of the Neutron Star Radius. ApJ Letters, Volume 857, Issue 2, article id. L23 (6pp), 2018.

5. C. A. Raithel, T. Sukhbold, and F. Özel. Confronting Models of Massive Star Evolution and Explosions with Remnant Mass Measurements. ApJ, Volume 856, Issue 1, article id. 35 (13pp), 2018.
4. C. A. Raithel, F. Özel, and D. Psaltis. From Neutron Star Observables to the Equation of State. II. Bayesian Inference of Equation of State Parameters. ApJ, Volume 844, Issue 2, 156 (9pp), 2017.
3. C. A. Raithel, F. Özel, and D. Psaltis. From Neutron Star Observables to the Equation of State. I. An Optimal Parametrization. ApJ, Volume 831, Issue 1, 44 (11pp), 2016.
2. C. A. Raithel, F. Özel, and D. Psaltis. Model-Independent Inference of Neutron Star Radii from Moment of Inertia Measurements. PhysRevC, Volume 93, Issue 3, id.032801 (4pp), 2016.
1. C. A. Raithel, R. M. Shannon, S. Johnston, and M. Kerr. Two Radio Emission Mechanisms in PSR J0901-4624. ApJ Letters, Volume 804, Issue 1, L18 (5pp), 2015.

Co-Authored Publications

2. D. Psaltis et al. [incl. Raithel]. Markov Chains for Horizons (MARCH). I. Identifying Biases in Fitting Theoretical Models to Event Horizon Telescope Observations. ApJ, Volume 928, 55, 2022.
1. R. M. Shannon et al. [incl. Raithel]. Limitations in timing precision due to single-pulse shape variability in millisecond pulsars. MNRAS, Volume 443, Issue 2, p.1463-1481, 2014.