

# Ross J. Jennings

## CURRICULUM VITÆ

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## Employment

- 2022 – ▶ **NANOGrav Physics Frontiers Center Postdoctoral Fellow**  
Department of Physics and Astronomy  
West Virginia University • Morgantown, WV

## Education

- 2015 – 2021 ▶ **Ph.D., Cornell University** • Astrophysics  
Adviser: James M. Cordes
- 2011 – 2015 ▶ **B.A., Carleton College** • Mathematics; Physics and Astronomy  
Thesis Adviser (Mathematics): Helen Wong  
Thesis Adviser (Physics and Astronomy): Joel Weisberg

## Collaborations & Professional Societies

- 2018 – ▶ **NANOGrav Collaboration** • Full member
- 2015 – ▶ **American Astronomical Society** • Member
- ▶ **American Physical Society** • Member

## Awards

- 2024 ▶ **Hero of NANOGrav** • NANOGrav Physics Frontiers Center
- 2020 ▶ **New York Space Grant Fellow** • NASA New York Space Grant Consortium
- 2015 ▶ **Phi Beta Kappa, Sigma Xi** • Carleton College
- 2011 ▶ **National Merit Scholar** • National Merit Scholarship Corporation

## Research Experiences and Professional Activities

- 2024 ▶ **GBO/NRAO postdoc symposium** • Green Bank Observatory, Green Bank, WV
- 2023 ▶ **Unravelling the Universe with PTAs workshop** • PITT PACC / University of Pittsburgh, Pittsburgh, PA • Invited speaker
  - ▶ **IPTA DR3 workshop** • Max Planck Institute for Radio Astronomy, Bonn, Germany
- 2022 ▶ **IPTA DR3 kickoff workshop** • Flatiron Institute, New York, NY
- 2021 ▶ **NASA review panel** • Reviewer (event held virtually)
- 2019 ▶ **GBT observer training workshop** • Green Bank Observatory, Green Bank, WV
- 2015 ▶ **IAS Park City Math Institute** • Park City, UT
- 2014 ▶ **NSF REU** • University of Michigan, Ann Arbor, MI  
Supervisor: David Gerdes
- 2013 ▶ **Budapest Semester in Mathematics** • Budapest, Hungary

## Teaching Experience

- 2016 ▶ **Physics II: Electromagnetism** • Teaching Assistant  
Led discussion sections; prepared solutions to problem sets; graded problem sets and exams.
  - ▶ **General Physics I (Autotutorial)** • Teaching Assistant  
Provided one-on-one instruction and tutoring to students; administered exams.
- 2015 ▶ **Why the Sky Is Blue: Aspects of the Physical World** • Teaching Assistant  
Led discussion sections; wrote review quizzes; graded homework.

## Software

- ▶ **Contributions:** PINT, PyPulse
- ▶ **High Proficiency:** Python, Mathematica, L<sup>A</sup>T<sub>E</sub>X, git, bash
- ▶ **Some Proficiency:** Inkscape, Julia, Rust, C, C++, Fortran, Docker

## Publications

### *Journal Articles*

- ▶ Bjorn Larsen, Chiara M. F. Mingarelli, Jeffrey S. Hazboun, and 61 others, including **Ross J. Jennings** (2024). *The NANOGrav 15 yr Data Set: Chromatic Gaussian Process Noise Models for Six Pulsars*. ApJL 972, 49.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 102 others, including **Ross J. Jennings** (2024). *The NANOGrav 15 yr Data Set: Running of the Spectral Index*. Preprint on arXiv.
- ▶ Abhimanyu Susobhanan, David L. Kaplan, Anne M. Archibald, and 21 others, including **Ross J. Jennings** (2024). *PINT: Maximum-likelihood Estimation of Pulsar Timing Noise Parameters*. ApJ 971, 150.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 99 others, including **Ross J. Jennings** (2024). *The NANOGrav 15 yr data set: Posterior predictive checks for gravitational-wave detection with pulsar timing arrays*. Preprint on arXiv.
- ▶ Thomas Donlon II, Sukanya Chakrabarti, Michael T. Lam, and 53 others, including **Ross J. Jennings** (2024). *The Anomalous Acceleration of PSR J2043+1711: Long-Period Orbital Companion or Stellar Flyby?*. Preprint on arXiv.
- ▶ Lankeswar Dey, Maura A. McLaughlin, Haley M. Wahl, and 32 others, including **Ross J. Jennings** (2024). *Exploring pulsar timing precision: A comparative study of polarization calibration methods for NANOGrav data from the Green Bank Telescope*. Submitted to ApJ.
- ▶ Aaron D. Johnson, Patrick M. Meyers, Paul T. Baker, and 95 others, including **Ross J. Jennings** (2024). *NANOGrav 15-year gravitational-wave background methods*. PRD 109, 3012.
- ▶ G. Agazie, J. Antoniadis, A. Anumalapudi, and 242 others, including **Ross J. Jennings** (2024). *Comparing Recent Pulsar Timing Array Results on the Nanohertz Stochastic Gravitational-wave Background*. ApJ 966, 105.
- ▶ Gabriella Agazie, Paul T. Baker, Bence B csy, and 80 others, including **Ross J. Jennings** (2024). *The NANOGrav 15 yr Data Set: Looking for Signs of Discreteness in the Gravitational-wave Background*. Submitted to ApJ.
- ▶ **Ross J. Jennings**, James M. Cordes, Shami Chatterjee, and 41 others (2024). *An Unusual Pulse Shape Change Event in PSR J1713+0747 Observed with the Green Bank Telescope and CHIME*. ApJ 964, 179.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 97 others, including **Ross J. Jennings** (2024). *The NANOGrav 15 yr Data Set: Search for Transverse Polarization Modes in the Gravitational-wave Background*. ApJL 964, 14.

## Publications (continued)

- ▶ Gabriella Agazie, Zaven Arzoumanian, Paul T. Baker, and 86 others, including **Ross J. Jennings** (2024). *The NANOGrav 12.5 yr Data Set: A Computationally Efficient Eccentric Binary Search Pipeline and Constraints on an Eccentric Supermassive Binary Candidate in 3C 66B*. ApJ 963, 144.
- ▶ Gabriella Agazie, Zaven Arzoumanian, Paul T. Baker, and 88 others, including **Ross J. Jennings** (2024). *The NANOGrav 12.5 yr Data Set: Search for Gravitational Wave Memory*. ApJ 963, 61.
- ▶ Bence B csy, Neil J. Cornish, Patrick M. Meyers, and 93 others, including **Ross J. Jennings** (2023). *How to Detect an Astrophysical Nanohertz Gravitational Wave Background*. ApJ 959, 9.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 90 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Search for Anisotropy in the Gravitational-wave Background*. ApJL 956, 3.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 112 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Constraints on Supermassive Black Hole Binaries from the Gravitational-wave Background*. ApJL 952, 37.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 96 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries*. ApJL 951, 50.
- ▶ Zaven Arzoumanian, Paul T. Baker, Laura Blecha, and 76 others, including **Ross J. Jennings** (2023). *The NANOGrav 12.5 yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries*. ApJL 951, 28.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 89 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Detector Characterization and Noise Budget*. ApJL 951, 10.
- ▶ Adeela Afzal, Gabriella Agazie, Akash Anumalapudi, and 121 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Search for Signals from New Physics*. ApJL 951, 11.
- ▶ Gabriella Agazie, Md Faisal Alam, Akash Anumalapudi, and 98 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Observations and Timing of 68 Millisecond Pulsars*. ApJL 951, 9.
- ▶ Gabriella Agazie, Akash Anumalapudi, Anne M. Archibald, and 112 others, including **Ross J. Jennings** (2023). *The NANOGrav 15 yr Data Set: Evidence for a Gravitational-wave Background*. ApJL 951, 8.
- ▶ M. Falxa, S. Babak, P. T. Baker, and 125 others, including **Ross J. Jennings** (2023). *Searching for continuous Gravitational Waves in the second data release of the International Pulsar Timing Array*. MNRAS 521, 5077.

## Publications (continued)

- ▶ J. Antoniadis, Z. Arzoumanian, S. Babak, and 123 others, including **Ross J. Jennings** (2022). *The International Pulsar Timing Array second data release: Search for an isotropic gravitational wave background*. MNRAS 510, 4873.
- ▶ Zaven Arzoumanian, Paul T. Baker, Harsha Blumer, and 69 others, including **Ross J. Jennings** (2021). *The NANOGrav 12.5-year Data Set: Search for Non-Einsteinian Polarization Modes in the Gravitational-wave Background*. ApJL 923, 22.
- ▶ Zaven Arzoumanian, Paul T. Baker, Harsha Blumer, and 63 others, including **Ross J. Jennings** (2021). *Searching for Gravitational Waves from Cosmological Phase Transitions with the NANOGrav 12.5-Year Dataset*. PRL 127, 251302.
- ▶ E. Fonseca, H. T. Cromartie, T. T. Pennucci, and 42 others, including **Ross J. Jennings** (2021). *Refined Mass and Geometric Measurements of the High-mass PSR J0740+6620*. ApJL 915, 12.
- ▶ Zaven Arzoumanian, Paul T. Baker, Adam Brazier, and 54 others, including **Ross J. Jennings** (2021). *The NANOGrav 11 yr Data Set: Limits on Supermassive Black Hole Binaries in Galaxies within 500 Mpc*. ApJL 914, 121.
- ▶ Nihan S. Pol, Stephen R. Taylor, Luke Zoltan Kelley, and 50 others, including **Ross J. Jennings** (2021). *Astrophysics Milestones For Pulsar Timing Array Gravitational Wave Detection*. ApJL 911, 34.
- ▶ Zaven Arzoumanian, Paul T. Baker, Harsha Blumer, and 59 others, including **Ross J. Jennings** (2020). *The NANOGrav 12.5-yr Data Set: Search for an Isotropic Stochastic Gravitational Wave Background*. ApJL 905, L34.
- ▶ Zaven Arzoumanian, Paul T. Baker, Adam Brazier, and 57 others, including **Ross J. Jennings** (2020). *Multimessenger Gravitational Wave Searches with Pulsar Timing Arrays: Application to 3C 66B Using the NANOGrav 11-yr Data Set*. ApJ 900, 102.
- ▶ **Ross J. Jennings**, James M. Cordes, and Shami Chatterjee (2020). *Pulsar Timing Signatures of Circumbinary Asteroid Belts*. ApJ 904, 191.
- ▶ Jing Luo, Scott Ransom, Paul Demorest, and 13 others, including **Ross J. Jennings** (2020). *PINT: A Modern Software Package for Pulsar Timing*. ApJ 911, 45.
- ▶ Md F. Alam, Zaven Arzoumanian, Paul T. Baker, and 68 others, including **Ross J. Jennings** (2020). *The NANOGrav 12.5-year Data Set: Wideband Timing of 47 Millisecond Pulsars*. ApJS 252, 5.
- ▶ Md. Faisal Alam, Zaven Arzoumanian, Paul T. Baker, and 68 others, including **Ross J. Jennings** (2020). *The NANOGrav 12.5-year Data Set: Observations and Narrowband Timing of 47 Millisecond Pulsars*. ApJS 252, 4.

## Publications (continued)

- ▶ M. Vallisneri, S. R. Taylor, J. Simon, and 61 others, including **Ross J. Jennings** (2020). *Modeling the Uncertainties of Solar System Ephemerides for Robust Gravitational Wave Searches with Pulsar Timing Arrays*. ApJ 893, 112.
- ▶ **Ross J. Jennings**, James M. Cordes, and Shami Chatterjee (2020). *Detecting Gravitational Scattering of Interstellar Objects Using Pulsar Timing*. ApJ 889, 145.
- ▶ J. S. Hazboun, J. Simon, S. R. Taylor, and 60 others, including **Ross J. Jennings** (2020). *The NANOGrav 11 yr Data Set: Evolution of Gravitational-Wave Background Statistics*. ApJ 890, 108.
- ▶ K. Aggarwal, Z. Arzoumanian, P. T. Baker, and 58 others, including **Ross J. Jennings** (2020). *The NANOGrav 11 yr Data Set: Limits on Gravitational Wave Memory*. ApJ 889, 38.
- ▶ K. Aggarwal, Z. Arzoumanian, P. T. Baker, and 61 others, including **Ross J. Jennings** (2019). *The NANOGrav 11 yr Data Set: Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries*. ApJ 880, 116.
- ▶ **Ross J. Jennings**, David L. Kaplan, Shami Chatterjee, and 2 others (2018). *Binary Pulsar Distances and Velocities from Gaia Data Release 2*. ApJ 864, 26.
- ▶ D. W. Gerdes, **R. J. Jennings**, G. M. Bernstein, and 64 others (2016). *Observation of Two New L4 Neptune Trojans in the Dark Energy Survey Supernova Fields*. AJ 151, 39.
- ▶ **Ross J. Jennings**, Jay D. Tasson, and Shun Yang (2015). *Matter-Sector Lorentz Violation in Binary Pulsars*. PRD 92, 125028.

## Talks

- ▶ “Cyclic Spectroscopy for Pulsar Scintillometry”. Contributed talk. DSA-2000 community Zoom meeting, held virtually.
- ▶ “Principal Component Analysis for Pulsar Timing in the Presence of Shape Changes”. Contributed talk. 2024 International Pulsar Timing Array meeting, Sexten Center for Astrophysics, Sexten (Sesto), BZ, Italy.
- ▶ “Progress Toward a Cyclic Spectroscopy Backend for the Green Bank Telescope”. Contributed talk. GBO/NRAO Postdoc Symposium, Green Bank Observatory, Green Bank, WV.
- ▶ “Progress Toward a Cyclic Spectroscopy Backend for the Green Bank Telescope”. Contributed talk. Fall 2023 NANOGrav collaboration meeting, University of British Columbia, Vancouver, BC, Canada.
- ▶ “A Tour of Pulsar Timing and PTA Noise Modeling”. Invited talk. Unravelling the Universe with PTAs Workshop, November 2023, University of Pittsburgh, Pittsburgh, PA.
- ▶ “The March 2021 Shape Change Event in J1713+0747 as Seen by NANOGrav”. Contributed talk. 2023 International Pulsar Timing Array meeting, Port Douglas, QLD, Australia.

## Publications (continued)

- ▶ “How to Find Profile Shape Changes (and More) with Quicklook”. Contributed talk. Spring 2023 NANOGrav collaboration meeting, Oregon State University, Corvallis, OR.
- ▶ “GBT and CHIME Observations of a Pulse Shape Change Event in PSR J1713+0747”. Invited talk. GBO community webinar, January 2023, held virtually.
- ▶ “Recovery of PSR J1713+0747 from a Profile Shape Change Event”. Contributed talk. Spring 2022 NANOGrav collaboration meeting, Flatiron Institute for Computational Astrophysics, New York, NY.
- ▶ “Improving Pulsar Timing by Detecting and Correcting for Pulse Shape Changes”. Contributed talk. June 2022 AAS Meeting, Pasadena, CA.
- ▶ “An Abrupt Pulse Shape Change in PSR J1713+0747”. Contributed talk. Fall 2021 NANOGrav collaboration meeting, Vanderbilt University, Nashville, TN.
- ▶ “Asteroid Belts and Pulsar Binaries”. Contributed talk. Spring 2020 NANOGrav collaboration meeting, University of Central Florida, Orlando, FL.
- ▶ “Detecting Interstellar Objects on Hyperbolic Orbits Using Pulsar Timing”. Contributed talk. Fall 2019 NANOGrav collaboration meeting, Cornell University, Ithaca, NY.
- ▶ “Correcting Jitter Noise in Pulsar Timing”. Contributed talk. Fall 2018 NANOGrav collaboration meeting, Green Bank Observatory, Green Bank, WV.
- ▶ “Parallax Measurements and the Kinematics of the Galactic MSP Population”. Contributed talk. Spring 2018 NANOGrav collaboration meeting, University of Virginia, Charlottesville, VA.
- ▶ “Characterizing and Mitigating Pulsar Timing Errors Caused by Intrinsic Pulse Shape Variability”. Contributed talk. January 2021 AAS Meeting, held virtually.

## *Posters*

- ▶ **Ross J. Jennings**, Ryan S. Lynch, and Jacob E. Turner. “Developing a Cyclic Spectroscopy Backend for the Green Bank Telescope”. Spring 2024 NANOGrav collaboration meeting, held virtually.
- ▶ **Ross J. Jennings**, James M. Cordes, and Shami Chatterjee. “Characterizing and Mitigating Pulsar Timing Errors Caused by Intrinsic Pulse Shape Variability”. January 2021 AAS Meeting, held virtually.
- ▶ S. K. Ocker, J. M. Cordes, S. Chatterjee, M. T. Lam, and **R. J. Jennings**. “Assessing Chromatic Arrival Time Perturbations for NANOGrav’s Error Budget”. January 2020 AAS Meeting, Honolulu, HI.
- ▶ **Ross J. Jennings**. “Detecting Hyperbolic Scattering of Interstellar Objects with NANOGrav Pulsar Timing Data”. January 2019 AAS Meeting, Seattle, WA.

## Publications (continued)

- ▶ Karen I. Perez, **Ross J. Jennings**, and James M. Cordes. “A Method for Mitigating Jitter Noise in Pulsar Timing”. January 2019 AAS Meeting, Seattle, WA.
- ▶ Carly Snell, Illeana Gomez Leal, Lisa Kaltenegger, and **Ross J. Jennings**. “How Obliquity Influences the Climate of Aquaplanets”. January 2017 AAS Meeting, Grapevine, TX.
- ▶ **Ross J. Jennings**. “Observation of New Trans-Neptunian Objects in the Dark Energy Survey Supernova Fields”. January 2015 AAS Meeting, Seattle, WA.

## *Other Publications*

- ▶ **Ross J. Jennings**, NANOGrav Collaboration, and CHIME/Pulsar Collaboration (2022). “Recovery of PSR J1713+0747 from a Sustained Pulse Shape Change”. ATel #15223.
- ▶ **Ross J. Jennings** (2021). “The NANOGrav TOA Generation Process”. NANOGrav Memo #7.
- ▶ **Ross J. Jennings** (2021). “Transmission Functions for Polynomial Fits”. NANOGrav Memo #6.
- ▶ D. James, R. Ogando, R. Cawthon, M. Schubnell, D. Gerdes, and **R. Jennings** (2015). “2013 RB98”. Minor planet electronic circular.
- ▶ J. Frieman, D. Gerdes, K. Honscheid, P. Martini, **R. Jennings**, and Z. Zhang (2014). “2012 VS113”. Minor planet electronic circular.