Jacob Eli Turner

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Education

West Virginia University — Morgantown, WV, USA
Ph.D. in Physics — Aug 2018 – Aug 2023 (Defended)/Dec 2023 (Conferred)
Advisor: Maura McLaughlin

Oberlin College — Oberlin, OH, USA
B.A. with Honors in Physics — Aug 2013 – May 2017
Advisor: Dan Stinebring

Professional Employment and Research Experience

Green Bank Observatory — Green Bank, WV, USA
Postdoctoral Fellow — August 2023–Present

Using cyclic spectroscopy to study the small-scale structure of the Milky Way via pulsar scintillation. Assisting in the development and testing of the world's first (and currently only) cyclic spectroscopy telescope backend. Training Green Bank Telescope observers, reviewing technical justifications for observing proposals. Serving as the on-call scientist for observations, organizing colloquia and lunch talks. Supervised by Ryan Lynch.

West Virginia University, Department of Physics & Astronomy — Morgantown, WV, USA
Graduate Research Assistant — 2019–2023
Graduate Teaching Assistant — 2018–2019
Visiting Scholar — 2018

University of Wisconsin-Milwaukee, Department of Physics — Milwaukee, WI, USA
Research Analyst — 2017

California Institute of Technology, Department of Astronomy — Pasadena, CA, USA
Summer Research Intern, Visiting Undergraduate Research Program — 2016

Oberlin College, Department of Physics & Astronomy — Oberlin, OH, USA
Drop-In Tutor — 2017
Undergraduate Research Assistant — 2015–2017
Undergraduate Teaching Assistant — 2015

Publications

NASA ADS Page
NOTE: Authors with asterisks indicate students ranging from high school to graduate school working under my supervision

Lead-Author Publications

6. **Pulsar Cyclic Spectroscopy in the Partial–Deconvolution Regime: Benefits & Limitations**
Turner, J. E., Dolch, T., Demorest, P. B., Lynch R. S., Stinebring, D. R., Jessup C., Jones, N., and Scheithauer, C., 2025, Accepted to ApJ

5. **The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies of Pulsars**
Turner, J. E., Lebron Medina, J. G.*, Zelensky, Z.*, Gustavson, K. A., Marx, J., Kothapalli, M.*, Cruz Vega, L. D.*, Lee, A.*, Figueroa, C. B.*, Reichart, D. E., Haislip, J. B., Kouprianov, V. V., White, S., Ghigo, F., Heatherly, S. A., and McLaughlin, M. A., 2024, ApJ, 977, 205

4. **A Cyclic Spectroscopy Scintillation Study of PSR B1937+21 I. Demonstration of Improved Scintillometry**
Turner, J. E., Dolch, T., Cordes, J. M., Ocker, S. K., Stinebring, D. R., Chatterjee, S., McLaughlin, M. A., Catlett. V. E., Jessup C., Jones, N., and Scheithauer, C., 2024, ApJ, 972, 16

3. **A Simultaneous Dual-Frequency Scintillation Arc Survey of Six Bright Canonical Pulsars Using the Upgraded GiantMetrewave Radio Telescope**
Turner, J. E., Joshi, B.C., McLaughlin, M. A., and Stinebring, D. R., 2024, ApJ, 961, 101

2. **Scattering Delay Mitigation in High Accuracy Pulsar Timing: Cyclic Spectroscopy Techniques**
Turner, J. E., Stinebring, D. R., McLaughlin, M. A., Archibald, A. M., Dolch, T., and Lynch, R. S., 2023, ApJ, 944, 191

1. **The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays**
Turner, J. E., et al. (36 authors), 2021, ApJ, 917, 10

Other Publications

26. **The NANOGrav 15 yr Data Set: Search for Gravitational-wave Memory**
Agazie, G. et al., (105 authors, including **Turner, J. E.**), 2025, ApJ, 987, 1

25. **The NANOGrav 15 yr Data Set: Harmonic Analysis of the Pulsar Angular Correlations**
Agazie, G. et al., (107 authors, including **Turner, J. E.**), 2025, ApJ, 985, 1

24. **The NANOGrav 15 yr dataset: Posterior predictive checks for gravitational-wave detection with pulsar timing arrays**
Agazie, G. et al., (104 authors, including **Turner, J. E.**), 2025, PhRvD, 111, 4

23. **The NANOGrav 15 yr Data Set: Running of the Spectral Index**
Agazie, G. et al., (105 authors, including **Turner, J. E.**), 2025, ApJL, 978, 2

22. **The NANOGrav 15 Yr Data Set: Removing Pulsars One by One from the Pulsar Timing Array**
Agazie, G. et al., (105 authors, including **Turner, J. E.**), 2025, ApJ, 978, 2

21. **The NANOGrav 15 yr Data Set: Looking for Signs of Discreteness in the Gravitational-wave Background**
Agazie, G. et al., (100 authors, including **Turner, J. E.**), 2025, ApJ, 978, 1

20. **Scintillation Bandwidth Measurements from 23 Pulsars from the AO327 Survey**
Sheikh, S., Brown, G. C., MacTaggart, J., Nguyen, T., Fletcher, W. D., Jones, B. L., Koller, E., Petrus, V., Pighini, K. F., Rosario, G., Smedile, V. A., Stone, A. T., You, S., McLaughlin, M. A., **Turner, J. E.**, Deneva, J. S., Lam, M. T., and Shapiro-Albert, B. J., 2024, ApJ, 976, 2

19. **NANOGrav 15-year gravitational-wave background methods**
Johnson, A. D. et al., (98 authors, including **Turner, J. E.**), 2024, PhRvD, 109, 10

18. **Comparing Recent Pulsar Timing Array Results on the Nanohertz Stochastic Gravitational-wave Background**
The International Pulsar Timing Array Collaboration, et al., (244 authors, including **Turner, J. E.**), 2024, ApJ, 966, 1

17. **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**
Agazie, G., et al., (89 authors, including **Turner, J. E.**), 2024, ApJ, 963, 2

16. **The NANOGrav 12.5 yr Data Set: Search for Gravitational Wave Memory**
Agazie, G., et al., (91 authors, including **Turner, J. E.**), 2024, ApJ, 963, 1

15. **How to Detect an Astrophysical Nanohertz Gravitational Wave Background**
Bécsy, B., et al., (96 authors, including **Turner, J. E.**), 2023, ApJ, 959, 1

14. **The NANOGrav 15 yr Data Set: Search for Anisotropy in the Gravitational-wave Background**
Agazie, G., et al., (93 authors, including **Turner, J. E.**), 2023, ApJL, 956, 1

13. **The NANOGrav 15 yr Data Set: Constraints on Supermassive Black Hole Binaries from the Gravitational-wave Background**
Agazie, G., et al., (99 authors, including **Turner, J. E.**), 2023, ApJL, 952, 2

12. **The NANOGrav 15 yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries**
Agazie, G., et al., (99 authors, including **Turner, J. E.**), 2023, ApJL, 951, 2

11. **The NANOGrav 15 yr Data Set: Search for Signals from New Physics**
Afzal, A., et al., (124 authors, including **Turner, J. E.**), 2023, ApJL, 951, 1

10. **The NANOGrav 15 yr Data Set: Detector Characterization and Noise Budget**
Agazie, G., et al., (92 authors, including **Turner, J. E.**), 2023, ApJL, 951, 1

9. **The NANOGrav 15 yr Data Set: Observations and Timing of 68 Millisecond Pulsars**
Agazie, G., et al., (101 authors, including **Turner, J. E.**), 2023, ApJL, 951, 1

8. **The NANOGrav 15 yr Data Set: Evidence for a Gravitational-wave Background**
Agazie, G., et al., (115 authors, including **Turner, J. E.**), 2023, ApJL, 951, 1

7. **Searching for continuous Gravitational Waves in the second data release of the International Pulsar Timing Array**
Falxa, M., et al., (127 authors, including **Turner, J.**), 2023, MNRAS, 521, 4

6. **Searching For Gravitational Waves From Cosmological Phase Transitions with the NANOGrav 12.5-year Dataset**
Arzoumanian, Z., et al., (64 authors, including **Turner, J. E.**), 2021, PRL, 127, 251302

5. **The NANOGrav 12.5-year data set: Search for Non-Einsteinian Polarization Modes in the Gravitational-Wave Background**
Arzoumanian, Z., et al., (71 authors, including **Turner, J. E.**), 2021, ApJL, 923, L22

4. **The NANOGrav 12.5-year Data Set: Search For An Isotropic Stochastic Gravitational-Wave Background**
Arzoumanian, Z., et al. (61 authors, including **Turner, J. E.**), 2020, ApJ, 905, L34

3. **The NANOGrav 11-Year Data Set: Evolution of Gravitational Wave Background Statistics**
Hazboun, J. S., et al. (63 authors, including **Turner, J. E.**), 2020, ApJ, 890, 108

2. **The NANOGrav 11 yr Data Set: Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries**
Aggarwal, K., et al. (63 authors, including **Turner, J. E.**), 2019, ApJ, 880, 116

1. **A Second Chromatic Timing Event of Interstellar Origin toward PSR J1713+0747**
Lam, M. T., Ellis, J. A., Grillo, G., Jones, M. L., Hazboun, J. S., Brook, P. R., **Turner, J. E.**, et al. (37 authors), 2018, ApJ, 861, 132

Invited Talks

Green Bank Observatory Community Zoom — Green Bank, WV, USA
An Extreme Scattering Event Towards PSR B2310+42 — June 2025

Georgia State University — Atlanta, GA, USA
Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium & Gravitational Waves — April 2025

University of Kansas (Remote) — Lawrence, KS, USA
Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium & Gravitational Waves — April 2025

Scintillometry Workshop 2024 (Florida Space Institute) — Orlando, FL, USA
The Green Bank Observatory Real-Time Cyclic Spectroscopy Backend — October 2024

Florida Space Institute — Orlando, FL, USA
Using Cyclic Spectroscopy to Study the Interstellar Medium with Pulsar Timing Arrays — September 2024

Florida Institute of Technology — Orlando, FL, USA
Using Cyclic Spectroscopy to Study the Interstellar Medium with Pulsar Timing Arrays — September 2024

University of Dallas — Dallas, TX, USA
Two Paths to Radio Astronomy — April 2024

McDaniel College — Westminster, MD, USA
Characterizing the Interstellar Medium through Radio Observations of Pulsars — November 2023

Green Bank Observatory (Remote) — Green Bank, WV, USA
Correcting for Interstellar Scattering Delays in Millisecond Pulsars — November 2020

Oberlin College — Oberlin, OH, USA
Detecting Gravitational Waves with Pulsars: Removing the Effects of the Interstellar Medium — April 2017

Contributed Conference Talks

- International Pulsar Timing Array Conference, *"Pulsar Cyclic Spectroscopy in the Partial–Deconvolution Regime: Benefits & Limitations"*, California Institute of Technology, June 2025
- National Radio Astronomy Observatory/Green Bank Observatory Postdoc Symposium 2024, *"An Extreme Scattering Event Towards PSR B2310+42"*, National Radio Astronomy Observatory-Charlottesville/Remote, May 2025
- Green Bank Observatory Internal Symposium, *"An Extreme Scattering Event Towards PSR B2310+42 "*, Green Bank Observatory, May 2025
- North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference, *"The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies"*, University of Michigan, October 2024
- International Pulsar Timing Array Conference, *"Cyclic Spectroscopy Studies of the ISM in PTA Observing Setups"*, Sexten Center of Astrophysics, June 2024
- Fields, Flows, and Filaments in the Magnetic ISM Workshop, *"Cyclic Spectroscopy Studies of the ISM in PTA Observing Setups"*, Stanford University, May 2024
- National Radio Astronomy Observatory/Green Bank Observatory Internal Symposium, *"The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies of Pulsars"*, Green Bank Observatory, May 2024
- National Radio Astronomy Observatory/Green Bank Observatory Postdoc Symposium 2024, *"Using Cyclic Spectroscopy in High-Accuracy Pulsar Timing Efforts"*, Green Bank Observatory March 2024
- Scintillometry Workshop 2023, *"Using Cyclic Spectroscopy in High-Accuracy Pulsar Timing Efforts"*, The Academia Sinica Institute of Astronomy and Astrophysics, November 2023
- North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference, *"Scattering Delay Mitigation in High Accuracy Pulsar Timing: Cyclic Spectroscopy Techniques"*, Oregon State University, March 2023
- 241st American Astronomical Society Meeting, *"Characterizing and Mitigating Scattering Delays in Radio Observations of Pulsars"*, January 2023
- North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference, *"The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays"*, Cornell University, October 2019
- International Pulsar Timing Array Conference, *"The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays"*, NCRA-TIFR, June 2019

Conference Posters

- Scintillometry Workshop 2024 , *"Evidence of an Extreme Scattering Event towards PSR J2313+4253"*, Florida Space Institute, October 2024
- 243rd American Astronomical Society Meeting , *"Cyclic Spectroscopy-Aided Studies of the ISM in PTA Observing Setups"*, January 2024
- North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference, *"Cyclic Spectroscopy-Aided Studies of the ISM in PTA Observing Setups"*, The University of British Columbia, October 2023
- International Pulsar Timing Array Conference, *"The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays"*, June 2018
- North American Nanohertz Observatory for Gravitational Waves Physics Frontiers Center Reverse Site Visit, *"Preliminary Continuous Wave Limits from NANOGrav 11-Year Dataset "*, West Virginia University, October 2017
- North American Nanohertz Observatory for Gravitational Waves Physics Frontiers Center Reverse Site Visit, *"NANOGrav Timing Pipeline: Adding a Scattering Delay Correction"*, West Virginia University, October 2017

Teaching Experience

Green Bank Observatory — Green Bank, WV, USA
Lecturer/Observing Mentor — October 2024
Green Bank Telescope Semester 24B Observer Training

Green Bank Observatory — Green Bank, WV, USA
Lecturer/Research Mentor — July 2024
Green Bank Observatory Single Dish Summer School

Green Bank Observatory — Green Bank, WV, USA
Lecturer/Research Mentor — June 2024
Pulsar Science Collaboratory Camp

Green Bank Observatory — Green Bank, WV, USA
Lecturer/Observing Mentor — February 2024
Green Bank Telescope Semester 24A Observer Training

West Virginia University — Morgantown, WV, USA
Guest Lecturer — Spring 2020
ASTR 700: Radio Astronomy

West Virginia University — Morgantown, WV, USA
Graduate Teaching Assistant — Spring 2019
PHYS 102L: Introductory Physics 2 Laboratory

West Virginia University — Morgantown, WV, USA
Graduate Teaching Assistant — Fall 2018
PHYS 101L: Introductory Physics 1 Laboratory

Oberlin College — Oberlin, OH, USA
Drop-in Tutor — Spring 2017
PHYS 068: Energy Science & Technology

Oberlin College — Oberlin, OH, USA
Undergraduate Teaching Assistant — Spring 2015
PHYS 104: Elementary Physics II Laboratory

Student Research Mentorship Supervision

- 2021–Present: **Pulsar Science Collaboratory Research Team Leader, Scintillation Measurement Project**
  - — Students: Juan G. Lebron Medina (PostBac Student/Graduate Student, University of Puerto Rico-Mayaguez), Zachary Zelensky (PostBac Student, Penn State/Graduate Student, Texas Tech), Manvith Kothapalli (High School Student/Undergrad, University of Washington-Seattle), Luis D. Cruz Vega (Undergrad, University of Puerto Rico-Mayaguez), Alexander Lee (Undergrad, University of Washington-Seattle), Caryelis B. Figueroa (Undergrad/Graduate Student, University of Puerto Rico-Mayaguez), Martina Salichs-Maidana (Undergrad, University of Puerto Rico-Mayaguez), Sanjit Subramaniam (High School Student), Katelyn Bryant (Undergrad, University of Arkansas), Dhruva Kalyani (Undergrad, University of Wisconsin-Madison), Adrian Hsu (Middle School Student/High School Student), Lahari Ganti (Middle School Student)
  - — Authored Peer-Reviewed Paper With 6 Students
  - — Authored Successful Green Bank Telescope Observing Proposal With 5 Students (Awarded 50 Hours)
  - — Authored Successful Green Bank Telescope Observing Proposal With 1 Student (Awarded 40 Hours)
- 2024–2025: **Undergraduate Senior Thesis Project Co-Mentor**
  - — Katelyn Bryant (Undergrad, University of Arkansas)
- 2024-2025 : **Green Bank Observatory REU Summer Student Mentor**
  - — Students: Rachel King (West Virginia University), Dhruva Kalyani (University of Wisconsin-Madison)

Outreach

- February 2024: Pocahontas County Science Fair Judge
- 2024–Present: Scientist Presenter for SETI tours at Green Bank Observatory
- 2023–Present: Adopt-A-Physicist
- 2020–Present: Skype A Scientist (over 20 talks given to various elementary, middle, and high schools)

Outreach Talks

- Green Bank Observatory PING (Physicists Inspiring the Next Generation) Camp, *"Neutron Stars: Nature's Most Versatile Laboratories"*, July 2025
- West Virginia Governor's STEM Institute, *"Neutron Stars: Nature's Most Versatile Laboratories"*, July 2025
- Green Bank Observatory Summer Student Bootcamp, *"Using Pulsars to Study the Interstellar Medium"*, May 2025
- Green Bank Observatory PING (Physicists Inspiring the Next Generation) Camp, *"Using Pulsars to Explore the Universe"*, July 2024
- Green Bank Observatory Single Dish Summer School, *"Pulsars"*, June 2024
- Green Bank Observatory Summer Student Bootcamp, *"Using Pulsars to Study the Interstellar Medium"*, May 2024
- Pulsar Science Collaboratory (PSC) Talk Series, *"Using Pulsars to Study the Interstellar Medium"*, April 2024

Telescope Time Allocations

- Green Bank Telescope, GBT25B-264, 45 hours (Observation PI)
  Cyclic Spectroscopy of Scattered NANOGrav Pulsars: Pilot for CS Observations
- Green Bank Telescope, GBT25B-040, 40 hours (Observation PI)
  Tracking A Multiple Order-of-Magnitude Change in Scintillation Towards A Pulsar
- Green Bank Telescope, GBT24B-040, 50 hours (Observation PI)
  Multi-Hour Scintillation Studies by the PSC: GBT Follow-up to Green Bank Observatory 20m Campaign
- Green Bank Telescope, GBT24B-039, 45 hours (Observation PI)
  Cyclic Spectroscopy of Three Pulsars with Considerable Pulse Broadening
- Green Bank Telescope, GBT24A-475, 4 hours (Observation PI)
  Constraining the Scintillation Constant C_1 in a Scatter-Broadened Pulsar
- Upgraded Giant Metrewave Radio Telescope, 44_035, 25 hours (Observation PI)
  Examining the Relation Between Scintillation Arc Curvature and Asymmetry
- Upgraded Giant Metrewave Radio Telescope, 40_019, 24 hours (Observation PI)
  Scintillation Arcs and Dispersion Measure Changes: A Follow-up to Pilot Observations
- Green Bank Telescope, GBT20A-588, 12 hours
  A Cyclic Spectroscopy Pilot Program: Baseband Observations of Three MSPs
- Upgraded Giant Metrewave Radio Telescope, 38_041, 24 hours (Observation PI)
  Scintillation Arcs and Dispersion Measure Changes: A Pilot Project

Professional Community Service/Leadership

- 2025−Present, Journal Referee, *The Astrophysical Journal*
- 2024−Present, Observing Proposal Scientific Reviewer, *Upgraded Giant Metrewave Radio Telescope*
- 2024: LOC, *National Radio Astronomy Observatory/Green Bank Observatory Postdoc Symposium*
- 2023−Present: Colloquium/Science Lunch Talk Organizer, *Green Bank Observatory*
- Spring 2022: Moderator, *North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference*
- Fall 2021: Moderator, *North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference*

Media Appearances

- 2025: Green Bank Observatory, **Students Contribute to New Understanding of "Twinkling" Pulsars**
- 2023: West Virginia University, **WVU faculty, students contribute to cosmic breakthrough uncovering evidence of low-frequency gravitational waves**

Panels

- Walter Payton College Preparatory High School, *Alumni STEM Panel, March 2024*

Awarded Grants

- 2022: West Virginia University Eberly College of Arts & Sciences Travel Grant, *3V459 A. Keith and Sandra F. McClung Enrichment Endowment, $600, Principal Investigator*

Organizations

- North American Nanohertz Observatory for Gravitational Waves (NANOGrav): *Full Member*
- International Pulsar Timing Array (IPTA): *Full Member*
- American Astronomical Society: *Full Member*

Skills

- **Programming Languages**: Python, Bash, C shell, Unix/Linux
  - **Scientific Python Packages**: Numpy, Scipy, Matplotlib, Astropy, PyCyc, Scintools, Pypulse
- **Software Packages**: Simulink, LaTeX, TEMPO/TEMPO2, PSRCHIVE, DSPSR, Slurm, Jupyter/IPython

Honors and Awards

- Green Bank Observatory Postdoctoral Fellowship, Green Bank Observatory, 2023-Present
- Graduate Research Fellowship, West Virginia University, 2019-2023
- Graduate Teaching Fellowship, West Virginia University, 2018-2019
- Oberlin Physics & Astronomy Department Honors Program 2016-2017
- John Frederick Oberlin Scholarship, Oberlin College, 2013