# 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 and 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

(32 total, 6 lead-author)
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, ApJ, 989, 228

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

Scintillometry Workshop 2025 (McGill University) — Montreal, Quebec, Canada
*Exploring The Benefits and Feasibility of Cyclic Spectroscopy in Different Deconvolution Regimes* — October 2025

Oregon State University — Corvallis, OR, USA
*Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium & Gravitational Waves* — August 2025

GRASP Lecture Series (Remote) — Cape Town, South Africa
*Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium & Gravitational Waves* — August 2025

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 — Caltech
*Pulsar Cyclic Spectroscopy in the Partial–Deconvolution Regime: Benefits & Limitations* — June 2025

National Radio Astronomy Observatory/Green Bank Observatory Postdoc Symposium 2024 — NRAO
*An Extreme Scattering Event Towards PSR B2310+42* — May 2025

Green Bank Observatory Internal Symposium — Green Bank Observatory
*An Extreme Scattering Event Towards PSR B2310+42* — May 2025

North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference — University of Michigan
*The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies* — October 2024

International Pulsar Timing Array Conference — Sexten Center of Astrophysics
*Cyclic Spectroscopy Studies of the ISM in PTA Observing Setups* — June 2024

Fields, Flows, and Filaments in the Magnetic ISM Workshop — Stanford University
*Cyclic Spectroscopy Studies of the ISM in PTA Observing Setups* — May 2024

National Radio Astronomy Observatory/Green Bank Observatory Internal Symposium — Green Bank Observatory
*The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies of Pulsars* — May 2024

National Radio Astronomy Observatory/Green Bank Observatory Internal Symposium — Green Bank Observatory
*The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies of Pulsars* — May 2024

National Radio Astronomy Observatory/Green Bank Observatory Postdoc Symposium — Green Bank Observatory
*Using Cyclic Spectroscopy in High-Accuracy Pulsar Timing Efforts* — March 2024

Scintillometry Workshop 2023 — ASIAA
*Using Cyclic Spectroscopy in High-Accuracy Pulsar Timing Efforts* — November 2023

North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference — Oregon State University
*Scattering Delay Mitigation in High Accuracy Pulsar Timing: Cyclic Spectroscopy Techniques* — March 2023

241$^{st}$ American Astronomical Society Meeting — Seattle, WA, USA
*Characterizing and Mitigating Scattering Delays in Radio Observations of Pulsars* — January 2023

North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference — Cornell University
*The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays* — October 2019

International Pulsar Timing Array Conference — NCRA-TIFR
*The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays* — June 2019

## Conference Posters

Scintillometry Workshop 2024 — Florida Space Institute
*Evidence of an Extreme Scattering Event towards PSR J2313+4253* — October 2024

243rd American Astronomical Society Meeting — New Orleans, LA, USA
*Cyclic Spectroscopy-Aided Studies of the ISM in PTA Observing Setups* — January 2024

North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference — UBC
*Cyclic Spectroscopy-Aided Studies of the ISM in PTA Observing Setups* — October 2023

International Pulsar Timing Array Conference — Albuquerque, NM, USA
*The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays* — June 2018

NANOGrav Physics Frontiers Center Reverse Site Visit — West Virginia University
*Preliminary Continuous Wave Limits from NANOGrav 11-Year Dataset* — October 2017

NANOGrav Physics Frontiers Center Reverse Site Visit — West Virginia University
*NANOGrav Timing Pipeline: Adding a Scattering Delay Correction* — October 2017

## Teaching Experience

**Green Bank Observatory** — Green Bank, WV, USA
Lecturer/Research Mentor — August 2025
*Pulsar Science Collaboratory Camp*

**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

**Pulsar Science Collaboratory Research Team Leader, Scintillation Measurement Project** 2021–Present

— Students: Juan G. Lebron Medina (Graduate Student, University of Puerto Rico-Mayaguez), Zachary Zelensky (Graduate Student, Texas Tech), Manvith Kothapalli (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 (Graduate Student, University of Puerto Rico-Mayaguez), Martina Salichs-Maidana (Undergrad, University of Puerto Rico-Mayaguez), Sanjit Subramaniam (High School Student), Katelyn Bryant (Graduate Student, West Virginia University), Dhruva Kalyani (Undergrad, University of Wisconsin-Madison), Adrian Hsu (High School Student), Lahari Ganti (High School Student), Kaito Hasebe (Undergrad, University of Washington-Bothell)

— 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)

**Undergraduate Senior Thesis Project Co-Mentor** 2024–2025

— Katelyn Bryant (Undergrad, University of Arkansas)

**Green Bank Observatory REU Summer Student Mentor** 2024-2025

— Students: Rachel King (West Virginia University), Dhruva Kalyani (University of Wisconsin-Madison)

## Outreach

Pocahontas County Science Fair Judge February 2024

Scientist Presenter for SETI tours at Green Bank Observatory 2024–Present

Adopt-A-Physicist 2023–Present

Skype A Scientist (over 20 talks given to various elementary, middle, and high schools) 2020–Present

## Outreach Talks

Rose City Astronomers August 2025
*Neutron Stars: Nature's Most Versatile Laboratories*

Astronomy on Tap Corvallis August 2025
*Neutron Stars: Nature's Most Versatile Laboratories*

Green Bank Observatory PING (Physicists Inspiring the Next Generation) Camp July 2025
*Neutron Stars: Nature's Most Versatile Laboratories*

West Virginia Governor's STEM Institute July 2025
*Neutron Stars: Nature's Most Versatile Laboratories*

Green Bank Observatory PING (Physicists Inspiring the Next Generation) Camp July 2024
*Using Pulsars to Explore the Universe*

Pulsar Science Collaboratory (PSC) Talk Series April 2024
*Using Pulsars to Study the Interstellar Medium*

## Telescope Time Allocations

Green Bank Telescope — GBT25B-264, 45 hours
*Cyclic Spectroscopy of Scattered NANOGrav Pulsars: Pilot for CS Observations* — Observation PI

Green Bank Telescope — GBT25B-040, 40 hours
*Tracking A Multiple Order-of-Magnitude Change in Scintillation Towards A Pulsar* — Observation PI

Green Bank Telescope — GBT24B-040, 50 hours
*Multi-Hour Scintillation Studies by the PSC* — Observation PI

Green Bank Telescope — GBT24B-039, 45 hours
*Cyclic Spectroscopy of Three Pulsars with Considerable Pulse Broadening* — Observation PI

Green Bank Telescope — GBT24A-475, 45 hours
*Constraining the Scintillation Constant $C_1$ in a Scatter-Broadened Pulsar* — Observation PI

Upgraded Giant Metrewave Radio Telescope — 44_035, 25 hours
*Examining the Relation Between Scintillation Arc Curvature and Asymmetry* — Observation PI

Upgraded Giant Metrewave Radio Telescope — 40_019, 24 hours
*Scintillation Arcs and Dispersion Measure Changes: A Follow-up to Pilot Observations* — Observation PI

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
*Scintillation Arcs and Dispersion Measure Changes: A Pilot Project* — Observation PI

## Professional Community Service/Leadership

Journal Referee — 2025–Present
*The Astrophysical Journal*

Observing Proposal Scientific Reviewer — 2024–Present
*Upgraded Giant Metrewave Radio Telescope*

LOC — 2024
*National Radio Astronomy Observatory/Green Bank Observatory Postdoc Symposium*

Colloquium/Science Lunch Talk Organizer — 2023–Present
*Green Bank Observatory Postdoc Symposium*

Moderator — 2022
*North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference*

Moderator — 2021
*North American Nanohertz Observatory for Gravitational Waves (NANOGrav) Conference*

## Media Appearances

Green Bank Observatory — 2025
**Students Contribute to New Understanding of "Twinkling" Pulsars**

West Virginia University — 2023
**WVU faculty, students contribute to cosmic breakthrough uncovering evidence of low-frequency gravitational waves**

## Panels

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

## Awarded Grants

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

## Honors and Awards

Green Bank Observatory — 2023-Present
*Green Bank Observatory Postdoctoral Fellowship*

Oberlin College — 2016-2017
*Oberlin College Department of Physics & Astronomy Honors Program*

Oberlin College — 2013-2017
*John Frederick Oberlin Scholarship*

## 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, HTML
  - **Scientific Python Packages**: Numpy, Scipy, Matplotlib, Astropy, PyCyc, Scintools, Pypulse
- **Software Packages**: Simulink, LaTeX, TEMPO/TEMPO2, PSRCHIVE, DSPSR, Slurm, Jupyter/IPython