

# Jacob Eli Turner

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## EDUCATION

### West Virginia University

Ph.D. in Physics

Advisor: Maura McLaughlin

Morgantown, WV, USA

Aug 2018 – Aug 2023 (Defended)/Dec 2023 (Conferred)

### Oberlin College

B.A. with Honors in Physics

Advisor: Dan Stinebring

Oberlin, OH, USA

Aug 2013 – May 2017

## PROFESSIONAL EMPLOYMENT AND RESEARCH EXPERIENCE

### Green Bank Observatory

Postdoctoral Fellow

Green Bank, WV, USA

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

Graduate Research Assistant

Graduate Teaching Assistant

Visiting Scholar

Morgantown, WV, USA

2019–2023

2018–2019

2018

### University of Wisconsin-Milwaukee, Department of Physics

Research Analyst

Milwaukee, WI, USA

2017

### California Institute of Technology, Department of Astronomy

Summer Research Intern, Visiting Undergraduate Research Program

Pasadena, CA, USA

2016

### Oberlin College, Department of Physics & Astronomy

Drop-In Tutor

Undergraduate Research Assistant

Undergraduate Teaching Assistant

Oberlin, OH, USA

2017

2015–2017

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, ApJ, 989, 228
5. [The Pulsar Science Collaboratory: Multi-Epoch Scintillation Studies of Pulsars](#)  
**Turner, J. E.**, Lebron Medina, J. G.<sup>\*</sup>, Zelensky, Z.<sup>\*</sup>, Gustavson, K. A., Marx, J., Kothapalli, M.<sup>\*</sup>, Cruz Vega, L. D.<sup>\*</sup>, Lee, A.<sup>\*</sup>, Figueroa, C. B.<sup>\*</sup>, 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

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Oregon State University <i>Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium &amp; Gravitational Waves</i>	Corvallis, OR, USA August 2025
GRASP Lecture Series (Remote) <i>Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium &amp; Gravitational Waves</i>	Cape Town, South Africa August 2025
Green Bank Observatory Community Zoom <i>An Extreme Scattering Event Towards PSR B2310+42</i>	Green Bank, WV, USA June 2025
Georgia State University <i>Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium &amp; Gravitational Waves</i>	Atlanta, GA, USA April 2025
University of Kansas (Remote) <i>Pulsar Cyclic Spectroscopy as a Probe of the Interstellar Medium &amp; Gravitational Waves</i>	Lawrence, KS, USA April 2025
Scintillometry Workshop 2024 (Florida Space Institute) <i>The Green Bank Observatory Real-Time Cyclic Spectroscopy Backend</i>	Orlando, FL, USA October 2024
Florida Space Institute <i>Using Cyclic Spectroscopy to Study the Interstellar Medium with Pulsar Timing Arrays</i>	Orlando, FL, USA September 2024

Florida Institute of Technology  
*Using Cyclic Spectroscopy to Study the Interstellar Medium with Pulsar Timing Arrays*

Orlando, FL, USA  
September 2024

University of Dallas  
*Two Paths to Radio Astronomy*

Dallas, TX, USA  
April 2024

McDaniel College  
*Characterizing the Interstellar Medium through Radio Observations of Pulsars*

Westminster, MD, USA  
November 2023

Green Bank Observatory (Remote)  
*Correcting for Interstellar Scattering Delays in Millisecond Pulsars*

Green Bank, WV, USA  
November 2020

Oberlin College  
*Detecting Gravitational Waves with Pulsars: Removing the Effects of the Interstellar Medium*

Oberlin, OH, USA  
April 2017

## CONTRIBUTED CONFERENCE TALKS

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- 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*”, Sixten 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

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- 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

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<b>Green Bank Observatory</b> Lecturer/Research Mentor <i>Pulsar Science Collaboratory Camp</i>	Green Bank, WV, USA August 2025
<b>Green Bank Observatory</b> Lecturer/Observing Mentor <i>Green Bank Telescope Semester 24B Observer Training</i>	Green Bank, WV, USA October 2024
<b>Green Bank Observatory</b> Lecturer/Research Mentor <i>Green Bank Observatory Single Dish Summer School</i>	Green Bank, WV, USA July 2024
<b>Green Bank Observatory</b> Lecturer/Research Mentor <i>Pulsar Science Collaboratory Camp</i>	Green Bank, WV, USA June 2024
<b>Green Bank Observatory</b> Lecturer/Observing Mentor <i>Green Bank Telescope Semester 24A Observer Training</i>	Green Bank, WV, USA February 2024
<b>West Virginia University</b> Guest Lecturer <i>ASTR 700: Radio Astronomy</i>	Morgantown, WV, USA Spring 2020
<b>West Virginia University</b> Graduate Teaching Assistant <i>PHYS 102L: Introductory Physics 2 Laboratory</i>	Morgantown, WV, USA Spring 2019
<b>West Virginia University</b> Graduate Teaching Assistant <i>PHYS 101L: Introductory Physics 1 Laboratory</i>	Morgantown, WV, USA Fall 2018
<b>Oberlin College</b> Drop-in Tutor <i>PHYS 068: Energy Science &amp; Technology</i>	Oberlin, OH, USA Spring 2017
<b>Oberlin College</b> Undergraduate Teaching Assistant <i>PHYS 104: Elementary Physics II Laboratory</i>	Oberlin, OH, USA Spring 2015

## STUDENT RESEARCH MENTORSHIP SUPERVISION

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- 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

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- 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

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- Rose City Astronomers, “*Neutron Stars: Nature’s Most Versatile Laboratories*”, August 2025
- Astronomy on Tap Corvallis, “*Neutron Stars: Nature’s Most Versatile Laboratories*”, August 2025
- 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

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- 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*

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## 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*

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## 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](#)

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## PANELS

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

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## 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*

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## ORGANIZATIONS

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

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## SKILLS

- **Programming Languages:** Python, Bash, C shell, Unix/Linux
  - **Scientific Python Packages:** Numpy, Scipy, Matplotlib, Astropy, PyCyc, Scintools, Pypulse
- **Software Packages:** Simulink, L<sup>A</sup>T<sub>E</sub>X, TEMPO/TEMPO2, PSRCHIVE, DSPSR, Slurm, Jupyter/IPython

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## 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