Robert S. Wharton

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Education

2017 Ph.D. in Physics, Cornell University
2009 B.Sc. in Physics and Mathematics, The Pennsylvania State University

Technical Skills

- Extensive experience handling and processing large astronomical data sets in various formats
- Strong programming skills (Python, C) and a proven history of developing end-to-end processing pipelines to discover faint astrophysical signals
- Developed and still maintain several astronomical processing tools on GitHub
- Experience maintaining software in containers like docker and Singularity.

Experience

- **Jet Propulsion Laboratory**, Pasadena, CA 2021–2024
  NASA Postdoctoral Program Fellow (2021–2023)
  JPL Postdoctoral Researcher

  I worked in the Planetary Radar and Radio Science group, using the Deep Space Network (DSN) radio dishes to detect faint astrophysical signals. I developed many tools and Python-based pipelines to process large data sets of raw telescope data and search for millisecond-duration Fast Radio Bursts (FRBs) originating from other galaxies. To utilize this software on our many computers, I developed and maintained Docker and Singularity containers for our software. In addition to studies of FRBs, I also worked closely with my colleagues to design experiments to use radar to monitor space debris in low Earth orbit and to probe solar plasma using spacecraft throught the solar system.

- **Max-Planck-Institut für Radioastronomie**, Bonn, Germany 2017–2021
  Postdoctoral Researcher

  I was a member of the pulsar group at the MPIfR and worked on searching for radio pulsars around Sgr A*, the supermassive black hole at the center of our Galaxy. I developed a Python-based processing pipeline to take a large (∼10 TB) interferometric data set from the Very Large Array (VLA), form thousands of beams, and then search each of those beams for pulsars. As a member of the Event Horizon Telescope collaboration, I also used high quality millimeter wavelength data from ALMA to search for pulsars.

- **Cornell University**, Ithaca, NY 2010–2017
  Graduate Research Assistant

  My thesis work focused on searching for radio pulsars around the supermassive black hole at the center of our Galaxy. I used a wide range of available multiwavelength data to model and constrain the pulsar population in the region. I helped develop a pulsar backend for the VLA and then used it to search inner few arcseconds around Sgr A*. Using the VLA in a novel high data rate mode, I developed a beam forming software that made the first arcsecond localization of an FRB.

Outreach

2011-2016	Expanding Your Horizons (EYH): *The Physics of Bubbles* Designed and ran the Physics of Bubbles workshop at Cornell's annual EYH conference to demonstrate physics principles to middle schoolers
2011	Graduate Student School Outreach Program (GRASSHOPR): *... And Physics For All!* Designed a series of lesson plans to introduce scientific concepts and ways of thinking for a local class of fifth graders

Honors and Awards

2021-2023	NASA Postdoctoral Program Fellow
2020	Breakthrough Prize in Fundamental Physics (as part of the EHT Collaboration)
2009	Jean Bennet Award (Penn State Physics Award)

Selected Publications:

1. **Wharton, R. S.**, et al., "High Frequency FRB Search of Nearby Star Forming Galaxies M77 and M82", *ApJ*, *submitted*
2. Bansal K., **Wharton, R. S.**, et al., "Simultaneous Radio and X-ray Observations of the Magnetar Swift J1818.0–1607", *MNRAS*, 523, 2401, 2023
3. Liu, K., Young, A., **Wharton, R. S.**, et al., "Detection of Pulses from the Vela Pulsar at Millimeter Wavelengths with Phased ALMA", *ApJL*, 885, L10, 2019
4. **Wharton, R. S.**, et al., "VLA Observations of Single Pulses from the Galactic Center Magnetar", *ApJ*, 875, 143, 2019
5. **Wharton, R. S.**, "Radio Interferometric Searches for Galactic Center Pulsars and Fast Radio Bursts", PhD Thesis, 2017
6. Chatterjee, S., Law, C. J., **Wharton, R. S.**, et al., "Direct localization of a fast radio burst and its enigmatic counterpart", *Nature*, 541, 58, 2017
7. **Wharton, R. S.**, et al., "Multiwavelength Constraints on Pulsar Populations in the Galactic Center", *ApJ*, 753, 108, 2012

Publications:

1. Torne, P., et al. (287 authors, including **Wharton, R. S.**), "A Search for Pulsars around Sgr A* in the First Event Horizon Telescope Data Set", *ApJ*, 959, 14, 2023
2. Bethapudi S., et al. (5 authors, including **Wharton, R. S.**), "High frequency study of FRB 20180916B using the 100-m Effelsberg radio telescope", *MNRAS*, 524, 3303, 2023
3. Abbate F., et al. (11 authors, including **Wharton, R. S.**), "Rotation measure variations in Galactic Centre pulsars", *MNRAS*, 524, 2966, 2023
4. Caleb M., et al. (30 authors, including **Wharton, R. S.**), "A subarcsec localized fast radio burst with a significant host galaxy dispersion measure contribution", *MNRAS*, 524, 2064, 2023
5. Main R. A., et al. (8 authors, including **Wharton, R. S.**), "Modelling Annual Scintillation Velocity Variations of FRB 20201124A", *MNRAS*, 522, L36, 2023

6. Gautam T., et al. (9 authors, including **Wharton, R. S.**), "Upgraded GMRT survey for pulsars in globular clusters. I. Discovery of a millisecond binary pulsar in NGC 6652", *A&A*, 664, A54, 2022
7. Main R. A., et al. (8 authors, including **Wharton, R. S.**), "Scintillation time-scale measurement of the highly active FRB20201124A", *MNRAS*, 509, 3172, 2022
8. Marthi V. R., et al. (10 authors, including **Wharton, R. S.**), "Burst properties of the highly active FRB20201124A using uGMRT", *MNRAS*, 509, 2209, 2022
9. Eatough R. P., et al. (13 authors, including **Wharton, R. S.**), "Multi-epoch searches for relativistic binary pulsars and fast transients in the Galactic Centre", *MNRAS*, 507, 5053, 2021
10. Majid W. A., et al. (9 authors, including **Wharton, R. S.**), "A Bright Fast Radio Burst from FRB 20200120E with Sub-100 Nanosecond Structure", *ApJL*, 919, L6, 2021
11. Liu K., et al. (27 authors, including **Wharton, R. S.**), "An 86 GHz Search for Pulsars in the Galactic Center with the Atacama Large Millimeter / submillimeter Array", *ApJ*, 914, 30, 2021
12. Torne P., et al. (16 authors, including **Wharton, R. S.**), "Searching for pulsars in the Galactic centre at 3 and 2 mm", *A&A*, 650, A95, 2021
13. Hilmarsson G. H., et al. (13 authors, including **Wharton, R. S.**), "Rotation Measure Evolution of the Repeating Fast Radio Burst Source FRB 121102", *ApJL*, 908, L10, 2021
14. Aggarwal K., et al. (12 authors, including **Wharton, R. S.**), "Your: Your Unified Reader", *JOSS*, 5, 2750, 2020
15. Marthi V. R., et al. (8 authors, including **Wharton, R. S.**), "Detection of 15 bursts from FRB 180916.J0158+65 with the upgraded Giant Metrewave Radio Telescope", *MNRAS*, 499, L16, 2020
16. Madison, D. R., et al. (14 authors, including **Wharton, R. S.**), "A Deep Targeted Search for Fast Radio Bursts from the Sites of Low-redshift Short Gamma-Ray Bursts", *ApJ*, 887, 252, 2019
17. Event Horizon Telescope Collaboration (348 authors, including **Wharton, R. S.**), "First M87 Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole" *ApJL*, 875, L1, 2019
18. —, "II. Array and Instrumentation" *ApJL*, 875, L2, 2019
19. —, "III. Data Processing and Calibration" *ApJL*, 875, L3, 2019
20. —, " IV. Imaging the Central Supermassive Black Hole" *ApJL*, 875, L4, 2019
21. —, "V. Physical Origin of the Asymmetric Ring" *ApJL*, 875, L5, 2019
22. —, "VI. The Shadow and Mass of the Central Black Hole" *ApJL*, 875, L6, 2019
23. Patel, C., et al. (29 authors, including **Wharton, R. S.**), "PALFA Single-pulse Pipeline: New Pulsars, Rotating Radio Transients, and a Candidate Fast Radio Burst", *ApJ*, 869, 181, 2018
24. Stovall, K., et al. (35 authors, including **Wharton, R. S.**), "PALFA Discovery of a Highly Relativistic Double Neutron Star Binary", *ApJL*, 854, L22, 2018
25. Michilli, D., et al. (34 authors, including **Wharton, R. S.**), "An extreme magneto-ionic environment associated with the fast radio burst source FRB 121102", *Nature*, 553, 182, 2018
26. Law, C., et al. (36 authors, including **Wharton, R. S.**), "A Multi-telescope Campaign on FRB 121102: Implications for the FRB Population", *ApJ*, 850, 76, 2017
27. Cordes, J. M., Wasserman, I., Hessels, J. W. T., Lazio, T. J. W., Chatterjee, S., **Wharton, R. S.**, "Lensing of Fast Radio Bursts by Plasma Structures in Host Galaxies", *ApJ*, 842, 35,

2017

28. Marcote, B., et al. (29 authors, including **Wharton, R. S.**), "The Repeating Fast Radio Burst FRB 121102 as Seen on Milliarcsecond Angular Scales", *ApJL*, 834, L8, 2017
29. Tendulkar, S. P., et al. (24 authors, including **Wharton, R. S.**), "The Host Galaxy and Redshift of the Repeating Fast Radio Burst FRB 121102", *ApJL*, 834, L7, 2017
30. Cordes, J. M., **Wharton, R. S.**, Spitler, L. G., Chatterjee, S., Wasserman, I., "Radio Wave Propagation and the Provenance of Fast Radio Bursts", arXiv:1605.05890, 2016
31. Chiti, A., Chatterjee, S., **Wharton, R. S.**, Cordes, J. M., Lazio, T. J. W., Kaplan, D. L., Bower, G. C., Croft, S., "Transient Events in Archival Very Large Array Observations of the Galactic Center", *ApJ*, 833, 11, 2016
32. Scholz, P., et al. (24 authors, including **Wharton, R. S.**), "The repeating Fast Radio Burst FRB 121102: Multi-wavelength observations and additional bursts", *ApJ*, 833, 177, 2016
33. Spitler, L. G., et al. (32 authors, including **Wharton, R. S.**), "Fast Radio Burst Discovered in the Arecibo Pulsar ALFA Survey", *ApJ*, 790, 101, 2014