

Stella Koch Ocker

CURRICULUM VITAE

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CITIZENSHIP: USA, Germany

EDUCATION

Cornell University

M.S., Ph.D. in Astronomy

Advisor: Prof. James Cordes

Thesis Title: “Characterizing Cosmic Plasmas from the Heliosphere to Distant Galaxies”

Ithaca, NY

August 2023

Oberlin College

B.A. with High Honors in Physics (Concentration in Astrophysics)

Oberlin, OH

2018

RESEARCH INTERESTS

- Interstellar, circumgalactic, & intergalactic media
- Energetic transients and compact objects, including fast radio bursts & pulsars
- Precision pulsar timing & its applications: gravitational wave detection & General Relativity

SCHOLARSHIPS, GRANTS, AND AWARDS

- International Space Science Institute (ISSI/Bern) International Team Award 2024–2025
- Carnegie-Caltech Brinson Prize Fellowship 2023–
- Cranson & Edna Shelley Graduate Research Award, Cornell University 2023
- NASA Outer Heliosphere Guest Investigator Grant 2020–2023
- Outstanding Student Presentation Award, American Geophysical Union Fall Meeting 2022
- International Astronomical Union & Heising-Simons Foundation Travel Grant 2022
- Cranson & Edna Shelley Graduate Research Award, Cornell University 2021
- Prize for Highest Scientific Merit, Cornell KK Wang Space Tech Poster Competition 2021
- Cranson & Edna Shelley Outstanding Teaching Assistant Award, Cornell University 2020
- Honorable Mention, NSF Graduate Research Fellowship Competition 2020
- Graduate Student Fellowship, Cornell University 2018–2019
- Carl E. Howe Prize in Physics, Oberlin College 2018
- Oberlin Physics & Astronomy Department Honors Program 2017–2018
- Robert Weinstock Prize for Outstanding Achievement in Physics Coursework (Oberlin) 2017
- John Frederick Oberlin Merit Scholarship 2014–2018

REFEREED PUBLICATIONS

1. **Ocker SK**, Anderson LD, Lazio J, Cordes JM, Ravi V. “Implications for Galactic electron density structure from pulsar sightlines intersecting HII regions.” Under review at *ApJ*. [arXiv:2406.07664](https://arxiv.org/abs/2406.07664)
2. **Ocker SK**, Cordes JM, Chatterjee S, Stinebring DR, Dolch T, Pelgrims V, McKee JW, Giannakopoulos C, Reardon DJ. “Pulsar scintillation through thick and thin: Bow shocks, bubbles, and the broader interstellar medium.” *MNRAS* 527:7568. January, 2024. [doi:10.1093/mnras/stad3683](https://doi.org/10.1093/mnras/stad3683)
3. **Ocker SK**, Cordes JM, Chatterjee S, Li D, Niu CH, McKee JW, Law CJ, Anna-Thomas R. “Scattering variability detected from the circumspace medium of FRB 20190520B.” *MNRAS* 519:821. February, 2023. [doi:10.1093/mnras/stac3547](https://doi.org/10.1093/mnras/stac3547)

4. **Ocker SK**, Cordes JM, Chatterjee S, Gorsuch M. “Radio scattering horizons for interstellar and extragalactic transients.” *ApJ* 934:71. July, 2022. [doi:10.3847/1538-4357/ac75ba](https://doi.org/10.3847/1538-4357/ac75ba)
 5. **Ocker SK**, Cordes JM, Chatterjee S, Niu CH, Li D, McKee JW, Law CJ, Tsai CW, Anna-Thomas R, Yao JM, Cruces M. “The large dispersion and scattering of FRB 20190520B are dominated by the host galaxy.” *ApJ* 931:87. May, 2022. [doi:10.3847/1538-4357/ac6504](https://doi.org/10.3847/1538-4357/ac6504)
 6. **Ocker SK**, Cordes JM, Chatterjee S, Dolch T. “An in situ study of turbulence near stellar bow shocks.” *ApJ* 922:233. December, 2021. [doi:10.3847/1538-4357/ac2b28](https://doi.org/10.3847/1538-4357/ac2b28)
 7. **Ocker SK**, Cordes JM, Chatterjee S, Gurnett D, Kurth B, Spangler S. “Persistent plasma waves in interstellar space detected by Voyager 1.” *Nature Astronomy* 5, 761-765. May, 2021. [doi:10.1038/s41550-021-01363-7](https://doi.org/10.1038/s41550-021-01363-7)
 8. **Ocker SK**, Cordes JM, Chatterjee S. “Constraining galaxy haloes from the dispersion and scattering of fast radio bursts and pulsars.” *ApJ* 911:2. April, 2021. [doi:10.3847/1538-4357/abeb6e](https://doi.org/10.3847/1538-4357/abeb6e)
 9. **Ocker SK**, Cordes JM, Chatterjee S. “Electron density structure of the local Galactic disk.” *ApJ* 897:2. July, 2020. [doi:10.3847/1538-4357/ab98f9](https://doi.org/10.3847/1538-4357/ab98f9)
 10. **Ocker SK**, Petrie G. “The effects of spatial smoothing on solar magnetic helicity parameters and the hemispheric helicity sign rule.” *ApJ*. 832:162. November, 2016. [doi:10.3847/0004-637X/832/2/162](https://doi.org/10.3847/0004-637X/832/2/162)
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11. Sherman M, Ravi V, El-Badry K, Sharma K, **Ocker SK**, Kosogorov N, Connor L, Sharma K. “Searching for magnetar binaries disrupted by core-collapse supernovae.” *MNRAS* 531:2379. June, 2024. [doi:10.1093/mnras/stae1289](https://doi.org/10.1093/mnras/stae1289)
 12. Johnson A et al. (including **Ocker SK**). “NANOGrav 15-year gravitational-wave background methods.” *Physical Review D* 109:103012. May, 2024. [doi:10.1103/PhysRevD.109.103012](https://doi.org/10.1103/PhysRevD.109.103012)
 13. The NANOGrav Collaboration (including **Ocker SK**). “Comparing recent pulsar timing array results on the nanohertz stochastic gravitational wave background.” *ApJ* 966:105. May, 2024. [doi:10.3847/1538-4357/ad36be](https://doi.org/10.3847/1538-4357/ad36be)
 14. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 15 yr data set: Search for transverse polarization modes in the gravitational wave background.” *ApJL* 964:L14. March, 2024. [doi:10.3847/2041-8213/ad2a51](https://doi.org/10.3847/2041-8213/ad2a51)
 15. The NANOGrav Collaboration (including **Ocker SK**). “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. March, 2024. [doi:10.3847/1538-4357/ad1f61](https://doi.org/10.3847/1538-4357/ad1f61)
 16. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 12.5 yr data set: Search for gravitational wave memory.” *ApJ* 963:61. March, 2024. [doi:10.3847/1538-4357/ad0726](https://doi.org/10.3847/1538-4357/ad0726)
 17. Becsy et al. (including **Ocker SK**). “How to detect an astrophysical nanohertz gravitational wave background.” *ApJ* 959:9. December, 2023. [doi:10.3847/1538-4357/ad09e4](https://doi.org/10.3847/1538-4357/ad09e4)
 18. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 15 yr data set: Search for anisotropy in the gravitational wave background.” *ApJ Letters* 956:L3. October, 2023. [doi:10.3847/2041-8213/acf4fd](https://doi.org/10.3847/2041-8213/acf4fd)
 19. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 15-year data set: Evidence for a gravitational wave background.” *ApJ Letters* 951:L8. June, 2023. [doi:10.3847/2041-8213/acdac6](https://doi.org/10.3847/2041-8213/acdac6)
 20. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 15-year data set: Observations and timing of 68 millisecond pulsars.” *ApJ Letters* 951:L9. June, 2023. [doi:10.3847/2041-8213/acda9a](https://doi.org/10.3847/2041-8213/acda9a)

21. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 15-year data set: Detector characterization and noise budget.” *ApJ Letters* 951:L10. June, 2023. [doi:10.3847/2041-8213/acda88](https://doi.org/10.3847/2041-8213/acda88)
22. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 15-year data set: Search for signals from new physics.” *ApJ Letters* 951:L11. June, 2023. [doi:10.3847/2041-8213/acdc91](https://doi.org/10.3847/2041-8213/acdc91)
23. Falxa et al. (including **Ocker SK**). “Searching for continuous gravitational waves in the second data release of the International Pulsar Timing Array.” *MNRAS* 521:5077. June, 2023. [doi:10.1093/mnras/stad812](https://doi.org/10.1093/mnras/stad812).
24. The NANOGrav Collaboration (including **Ocker SK**). “The NANOGrav 12.5 year data set: Bayesian limits on gravitational waves from individual supermassive black hole binaries.” *ApJ Letters* 951:L28. July, 2023. [doi:10.3847/2041-8213/acdbc7](https://doi.org/10.3847/2041-8213/acdbc7).
25. Anna-Thomas R, Connor L, ... **Ocker SK** et al. “Magnetic field reversal in the turbulent environment around a repeating fast radio burst.” *Science* 380:6645. May, 2023. [doi:10.1126/science.abo6526](https://doi.org/10.1126/science.abo6526)
26. Stinebring DR, Rickett BJ, Minter AH, Hill AS, Jussila AP, Mathis L, McLaughlin MA, **Ocker SK**, Ransom SM. “A scintillation arc survey of 22 pulsars with low to moderate dispersion measures.” *ApJ* 941:34. December, 2022. [doi:10.3847/1538-4357/ac8ea8](https://doi.org/10.3847/1538-4357/ac8ea8)
27. Niu CH, Li D, ..., **Ocker SK** et al. “A repeating fast radio burst in a dense environment with a compact persistent radio source.” *Nature* 606, 873877. June, 2022. [doi:10.1038/s41586-022-04755-5](https://doi.org/10.1038/s41586-022-04755-5)
28. Cordes JM, **Ocker SK**, Chatterjee S. “Redshift estimation and constraints on intergalactic and interstellar media from dispersion and scattering of fast radio bursts.” *ApJ* 931:88. May, 2022. [doi:10.3847/1538-4357/ac6873](https://doi.org/10.3847/1538-4357/ac6873)
29. Stinebring DR, Rickett BJ, **Ocker SK**. “The frequency dependence of scintillation arc thickness in pulsar B1133+16.” *ApJ* 870:2. January, 2019. [doi:10.3847/1538-4357/aaef80](https://doi.org/10.3847/1538-4357/aaef80)

NON-REFEREED PUBLICATIONS

1. **Ocker SK** & Cordes JM. “NE2001p: A native Python implementation of the NE2001 Galactic electron density model.” *RNAAS*, 8, 17. January, 2024. [doi:10.3847/2515-5172/ad1bf1](https://doi.org/10.3847/2515-5172/ad1bf1)
2. **Ocker SK**, Cordes JM, Chatterjee S, Hazboun J, Dolch T, Stinebring D, Madison D, White S, Taylor G, Lewandowska N, Lam M. “Heliosphere meets interstellar medium, in a Galactic context.” Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033, white paper, *BAAS*, 55, 301. July, 2023. [doi:10.3847/252cfeb.dd406a9d](https://doi.org/10.3847/252cfeb.dd406a9d)

AFFILIATIONS

- North American Nanohertz Observatory for Gravitational Waves (NANOGrav) 2019–
- NASA Guest Investigator: *Voyager Interstellar Mission* 2020–2023

TELESCOPE TIME ALLOCATIONS (PI: OCKER)

- Magellan, Clay/Baade: 8.5 nights 2024B
“Host Galaxies of High-Redshift Fast Radio Bursts”
- Green Bank Telescope: 27.5 hours (Rank B) 2024B
“An Ultra-Wideband Study of Repeating Fast Radio Bursts”
- Palomar, Hale: 2.5 nights 2024B
“Bow Shocks as Tests of Magnetar Formation & Energetics”
- Magellan, Clay: 4.5 nights 2024A
“Evolution of Pulsar Bow Shocks in the Fluctuating ISM”
- Keck II: 1.5 nights 2024A

- “*Evolution of Pulsar Bow Shocks in the Fluctuating ISM*”
- Green Bank Telescope: 16.5 hours (Rank A) 2023A
“*An Ultra-Wideband Study of Repeating Fast Radio Bursts*”
- Five-hundred-meter Aperture Spherical Telescope: 17.3 hours (Rank A) 2021
“*A Search for Pulsar Bow Shocks Using Interstellar Scintillations*”

TEACHING

- **Python Programming Workshop** at Cornell University Summer 2021
Research Experiences for Undergraduates
- **Head Teaching Assistant** at Cornell University Spring 2020
Our Solar System (ASTRO 1102/1104)
- **Teaching Assistant** at Cornell University Fall 2019
From New Worlds to Black Holes (ASTRO 1101/1103)
- **Teaching Assistant** at Oberlin College Spring 2017
Electricity, Magnetism, & Thermodynamics (PHYS 111)
- **Teaching Assistant** at Oberlin College Fall 2016
Mechanics & Relativity (PHYS 110)

MENTORING

- Advancing Inclusive Mentoring (AIM) Program**, CSU Long Beach & Carnegie Science
Mentoring course & certification 2024
- CASSI-SURF Summer Research Program**, Caltech & Carnegie Observatories
Mentee: Stephen Romero-Ruiz, Caltech 2024
- Research Experiences for Undergraduates**, Cornell University
Mentee: Taite Ellenson, Cornell University 2022
- Mentee: Miranda Gorsuch, University of Wisconsin Stevens Point* 2021
- Mentee: Samantha Rosenfeld, Union College* 2020

INVITED TALKS

1. International Pulsar Timing Array Annual Conference, Haus-Sexten Center for Astrophysics (2024).
2. Fields, Flows, & Filaments Workshop, Stanford University (2024).
3. Astrophysics Lunch Seminar, UC Berkeley (2024).
4. KIPAC Tea, Stanford University (2024).
5. Astrophysics Division Seminar, Jet Propulsion Laboratory, California Institute of Technology (2023).
6. Salpeter Workshop on the Interstellar Medium, Cornell University (2023).
7. Astrophysics of Fast Radio Bursts II, Flatiron Institute (2023).
8. Physics & Astronomy Colloquium, Oberlin College (2023).
9. Special Session SH22C (*Interstellar Probe*), American Geophysical Union Conference (2022).
10. “There’s Plenty of Room at the Bottom” FRB Meeting, Cornell University (2022).
11. Colloquium, CSIRO Australia National Telescope Facility (2022).
12. Scintillometry Workshop, University of Toronto (2022).
13. Breaking News Session, International Astronomical Union General Assembly Symposium: The Dawn of Cosmology & Multi-Messenger Studies with Fast Radio Bursts (2022).

14. Diffuse Ionized Gas Seminar, University of Washington, Seattle (2022).
15. FRB Seminar, Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taiwan (2022).
16. Radio/mm/sub-mm Seminar, Caltech (2022).
17. Colloquium, Green Bank Observatory (2021).
18. *Interstellar Probe* Workshop, Applied Physics Laboratory, Johns Hopkins University (2021).
19. Colloquium, Netherlands Institute for Radio Astronomy (ASTRON/JIVE; 2021).
20. CHIME/FRB Collaboration Journal Club (2021).

CONTRIBUTED TALKS AND POSTERS

1. Probing the Sun's Interstellar Environment from AU to 100s of Parsec Scales. Poster. American Geophysical Union Conference (2023).
2. Pulsar Scintillation through Thick and Thin. Talk. Scintillometry Workshop (2023).
3. The Path to a Next-Generation Galactic Electron Density Model. Talk. FRB2023 (2023).
4. A High-Resolution Study of Pulsar Scintillation. Talk. NANOGrav Fall Meeting (2023).
5. Mapping Small-Scale Structure in the ISM from Voyager to Nearby Pulsars. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2023).
6. A Search for Scintillation from Pulsar Bow Shocks. Talk. NANOGrav Spring Meeting (2023).
7. Noise Considerations for Pulsar Science with DSA-2000. Scientific Frontiers and Synergies with the DSA-2000 Radio Camera. Poster. California Institute of Technology (2023).
8. Bow Shocks of Scintillating Pulsars. Talk. Scintillometry Workshop, University of Toronto (2022).
9. Scattering Horizons for Fast Radio Bursts. Talk. International Astronomical Union General Assembly; Symposium: The Dawn of Cosmology & Multi-Messenger Studies with Fast Radio Bursts (2022).
10. Mapping the Local ISM From Voyager to Pulsars. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2022).
11. Scattering Horizons for Pulsars and Fast Radio Bursts. Poster. NANOGrav Spring Meeting (2022).
12. An In Situ Study of Turbulence Near Stellar Bow Shocks. Talk. NANOGrav Fall Meeting (2021).
13. Turbulence Near Stellar Bow Shocks. Talk. Fall Meeting of the Voyager Interstellar Mission Science Steering Group (2021).
14. Leveraging the Combined Scattering and DM Budget. Talk. FRB2021 (2021).
15. Interstellar Propagation Effects Near and Far. Talk. NANOGrav Spring Meeting (2021).
16. Voyager 1 Is Now an Interstellar Probe. Poster. KK Wang Cornell Space Tech Industry Day (2021).
17. Voyager 1 Detects Persistent Plasma Waves in Interstellar Space. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2021).
18. Interstellar Turbulence Near the Heliospheric Boundary. Talk. Fall Meeting of the Voyager Interstellar Mission Science Steering Group (2020).
19. Assessing Chromatic Arrival Time Perturbations for NANOGrav's Error Budget. Poster. 235th AAS Meeting (2020).
20. Multi-Frequency Scintillation Arc Study of Pulsar B1133+16. Poster. 233rd AAS Meeting (2019).
21. Multiple scintillation arcs in a nearby pulsar, B1133+16: crucial clues? Talk. Scintillometry Workshop, University of Toronto (2017).

22. The effects of spatial smoothing on solar magnetic helicity and the hemispheric helicity sign rule. Poster. 47th AAS/Solar Physics Division Meeting (2016).

PROFESSIONAL SERVICE

- **Journal Referee** 2021–
ApJ, Nature Astronomy, Nature Communications, MNRAS, A&A
- **Scientific Organizing Committee, FRB2024 Thailand** 2024
Drafted conference goals, reviewed abstracts, meeting schedule
- **Hubble Space Telescope Allocation Committee: External Reviewer** 2024
Evaluated grant proposals, provided written feedback
- **Caltech Optical Observatories Time Allocation Committee** 2024
Evaluated observing proposals, recommended time allocations, provided written feedback
- **NASA Review Panel Member** 2023
Evaluated grant proposals
- **NANOGrav Climate & Equity Committee Member** 2021–2023
Contributor to NANOGrav Diversity Plan, annual climate survey, & DEI trainings for biannual collaboration meetings
- **Peer Mentor Coordinator, Cornell Astronomy Graduate Network** 2021–2022
Paired graduate student mentors and mentees; trained mentors; led group mentoring sessions
- **President, Cornell Astronomy Graduate Network** 2020–2021
Contributed to creation of Cornell Astronomy Graduate Student Handbook and the Astronomy Peer Mentoring Network
- **Secretary & Outreach Coordinator, Cornell Astronomy Graduate Network** 2019–2020
Organized the weekly graduate student and post-doc seminar; lead organizer of outreach events involving graduate students (see Outreach section below)
- **Student Representative, Oberlin College Department of Physics & Astronomy** 2016–2018
Attended all faculty meetings; led student committee for 2017 faculty search; organized weekly Women/Trans/Nonbinary in Physics Tea

OUTREACH

- Carnegie Observatories Open House 2023
- Public Talk, Cornell Astronomical Society 2023
- Contributing Writer, Ask an Astronomer: curious.astro.cornell.edu 2018–2023
- Public Talk, Southern Maine Astronomers Organization 2022
- Workshop Leader, Expanding Your Horizons, Cornell University 2019, 2021–2022
- Organizer, Museum in the Dark Event, Museum of the Earth, Ithaca NY 2019–2020
- Program Leader, 4-H Career Explorations, Cornell University 2019

SELECTED MEDIA INTERVIEWS

- NPR: “The Voyager 1 spacecraft has a big glitch” [npr.org](https://www.npr.org)
- Vice News: “Flying 15 Billion Miles Away from Earth” [youtube.com](https://www.youtube.com)
- NPR: “Planning for a space mission to last more than 50 years” [npr.org](https://www.npr.org)
- WKMG News 6 Space Curious Podcast: “How Big is the Solar System?” podcasts.apple.com
- NBC: “NASA spacecraft detects a constant ‘hum’ deep in the cosmos” [nbcnews.com](https://www.nbcnews.com)
- Gizmodo: “NASA’s Voyager 1 Probe Detects the Steady ‘Hum’...” [gizmodo.com](https://www.gizmodo.com)
- NASA: “Voyager 1’s Density Measurements are Making Waves” [nasa.gov](https://www.nasa.gov)
- AASNova: “What Fast Radio Bursts Tell Us About Galaxy Halos” [aasnova.org](https://www.aasnova.org)