Stella Koch Ocker

Curriculum Vitae

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Citizenship: USA, Germany

Education

Cornell University — Ithaca, NY
Ph.D. in Astronomy — 2023
M.S. in Astronomy — 2020

Oberlin College — Oberlin, OH
B.A. with High Honors in Physics (Concentration in Astrophysics) — 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 Grant — 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**, Chen M, Oh SP, Sharma P. "Microphysics of circumgalactic turbulence probed by fast radio bursts and quasars." Accepted to *ApJ*. arXiv:2503.02329
2. **Ocker SK** and Cosens M. "Probing the low-velocity regime of non-radiative shocks with neutron star bow shocks." *ApJL* 975:L31. November, 2024. doi:10.3847/2041-8213/ad87cf
3. **Ocker SK**, Anderson LD, Lazio J, Cordes JM, Ravi V. "Implications for Galactic electron density structure from pulsar sightlines intersecting HII regions." *ApJ* 974:10. October, 2024. doi:10.3847/1538-4357/ad6a51

4. **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
5. **Ocker SK**, Cordes JM, Chatterjee S, Li D, Niu CH, McKee JW, Law CJ, Anna-Thomas R. "Scattering variability detected from the circumsource medium of FRB 20190520B." *MNRAS* 519:821. February, 2023. doi:10.1093/mnras/stac3547
6. **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
7. **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
8. **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
9. **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
10. **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
11. **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
12. **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

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13. The NANOGrav Collaboration (including **Ocker SK**. "The NANOGrav 15 yr dataset: Search for gravitational wave memory." *ApJ* 987:5. June, 2025. doi:10.3847/1538-4357/add874
14. Wang Z et al. (including **Ocker SK**). "Detection of X-ray emission from a bright long-period radio transient." *Nature* 642:8068. June, 2025. doi:10.1038/s41586-025-09077-w
15. Connor L, Ravi V, Sharma K, **Ocker SK** et al. "A gas rich cosmic web revealed by partitioning the missing baryons." *Nature Astronomy*. June, 2025. doi:10.1038/s41550-025-02566-y
16. Geiger A, Cordes JM, Lam MT, **Ocker SK** et al. "The NANOGrav 12.5 yr dataset: Probing interstellar turbulence and precision pulsar timing with PSR J1903+0327." *ApJ* 986:191. June, 2025. doi:10.3847/1538-4357/add0b6
17. The NANOGrav Collaboration (including **Ocker SK**). "The NANOGrav 15 yr dataset: Harmonic analysis of the pulsar angular correlations." *ApJ* 985:99. May, 2025. doi:10.3847/1538-4357/adc997
18. Reardon DJ, Main R, **Ocker SK** et al. "Bow shock and Local Bubble plasma unveiled by the scintillating millisecond pulsar J0437−4715." *Nature Astronomy*. April, 2025. doi:10.1038/s41550-025-02534-6
19. Lee et al. (including **Ocker SK**). "The emission of interpulses by a 6.45-h-period coherent radio transient." *Nature Astronomy* 9:393. March, 2025. doi:10.1038/s41550-024-02452-z
20. The NANOGrav Collaboration (including **Ocker SK**). "The NANOGrav 15 yr dataset: Posterior predictive checks for gravitational-wave detection with pulsar timing arrays." *Phys. Review D* 111:4. February, 2025. doi:10.1103/PhysRevD.111.042011

21. The NANOGrav Collaboration (including **Ocker SK**). "The NANOGrav 15 yr Data Set: Running of the Spectral Index." *ApJL* 978:L29. January, 2025. doi:10.3847/2041-8213/ad99d3
22. The NANOGrav Collaboration (including **Ocker SK**). "The NANOGrav 15 Yr Data Set: Removing Pulsars One by One from the Pulsar Timing Array." *ApJ* 978:168. January, 2025. doi:10.3847/1538-4357/ad93aa
23. The NANOGrav Collaboration (including **Ocker SK**). "The NANOGrav 15 yr Data Set: Looking for Signs of Discreteness in the Gravitational-wave Background." *ApJ* 978:31. January, 2025. doi:10.3847/1538-4357/ad93d5
24. Sharma K, Ravi V, Connor L, Law C, **Ocker SK**, Sherman M et al. "Preferential occurrence of fast radio bursts in massive star-forming galaxies." *Nature* 635:61. November, 2024. doi:10.1038/s41586-024-08074-9
25. Turner JE, Dolch T, Cordes JM, **Ocker SK** et al. "A Cyclic Spectroscopy Study of PSR B1937+21: Demonstration of Improved Scintillometry." *ApJ* 927:16. September, 2024. doi:10.3847/1538-4357/ad5af9
26. 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
27. 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
28. 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
29. The NANOGrav Collaboration (including **Ocker SK**). "The NANOGrav 15 yr data set: Search for transverse polarization modes in the graviational wave background." *ApJL* 964:L14. March, 2024. doi:10.3847/2041-8213/ad2a51
30. 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
31. 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
32. 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
33. 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
34. 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
35. 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
36. 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
37. 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
38. 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.

39. 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.
40. 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
41. 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
42. 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
43. 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
44. 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

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
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:103847/252cfeb.dd406a9d

Affiliations

- DSA-2000 Pulsar Search Working Group 2025–
- Pulsar Science Working Group, Square Kilometer Array Observatory (SKAO) 2024–
- North American Nanohertz Observatory for Gravitational Waves (NANOGrav) 2019–
- Voyager Interstellar Mission
  NASA Outer Heliosphere Guest Investigator *2020–2023*
  Science Steering Group *2023–*

Telescope Time Allocations (PI: Ocker)

- Magellan Telescopes, Las Campanas Observatory: 6.5 nights (2025A), 8.5 nights (2024B), 4.5 nights (2024A)
- Keck II Telescope, W.M. Keck Observatory: 1.5 nights (2025B), 3 nights (2025A), 1.5 nights (2024A)
- Hale Telescope, Palomar Observatory: 2 nights (2025A), 2.5 nights (2024B)
- Green Bank Telescope: 27.5 hr Rank B (2024B), 16.5 hr Rank A (2023A)
- Five-hundred-meter Aperture Spherical Telescope: 17.3 hr Rank A (2021)

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

Visiting Graduate Student Researcher Program, Caltech
Mentee: Francesco Angelo Iraci — *2025*

CASSI-SURF Summer Research Program, Caltech & Carnegie Observatories
Mentee: Zaara Bhatia, Harvey-Mudd College — *2025*
Mentee: Stephen Romero-Ruiz, Caltech — *2024*

Advancing Inclusive Mentoring (AIM) Program, CSU Long Beach & Carnegie Science
Mentoring course & certification — *2024*

Astronomy Mentoring Program for Upcoming Postdocs (AMP-UP)
Mentee: Abby Lee, University of Chicago — *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. Colloquium, Max Planck Institute for Radio Astronomy (2025).
2. Colloquium, Anton Pannekoek Institute for Astronomy, University of Amsterdam (2025).
3. Colloquium, ASTRON Institute for Radio Astronomy (2025).
4. Colloquium, Institute for Theory and Computation, Harvard University (2025).
5. Observational Astronomy Seminar, CIERA, Northwestern University (2025).
6. Research Seminar, University of Chicago (2025).
7. FRB2024 Conference, Khao Lak, Thailand (2024).
8. Towards a Holistic Understanding of the Multi-scale, Multi-phase Circumgalactic Medium, Aspen Center for Physics (2024).
9. International Pulsar Timing Array Annual Conference, Haus-Sexten Center for Astrophysics (2024).
10. Fields, Flows, & Filaments Workshop, Stanford University (2024).
11. Astrophysics Lunch Seminar, UC Berkeley (2024).
12. KIPAC Tea, Stanford University (2024).
13. Astrophysics Division Seminar, Jet Propulsion Laboratory, California Institute of Technology (2023).
14. Salpeter Workshop on the Interstellar Medium, Cornell University (2023).
15. Astrophysics of Fast Radio Bursts II, Flatiron Institute (2023).
16. Physics & Astronomy Colloquium, Oberlin College (2023).
17. Special Session SH22C (*Interstellar Probe*), American Geophysical Union Conference (2022).

18. “There’s Plenty of Room at the Bottom” FRB Meeting, Cornell University (2022).
19. Colloquium, CSIRO Australia National Telescope Facility (2022).
20. Scintillometry Workshop, University of Toronto (2022).
21. Breaking News Session, International Astronomical Union General Assembly Symposium: The Dawn of Cosmology & Multi-Messenger Studies with Fast Radio Bursts (2022).
22. Diffuse Ionized Gas Seminar, University of Washington, Seattle (2022).
23. FRB Seminar, Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taiwan (2022).
24. Radio/mm/sub-mm Seminar, Caltech (2022).
25. Colloquium, Green Bank Observatory (2021).
26. *Interstellar Probe* Workshop, Applied Physics Laboratory, Johns Hopkins University (2021).
27. Colloquium, Netherlands Institute for Radio Astronomy (ASTRON/JIVe; 2021).
28. CHIME/FRB Collaboration Journal Club (2021).

Contributed Talks and Posters

1. Using Bow Shocks to Unveil the Structure of Neutron Star Winds. Talk. 18th Annual Bonn Neutron Star Workshop, Max Planck Institute for Radio Astronomy (2025).
2. Constraining the Dissipation of VLISM Turbulence. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2025).
3. Pulsar Scintillation in the Interstellar Zoo. Talk. Scintillometry Workshop, University of Central Florida (2024).
4. Probing the Sun’s Interstellar Environment from AU to 100s of Parsec Scales. Poster. American Geophysical Union Conference (2023).
5. Pulsar Scintillation through Thick and Thin. Talk. Scintillometry Workshop (2023).
6. The Path to a Next-Generation Galactic Electron Density Model. Talk. FRB2023 (2023).
7. A High-Resolution Study of Pulsar Scintillation. Talk. NANOGrav Fall Meeting (2023).
8. Mapping Small-Scale Structure in the ISM from Voyager to Nearby Pulsars. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2023).
9. A Search for Scintillation from Pulsar Bow Shocks. Talk. NANOGrav Spring Meeting (2023).
10. Noise Considerations for Pulsar Science with DSA-2000. Scientific Frontiers and Synergies with the DSA-2000 Radio Camera. Poster. California Institute of Technology (2023).
11. Bow Shocks of Scintillating Pulsars. Talk. Scintillometry Workshop, University of Toronto (2022).
12. 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).
13. Mapping the Local ISM From Voyager to Pulsars. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2022).
14. Scattering Horizons for Pulsars and Fast Radio Bursts. Poster. NANOGrav Spring Meeting (2022).
15. An In Situ Study of Turbulence Near Stellar Bow Shocks. Talk. NANOGrav Fall Meeting (2021).
16. Turbulence Near Stellar Bow Shocks. Talk. Fall Meeting of the Voyager Interstellar Mission Science Steering Group (2021).
17. Leveraging the Combined Scattering and DM Budget. Talk. FRB2021 (2021).

18. Interstellar Propagation Effects Near and Far. Talk. NANOGrav Spring Meeting (2021).
19. Voyager 1 Is Now an Interstellar Probe. Poster. KK Wang Cornell Space Tech Industry Day (2021).
20. Voyager 1 Detects Persistent Plasma Waves in Interstellar Space. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2021).
21. Interstellar Turbulence Near the Heliospheric Boundary. Talk. Fall Meeting of the Voyager Interstellar Mission Science Steering Group (2020).
22. Assessing Chromatic Arrival Time Perturbations for NANOGrav's Error Budget. Poster. 235th AAS Meeting (2020).
23. Multi-Frequency Scintillation Arc Study of Pulsar B1133+16. Poster. 233rd AAS Meeting (2019).
24. Multiple scintillation arcs in a nearby pulsar, B1133+16: crucial clues? Talk. Scintillometry Workshop, University of Toronto (2017).
25. 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** ongoing
  ApJ, Nature Astronomy, Nature Communications, MNRAS, A&A, Science China PMA
- **Observational Eras Committee, NANOGrav Collaboration** 2024–
  Gathered materials on organizational structure of other collaborations; formulated recommendations for reorganization of collaboration procedures
- **Colloquium Committee, Carnegie Observatories** 2024–
  Invited speakers, organized talks
- **Scientific Organizing Committee, FRB2024 Thailand** 2024
  Drafted conference goals, reviewed abstracts, meeting schedule
- **German Israeli Foundation for Scientific Research and Development: External Reviewer** 2024
  Evaluated grant proposals, provided written feedback
- **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, 2024
  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

- Letters to a Pre-Scientist 2024–2025
- Caltech Astronomy on Tap 2025
- Reddit Ask Me Anything, Voyager Interstellar Mission 2024
- 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
- Vice News: "Flying 15 Billion Miles Away from Earth" youtube.com
- NPR: "Planning for a space mission to last more than 50 years" 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
- Gizmodo: "NASA's Voyager 1 Probe Detects the Steady 'Hum'..." gizmodo.com
- NASA: "Voyager 1's Density Measurements are Making Waves" nasa.gov
- AASNova: "What Fast Radio Bursts Tell Us About Galaxy Halos" aasnova.org