Stella Koch Ocker

Website: stellakochocker.com
Email: sko36@cornell.edu

Education

Cornell Univerity — Ithaca, NY
Ph.D. in Astronomy, Advisor: Prof. James Cordes — 2020–Current

Cornell University — Ithaca, NY
M.S. in Astronomy, Advisor: Prof. James Cordes — 2018–2020

Oberlin College — Oberlin, OH
B.A. with High Honors in Physics — 2014–2018

- Concentration: Astrophysics
- Minor: English

Research Interests

- Radio transients, including fast radio bursts and pulsars
- Precision pulsar timing and its applications, including gravitational wave detection and tests of General Relativity
- The interstellar medium, including plasma turbulence and radio wave propagation

Scholarships, Grants, and Awards

- International Astronomical Union & Heising-Simons Foundation Travel Grant — 2022
- Cranson & Edna Shelley Graduate Research Award, Cornell University — 2021
- Prize for Highest Scientific Merit, KK Wang Space Tech Poster Competition, Cornell University — 2021
- NASA Outer Heliosphere Guest Investigator — 2020–2023
- Cranson & Edna Shelley Outstanding Teaching Assistant Award, Cornell University — 2020
- Honorable Mention, NSF Graduate Research Fellowship Competition — 2020
- Cornell Graduate Student Fellowship — 2018–2019
- Cornell Graduate Travel Grant — 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 — 2017
- John Frederick Oberlin Merit Scholarship — 2014–2018
- Valedictorian, Sir Francis Drake High School — 2014
- Ellsworth Hagen Scholarship, Drake Scholarship Foundation — 2014

Research Experience

Cornell University — Ithaca, NY
Astronomy Graduate Research Assistant, Advisor: Prof. James Cordes — 2018–current

Oberlin College — Oberlin, OH
Physics & Astronomy Honors Program, Advisor: Prof. Dan Stinebring — 2017–2018

– Testing the Production of Scintillation Arcs with PSR B1133+16

McGill Space Institute Montreal, Canada
Undergraduate Research Assistant, Advisor: Prof. Victoria Kaspi Summer 2016 & Summer 2017

– Modeling FRB 121102 as a Poisson Process
– Searching for Neutral Hydrogen Absorption in FRB 121102

San Francisco State University San Francisco, CA
Remote Research Assistant, Advisor: Prof. Stephen Kane 2016–2017

– Modeling the Retrieval of Lens Star Spectra During Microlensing Events

Oberlin College Oberlin, OH
Undergraduate Research Assistant, Advisor: Prof. Dan Stinebring 2015–2016

– Testing Physical Models for Scintillation Arcs

National Solar Observatory Tucson, AZ
REU Program, Advisor: Dr. Gordon Petrie Summer 2015

– Characterizing the Effects of Spatial Smoothing on Solar Magnetic Helicity Parameters and the Solar Hemispheric Helicity Sign Rule

Publications

1. **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. White paper submitted to the National Academies Heliophysics 2024 Decadal Survey. https://doi.org/10.48550/arXiv.2208.11804 (2022)
2. 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. Accepted to ApJ. arXiv:2207.08756 (2022)
3. **Ocker SK**, Gorsuch M, Cordes JM, Chatterjee S, et al. Radio scattering horizons for interstellar and extragalactic transients. ApJ 934:71. https://doi.org/10.3847/1538-4357/ac75ba (2022)
4. Anna-Thomas R, Burke-Spolaor S, ... **Ocker SK** et al. A highly variable magnetized environment in a fast radio burst source. Under review. arXiv:2202.11112 (2022)
5. Niu CH, Li D, ..., **Ocker SK** et al. A repeating fast radio burst in a dense environment with a compact persistent radio source. *Nature*. https://doi.org/10.1038/s41586-022-04755-5 (2022)
6. **Ocker SK**, Cordes JM, Chatterjee S, et al. The large dispersion and scattering of FRB 20190520B are dominated by the host galaxy. *ApJ* 931:87. https://doi.org/10.3847/1538-4357/ac6504 (2022)
7. 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. https://doi.org/10.3847/1538-4357/ac6873 (2022)
8. **Ocker SK**, Cordes JM, Chatterjee S, Dolch T. An in situ study of turbulence near stellar bow shocks. *ApJ* 922:233 https://doi.org/10.3847/1538-4357/ac2b28 (2021)
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*. doi:10.1038/s41550-021-01363-7 (2021)
10. **Ocker SK**, Cordes JM, Chatterjee S. Constraining galaxy haloes from the dispersion and scattering of fast radio bursts and pulsars. *ApJ* 911:2. doi:10.3847/1538-4357/abeb6e (2021)
11. **Ocker SK**, Cordes JM, Chatterjee S. Electron density structure of the local Galactic disk. *ApJ* 897:2. doi:10.3847/1538-4357/ab98f9 (2020)
12. Stinebring DR, Rickett BJ, **Ocker SK**. The frequency dependence of scintillation arc thickness in pulsar B1133+16. *ApJ*. 870:2. https://doi.org/10.3847/1538-4357/aaef80 (2019)

13. **Ocker SK**. Testing the production of scintillation arcs with the pulsar B1133+16. Electronic Thesis. Oberlin College, 2018. *OhioLINK Electronic Theses and Dissertations Center*. http://rave.ohiolink.edu/etdc/view?acc_num=oberlin1526565414057674

14. **Ocker SK**, Petrie G. The effects of spatial smoothing on solar magnetic helicity parameters and the hemispheric helicity sign rule. *ApJ*. 832:162. doi:10.3847/0004-637X/832/2/162 (2016)

Invited Talks

1. Scattering Variations Detected from a Repeating Fast Radio Burst. Scintillometry Workshop, University of Toronto (2022).

2. Scattering Variations Detected from a Repeating Fast Radio Burst. Breaking news session, International Astronomical Union General Assembly Symposium: The Dawn of Cosmology & Multi-Messenger Studies with (2022).

3. Scattering Horizons for Extragalactic Fast Radio Bursts. University of Washington, Seattle (2022).

4. The Large Dispersion and Scattering of FRB 20190520B Are Dominated by the Host Galaxy. ASIAA FRB Meeting (2022).

5. Scattering Horizons for Fast Radio Transients. Radio/mm/sub-mm Seminar, Caltech (2022).

6. Exploring the Interstellar Medium from Voyager to Pulsars. Green Bank Observatory Colloquium (2021)

7. Voyager 1 Detects Persistent Plasma Waves in Interstellar Space. Interstellar Probe Workshop, Applied Physics Laboratory (2021)

8. Probing the Local ISM on Sub-AU Scales with Voyager. ASTRON/JIVe (2021)

9. Constraining Galaxy Haloes from the Dispersion and Scattering of Fast Radio Bursts. CHIME/FRB Collaboration Journal Club (2021)

Contributed Talks and Posters

1. Bow Shocks of Scintillating Pulsars. Talk. Scintillometry Workshop, University of Toronto (2022).

2. 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).

3. Mapping the Local ISM From Voyager to Pulsars. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2022)

4. Scattering Horizons for Pulsars and Fast Radio Bursts. Poster. NANOGrav Spring Meeting (2022).

5. An In Situ Study of Turbulence Near Stellar Bow Shocks. Talk. NANOGrav Fall Meeting (2021)

6. Turbulence Near Stellar Bow Shocks. Talk. Fall Meeting of the Voyager Interstellar Mission Science Steering Group (2021)

7. Interstellar Propagation Effects Near and Far. Talk. NANOGrav Spring Meeting (2021)

8. Voyager 1 Is Now an Interstellar Probe. Poster. KK Wang Cornell Space Tech Industry Day (2021)

9. Voyager 1 Detects Persistent Plasma Waves in Interstellar Space. Talk. Spring Meeting of the Voyager Interstellar Mission Science Steering Group (2021)

10. Interstellar Turbulence Near the Heliospheric Boundary. Talk. Fall Meeting of the Voyager Interstellar Mission Science Steering Group (2020)

11. Assessing Chromatic Arrival Time Perturbations for NANOGrav's Error Budget. Poster. 235th AAS Meeting (2020)

12. Multi-Frequency Scintillation Arc Study of Pulsar B1133+16. Poster. 233rd AAS Meeting (2019)

13. Multiple scintillation arcs in a nearby pulsar, B1133+16: crucial clues? Talk. University of Toronto Scintillometry with Pulsar VLBI Workshop (2017)

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

Affiliations

- Full Member, North American Nanohertz Observatory for Gravitational Waves (NANOGrav) 2021–
- NASA Outer Heliosphere Guest Investigator, Voyager Interstellar Mission 2020–2023
- Associate Member, North American Nanohertz Observatory for Gravitational Waves (NANOGrav) 2019–2021
- Carl Sagan Institute, Cornell University 2020–
- Cornell Center for Astrophysics and Planetary Science 2018 –
- Graduate Student Member, American Astronomical Society (AAS) 2018–

Teaching

- **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)
- **Tutor** at Oberlin College 2015–2016
  Quantitative Skills Center

Mentoring

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*

Skills

- **Programming languages:** Python, Mathematica, LaTex, IDL, Fortran
- **Code:** NE2001, YMW16

Languages

- **French:** Intermediate
- **Hebrew:** Beginner
- **German:** Beginner

Professional Service

- **Referee** 2021–
  MNRAS, ApJ
- **NANOGrav Climate & Equity Committee Member** 2021–
  Contributor to NANOGrav Diversity Plan, annual climate survey
- **Peer Mentor Coordinator, Cornell Astronomy Graduate Network** 2021–2022

Paired graduate student mentors and mentees; conducted mentor trainings; organized group mentoring sessions

- **President, Cornell Astronomy Graduate Network** 2020–2021
  Contributed to creation of Cornell Astronomy Graduate Student Handbook and the Astronomy Graduate Peer Mentoring Network; facilitated #Strike4BlackLives event; created virtual outreach event for Expanding Your Horizons
- **Secretary & Outreach Coordinator, Cornell Astronomy Graduate Network** 2019–2020
  Organized the weekly graduate student and post-doc seminar; lead organizer of all outreach events involving graduate students; coordinated graduate student lectures at Ithaca public libraries
- **Student Representative, Oberlin College Department of Physics & Astronomy** Fall 2016 –Spring 2018
  Attended all faculty meetings; led student committee for 2017 faculty search; organized Women/Trans/Nonbinary in Physics Tea; organized annual departmental t-shirt contest; awarded Carl E. Howe Prize in Physics for service as student representative

Outreach

- Public Talk, Southern Maine Astronomers July 2022
- Workshop Leader, Expanding Your Horizons, Cornell University 2021 - 2022
- Programming Workshop Leader, Research Experiences for Undergraduates, Cornell University June 2021
- Volunteer, Museum in the Dark, Museum of the Earth, Ithaca NY October 2020
- Lead Organizer, Museum in the Dark, Museum of the Earth, Ithaca NY October 2019
- Organizer, Cornell STEP Astronomy program July 2019
- Program Leader, 4-H Career Explorations, Cornell University June 2019
- Coordinator, Kids' Science Day at the Big Red Barn, Cornell University May 2019
- Volunteer, Expanding Your Horizons, Cornell University April 2019

Selected Media

- Vice News/Motherboard Space Show: "Flying 15 Billion Miles Away from Earth" youtube.com
- NPR: "If NASA green lights this interstellar mission, it could last 100 years" npr.org
- NPR Short Wave Podcast: "Planning for a space mission to last more than 50 years" npr.org
- Ask an Astronomer: "Earth's Bow Shock" curious.astro.cornell.edu
- WKMG News 6 Space Curious Podcast: "How Big is the Solar System?" clickorlando.com
- NBC: "NASA spacecraft detects a constant 'hum' deep in the cosmos" nbcnews.com
- Gizmodo: "NASA's Voyager 1 Probe Detects the Steady 'Hum' of Plasma in Interstellar Space" gizmodo.com
- NASA: "Voyager 1's Density Measurements are Making Waves" nasa.gov
- Cornell Chronicle: "In the emptiness of space, Voyager 1 detects plasma 'hum"' news.cornell.edu
- AASNova: "What Fast Radio Bursts Tell Us About Galaxy Halos" aasnova.org