PAUL M. CHICHURA
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EDUCATION:

2025 **The University of Chicago (UChicago)**: Ph.D. (Physics, Advisor: Thomas Crawford)
2022 **UChicago**: M.S. (Physics)
2018 **University of Pennsylvania (Penn)**: M.S. (Physics and Astronomy)
2018 **Penn**: B.A. (Physics w/ honors, Math minor, *Summa Cum Laude*, Advisor: James Aguirre)
2014–2015 **The Pennsylvania State University (PSU)**: Schreyer Honors College

RESEARCH EXPERIENCE:

2025–*current* **NSF-Simons AI Institute for the Sky (SkAI)**
UChicago, Astronomy – postdoctoral scholar, supervisor: Alex Drlica-Wagner
- Developing reinforcement learning-based AI agents for optimizing **telescope scheduling**, and deploying the agent on live systems to improve observing efficiency and reduce human labor

2020–2025 **South Pole Telescope (SPT) and Event Horizon Telescope (EHT)**
UChicago, Physics – Ph.D. Thesis, supervisor: Thomas Crawford
- Created and deployed XGBoost machine learning models for the SPT control system in order to **improve real-time accuracy pointing** at science targets during EHT observations. Reduced the average pointing error by 33% for sources within the training regime during the 2024 EHT campaign, a huge improvement for a decades-old problem.
- Designed and coordinated 2 month-long surveys of the galactic center with the SPT. Led analysis of **polarized variability of Sgr A***, the black hole at the center of our galaxy.
- Developed tools to create difference images of SPT data. Led the first targeted analysis of detections of **asteroids** in data from cosmic microwave background survey experiments.

2017–2019 **Hydrogen Epoch of Reionization Array (HERA)**
Penn, Physics and Astronomy – Senior Honors Thesis, supervisor: James Aguirre
- Wrote code to calculate power spectra for data from the HERA commissioning array.
- Analyzed the quality and effect of various calibration techniques.

2016 **Dark Energy Survey (DES)**
Penn, Physics and Astronomy – Summer Research Experience, supervisor: Masao Sako
- Developed code to systematically save thumbnails of point sources in FITS files.

HONORS AND AWARDS:

2024 **Nathan Sugarman Award for Excellence in Graduate Student Research**, UChicago
Awarded yearly by the Enrico Fermi Institute to graduating physics students. $2,000 prize, 2 graduate student recipients, ~40 candidates. Awarded "for creative and innovative research that has expanded the scope of science carried out with the 10-meter South Pole Telescope."

2021 **Sachs Fellowship**, UChicago
Summer support for top-performing graduate students

2021 **Chambliss Astronomy Achievement Student Award Honorable Mention**
Awarded by the American Astronomical Society (AAS) through a competition presenting a research poster at a AAS conference. 14 entrants: 2 recipients, 5 honorable mentions.

2018 **Phi Beta Kappa Honor Society**, Penn
The USA's oldest and most prestigious honor society, recognizing academic excellence. Inductees are within the top 10% of students at participating universities.

SELECTED PUBLICATIONS:

[1] **Chichura, P.**, *et al.* 2025. "Pointing Accuracy Improvements for the South Pole Telescope with Machine Learning." *Journal of Astronomical Instrumentation* 14 (January): 2550001. arXiv:2412.15167.
- Led analysis, development, and deployment of models; a substantial part of Ph.D. thesis

[2] Wan, Y., *et al.* 2025. "Detection of Millimeter-Wavelength Flares from Two Accreting White Dwarf Systems in the SPT-3G Galactic Plane Survey." *arXiv e-prints* (September): arXiv:2509.08962.
- Designed and led the observation survey that resulted in data analyzed in this paper

[3] **Chichura, P.**, *et al.* 2022. "Asteroid Measurements at Millimeter Wavelengths with the South Pole Telescope." *ApJ* 936, no. 2 (September): 173. arXiv:2202.01406.
- Led analysis and development of novel techniques; a substantial part of Ph.D. thesis

[4] Kohn, S., *et al.* 2019. "The HERA-19 Commissioning Array: Direction-dependent Effects." *ApJ* 882, no. 1 (September): 58. arXiv:1802.04151.
- Results from undergraduate honors thesis research

CONFERENCE PRESENTATIONS:

Speaker, National Radio Science Meeting, "Pointing the South Pole Telescope with Machine Learning, University of Colorado, 7-10 Jan. 2025.

Poster, AI+Science, "Pointing Model Predictions with Machine Learning for the South Pole Telescope," UChicago, 15-19 Jul. 2024.

Poster, AI+Science, "Pointing Model Predictions for the South Pole Telescope," UChicago, 17-21 Jul. 2023.

Speaker, The Transient and Variable Universe 2023, "Asteroid Measurements at Millimeter Wavelengths with the South Pole Telescope," University of Illinois Urbana-Champaign, 20-22 Jun. 2023.

Poster, 238th Meeting of the American Astronomical Society, "Measuring the Millimeter-Wavelength Flux of Asteroids with the South Pole Telescope," remote, 7-9 Jun 2021.

Poster, 231st Meeting of the American Astronomical Society, "Polarized Power Spectra from HERA-19 Commissioning Data: Effect of Calibration Techniques," Washington, DC, 8-9 Jan. 2018.

TEACHING EXPERIENCE:

2025 **College Teaching Certificate**, UChicago
Certificate awarded by the Chicago Center for Teaching and Learning upon completion of a range of professional development activities including a pedagogical class in course design, observation and feedback, and reflection on teaching and inclusive pedagogy.

2023–current **Research Advising**, UChicago and University of Illinois Urbana-Champaign (UIUC)
Remotely advising a graduate student at UIUC on a research project continuing my work with asteroids in SPT data; met weekly and helped prepare conference presentations.

2024 **Guest Lecturer**, UChicago
Designed and taught 3 lectures for undergraduate course *ASTR 12620: The Big Bang*.

2021–2023 **Research Experience for Undergraduates (REU) Advisor**, UChicago
Directly supervised 3 REU students, 1 per summer, including career and research mentoring with weekly meetings.

2019–2020 **Teaching Assistant**, UChicago
Designed and taught discussion sections, ran lab sessions, graded assignments and exams, and held office hours for undergraduate courses *PHSC 116: Physics for Future Presidents*, *PHSC 117: Physics for Future presidents*, *PHYS 123: General Physics III*.

2018–2019 **Teaching Assistant**, Penn
Led active-learning class activities and held office hours for undergraduate courses *PHYS 101: General Physics: Mechanics*, *PHYS 102: General Physics Electricity and Magnetism*.

OUTREACH ACTIVITIES AND DEI EFFORTS:

2020–2025 **First Discoveries Lead and Volunteer**, UChicago

- An initiative by the SPT Collaboration to improve early-childhood science education and teacher self-efficacy, especially within marginalized communities.
- Program leader, 2022-current: organized and led weekly volunteer meetings, communicated with school administration and teachers, published select lesson plans.[1]
- Program volunteer, 2020-current: designed and taught lessons at John Fiske Elementary School, main contact for four classes as large as 16 students.
- Expansion: co-designed, co-led professional development training for 15 teachers, 2023.

2022 **South Side Science Festival Volunteer**, UChicago

- A community event bringing together UChicago scientists so that local families can meet scientists and engage in experiments at demonstration tables.
- Created and ran a demonstration table for SPT Collaboration. ~100 family interactions

2021–2023 **DEI Discussion Organizer**, UChicago

- Organized and led weekly discussions on DEI efforts during Chicago-SPT group meetings, including: updating ongoing efforts, identifying areas of improvement, discussing readings.
- Initiated, conducted 3 climate surveys of the Chicago-SPT group. Led discussions on responses, resulting in demonstrable changes to group culture and structure.

ALL SCIENTIFIC PUBLICATIONS:

[5] Archipley, M., *et al.* 2025. "Millimeter-wave observations of Euclid Deep Field South using the South Pole Telescope: A data release of temperature maps and catalogs." *arXiv e-prints* (May): arXiv:2506.00298.

[6] Camphuis, E., *et al.* 2025. "SPT-3G D1: CMB temperature and polarization power spectra and cosmology from 2019 and 2020 observations of the SPT-3G Main field." *arXiv e-prints* (June): arXiv:2506.20707.

[1] **Chichura, P.**, *et al.* 2025. "Pointing Accuracy Improvements for the South Pole Telescope with Machine Learning." *Journal of Astronomical Instrumentation* 14 (January): 2550001. arXiv:2412.15167.

[7] Coerver, A., *et al.* 2025. "Measurement and Modeling of Polarized Atmosphere at the South Pole with SPT-3G." *ApJ* 982, no. 1 (March): 15. arXiv:2407.20579.

[8] Foster, A., *et al.* 2025. "Detection of Thermal Emission at Millimeter Wavelengths from Low-Earth Orbit Satellites." *The Open Journal of Astrophysics* 8 (May): 51. arXiv:2411.03374.

[9] Ge, F., *et al.* 2025. "Cosmology from CMB lensing and delensed EE power spectra using 2019–2020 SPT-3G polarization data." *PhRvD* 111, no. 8 (April): 083534. arXiv:2411.06000.

[10] Khalife, A., *et al.* 2025. "SPT-3G D1: Axion Early Dark Energy with CMB experiments and DESI." *arXiv e-prints* (July): arXiv:2507.23355.

[11] Kornoelje, K., *et al.* 2025. "The SPT-Deep Cluster Catalog: Sunyaev-Zel'dovich Selected Clusters from Combined SPT-3G and SPTpol Measurements over 100 Square Degrees." *arXiv e-prints* (March): arXiv:2503.17271.

[12] Qu, F., et al. 2025. "Unified and consistent structure growth measurements from joint ACT, SPT and Planck CMB lensing." *arXiv e-prints* (April): arXiv:2504.20038.

[13] The Event Horizon Telescope Collaboration. 2025. "Horizon-scale variability of M87* from 2017–2021 EHT observations." *arXiv e-prints* (September): arXiv:2509.24593.

[2] Wan, Y., *et al.* 2025. "Detection of Millimeter-Wavelength Flares from Two Accreting White Dwarf Systems in the SPT-3G Galactic Plane Survey." *arXiv e-prints* (September): arXiv:2509.08962.

[14] Zebrowski, J., *et al.* 2025. "Constraints on Inflationary Gravitational Waves with Two Years of SPT-3G Data." *arXiv e-prints* (May): arXiv:2505.02827.

[15] Ansarinejad, B., *et al.* 2024. "Mass calibration of DES Year-3 clusters via SPT-3G CMB cluster lensing." *JCAP* 2024, no. 7 (July): 024. arXiv:2404.02153.

[16] Prabhu, K., *et al.* 2024. "Testing the ΛCDM Cosmological Model with Forthcoming Measurements of the Cosmic Microwave Background with SPT-3G." *ApJ* 973, no. 1 (September): 4. arXiv:2403.17925.

[1] https://pole.uchicago.edu/public/First%20Discoveries.html

[17] Raghunathan, S., *et al.* 2024. "First Constraints on the Epoch of Reionization Using the Non-Gaussianity of the Kinematic Sunyaev-Zel'dovich Effect from the South Pole Telescope and Herschel-SPIRE Observations." *PhRvL* 133, no. 12 (September): 121004. arXiv:2403.02337.
[18] Tandoi, C., *et al.* 2024. "Flaring Stars in a Nontargeted Millimeter-wave Survey with SPT-3G." *ApJ* 972, no. 1 (September): 6. arXiv:2401.13525.
[19] Balkenhol, L., *et al.* 2023. "Measurement of the CMB temperature power spectrum and constraints on cosmology from the SPT-3G 2018 TT, TE, and EE dataset." *PhRvD* 108, no. 2 (July): 023510. arXiv:2212.05642.
[20] Pan, Z., *et al.* 2023. "Measurement of gravitational lensing of the cosmic microwave background using SPT-3G 2018 data." PhRvD 108, no. 12 (December): 122005. arXiv:2308.11608.
[21] Schiappucci, E., *et al.* 2023. "Measurement of the mean central optical depth of galaxy clusters via the pairwise kinematic Sunyaev-Zel'dovich effect with SPT-3G and DES." *PhRvD* 107, no. 4 (February): 042004. arXiv:2207.11937.
[3] **Chichura, P.**, *et al.* 2022. "Asteroid Measurements at Millimeter Wavelengths with the South Pole Telescope." *ApJ* 936, no. 2 (September): 173. arXiv:2202.01406.
[22] Ferguson, K., *et al.* 2022. "Searching for axionlike time-dependent cosmic birefringence with data from SPT-3G." *PhRvD* 106, no. 4 (August): 042011. arXiv:2203.16567.
[23] Ghosh, A., *et al.* 2020. "Foreground modelling via Gaussian process regression: an application to HERA data." *MNRAS* 495, no. 3 (January): 2813–2826. arXiv:2004.06041.
[4] Kohn, S., *et al.* 2019. "The HERA-19 Commissioning Array: Direction-dependent Effects." *ApJ* 882, no. 1 (September): 58. arXiv:1802.04151.