# COLIN J. BURKE

## PERSONAL


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| Citizenship: | United States and Canada (dual) |
| Address: | 132 Astronomy Building<br>1002 W Green St<br>Urbana, IL 61801 |
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## EDUCATION

**University of Illinois at Urbana-Champaign** *in progress*
Ph.D. Astronomy

**Purdue University**, West Lafayette May 2018
B.S. Physics

## RESEARCH & PROFESSIONAL EXPERIENCE

**Graduate Research** December 2018 – Present
*Department of Astronomy, University of Illinois at Urbana-Champaign*

- Advisor: Professor Xin Liu
- Time series analysis of active galactic nuclei (AGN) variability in optical surveys.
- Discovery and observational studies of AGN in dwarf galaxies.

**R&D Intern, Space and Missile Systems** June 2018 – August 2018
*Engility Corporation (currently SAIC)* June 2017 – August 2017

- Developed computational models and simulations for communications and remote sensing satellites for US government customers.

**Undergraduate Research Assistant** February 2014 – May 2018
*Department of Physics and Astronomy, Purdue University*

- Advisor: Professor John R. Peterson
- Developer of internal image simulation code, *PhoSim*, for LSST and JWST.

## AWARDS

**Mr. and Mrs. Hsiang-pai and Wen-hua Chu Department of Astronomy Excellence in Research Graduate Student Award** 2022
*Department of Astronomy, University of Illinois at Urbana-Champaign*

**Illinois Graduate Survey Science Fellow** 2019 – 2022
*National Center for Supercomputing Applications & Department of Astronomy, University of Illinois at Urbana-Champaign*

**Teacher Ranked as Excellent** Spring 2019
*University of Illinois at Urbana-Champaign*

**Richard W. King Award** 2017
*Department of Physics and Astronomy, Purdue University*

## PUBLICATIONS

### First-Author Publications

- **Burke, C. J.**, Shen, Y., Liu, X., et al. 2022, 2022, MNRAS in press, *Dwarf AGNs from Variability for the Origins of Seeds (DAVOS): Intermediate-mass black hole demographics from optical synoptic surveys*
- **Burke, C. J.**, Liu, X., Shen, Y., et al. 2022, MNRAS in press, *Dwarf AGNs from optical variability for the origins of seeds (DAVOS): Insights from the dark energy survey deep fields*
- **Burke, C. J.**, Shen, Y., Blaes, O., et al. 2021, Science, 373, 789, *A characteristic optical variability time scale in astrophysical accretion disks*
- **Burke, C. J.**, Liu, X., Chen, Y.-C., Shen, Y., & Guo, H. 2021, MNRAS, 504, 543, *On the AGN nature of broad balmer emission in four low-redshift metal-poor galaxies*
- **Burke, C. J.**, Shen, Y., Chen, Y.-C., et al. 2020, ApJ, 899, 136, *Optical Variability of the Dwarf AGN NGC 4395 from the Transiting Exoplanet Survey Satellite*
- **Burke, C. J.**, Baldassare, V. F., Liu, X., et al. 2020, ApJL, 894, L5, *The Curious Case of PHL 293B: A Long-lived Transient in a Metal-poor Blue Compact Dwarf Galaxy*
- **Burke, C. J.**, Aleo, P. D., Chen, Y.-C., et al. 2019, MNRAS, 490, 3952, *Deblending and classifying astronomical sources with Mask R-CNN deep learning*
- **Burke, C. J.**, Peterson, J. R., Egami, E., et al. 2019, Journal of Astronomical Telescopes, Instruments, and Systems, 5, 038002, *PhoSim-NIRCam: photon-by-photon image simulations of the James Webb Space Telescope's near-infrared camera*

### Contributing-Author Publications

- Stone, Z., Shen, Y., **Burke, C. J.**, et al. 2022, MNRAS, 514, 164, *Optical variability of quasars with 20-yr photometric light curves*
- Bellm, E. C., **Burke, C. J.**, Coughlin, M. W., et al. 2022, ApJS, 258, 13, *Give Me a Few Hours: Exploring Short Timescales in Rubin Observatory Cadence Simulations*
- Shen, Y., & **Burke, C. J.** 2021, ApJL, 918, L19, *A Sample Bias in Quasar Variability Studies*
- Palmese, A., Fishbach, M., **Burke, C. J.**, Annis, J., & Liu, X. 2021, ApJL, 914, L34, *Do LIGO/Virgo Black Hole Mergers Produce AGN Flares? The Case of GW190521 and Prospects for Reaching a Confident Association*
- Guo, H., Peng, J., Zhang, K., et al. 2020, ApJ, 905, 52, *High-redshift Extreme Variability Quasars from Sloan Digital Sky Survey Multiepoch Spectroscopy*
- Sánchez, J., Walter, C. W., Awan, H., et al. 2020, MNRAS, 497, 210, *The LSST DESC data challenge 1: generation and analysis of synthetic images for next-generation surveys*
- Guo, H., **Burke, C. J.**, Liu, X., et al. 2020, MNRAS, 496, 3636, *Dark Energy Survey identification of a low-mass active galactic nucleus at redshift 0.823 from optical variability*
- Peterson, J. R., Peng, E., **Burke, C. J.**, Sembroski, G., & Cheng, J. 2019, ApJ, 873, 98, *Deformation of Optics for Photon Monte Carlo Simulations*

### Conference Proceedings & White Papers

- Breivik, K., Connolly, A. J., Ford, K. E. S., et al. 2022, arXiv e-prints, arXiv:2208.02781, *From Data to Software to Science with the Rubin Observatory LSST*
- Peterson, J., Sembroski, G., **Burke, C.**, et al. 2019, AAS Meeting Abstracts, 233, 468.10, *PhoSim: A Comprehensive Observational Simulation Tool for Precision Astronomy*

· Thomas, D., Kahn, S. M., Bianco, F. B., et al. 2018, LSST cadence optimization white paper, arXiv:1812.02932, *Unveiling the Rich and Diverse Universe of Subsecond Astrophysics through LSST Star Trails*

## APPROVED OBSERVING PROGRAMS

### Gemini Observatory 8-meter Telescope

· **Burke, C. J. (PI)**, Liu, X. *Pristine Seeds: Confirming a variability-selected dwarf AGN at* $z \sim 1$. 3.2 hours with GMOS. GS-2021A-FT-218.
· **Burke, C. J. (PI)**, Liu, X., et al. *Testing the AGN Nature of a Nearby Star-Forming Knot.* 1.1 hours with GMOS. 2021A-FT-108.
· **Burke, C. J. (PI)**, Liu, X., et. al. *Origin of the extreme broad emission in three metal-poor galaxies.* 2.3 hours with GMOS. 2020A-FT-204.
· Baldassare, V. (PI), **Burke, C. J.** *Investigating the nature of broad Balmer emission in the blue compact dwarf galaxy PHL 293B.* 0.5 hours with GMOS. 2019B-DD-109.

### Blanco 4-meter Telescope

· Thomas, D. (PI), Kahn, S., Smith, K. L., et al. *Probing Short Duration Stellar Variability with Star Trail Images of Four K2 Fields.* 0.5 nights on DECam. 2019A-0345.

### WIYN 3.5-meter Telescope

· Peterson, J. R. (PI), Sembroski, G. H., **Burke, C. J.**, Graves, K., Geckler, M. *Weak Lensing in Clusters of Galaxies with PhoSim.* 1 night on ODI. 2018B-0374.
· Peterson, J. R. (PI), Sembroski, G. H., Peng, E., **Burke, C. J.** *Weak Lensing in Clusters of Galaxies with PhoSim.* 5 nights on ODI. 2017B-0824.

### Very Large Array

· **Burke, C. (PI)**, Liu, X., Guo, H., Nyland, K., Vieira, J., Chen, Y.-C. *Pilot Follow-Up of Variability-Selected IMBH from the Dark Energy Survey.* 5.07 hours. VLA/20A-132.
· **Burke, C. (PI)**, Liu, X., Guo, H., Nyland, K., Chen, Y.-C. *Radio Properties of a Variability-Selected Dwarf AGN from the Dark Energy Survey.* 5.07 hours. VLA/20B-334.
· **Burke, C. (PI)**, Liu, X., Guo, H., Shen, Y., Chen, Y.-C. *A 30,000 solar mass black hole in a star-forming dwarf galaxy.* 5.01 hours. VLA/20A-525.

### Multi-Element Radio Linked Interferometer Network (e-MERLIN)

· Chen, Y.-.C. (PI), **Burke, C. J.** *A strong radio jet launched from the merger of supermassive black holes.*

## TALKS

### Contributed Talks

· *Origin, growth and feedback of black holes in dwarf galaxies*, San Sebastián, Spain (September 2022).
· *Boom! A Workshop on Explosive Transients with LSST*, University of Illinois at Urbana-Champaign (July 2022).
· *Intermediate-Mass Black Holes: New Science from Stellar Evolution to Cosmology* workshop, Northwestern University/COFI (May 2022).
· *Illinois Astrofest*, University of Illinois at Urbana-Champaign (April 2022).
· AAS#239, AGN variability session (January 2022; canceled due to COVID pandemic).

- Astroinformatics 2021, Caltech (November 2021; remote).
- TESS Science Conference II, Massachusetts Institute of Technology (August 2021; remote).
- *New Faces of Black Holes* workshop, Joint Space-Science Institute (November 2019).

### Invited Talks

- KIPAC Tea Talk, Stanford University (October 2022; remote).
- Max Planck Institute for Extraterrestrial Physics, Garching, Germany (September 2022).
- AGN Coffee Series, European Southern Observatory, Garching, Germany (September 2022).
- Astronomy Tea Talk, Caltech (May 2022; remote).
- X-ray Binaries Group, University of Southampton (February 2022; remote).
- AAS#239, DES special session (January 2022; rescheduled as CosmoPalooza webinar due to COVID pandemic).
- LSST AGN Science Collaboration Meeting (July 2021; remote).
- MINERVA Seminar, Paris Observatory (May 2021; remote).
- DES Collaboration Meeting Plenary (May 2020; remote).
- LSST Science Collaboration Meeting: DESC deblending parallel session (May 2019; remote).

## PROFESSIONAL SERVICE

- Referee for major peer-reviewed journals in astronomy, e.g., *Astronomy & Astrophysics, The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Astronomy & Computing*.
- Significant open source software contributions: *PhoSim*, *lightkurve*, *PyQSOFit*, *PyZOGY*.
- Organizer of UIUC Journal Club seminar series (2021-2022)

## TEACHING & OUTREACH

### Student Advising & Mentoring

- Z. Franklin Wang (astronomy undergraduate)
- Yufeng Liu (NCSA SPIN undergraduate)
- Anshul Shah (NCSA SPIN undergraduate)
- Will Lande (high school student, Illinois State Science Fair project)

### Teaching

- Guest lecturer: ASTR 596: AI and Big Data in Astronomy (Fall 2021)
- Teaching Assistant: ASTR 122: Stars and Galaxies (Spring 2019; Ranked as excellent teacher)
- Teaching Assistant: ASTR 350: Big Bang, Black Holes, and the Universe (Fall 2018)

### Broader Outreach

- Secured thousands of dollars in grant money for purchase and distribution of 10,000 solar eclipse glasses to schools and libraries near Purdue's campus in 2017
- Co-taught middle school physics in joint Purdue–Jiangsu Second Normal University service learning trip to Nanjing, China (May 2017)

### Media

- Work featured in popular media outlets such as *The London Times*, *space.com*, *Popular Science*, *Science News*.