

# COLIN J. BURKE

## PERSONAL

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Citizenship: United States and Canada (dual)  
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## EDUCATION

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**University of Illinois at Urbana-Champaign** *in progress*  
Ph.D. Astronomy  
**Purdue University**, West Lafayette May 2018  
B.S. Physics  
Minor in Astronomy  
Certificate of learning beyond the classroom

## RESEARCH & PROFESSIONAL EXPERIENCE

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**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

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**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** 2016 – 2017  
*Department of Physics and Astronomy, Purdue University*

**First-Author Publications**

- **C. J. Burke**, X. Liu, Y. Shen, K. A. Phadke, Q. Yang, W. G. Hartley, I. Harrison, A. Palmese, H. Guo, K. Zhang, R. Kron, D. J. Turner, P. A. Giles, C. Lidman, Y.-C. Chen, R. A. Gruendl, A. Choi, A. Amon, E. Sheldon, M. Agüena, S. Allam, F. Andrade-Oliveira, D. Bacon, E. Bertin, D. Brooks, A. Carnero Rosell, M. Carrasco Kind, J. Carretero, C. Conselice, M. Costanzi, L. N. da Costa, M. E. S. Pereira, T. M. Davis, J. De Vicente, S. Desai, H. T. Diehl, S. Everett, I. Ferrero, B. Flaugher, J. Garca-Bellido, E. Gaztanaga, D. Gruen, J. Gschwend, G. Gutierrez, S. R. Hinton, D. L. Hollowood, K. Honscheid, B. Hoyle, D. J. James, K. Kuehn, M. A. G. Maia, J. L. Marshall, F. Menanteau, R. Miquel, R. Morgan, F. Paz-Chinchón, A. Pieres, A. A. Plazas Malagn, K. Reil, A. K. Romer, E. Sanchez, M. Schubnell, S. Serrano, I. Sevilla-Noarbe, M. Smith, E. Suchyta, G. Tarle, D. Thomas, C. To, T. N. Varga, R. D. Wilkinson (DES Collaboration). “Variability-Selected Dwarf AGN Candidates in the Dark Energy Survey Deep Fields.” submitted.
- **C. J. Burke**, Y. Shen, O. Blaes, C. F. Gammie, K. Horne, Y.-F. Jiang, X. Liu, I. McHardy, C. W. Morgan, S. Scaringi, Q. Yang. “A characteristic optical variability time scale in astrophysical accretion disks.” *Science* **373**(6556), 789 (2021).
- **C. J. Burke**, X. Liu, Y.-C. Chen, Y. Shen, H. Guo “On the AGN Nature of Broad Balmer Emission in Four Low-Redshift Metal-Poor Galaxies.” *MNRAS* **504**, 534 (2021).
- **C. J. Burke**, Y. Shen, Y.-C. Chen, S. Scaringi, C.-A. Faucher-Giguere, X. Liu, Q. Yang. “Optical Variability of the Dwarf AGN NGC 4395 from the Transiting Exoplanet Survey Satellite.” *ApJ* **899**, 136 (2020).
- **C. J. Burke**, V. F. Baldassare, X. Liu, R. J. Foley, Y. Shen, A. Palmese, H. Guo, K. Herner, T. M. C. Abbott, M. Agüena, S. Allam, S. Avila, E. Bertin, D. Brooks, A. Carnero Rosell, M. Carrasco Kind, J. Carretero, L. N. da Costa, J. De Vicente, S. Desai, P. Doel, T. F. Eifler, S. Everett, J. Frieman, J. Garca-Bellido, E. Gaztanaga, D. Gruen, R. A. Gruend, J. Gschwend, G. Gutierrez, D. L. Hollowood, K. Honscheid, D. J. James, E. Krause, K. Kuehn, M. A. G. Maia, F. Menanteau, R. Miquel, F. Paz-Chinchón, A. A. Plazas, E. Sanchez, B. Santiago, V. Scarpine, S. Serrano, I. Sevilla-Noarbe, M. Smith, M. Soares-Santos, E. Suchyta, M. E. C. Swanson, G. Tarle, D. L. Tucker, T. N. Varga (DES Collaboration). “The Curious Case of PHL 293B: A Long-lived Transient in a Metal-poor Blue Compact Dwarf Galaxy.” *ApJ Letters* **894**, L5 (2020).
- **C. J. Burke**, P. D. Aleo, X. Liu, J. R. Peterson, G. H. Sembroski, Y.-C. Chen, Y.-Y. Lin. “Deblending and Classifying Astronomical Sources with Mask R-CNN Deep Learning.” *MNRAS* **490**, 3952 (2019).
- **C. J. Burke**, J. R. Peterson, E. Egami, J. M. Leisenring, G. H. Sembroski, Marcia J. Rieke. “PhoSim-NIRCam: photon-by-photon image simulations of the James Webb Space Telescope’s near-infrared camera.” *JATIS* **5**(3), 038002 (2019).

**Contributing-Author Publications**

- Z. Stone, Y. Shen, **C. J. Burke**, et al. “Optical Variability of Quasars with 20-Year Photometric Light Curves.” in prep.
- E. C. Bellm, **C. J. Burke**, M. W. Coughlin, I. Andreoni, C. M. Raiteri, R. Bonito. “Give Me a Few Hours: Exploring Short Timescales in Rubin Observatory Cadence Simulations.” *ApJS* **258** 13 (2022).
- Y. Shen, **C. J. Burke**. “A sample bias in quasar variability studies.” *ApJL* **918** L19 (2021).
- A. Palmese, M. Fishbach, **C. J. Burke**, J. T. Annis, X. Liu. “Do LIGO/Virgo black hole mergers produce AGN flares? The case of GW190521 and prospects for reaching a confident association.” *ApJL* **914** L34 (2021).

- H. Guo, J. Peng, K. Zhang, **C. J. Burke**, X. Liu, M. Sun, S. Wang, M. Kong, Z. Sheng, T. Wang, Z. He, M. Gu. “High-redshift Extreme Variability Quasars from Sloan Digital Sky Survey Multi-Epoch Spectroscopy.” *ApJ* 905, 52 (2020).
- H. Guo, **C. J. Burke**, X. Liu, K. A. Phadke, K. Zhang, Y.-C. Chen, C. Lidman, Y. Shen, R. A. Gruendl, C. Lidman, Y. Shen, E. Morganson, M. Agüena, S. Allam, S. Avila, E. Bertin, D. Brooks, A. Carnero Rosell, D. Carollo, M. Carrasco Kind, M. Costanzi, L. N. da Costa, J. De Vicente, S. Desai, P. Doel, T. F. Eifler, S. Everett, J. Garcia-Bellido, E. Gaztanaga, D. W. Gerdes, D. Gruen, J. Gschwend, G. Gutierrez, S. R. Hinton, D. L. Hollowood, K. Honscheid, D. J. James, K. Kuehn, M. Lima, M. A. G. Maia, F. Menanteau, R. Miquel, A. Moller, R. L. C. Ogando, A. Palmese, F. Paz-Chinchon, A. A. Plazas, A. K. Romer, A. Roodman, E. Sanchez, V. Scarpine, M. Schubnell, S. Serrano, M. Smith, M. Soares-Santos, N. E. Sommer, E. Suchyta, M. E. C. Swanson, G. Tarle, B. E. Tucker, T. N. Varga (DES Collaboration). “Dark Energy Survey Identification of a low-mass Active Galactic Nucleus at Redshift 0.82 from Optical Variability.” *MNRAS* 496, 3636 (2020).
- F. J. Sánchez, C. W. Walter, H. Awan, J. Chiang, S. F. Daniel, E. Gawiser, T. Glanzman, D. P. Kirkby, R. Mandelbaum, A. Slosar, W. M. Wood-Vasey, Y. AlSayyad, **C. J. Burke**, S. W. Digel, M. Jarvis, T. Johnson, H. Kelly, S. Krughoff, R. H. Lupton, P. J. Marshall, J. R. Peterson, P. A. Price, G. Sembroski, B. Van Klaveren, M. P. Wiesner, B. Xin. “The LSST DESC Data Challenge 1: Generation and Analysis of Synthetic Images for Next Generation Surveys.” *MNRAS* 497, 210 (2020).
- J. R. Peterson, E. Peng, **C. J. Burke**, G. Sembroski, J. Cheng. “Deformation of Optics for Photon Monte Carlo Simulations.” *ApJ* 873, 98 (2019).

#### Conference Proceedings & White Papers

- J. Peterson, G. Sembroski, **C. Burke**, C. Remocoldo; A. Dutta, G. Jernigan. “PhoSim: A Comprehensive Observational Simulation Tool for Precision Astronomy.” *AAS Meeting Abstracts #223* (2019)
- D. Thomas, S. M. Kahn, F. B. Bianco, Z. Ivezić, C. M. Raiteri, A. Possenti, J. R. Peterson, **C. J. Burke**, R. D. Blum, G. H. Jacoby, S. B. Howell, G. Madejski. “Unveiling the Rich and Diverse Universe of Subsecond Astrophysics through LSST Star Trails.” *LSST Cadence Optimization White Paper* (2018)

## APPROVED OBSERVING PROGRAMS

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### Gemini Observatory 8-meter Telescope

- **C. J. Burke (PI)**, X. Liu. “Pristine Seeds: Confirming a variability-selected dwarf AGN at  $z \sim 1$ ” 3.2 hours with GMOS. GS-2021A-FT-218.
- **C. J. Burke (PI)**, X. Liu et al. “Testing the AGN Nature of a Nearby Star-Forming Knot.” 1.1 hours with GMOS. 2021A-FT-108.
- **C. J. Burke (PI)**, X. Liu et al. “Origin of the extreme broad emission in three metal-poor galaxies.” 2.3 hours with GMOS. 2020A-FT-204.
- V. Baldassare (PI), **C. J. Burke**. “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

- D. Thomas (PI), S. Kahn, K. L. Smith, R. Blum, Ž. Ivezić, **C. J. Burke**. “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

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

### Very Large Array

- **C. Burke (PI)**, X. Liu, H. Guo, K. Nyland, J. Vieira, Y.-C. Chen. “Pilot Follow-Up of Variability-Selected IMBH from the Dark Energy Survey.” 5.07 hours. VLA/20A-132.
- **C. Burke (PI)**, X. Liu, H. Guo, K. Nyland, Y.-C. Chen. “Radio Properties of a Variability-Selected Dwarf AGN from the Dark Energy Survey.” 5.07 hours. VLA/20B-334.
- **C. Burke (PI)**, X. Liu, H. Guo, Y. Shen, Y.-C. Chen. “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)

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

## PRESS RELEASES

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“Black hole size revealed by its eating pattern.” University of Illinois at Urbana-Champaign (2021).

## TALKS

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### Contributed Talks

- *Intermediate-Mass Black Holes: New Science from Stellar Evolution to Cosmology* workshop, Northwestern University/COFI (May 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

- 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

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Referee for *Astronomy & Astrophysics*, *The Astrophysical Journal*, *Monthly Notices of the Royal Astronomical Society*, *Astronomy & Computing*.

## TEACHING & OUTREACH

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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)

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**

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