# BRIAN A. CLARK

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## RESEARCH PROFILE

Experimental astrophysics PhD candidate and National Science Foundation Graduate Research Fellow, working with the Askaryan Radio Array (ARA). Interested in ultra-high energy neutrino astronomy, specifically the construction, simulation, and data analysis of radio-based Antarctic neutrino telescopes.

## EDUCATION

**Ph.D in Physics, The Ohio State University**, Columbus, Ohio USA — 2014-2019 (Expected)
Advisor: Prof. Amy Connolly

**M.S. in Physics, The Ohio State University**, Columbus, Ohio USA — 2014-2016

**B.A. in Physics, Washington University in St. Louis**, St. Louis, Missouri USA — 2010-2014
*Cum Laude*, Advisor: Prof. Henric Krawczynski

## AWARDS

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| National Science Foundation Graduate Research Fellowship | 2016-2019 |
| APS Divison of Astrophysics Travel Award | 2017 |
| OSU Graduate Enrichment Fellowship | 2014-2015 |
| WUSTL Undergraudate Physics Research Fellow | Summer 2011 |

## EXPERIENCE

**The Ohio State University**, Columbus, OH USA — **August 2014 - present**
*Ph.D. Student*, Ultra-High Energy Neutrino Astrophysics

- Developed frequency and time-series analysis techniques to analyze radio emission from solar flares in the ARA prototype station; this is the first extraterrestrial emission observed by the array.
- Implemented filtering techniques to remove human-made noise from ARA data, and utilized them in a search for a diffuse flux of ultra-high energy neutrinos.
- Built and tested printed circuit boards for RF signal conditioning and power distribution, improving access to instrument dynamic range and operability in harsh environments.
- Lead and directed the mechanical and electrical systems integration of three new neutrino detecting stations, including the management of a six person team of junior students.
- Deployed to Antarctica for five weeks to lead the commissioning and calibration of five neutrino detecting stations; performed rapid on site assessment of instrument performance.

**Washington University in St. Louis**, St. Louis, MO USA — **October 2012 - May 2014**
*Undergraduate Research Associate*, X-Ray Astrophysics

- Participated in X-Calibur collaboration to detect x-rays in the upper atmosphere, including fabrication of CCDs in a cleanroon environment.
- Wrote Monte Carlo simulations to explore Stokes parameters in x-ray astronomy by using methods of Bayesian confidence intervals.

## PUBLICATIONS

4. "Design and Performance of an Interferometric Trigger Array for Radio Detection of High-Energy Neutrinos"
   P. Allison *et. al.* for the ARA Collaboration (incl. **B. A. Clark**)
   Submitted to Nuclear Instruments and Methods A (2018). [arXiv:1809.04573]

3. "Observation of Reconstructable Radio Emission Coincident with an X-Class Solar Flare in the Askaryan Radio Array Prototype Station."
   P. Allison *et. al.* for the ARA Collaboration (incl. **B. A. Clark** as corresponding author)
   Submitted to Astroparticle Physics (2018). [arXiv:1807.03335]

2. "Measurement of the real dielectric permittivity $\epsilon_r$ of glacial ice."
   P. Allison *et. al.* for the ARA Collaboration (incl. **B. A. Clark**)
   Submitted to the Journal of Glaciology (2017). [arXiv:1712.03301]

1. "Analyzing the Data from X-ray Polarimeters with Stokes Paramters."
   F. Kislat, **B. Clark**, M. Bielicke, H. Krawczynski.
   Astroparticle Physics Vol 68 Pg 45-51 (2015). [arXiv:1409.6214]

## SCIENTIFIC TALKS

### National & International Conferences

3. APS April Meeting, Columbus OH. 2018/04/16
   *Directional Reconstruction as a Means of Lowering Thresholds for Point-Source Searches in the Askaryan Radio Array.*

2. TeV Particle Astrophysics, Columbus OH. 2017/08/11
   *The Askaryan Radio Array: Current Status and Future Plans.*

1. APS April Meeting, Washington DC. 2017/01/31
   *Observation of Reconstructable Radio Waveforms from Solar Flares with Askaryan Radio Array.*

### Colloquia, Seminars, and Other Talks

7. Ohio Section of the APS Fall 2018 Meeting, Toledo OH. 2018/09/29
   *Latest Results in the Search for Ultra-High Energy Neutrinos in the Askaryan Radio Array*

6. OSU Physics Summer Seminar Series, Columbus OH. 2018/06/26
   *Ultra-High Energy Neutrino Astrophysics with Radio-Based Detectors.*

5. OSU CCAPP Seminar, Columbus OH. 2018/05/22
   *The Askaryan Radio Array: Detector Status and Prospects for Using Directional Reconstruction in Point-Source Searches.*

4. Colloquium, College of Wooster Physics Department, Wooster OH. 2016/10/04
   *Ultra-High Energy Neutrino Astrophysics with Radio Detectors.*

3. Computing in High Energy Astropart. Phys. Research 2016, Columbus OH. 2016/05/26
   *Machine Learning Prospects in Trigger Thresholds for High Energy Radio Neutrino Astronomy.*

2. OSU Physics Summer Seminar Series, Columbus OH. 2016/04/23
   *Trigger Thresholds in High Energy Neutrino Astronomy.*

1. Ohio Section of the APS Spring 2016 Meeting, Dayton OH. 2016/04/09
   *Ultra-High Energy Neutrino Astrophysics with the Askaryan Radio Array (ARA).*

## RELEVANT SKILLS

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| Programming/Software | C++, C, Python, BASH, Energia, Code Composer Studio, PADS |
| Mechanical/Electrical | Surface mount soldering, power distribution, RF signal conditioning |

## TEACHING

**The Ohio State University**, Columbus, OH

*TA Training Facilitator, University Center for the Advancement Teaching* **August 2016**

- Facilitated two-day "introduction to teaching and learning" workshop for 30 first-time Teaching Assitants across the Universities 40 STEM science programs.
- Built confidence in new TAs, guided development of teaching identities, adressed diversity in the classroom, and aided participant planning for longterm classroom success.

*Teaching Assistant–"Astronomy 1143: Stars, Galaxies, and Cosmology"* **Spring 2016**

- Taught 80 student introductory survey course, open to students across the university.
- Aided student learning by teaching review sessions and lecturing when lead faculty was absent.
- Moderated online forum, in collaboration with lead faculty, for students to exchange questions and clarify concepts.

*Teaching Assistant–"Physics 1251: E&M, Optics, and Quantum Mechanics"* **Fall 2015**

- Guided student learning in the recitation and laboratory context for four contact hours per week.
- Facilitated quantitative laboratory experiments including team-based problem solving exercises.
- Designed rubrics for fair, efficient, and consistent grading of quiz and examination instruments.

## OUTREACH AND SERVCE

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| Coordinator for ASPIRE Workshop for High School Girls, OSU | July 2015-present |
| Physics Climate and Diversity Committee, OSU | January 2017-May 2018 |
| Volunteer Judge, Ohio State Science Day | 2015-present |
| Talk, Columbus Science Pub | May 2018 |
| Talk, The Wellington School, Columbus, OH | April 2018 |
| Officer, Physics Graduate Student Council, OSU | October 2014-May 2017 |

## MENTORSHIP

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| **Graduate Students:** | Lauren Ennesser, Keith McBride, Andrés Medina, Julie Rolla, Jorge Torres-Espinosa |
| **Undergraduate Students:** | Ian Best, Suren Gourapura, Hannah Hassan, Spoorthi Nagasmudram, Victoria Niu, Jude Rajasekera, Lucas Smith, Jason Torok |
| **High School Students:** | Addison Hartman, Natalie Keyes |

## REFERENCES

**Amy Connolly**
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**Dave Besson**
Professor of Physics and Astronomy
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**James Beatty**
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