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

National Science Foundation Graduate Research Fellowship	2016-2019
APS Division of Astrophysics Travel Award	2017, 2019
Bunny and Thomas Clark Graduate Scholarship Honorable Mention	2019
OSU Graduate Enrichment Fellowship	2014-2015
WUSTL Undergraduate 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.
- Implemente d 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 three 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

5. "NuRadioMC: Simulating the radio emission of neutrinos from interaction to detector"
   C. Glaser *et. al.* (incl. **B. A. Clark**)
   Submitted to Eur. Phys. J. C (2019). [arXiv:1906.01670]

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**)
   Nuclear Instruments and Methods A Vol 930 Pg 112-125 (2019). [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 ϵ_r of glacial ice."
   P. Allison *et. al.* for the ARA Collaboration (incl. **B. A. Clark**)
   Astroparticle Physics Vol 108 Pg 63-73 (2019). [arXiv:1712.03301]

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

SCIENTIFIC TALKS

National & International Conferences

4. APS April Meeting, Denver CO. 2019/04/15
   Searching for Neutrinos & Cosmic Rays and Studying Antarctic ice with Askaryan Radio Array.

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

8. OSU CCAPP Seminar, Columbus OH. 2019/07/16
   The Quest for Ultra-High Energy Neutrinos

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

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 Assistants across the University's 40 STEM science programs.
- Built confidence in new TAs, guided development of teaching identities, addressed diversity in the classroom, and aided participant planning for long-term classroom success.

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

- Aided student learning by teaching review sessions and lecturing when lead faculty was absent for 80 student introductory survey course, open to students across the university
- 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 SERVICE

Coordinator for ASPIRE Workshop for High School Women, 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

Graduate Students:	Lauren Ennesser, Keith McBride, Andrés Medina, Julie Rolla, Jorge Torres-Espinosa
Undergraduate Students:	Ian Best, Eliot Ferstl, Suren Gourapura, Hannah Hassan, Scott Janse, Spoorthi Nagasmudram, Victoria Niu, Alex Patton, Jude Rajasekera, Cade Sbrocco, Lucas Smith, Jason Torok
High School Students:	Addison Hartman, Natalie Keyes

REFERENCES

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Dave Besson
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The University of Kansas
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