

# EVAN J. ARENA

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## RESEARCH INTERESTS

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**Theoretical astrophysics and cosmology**, including general relativity, gravitational lensing, modified gravity, large-scale structure, 21 cm cosmology, dark energy, inflation, dark matter, radio astronomy, and gravitational waves.

## EDUCATION

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**Drexel University**  
 Ph.D. in Physics June 2024  
 Thesis: "Flexion in gravitation and cosmology"  
 Advisor: David M. Goldberg, Ph.D., Co-advisor: David J. Bacon, Ph.D.  
 M.S. in Physics June 2020

**Stony Brook University**  
 B.S. in Physics, second major: Astronomy/Planetary Sciences May 2017  
 Cum Laude  
 Departmental Honors in Physics

## POSITIONS HELD

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**Bryn Mawr College** 2024 { Present  
 Lecturer of Physics and Lab Coordinator  
 Department of Physics

**Drexel University** 2018 { 2024  
 Doctoral Research Fellow, Doctoral Teaching Fellow, And CoAS Dean's Fellow  
 Department of Physics

**Stony Brook University and Brodhead Lab (Ti)3>TrTTO /P <</MCID 27 >>BDC /T1\_1 1 Tf 10.909 0**

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Award amount: \$359,436.00

Contribution: Wrote significant portion of proposal.

## AWARDS AND HONORS

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Graduate College Continuing Excellence in Teaching Assistance Award, Drexel University	2023
Graduate College Continuing Excellence in Teaching Assistance Award, Drexel University	2022
Graduate College Continuing Excellence in Teaching Assistance Award, Drexel University	2021
Graduate College Teaching Assistant Excellence Award, Drexel University	2020
Sigma Xi Scientific Research Honor Society Member, Drexel University	2019
College of Arts and Sciences (CoAS) Dean's Fellowship, Drexel University	2018
Sigma Pi Sigma National Physics Honor Society Member, Stony Brook University	2017
Presidential Scholarship, Stony Brook University	2013

## RESEARCH HISTORY

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2018 { Present	<b>Weak gravitational lensing</b> Developed a novel method for measuring the second-order weak gravitational lensing effect known as $\xi$ ion; Created a full theoretical formalism for $\xi$ cosmic $\xi$ ion" { a family of cosmological weak lensing signals originating from the large-scale structure of the universe; Discovered previously unknown cosmological weak lensing signals and posited the existence of non-commutativity in weak lensing; Measurement of $\xi$ ion in the Dark Energy Survey, including building the largest $\xi$ ion catalogue to date as well as making the first ever detection of cosmic $\xi$ ion; Discovered unique weak lensing signatures for negative mass compact objects and exotic objects such as the Ellis wormhole.
2015 { 2019	<b>Low redshift 21cm intensity mapping</b> Cosmological parameter and modified gravity forecasts for a general 21 cm cosmology experiment, member of the DOE Cosmic Visions Dark Energy 21 cm Working Group, and design and construction of the radio telescope used for the 21 cm Baryon Mapping eXperiment at Brookhaven National Laboratory.
2013	<b>Gravitational waves</b> New method for the indirect detection of gravitational waves.
2012	<b>Modified Newtonian Dynamics</b> Investigated the plausibility of Modified Newtonian Dynamics on a local scale based on rotation curves of the Milky Way.

## REFEREED PUBLICATIONS

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- Arena, E. J., "Weak gravitational  $\xi$ ion in various spacetimes: Exotic lenses and modified gravity," Phys.Rev.D **106**,064019 (2022) [[arXiv:2207.07784](https://arxiv.org/abs/2207.07784)]
- Arena, E. J., "Cosmological parameter and modified gravity forecasts for a general 21 cm cosmology experiment," Phys.Rev.D **101**,123508 (2020) [[arXiv:1910.07784](https://arxiv.org/abs/1910.07784)]

## CONFERENCE PROCEEDINGS, SCIENCE BOOKS, WHITE PAPERS

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3. Timbie, P. et al., including **Arena, E. J.**, "Research and Development for HI Intensity Mapping," ArXiv e-prints (2019) [[arXiv:1907.13090](#)]
2. Slosar, A. et al., including **Arena, E. J.**, "Packed Ultra-wideband Mapping Array (PUMA): A Radio Telescope for Cosmology and Transients," Bull. Am. Astron. Soc. 51, 53 (2019) [[arXiv:1907.12559](#)]
1. Cosmic Visions 21 cm Collaboration, including **Arena, E. J.**, "Inflation and Early Dark Energy with a Stage II Hydrogen Intensity Mapping experiment," ArXiv e-prints (2018) [[arXiv:1810.09572](#)]

## CONFERENCES AND TALKS

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### Invited Talks

2. Astro Lunch Seminar at the University of Sussex; "Constraining the dark universe with light bananas;" Falmer, East Sussex, United Kingdom; 16 Nov. 2023
1. Colloquium at the Institute of Cosmology and Gravitation, University of Portsmouth; "Constraining the dark universe with light bananas;" Portsmouth, Hampshire, United Kingdom; 9 Nov. 2023

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Fisher21cm      Fisher forecast for a general 21 cm experiment. Publicly available code written in Python. <https://github.com/evanjarena/Fisher21cm>

**Contributed**

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PythonOpenMPI      A generalizable utility for efficient task-based parallel programming

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electric charges, electric fields, electric potential, DC circuits, magnetic induction, electromagnetic waves, special relativity, and optical interference. This course includes labs that are intended to enrich the concepts presented in lecture and recitation section.

F`22: 3 recitation sections, 64 students total

F`21: 3 recitation sections, 58 students total

F`20: 2 recitation sections and 1 lab section, 84 students total

F`19: 4 recitation sections, 92 students total

F`18: 1 recitation section and 1 lab section, 42 students total

Grader 42

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Free physics tutoring at the Stony Brook University Veterans Student Organization (2023).

Assist in running the monthly Drexel Physics Department open house, where we open the the Joseph R. Lynch Observatory for public viewing (2018 { Present).

Invited to appear on the Drexel University Teaching Assistant Orientation Panel, as part of the Teaching Assistant Orientation and Preparation Course GRAD T580 (17 Sep. 2020).

Helped run the Kaczmarczik Lecture Series Open House, hosted by the Drexel University Department of Physics (14 Nov. 2018).

**Committee Work**

**Bryn Mawr College**

Tenure Track Faculty (2014-2018).lege

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