EVAN J. ARENA

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RESEARCH INTERESTS

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

Drexel University
Ph.D. Student of Physics — 2018 – Present
M.S. in Physics — 2020

Stony Brook University
B.S. in Physics and Astronomy/Planetary Sciences — 2017
Cum Laude
Departmental Honors in Physics

POSITIONS HELD

Drexel University — 2018 – Present
Graduate Research Assistant and CoAS Dean's Fellow
Department of Physics

Stony Brook University and Brookhaven National Laboratory — 2015 – 2019
Research Assistant
SBU Department of Physics & Astronomy and BNL Department of Physics

Brookhaven National Laboratory — 2012 – 2013
Intern
Department of Physics

AWARDS AND HONORS

Drexel University 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

2018 – Present **Gravitational Lensing**
Developing a novel method for measuring the second-order weak gravitational lensing effect known as flexion.

2015 – Present **Low redshift 21 cm intensity mapping**
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 **Gravitational Waves**
Proposed a new method for the indirect detection of gravitational waves via precision stellar redshift measurement.

2012 **Modified Newtonian Dynamics**
Investigated the plausibility of Modified Newtonian Dynamics on a local scale based on rotation curves of the Milky Way.

REFEREED PUBLICATIONS

1. Fabritius, J. M., **Arena, E. J.**, Goldberg, D. M. *"Shape, Color, and Distance in Weak Gravitational Flexion"*, Accepted for MNRAS Publication, (2020) [arXiv:2006.03506]

CONFERENCE PROCEEDINGS, SCIENCE BOOKS, WHITE PAPERS

3. Ahmed, Z., Alonso, D., Amin, M. A., Ansari, R., **Arena, E. J.**, Bandura, K., Battaglia, N, Blazek, J., Bull, P., Castorina, E., Chang, T.-C., Connor, L., Davé, R., Dillon, J. S., Dvorkin, C., van Engelen, A., Ferraro, S., Flauger, R., Foreman, S., Frisch, J., Green, D., Holder, G., Jacobs, D., Johnson, M. C., Karagiannis, D., Kaurov, A. A., Knox, L., Liu, A., Loverde, M., Ma, Y.-Z., Masui, K. W., McClintock, T., Meerburg, P. D., Moodley, K., Münchmeyer, M., Newburgh, L. B., Ng, C., Nomerotski, A., O'Connor, P., Obuljen, A., Padmanabhan, H., Parkinson, D., Prochaska, J. X., Rajendran, S., Rapetti, D., Saliwanchik, B., Schaan, E., Sehgal, N., Shaw, J. R., Sheehy, C., Sheldon, E., Shirley, R., Silverstein, E., Slatyer, T., Slosar, A., Stankus, P., Stebbins, A., Timbie, P., Tucker, G. S., Tyndall, W., Villaescusa-Navarro, F., Wallisch, B., and White, M., *"Packed Ultra-wideband Mapping Array (PUMA): A Radio Telescope for Cosmology and Transients"*, ArXiv e-prints (2019) [arXiv:1907.12559]

2. Ahmed, Z., Alonso, D., Amin, M. A., Ansari, R., **Arena, E. J.**, Bandura, K., Beardsley, A., Bull, P., Castorina, E., Chang, T.-C., Davé, R., Dillon, J. S., van Engelen, A., Ewall-Wice, A., Ferraro, S., Foreman, S., Frisch, J., Green, D., Holder, G., Jacobs, D., Karagiannis, D., Kaurov, A. A., Knox, L., Kuhn, E., Liu, A., Ma, Y.-Z., Masui, K. W., McClintock, T., Moodley, K., Münchmeyer, M., Newburgh, L. B., Nomerotski, A., O'Connor, P., Obuljen, A., Padmanabhan, H., Parkinson, D., Perdereau, O., Rapetti, D., Saliwanchik, B., Sehgal, N., Shaw, J. R., Sheehy, C., Sheldon, E., Shirley, R., Silverstein, E., Slatyer, T., Slosar, A., Stankus, P., Stebbins, A., Timbie, P., Tucker, G. S., Tyndall, W., Villaescusa-Navarro, F., and Wulf, D., *"Research and Development for HI Intensity Mapping"*, ArXiv e-prints (2019) [arXiv:1907.13090]

1. Cosmic Visions 21 cm Collaboration, Ansari, R., **Arena, E. J.** , Bandura, K., Bull, P., Castorina, E., Chang, T.-C., Foreman, S., Frisch, J., Green, D., Karagiannis, D., Liu, A., Masui, K. W., Meerburg, P. D., Newburgh, L. B., Obuljen, A., O'Connor, P., Shaw, J. R., Sheehy, C., Slosar, A., Smith, K., Stankus, P., Stebbins, A., Timbie, P., Villaescusa-Navarro, F., and White, M., *"Inflation and Early Dark Energy with a Stage* II *Hydrogen Intensity Mapping experiment"*, ArXiv e-prints (2018) [arXiv:1810.09572]

CONFERENCES AND TALKS

Contributed Talks

"Hybrid analytic image modeling and image moments approach to gravitational lensing"
Research talk to incoming graduate students, Drexel University 17 Sep. 2019

"Observation of gravitational waves through precision stellar redshift measurement"
High School Research Program conference, Brookhaven National Laboratory 16 Aug. 2013

Poster Presentations

"Hybrid analytic image modeling and image moments approach to gravitational lensing"
First-year graduate student presentations, Drexel University 11 Jun. 2019

"Dark matter and its alternatives"
High School Research Program conference, Brookhaven National Laboratory 27 Nov. 2012

SOFTWARE DEVELOPED

Authored

`Lenser` A tool for measuring weak gravitational flexion. *Publicly available code written in Python.* https://github.com/DrexelLenser/Lenser

21cmMG A suite for probing modified gravity with 21 cm cosmology. *Publicly available code written in Python.* https://github.com/evanjarena/21cmMG

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

Contributed

`LensTools` Useful computing tools for weak lensing analyses. *Publicly available code written in Python.* https://github.com/apetri/LensTools

TEACHING

Drexel University
Teaching Assistant (Recitation and Lab Instructor)
PHYS 100, *Preparation for Engineering Studies* Winter 2020, Winter 2019
PHYS 152, *Introductory Physics I* Spring 2020, Spring 2019
PHYS 154, *Introductory Physics III* Fall 2020, Fall 2019, Fall 2018

Stony Brook University
Lecturer
Della Pietra High School Applied Math Program Spring 2017

PROFESSIONAL ACTIVITIES AND SERVICE

Working Groups Member of the DOE Cosmic Visions Dark Energy 21 cm Working Group

Collaborations Member of the Large Synoptic Survey Telescope Dark Energy Science Collaboration (LSST-DESC)

Outreach Activities
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).

Gave a physics demonstration at the Kaczmarczik Lecture Series Open House, hosted by the Drexel University Department of Physics (14 Nov. 2018).