

SEAN C. LEWIS

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RESEARCH INTERESTS

Computational astrophysics, 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/Candidate of Physics

2017 – Present

M.S. in Physics

2019

California Polytechnic State University

B.S. in Physics

2016

Cum Laude

POSITIONS HELD

Drexel University

2017 – Present

Doctoral Teaching Fellow; Research Fellow

Department of Physics

California Polytechnic State University

2015 – 2016

Research Assistant

Department of Physics

AWARDS AND HONORS

Chambliss Astronomy Achievement Honorable Mention, American Astronomical Society

2020

Department of Physics Teaching Excellence Award, Drexel University

2019

CoAS Dean Honors List, California Polytechnic State University

2012–2016

RESEARCH HISTORY

2021–Present

Hydrodynamical Simulation Data Structure Conversion

Developed a novel software technique for transferring simulation data from a Voronoi Mesh data structure to a block-based adaptively refined grid structure.

2018–Present

Early Forming Massive Stars

Developed a controlled experiment using the the high performance coupled magnetohydrodynamic, radiation, and N-body software suite Torch to determine the effects of the formation time of very massive stars, an under-tested parameter space. Time series data analysis and cluster identification techniques revealed that early forming massive stars had significant effect on star cluster development and evolution.

REFEREED PUBLICATIONS

3. **Lewis, S. C.**, McMillan, S. L. W., Mac Low, M-M., Cournoyer-Cloutier, C., Polak, B., Wilhelm, M. J. C., Tran, A., Sills, A., Portegies Zwart, S., Klessen R., and Wall, J. E., “*Early Forming Massive Stars Suppress Star Formation and Hierarchical Cluster Assembly*,” Submitted to ApJ (2022)

2. Cournoyer-Cloutier, C., Tran, A., **Lewis, S. C.**, Wall, J. E., Harris, W. E., Mac Low, M-M., McMillan, S. L. W., Portegies Zwart, S., and Sills, A., “*Implementing primordial binaries in simulations of star cluster formation with a hybrid MHD and direct N-body method*”, MNRAS **501**, 4464–4478 (2021) [[arXiv:2011.06105](#)]
1. Bennert, V., N., Loveland, D., Donohue, E., Cosens, M., **Lewis, S. C.**, Komossa, S., Treu, T., Malkan, M. A., Milgram, N., and Flatland, K., “*Studying the O III $\lambda 5007$ emission-line width in a sample of ~ 80 local active galaxies: a surrogate for σ* ”, MNRAS. **481**, 138–152 (2018) [[arXiv:1808.04821](#)]

CONFERENCES AND TALKS

Contributed Talks

- “Hybrid analytic image modeling and image moments approach to gravitational lensing”
Public talk for my Physics Ph.D. Candidacy Exam, Drexel University 4 Jun. 2020
- “Quantifying the Effects of O-type Star Formation in Embedded Stellar Clusters”
Modest 21a Virtual Conference Jul. 2021

Poster Presentations

- “The Effects of Early Massive Star Formation: Gas Expulsion and Cluster Dynamics”
American Astronomical Society – 238th Conference Jun. 2021
- “The effects of O-type star formation in embedded stellar clusters.”
American Astronomical Society – 236th Conference Jun. 2020
- “Was the first observed hypervelocity globular cluster, HVGC-1, accelerated by a supermassive binary black hole?”
American Astronomical Society – 233rd Conference Jan. 2019
- “The mystery of a hypervelocity globular cluster: is a binary black hole to blame?”
Drexel Emerging Graduate Scholars, Drexel University Sept. 2018

SOFTWARE DEVELOPED

Authored

- F-SHARP** Code for computing weak gravitational lensing correlations. *Publicly available code written in Python.* <https://github.com/evanjarena/F-SHARP>
- 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*

PHYS 152, *Introductory Physics I*

Winter: 2021, 2020, 2019

Spring: 2022, 2021, 2020, 2019

PHYS 154, <i>Introductory Physics III</i>	Fall: 2021, 2020, 2019, 2018
<i>Grader</i>	
PHYS 131, <i>Survey of the Universe</i>	Winter 2022
PHYS 231, <i>Introductory Astrophysics</i>	Winter 2022
<i>Guest Lecturer</i>	
PHYS 231, <i>Introductory Astrophysics</i>	Winter 2022
Stony Brook University	
<i>Lecturer</i>	
Della Pietra High School Applied Math Program	Spring 2017

PROFESSIONAL ACTIVITIES AND SERVICE

Collaborations	External Collaborator, Dark Energy Survey (DES) Member, Packed Ultra-wideband Mapping Array (PUMA) [Inactive] Member, Baryon Mapping eXperiment (BMX) [Inactive]
Working Groups	Member, DOE Cosmic Visions Dark Energy 21 cm Working Group [Inactive]

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).

Committee Work

Treasurer of the Drexel University Physics Graduate Student Association (2020 – 2021).