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 magnetoydrodynamic, 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 λ5007 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 Phyics 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

`VorAMR` — A robust tool that utilizes `scipy` nearest neighbor interpolation and the AMUSE software suite to convert output data from any Voronoi mesh data structure to input data for adaptive block-based structures. *Publicly available code written in Python.* https://bitbucket.org/torch-sf/voramr/src/main

`PythonOpenMPI` — A generalizable utility for efficient task-based parallel programming using the `mpi4py` library. *Publicly available code written in Python.* https://github.com/seanlabean/PythonOpenMPI

Contributed

`Torch` — A star cluster formation simulation software suite that couples the AMUSE framework with the magnetohydrodynamical code FLASH. *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: 2021, 2020, 2019
PHYS 152, *Introductory Physics I*	Spring: 2022, 2021, 2020, 2019
PHYS 154, *Introductory Physics III*	Fall: 2021, 2020, 2019, 2018

Grader

PHYS 131, *Survey of the Universe* — Winter 2022

PHYS 231, *Introductory Astrophysics* — Winter 2022

Guest Lecturer

PHYS 231, *Introductory Astrophysics* — Winter 2022

Stony Brook University

Lecturer

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).