

# Sean C. Lewis

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## Skills

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**Programming** Python (Jupyter, Pandas, NumPy, Scikit-learn), SQL, Fortran90, MPI, HTML/CSS, C/C++.  
**Technical** Big Data, Machine Learning, High Performance Computing, Git, Unix, AWS.  
**General** Time Management, Teamwork, Problem-solving, Long-Horizon Goals, Communication.

## Experience

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### Data Scientist & Software Engineer

Sept 2023 - Present

Near-Miss Management - Philadelphia, PA

- Produced, tested, and deployed via AWS impactful risk management software products critical to the operations of a world-wide customer base.
- Collaborated with a small team to develop back-end architecture, data processing methods, and machine learning pipelines in Python.
- Pioneered the development of novel software products which aid to increase safety of chemical manufacturing facilities.
- Developed novel data pipelines for quality assurance testing, building upon interfaces with databases (MongoDB, PostgreSQL).

### Research Scientist

Sept 2017 - Sept 2023

Drexel University - Philadelphia, PA

- Co-led a dynamic and highly collaborative multi-national research team.
- Engineered, and documented an extensive Fortran and Python-based multiphysics software suite deployed across 5 supercomputing clusters.
- Slashed computation time of embedded algorithms by employing optimized matrix vectorization and manipulation.
- Published research findings in the Astrophysical Journal after analyzing terabytes of time-series astrophysical simulation data.
- Co-authored several peer-reviewed journal articles, showcasing field-advancing software implementations and simulation analyses.
- Delivered impactful research presentations at several prestigious American Astronomical Society meetings, fostering valuable collaborations.

## Education

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### Ph.D. Physics - Computational Astrophysics

2019 – 2023

Drexel University - Philadelphia, PA

- Supported by or contributed to several National Science Foundation grants. Co-PI of one NSF computational grant.
- Received the Department of Physics Teaching Excellence Award.

### M.S. Physics

2017–2019

Drexel University - Philadelphia, PA

- Treasurer and Event Coordinator of the Physics Graduate Student Association.
- **Courses:** Big Data Physics, Mathematical Physics, Statistical Mechanics, Electromagnetic Theory, Quantum Mechanics, Cosmology.

### B.S. Physics

2012–2016

California Polytechnic State University - San Luis Obispo, CA

- Observational and statistical astronomy research assistant.
- Treasurer and member of the Physics Honors Society.

## Open Source Projects

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### PythonOpenMPI

Parallel Task-Based Processing Library For HPC Systems

- Designed, deployed, and maintain an efficient python library for data analysis parallelization via task-based methods using MPI.
- Provided significant data processing efficiency improvements of up to 40% when compared with the strong scaling of data-based methods.
- Currently used by and interfaces with software from 3 research groups on several supercomputing clusters. Total data processed: >20 Terabytes.
- **Skills Developed:** Software Design – High Performance Computing – Git

### DrexelCodingLessons

Lessons In Python For Graduate Students

- Led a 20 hour series of Python courses for nearly 2 dozen physics graduates students over 2020, 2021, and 2022.
- Taught advanced coding topics including data visualization, parallelization and machine learning.
- Designed Jupyter Notebooks to promote interaction, collaboration, and group-based problem solving.
- **Skills Developed:** Jupyter Notebooks – Communication – Documentation

# Research Achievements

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## PUBLISHED JOURNAL ARTICLES

Massive Star Cluster Formation I. High Star Formation Efficiency While Resolving Feedback of Individual Stars

B. Polak, M.M. Mac Low, R. Klessen, J.W. Teh, C. Cournoyer-Cloutier, E. Andersson, S. Appel, A. Tran, **Sean C. Lewis**, et al.  
*submitted to Astronomy & Astrophysics* (2024). 2024

Transferring Data from A Voronoi Mesh to An Adaptive Cartesian Grid in Pursuit of Self-consistent Top-down Star Formation  
**S. C. Lewis**, et al.

*paper in prep.* (2024). 2024

Early Evolution and 3D structure of Embedded Star Clusters

C. Cournoyer-Cloutier, A. Sills, W.E. Harris, S. Appel, **S. C. Lewis**, et al.  
*MNRAS* 521 (2023) pp. 1338–1352. 2023

Modeling protoplanetary disk evolution in young star forming regions

M. J. C. Wilhelm, C. Cournoyer-Cloutier, **S. C. Lewis**, et al.  
*Proceedings of the International Astronomical Union* 16(S362) (2023) pp. 300–305. 2023

Radiation shielding of protoplanetary discs in your star-forming regions

M. J. C. Wilhelm, S. Portegies Zwart, C. Cournoyer-Cloutier, **S. C. Lewis**, et al.  
*MNRAS* 520 (2023) pp. 5331–5353. 2023

Early-forming Massive Stars Suppress Star Formation and Hierarchical Cluster Assembly

**S. C. Lewis**, et al.  
*The Astrophysical Journal* 944.11 (2023). 2023

Implementing primordial binaries in simulations of star cluster formation with a hybrid MHD and direct N-body method

C. Cournoyer-Cloutier, A. Tran, **S. C. Lewis** et al.  
*MNRAS* 501 (2021) pp. 4464–4478. 2021

Studying the OIII  $\lambda 5007$  emission-line width in a sample of  $\sim 80$  local active galaxies: a surrogate for  $\sigma$

V. N. Bennert, D. Loveland, E. Donohue, M. Cosens, **S. C. Lewis**, et al.  
*MNRAS* 481 (2018) pp. 138–152. 2018

## CONFERENCE PROCEEDINGS

The effects of early forming massive stars and building a bridge between Voronoi mesh and block-structured codes

**S. C. Lewis**, et al.  
*American Astronomical Society 241st Conference*, 2023, Seattle, WA

The Effects of Early Forming Massive Stars & A Novel Method for Inter-codebase Interpolation

**S. C. Lewis**, et al.  
*Clusters Conference*, 2022, McMaster Univ. Toronto, Canada

Quantifying the Effects of O-type Star Formation in Embedded Stellar Clusters

**S. C. Lewis**, et al.  
*Modest 21a*, 2021, Virtual

The Effects of Early Massive Star Formation: Gas Expulsion and Cluster Dynamics

**S. C. Lewis**, et al.  
*American Astronomical Society 238th Conference*, 2021, Virtual

The effects of O-type star formation in embedded stellar clusters.

**S. C. Lewis**, et al.  
*American Astronomical Society 236th Conference*, 2020, Virtual

Was the first observed hypervelocity globular cluster, HVGC-1, accelerated by a supermassive binary blackhole?

**S. C. Lewis**, et al.  
*American Astronomical Society 233rd Conference*, 2019, Seattle, WA

## SUPPORTING GRANTS

NSF Grant AST18-14772

*"Collaborative Research: Globular Cluster Formation in Hierarchically Collapsing Clouds as an Origin for Multiple Stellar Populations"*  
Awarded Aug. 2018 – \$182,673 (Drexel University Portion)

Co-PI NSF Accelerate ACCESS Grant PHY22-0160

*"Models of Star Cluster Formation Using a Multiphysics Framework"*  
Awarded Jan. 2023 – 1,675,000 Supercomputing Credits

NSF Grant AST23-07950

*"The Untimely Deaths of Star Clusters"*  
Awarded Jul. 2023 – \$546,269

References available upon request.