

MADELYN CAIN

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EDUCATION

Massachusetts Institute of Technology | Class of 2019 Cambridge, MA

- Candidate for B.Sc. in Physics and B.Sc. in Mathematics with Computer Science
- Overall GPA: 4.9/5.0
 - Selected coursework: Quantum Physics I-III, Statistical Physics I-II, Graduate General Relativity, Vibrations and Waves, Classical Mechanics I-II, Electricity and Magnetism I, Differential Equations, Linear Algebra, Abstract Algebra, Probability and Random Variables, Introduction to Algorithms, Introduction to EECS by Robot Sensing, Computation Structures, Mathematics for Computer Science
 - Planned coursework (Fall 2018): Graduate Quantum Theory I, Graduate Statistical Mechanics I, Real Analysis, Introduction to Machine Learning, Design and Analysis of Algorithms

James Bowie High School | Class of 2015 Austin, TX

- Valedictorian (Ranked 1/673)

PUBLICATIONS

- Cain, Madelyn; Frebel, Anna; Gull, Maude, et al. (2018). Chemical abundances for a trio of r-process-enhanced stars - one strong, one moderate, and one mild. *Accepted to The Astrophysical Journal*.
- Gull, Maude; Frebel, Anna; Cain, Madelyn, et al. (2018). Discovery of the first metal-poor star with a combined r- and s-process element signature. *Accepted to The Astrophysical Journal*.

EXPERIENCE

Comin Photon Scattering Laboratory Cambridge, MA
Researcher May 2018 – Present

- Developed a Python package to reconstruct images of nanometer-scale objects from x-ray diffraction data. Built several phase retrieval algorithms to be used on data taken at the NSLC in August 2018.

Kavli Institute for Astrophysics and Space Research Cambridge, MA
Researcher May 2016 – Present

- Analyzed the chemical signatures of four metal-poor stars to shed light on the origin of the r-process, a distinct series of nuclear reactions that occur during core-collapse supernovae and neutron star mergers.
- Examined how accounting for Rayleigh scattering in stellar atmospheres affects chemical abundance as a function of emission line wavelength and excitation potential. Studied how atmospheric parameters fluctuated with depth when Rayleigh scattering was considered.

NASA Jet Propulsion Laboratory Pasadena, CA
Software Engineering Intern June – August 2017

- Built a web API using Elasticsearch that provides guest searching capabilities for JPL-Visits, an application that allows users worldwide to plan visits to JPL. Integrated the API in a web service that suggests and auto-populates guest profiles to enhance user experience.
- Created a modular commenting microservice with Flask and PostgreSQL that will be deployed on internal JPL websites. Features include real-time updates with SocketIO and comment editing/deleting capabilities.

MIT Physics Department Cambridge, MA
Teaching Assistant August 2016 – Present

- Three-year teaching assistant for MIT's advanced classical mechanics course for freshmen. Led weekly problem-solving sessions to help students with their coursework and problem sets.
- Rated a 6.7/7.0 on overall quality by students on MIT course evaluations.

SKILLS

Technologies

- Programming languages: Python, Javascript, HTML/CSS, LaTeX, Mathematica, MATLAB, C++, C
- Software: Flask, Angular 2, Elasticsearch, Tensorflow, PostgreSQL, Git
- Systems: Macintosh OS X, Linux (Ubuntu)