MARGARET ANDERSON

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Additional contact info available upon request

EDUCATION

California Institute of Technology	B.S. Physics and History	GPA: 4.0	June 2020
Harvard University	**PhD Physics**		**Est. 2026**

RESEARCH EXPERIENCE

Condensed Matter Physics Senior Thesis Project| Partial Academic Year 2019-20
Mentor: Nai-Chang Yeh
- Planned to investigate the energy levels and quantum confinement in nanoparticle quantum dots using Scanning Tunneling Microscopy and Spectroscopy (STM and STS)

Medieval History Senior Thesis Project| Academic Year 2019-20
Mentor: Warren Brown
- Considered why Charlemagne's grandson was called Charles the Bald given that he might not have been physically bald
- Explored medieval symbolism surrounding hair, the origin of epithets, and the image of Carolingian kings

Imaging in the Physical Sciences REU at the Rochester Institute of Technology | Summer 2019
Mentors: David Messinger and Roger Easton, Jr
- Investigated radiation exposure and heating conservation concerns of parchment documents
- Dated and characterized medieval documents with reflectance spectroscopy
- Conducted advanced image processing of multi- and hyperspectral images to reveal erased, damaged, and hidden text using ENVI Image Processing Software and MATLAB

Summer Undergraduate Research Fellowship at Caltech | Summer 2018
Mentors: Nai-Chang Yeh and Matthew Hunt
- Outlined and electrically isolated Graphene devices using a He-Ne-Ga Ion Beam Milling System
- Optimized milling quality with unique tilting method to reduce substrate swelling
- Characterized cut profiles with Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM)
- Patterned electrodes with E-beam Lithography
- Performed work in the Kavli Nanoscience Institute cleanroom

California Institute of Technology Condensed Matter Physics Research Intern | Fall 2017-Spring 2018
Mentor: Nai-Chang Yeh
- Investigated the induction of magnetism in 2-dimensional Transition Metal Dichalcogenides with self-assembled nanoparticle films
- Deposited magnetic nanoparticle solutions in a strong magnetic field to form oriented self-assembled arrays with net magnetism and characterized samples with SEM

Independent Study History Project| Winter 2018
Mentor: Maura Dykstra
- Discussed the introduction of female undergraduates to Caltech based on archival evidence

Summer Undergraduate Research Fellowship at Cornell University | Summer 2017
Mentor: Darrell Schlom
- Characterized multiferroic thin films with AFM, X-ray Diffraction (XRD), and Vibrating Sample Magnetometry (VSM) to improve future growth, crystal quality, and ferroelectric and ferromagnetic properties

- Observed film growth with Molecular Beam Epitaxy (MBE) and in situ characterization with Reflection High-Energy Electron Diffraction (RHEED)

California Institute of Technology Geology Research Intern | Spring 2017
Mentor: Joann Stock

- Used Python to analyze emission spectra and characterize composition of rock samples from alluvial fans

Southern Illinois University of Edwardsville Research Intern | Summer 2016
Mentor: Abdullatif Hamad

- Observed optics research in thermal lensing where weak lenses were formed via the laser heating and resulting expansion of a thin layer of liquid

Missouri University of Science and Technology Summer Research Academy | Summer 2015
Mentor: Edward Kinzel

- Studied the scalability and throughput of the process of Nanosphere Photolithography which produced microhole arrays beyond the diffraction limit by using a self-assembled monolayer array of silicon nanoparticles as a microlens array
- Analyzed and measured samples with light microscopy, SEM, and ImageJ

EXTRACURRICULAR ACTIVITIES AND WORK EXPERIENCE

Caltech Association of Makers (President)	September 2017 – June 2018
Caltech Academics and Research Committee	January 2017 – June 2018
Teaching Assistant in Physics Electronics Lab	September 2018 – December 2018
Work Study in 3D Printing Lab	January 2017 – June 2017
Caltech-Occidental Wind Orchestra	September 2016 – March 2020
Caltech Science Olympiad Volunteer	September 2016 – March 2020
Work Study/ Employment with the Einstein Papers Project	January 2019 – present

AWARDS

- Arthur Noyes Scholarship 2016 – merit scholarship
- Margie Lauritsen Leighton Prize 2018 – awarded to a sophomore female physics major based on nomination from a faculty member
- Hugh F. and Audy Lou Colvin Named SURF Fellowship 2018 – awarded based on project proposal
- Carnation Foundation Scholarship 2018 and 2019 – merit scholarship
- Rodman W. Paul History Prize 2020
- 2020 Senior Undergraduate Thesis Prize

SPECIAL SKILLS

- Python
- LaTeX
- MATLAB
- Mathematica
- ImageJ
- ENVI image processing
- CSS
- HTML
- jQuery
- SEM
- AFM
- VSM
- He-Ne-Ga Ion Milling/Microscopy
- Photolithography
- E-beam Lithography
- Additive Manufacturing (3D Printing)
- Multispectral Imaging
- Hyperspectral Imaging
- Reflectance spectroscopy
- Transmission Electron Microscopy (TEM)
- STM and STS

ADVANCED COURSEWORK

- Atoms and Photons – A graduate-level class on the interaction of atoms with electromagnetic fields, atomic trapping and cooling, and other manipulation and control methods
- Analog Electronics for Physicists – a laboratory course covering analog electronics with an emphasis on Op-Amps which culminated in a two-week student designed project
- Mathematical Methods for Physics, Group Theory – a graduate-level course on group theory methods applied to physics
- Introductory Methods of Applied Mathematics for the Physical Sciences – a graduate-level course on complex analysis, ordinary differential equations, partial differential equations, transform methods, and green's functions
- Graduate-level quantum mechanics including quantum field theory and scattering