

Jay Aronow Frothingham

CONTACT

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EDUCATION

B.A. Engineering and Astronomy, 3.92 GPA
Smith College, Northampton MA, May 2023

Technical CV

EXPERIENCE

Scientific Data Analyst, Green Bank Observatory
Green Bank WV
May 2023 - Present

Student Researcher, Smith College Physics Department
Northampton MA
September 2019 - September 2021

Hardware Engineering Intern, HP, Inc.
Corvallis OR
Summer 2019

Electrical Engineering Intern, HP, Inc.
Corvallis OR
Summer 2018

PUBLICATIONS

LaBarre, P.G., Rydh, A., Palmer-Fortune, J., **Frothingham, J.A.**, Hannahs, S.T., Ramirez, A.P., Fortune, N.A. "Magnetoquantum oscillations in the specific heat of a topological Kondo insulator." *Journal of Physics: Condensed Matter* (2022).

RESEARCH

Microwave Photonic Synthesizer Characterization for Applications in Radio Astronomy Instrumentation
National Radio Astronomy Observatory (NRAO) Research Experience for Undergraduates

Tested and characterized laser source for potential use as ngVLA (next-generation Very Large Array) local oscillator. Presented findings to external engineering representatives and NRAO mentors.

Research Mentor: William Shillue

A Circuit Board Printer for Muon Detector Construction and Classroom Use

Summer Undergraduate Research Fellowship, Smith College Dept. of Physics

Tested feasibility of a circuit board printer to manufacture components quickly and reliably. Assembled and tested muon detectors to assess quality of reflow soldering techniques. Designed and built an adjustable camera mount to improve equipment accessibility. Wrote documentation and user guide to circuit board printer. Presented results to Smith College Physics and Astronomy departments.

Research Advisor: Dr. Nathanael Fortune

Portable Muon Detectors for Tests of Time Dilation

STudent Research In DEpartments (STRIDE), Smith College Dept. of Physics

Used custom-built portable muon detectors to collect data at different elevations. Worked with peers to analyze data collected in various locations. Managed project milestones and scheduled lab meetings during periods of remote work. Presented results to Smith College Physics and Astronomy departments.

Research Advisor: Dr. Nathanael Fortune

A Python Package for Correction of Magnetic Field Dependence of Resistive Thermometers

Summer Undergraduate Research Fellowship, Smith College Dept. of Physics

Optimized Python code characterizing resistive thermometers' response to magnetic fields. Removed code redundancies by bundling custom functions into a package and defining a class. Automated essential functions and increased user control over other functions. Managed revisions through Gitlab. Wrote detailed documentation in Markdown and Python. Code used in analysis for published paper.

Research Advisor: Dr. Nathanael Fortune

Experimental Measurements of Phase Transitions in Superconductors Under Extreme Conditions

STudent Research In DEpartments (STRIDE), Smith College Dept. of Physics

Designed and fabricated custom lab equipment in a machine shop. Performed soldering under a microscope. Evaluated and modified test probe electronics and wiring.

Research Advisor: Dr. Nathanael Fortune

Using Arduino to Teach Mechatronics

Apprenticeships in Science and Engineering, Oregon State University, Corvallis OR

research description here

Research Advisor: Dr. Burak Sencer

WORKSHOPS

Synthesis Imaging Workshop

National Radio Astronomy Observatory, Socorro NM

May 2024

Single Dish Summer School - Presenter, Observing Group Leader

Green Bank Observatory, Green Bank WV

dates here

Green Bank Telescope Observer Training Workshop - Presenter, Observing Group Leader

Green Bank Observatory, Green Bank WV

dates here

AstroTech Astronomical Instrumentation Summer School

University of California, Berkeley CA

August 2022

Designed and built functioning spectrograph with a small team in three days. Assembled light-integration box for successful calibration of CCD flat-field images. Hands-on sessions covering optics, teamwork, and instrument development.

National Radio Astronomy Observatory Summer Student Workshop

Green Bank Observatory, Green Bank WV

June 2022

Designed and carried out an observing project with a 40ft radio telescope in a small-group setting. Attended lectures on historical and contemporary radio astronomy research and instrumentation. Toured Green Bank Observatory facilities, including climbing the Green Bank Telescope.

that National High Magnetic Field Lab summer school I did

details here

COURSEWORK

Course highlights

Engineering mechanics, circuit theory, thermodynamics

Physics through quantum mechanics

Mathematics through multivariate calculus

Introductory chemistry

Astronomy including telescopes and astrophysics

Observational Techniques in Optical and Infrared Astronomy

Programmed data reduction pipeline in Python. Observed open star cluster M34 using 16" Schmidt-Cassegrain telescope. Produced BVRI images, color-magnitude diagrams, and isochrone fits.

Astronomical Data Science

Demonstrated statistical concepts through collaborative Python programming in Jupyter notebooks and Google Colab. Independent projects using real-world data with scientific-style papers and presentations. Focus on best practices in written and visual communication of data.

Project titles:

- Investigation of Links Between Brightness and Orbits in Comets
- Exoplanet Distributions in Systems of Massive Host Stars
- Redesign of Decadal Survey Figure: Impacts of Well-Organized Data Archives

Astronomy & Public Policy

Practiced written and verbal science communication and outreach on topics including light pollution, contested observatory construction sites, and climate change.

Engineering Seminar: Remote Sensing

Wrote technical memos and frequently presented on published scientific articles. Designed and carried out a

ground-penetrating radar survey project concluding with presentation and formal scientific report.

Foucault Pendulum Repair (Physics)

Self-designed project to repair and possibly redesign non-functioning drive mechanism for Foucault pendulum displayed on Smith College campus. Will additionally develop display materials and sample lesson plans to increase awareness and educational impact of the Foucault pendulum.

SKILLS

Languages:

Proficiency in German

Limited studies in written and spoken Yiddish

Electronics:

Arduino, breadboard, soldering, printed circuit board design. Motors, sensors, LEDs.

Design:

3D printers, laser cutters, hand tools, power tools. Repair and maintenance of 3D printers.

Computer-aided design (CAD) programs including Solidworks, AutoCAD, and Inventor.

Metal/wood:

Manual and CNC mills and lathes. Bandsaws, table saws, jointers, planers.

Software:

Python, IDL, Java, Arduino, Javascript, Jupyter, Github.

Equipment:

Microscopes, telescopes, oscilloscopes, voltmeters, function generators.

Outreach CV

OUTREACH

Letters to a Pre-Scientist

Family Science Day

2 years of GSI and PING mentorship

GBT tours

County Science Fair Judging

Robotics Competition Judging

star parties (include Mission2Mars Canaan Star Party!)

Eclipse party

2023 Introduce A Girl To Engineering Day (IGTED), Volunteer Northampton, MA

Worked directly with parents and middle school girls to facilitate science activities. Child-safety certification.

2018, 2019 Girl Scout Brownie/Junior Robotics Badge Day, Organizer, Volunteer Corvallis, OR

Developed hands-on physics, programming, and design activities within published requirements for completion

of Robotics Badges. Taught physics to Girl Scouts aged 7-12 through building simple machines and catapults.

LEADERSHIP

2022 Smith College Jewish Community, Co-Chair Northampton, MA

Planned and led religious services hosted on campus. Organized and led a special "Sensory Shabbat" designed

to center the needs and experiences of students with autism and other disabilities.

2019-23 Smith College Glee Club, Vice President, Business Manager Northampton, MA

Kept records of leadership meetings and reported rehearsal attendance to supervisors. Managed event logistics

including food, location, and cleanup. Provided assistance as needed to all students in the Smith College choirs.

2015-19 FIRST Robotics Competition Team 997, Co-Captain, Lead Programmer Corvallis, OR

Arranged and participated in outreach including visits to local schools, showcase events at county and state fairs, social media presence, and interviews with local newspapers. Trained and supervised new students while meeting programming project deadlines. Repaired and maintained robot at competitions under time pressure while representing the team to judges and peers. Coordinated all team meetings and leadership discussions. Implemented workflow changes to improve team culture surrounding stress management and mental health. Provided support and mentorship to other LGBTQIA+ students on the team.

2019 FIRST Force Robotics Scrimmage, Organizer, Pit Manager Corvallis, OR

Hosted over a dozen high school robotics teams in a showcase event open to the public. Planned logistics and

directed all event volunteers. Arranged local media coverage of the event. Organized and participated in event

setup and cleanup. Served as contact person for attendees needing assistance during the event.

2015, 2016 Benton Girl Scout Day Camp, Program Assistant Corvallis, OR

Supervised a dozen Girl Scouts aged 11-13 in a rural day camp setting with one night of overnight camping. Safely taught wilderness skills including whittling, fire starting, and knot-tying. Assisted other Program Assistants in teaching and leading songs and activities.

CERTIFICATIONS

Technical Rope Rescue Operations

October 2024

Rope Rescue course, Safety Educators LLC

American Heart Association Basic Life Support Provider

October 2024

Advanced First Aid and CPR course, Safety Educators LLC

Green Bank Observatory Tour Bus Driver

August 2024

non-CDL certification to operate 12m buses on Observatory property