# Jay Aronow Frothingham

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## EDUCATION

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

# Technical CV

## EMPLOYMENT

**Research Assistant, Hat Creek Radio Observatory, SETI Institute**
*December 2025 - Present // Hat Creek CA*
Coming soon 😃

**Scientific Data Analyst, Green Bank Observatory**
*May 2023 - December 2025 // Green Bank WV*
Scientific and operational support of the Green Bank Telescope. Troubleshot critical telescope issues as the "On-call Support Scientist." Provided technical training to new Observatory staff and scientists. Performed specialty observations (radar, interferometric imaging). Regularly assessed telescope performance and data quality. Reviewed telescope time proposals on a technical basis. Prepared and corrected daily telescope observing schedules. Provided access to archival data, data products, and documentation upon request.

**Student Researcher, Smith College Physics Department**
*September 2019 - September 2021 // Northampton MA*
Completed independent research on several projects. Mechanical and electrical fabrication, circuit board design, software development, and soldering under a microscope. Trained and mentored new lab members. Led lab meetings in-person and remotely. Presented results to other researchers.

**Hardware Engineering Intern, HP, Inc.**
*Summer 2019 // Corvallis OR*
Optimized printer drum testbed control settings to improve motor torque and performance, allowing for more efficient testing.

**Electrical Engineering Intern, HP, Inc.**
*Summer 2018 // Corvallis OR*
Programmed FPGAs (Field Programmable Gate Arrays) to control and debug custom components. Revised circuit board designs using powerful PCB design software.

## 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*
Developed a hands-on, Arduino-based system for use in Oregon State University's "Computer Control of Manufacturing Processes" class, teaching undergraduate engineering students fundamentals of industrial mechatronic systems including servo motion control using various types of sensors and feedback control components commonly used in manufacturing industries.
*Research Advisor: Dr. Burak Sencer*

# WORKSHOPS

**The 20th NRAO Synthesis Imaging Workshop**
*May 2024 // National Radio Astronomy Observatory, Socorro NM*

A week of lectures on aperture synthesis theory and techniques at a level appropriate for graduate students in astrophysics, covering both radio interferometry fundamentals and state-of-the-art methods and techniques. Discussion groups and tutorials demonstrating data collection, calibration, and imaging of various types of observations, including new data from the Very Large Array (VLA), Very Long Baseline Array (VLBA), and the Atacama Large Millimeter/submillimeter Array (ALMA).

**Single Dish Summer School** - Presenter, Observing Group Leader
*2023, 2024 // Green Bank Observatory, Green Bank WV*
Gave 30-45 minute presentations on single-dish radio astronomy and very long baseline interferometry. Assisted small groups with observation preparation, observing, and data reduction with a 20m-diameter radio telescope.

**Green Bank Telescope Observer Training Workshop** - Presenter, Observing Group Leader
*2023 - 2025 // Green Bank Observatory, Green Bank WV*
Demonstrated observing procedures with the Green Bank Telescope. Assisted small groups with observation preparation, observing, and data reduction. Observations included spectral line, mapping, and pulsar observations at high (>20GHz) and low (<1.4GHz) frequencies using a 100m-diameter radio telescope.

**AstroTech Astronomical Instrumentation Summer School**
*August 2022 // University of California, Berkeley CA*
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**
*June 2022 // Green Bank Observatory, Green Bank WV*
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.

# COURSEWORK

**Course highlights**
Physics through quantum mechanics
Mathematics through multivariate calculus
Astronomy including telescopes and astrophysics
Engineering mechanics, circuit theory, thermodynamics

**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. Developed display materials to increase awareness and educational impact of the Foucault pendulum.

**Engineering: Signals and Systems**
Upper-level elective covering signal processing techniques. Labs and data analysis performed in Matlab. Projects included removal of an echo from audio signals, design and use of an AM radio receiver, and analysis of heartbeats collected from an electrocardiogram (ECG) machine.

**Electronics Lab**
Hands-on physics course covering AC circuits, DC circuits, semiconductors, and amplifiers through projects and lectures. Project videos available here.

## SKILLS

**Languages:** Proficiency in German. Limited studies in written and spoken Yiddish
**Software:** Python, IDL, Matlab, Java, Arduino, Javascript, Jupyter, Github, Verilog
**Hardware:** Microscopes, telescopes, oscilloscopes, voltmeters, function generators
**Electronics:** Arduino, breadboard, soldering, printed circuit board design
**Design:** Computer-aided design (CAD) programs including Solidworks, AutoCAD, and Inventor
**Fabrication:** 3D printers, laser cutters, hand tools, power tools; Manual and CNC mills and lathes; Bandsaws, table saws, jointers, planers

# Outreach CV

## OUTREACH

**Letters to a Pre-Scientist Program, Pen Pal**
*2024, 2025*
Exchanged letters over the course of a school year with a middle school student from a low-income public school to help students discover possibilities in STEM by discussing STEM career pathways, higher education journeys, and overcoming obstacles.

**WV Governor's School Institute (GSI) and Physicists Inspiring the Next Generation (PING), Mentor**
*Summers 2023-2025 // Green Bank, WV*
Mentored small groups of rising 9th graders as they learned the fundamentals of radio astronomy. Helped

them set up and interpret their own astronomical observations with a 40ft-diameter radio telescope. GSI and PING are multi-week, residential summer camps held annually at the Green Bank Observatory.

**Pocahontas County Science Fair, Judge**
*2025 // Green Bank, WV*
Provided feedback to local elementary and middle school students' posters and presentations of their self-designed science experiments. High-scoring projects became eligible to compete at the West Virginia state level. Judged projects relating to Health Science and Animal Science.

**VEX Robotics Competition, Judge**
*2025 // Green Bank, WV*
Judged middle and high school robotics students on their iterative design process and innovation in creating small robots. Interviewed teams, reviewed design notebooks, and watched robots compete to complete various tasks.

**Green Bank Observatory Telescope Tours, Guide and Photographer**
*2023-2025 // Green Bank, WV*
Guide visiting students and astronomers on safety-sensitive tours of the Green Bank Telescope, up to 450ft in elevation. Provide historical and scientific information on the telescope's design, construction, and operation. Authorized to photograph visitors at several key locations on the telescope structure.

**Green Bank Observatory Solar Eclipse Party, Volunteer**
*April 2024 // Green Bank, WV*
Assisted local community members in safely viewing the sun through a filtered telescope during the April 2024 total solar eclipse. Visitors were able to view 91% of totality from the Green Bank Observatory!

**Green Bank Observatory Star Parties, Volunteer**
*2024-2025 // Green Bank, WV and Canaan Valley, WV*
Operate optical telescopes to assist up to 60 amateur astronomers and students in observing the night sky. Typical monthly star parties include viewing the Moon, various planets, and naked-eye observations of the Milky Way, often in support of scout merit badge awards. Led a star party at the Canaan Valley National Wildlife Refuge as part of the NASA-funded Mission2Mars program.

**Green Bank Observatory SETI Tours, Presenter**
*2024-2025 // Green Bank, WV*
Gave 30-minute presentations on the history and theory of the search for extraterrestrial intelligence (SETI), with a focus on the Drake Equation and the implications of current search methods in readio astronomy. Presentations given to a general public audience following in-depth tours of telescopes at the Green Bank Observatory historically used in SETI projects.

**Green Bank Obsevatory Family Science Day, Volunteer**
*2023, 2025 // Green Bank, WV*
Led activities at the Green Bank Observatory Science Center to engage local families. Demonstrated properties of materials and wavelengths using an infrared (IR) camera. Gave ground-based tours of the Green Bank Telescope.

**Introduce A Girl To Engineering Day (IGTED), Volunteer**
*2023 // Northampton, MA*
Worked directly with parents and middle school girls to facilitate science activities. Child-safety certification.

**FIRST Force Robotics Scrimmage, Organizer, Pit Manager**

*2019 // 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.

**Girl Scout Brownie/Junior Robotics Badge Day, Organizer, Volunteer**

*2018-19 // 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

**Green Bank Observatory Rope Rescue Team, Volunteer Responder**

*2024-2025 // Green Bank, WV*

Trained to respond to emergencies at the Green Bank Observatory, an extremely remote rural location. Due to the nature of work performed onsite, emergencies can occur up to 500ft in the air, in areas accessible only with a rope and harness, and with limited medical personnel available.

**Smith College Jewish Community, Co-Chair**

*2022 // 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.

**Smith College Glee Club, Vice President, Business Manager**

*2019-23 // 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.

**FIRST Robotics Competition Team 997, Co-Captain, Lead Programmer**

*2015-19 // 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.

**Benton Girl Scout Day Camp, Program Assistant**

*2015-16 // Corvallis, OR*

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

## CERTIFICATIONS

**Green Bank Observatory Rope Rescue Team, Volunteer Responder**
2024-2025
Trained to respond to emergencies at the Green Bank Observatory, an extremely remote rural location. Due to the nature of work performed onsite, emergencies can occur up to 500ft in the air, in areas accessible only with a rope and harness, and with limited medical personnel available.

**Adult Mental Health First Aid**
August 2025\

**Rope Rescue Technician course**
August 2025\

**BFD (Bartow Frank Durbin) Volunteer Fire Department**
June 2025-August 2025
Probationary member

**Emergency Vehicle Operations Course**
August 2025
16-hour VFIS course, Shavers Fork Fire-Rescue

**Rope Rescue Awareness/Operations**
October 2024
Rope Rescue course, Safety Educators LLC

**American Heart Association Basic Life Support Provider**
Octber 2024, August 2025
Advanced First Aid and CPR\

**Green Bank Observatory Tour Bus Driver**
August 2024
non-CDL certification to operate 12m buses on Observatory property