THE PHYSICS MAJOR
Department of Physics and Astronomy
SONOMA STATE UNIVERSITY

Sonoma State Physics Majors Experience GROWTH!

By Dr. Alexandra Miller

GROWTH (Growing Research Opportunities with Traineeship in High Energy Physics) is a Department of Energy–funded program designed to introduce students to the exciting field of High Energy Physics. This nearly million-dollar grant supports students at Sonoma State University (SSU) and six other Minority Serving Institutions (MSIs).

As part of the GROWTH traineeship, students take a course in Particle Physics, attend a High Energy Physics seminar series, and conduct original research under the mentorship of scientists at partner research institutions.

Three SSU students participated in the inaugural cohort of the GROWTH program. Bahareh Adami Ardestani is currently aiding in the search for Dark Matter; Merlin Goddard is working on experimentally detecting the coupling of the charm quark to the Higgs field; and Madison Ambriz is developing improved algorithms for identifying charm and bottom quarks. All three students are conducting their research under the guidance of scientists at Lawrence Berkeley National Laboratory, addressing some of the most fundamental questions in particle physics. They are all set to graduate later this year. More details about their research and future plans are featured in their individual articles.

This year, two more SSU students joined the second GROWTH cohort. Jennifer Ortiz and Daniel Downey are currently enrolled in the newly developed Particle Physics course, preparing for their upcoming research internships. This summer, Jennifer will be working at Lawrence Livermore National Laboratory to enhance photon detection techniques, while Daniel will be at Berkeley Lab developing improved Monte Carlo algorithms for applications in collider physics. These hands-on research experiences equip students with the skills needed to pursue graduate studies or transition directly into the technical workforce.

In March, four SSU GROWTH trainees attended the American Physical Society's Global Physics Summit in Anaheim, California. There, they attended a wide array of physics presentations, networked with scientists and peers from around the globe, and presented their own research. Notably, both Bahareh and Madison received Top Presenter Awards for their outstanding presentations.

The current grant will support the GROWTH program through May 2026. Principal Investigators Dr. Alexandra Miller (SSU) and Dr. Wing To (Stanislaus State) are actively seeking new funding opportunities to sustain and expand this impactful traineeship.

Thank You for Your Support!

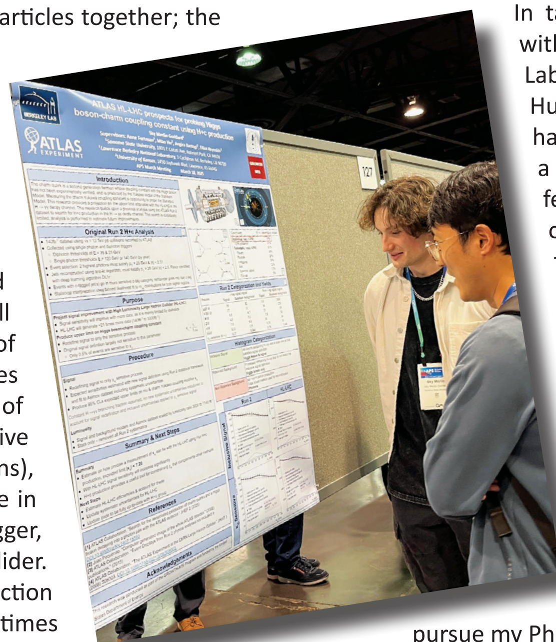
Due to the uncertain status of the Physics & Astronomy program, this may be the last edition of the Physics Major newsletter. If you have been a donor to the Department, we thank you for your past support and are grateful for the opportunities that your support has provided for our students. This year, the only Departmental fund for which we are asking support is the Equipment fund that supports lab equipment and the SSU Observatory (C0142), as we will continue to support our lower-division classes. Donations recognizing Prof. Cominsky's retirement (see page 11) can be directed to EdEon STEM Learning Account C0486.

To send a donation, please contact the SSU Advancement Office at (707) 664-2712. You can also contact the Department at (707) 664-2119 or *PAdept@sonoma.edu*.

Capstone Research:
Higgs Boson-charm Quark Coupling Prospects
By Sky Merlin Goddard - Research Advisor: Dr. Alexandra Miller

My capstone research, which was made possible by the GROWTH-MSI program, advised by Dr. Alexandra Miller-Bordisso, took me into the very interesting field of particle physics analysis. I worked on making a projection for future physics based on a search that was already done for the production of 2 particles together; the Higgs boson, and the charm quark.

To make things simple, the Higgs boson is related to mass, and the charm quark is an intermediate mass particle – the main thing to know is that the Higgs boson likes very massive particles, and so it is not seen as often along with the charm quark. This means we have not confirmed the Standard Model prediction for how often they will interact, because we don't see enough of them together yet. My research first removes events that only have indirect production of the Higgs and charm together (these can't give us information on their direct interactions), and then projects how things might change in the future as particle experiments get bigger, like the High Luminosity Large Hadron Collider. We see the upper limit of what interaction strengths we could detect go from 20.4 times what we predict down to only 7.2 – possibly lower as other complex aspects are improved. This is an important step in informing future analyses of where they should look for new and exciting physics, and what needs to be improved in order to pull back the curtain on this exciting field.



In taking on this project, which was done with help from Lawrence Berkeley National Laboratory scientists Anne Fortman, Miao Hu, Angira Rastogi, and Elliot Reynolds, I had to learn a great deal and I experienced a very exciting rate of research I hadn't felt before. I met a wonderful number of very helpful active researchers in the field, went to weekly meetings and was exposed to a truly invigorating diversity of research. I learned how to code in C++, along with many of the packages that are used in fields like particle physics for powerful data analysis, and how statistics are used to sort convoluted data into meaningful information. This really felt like I was a part of the active field of particle physics, and I am excited to continue this kind of research in graduate school, as I pursue my PhD at Texas Tech University.

Capstone Research:
A Theoretical Physicist's Journey
By Aaron Russell - Advisor: Prof. Alexandra Miller

For my capstone project I worked to create a primer on Conformal Field Theory (CFT) in 2 dimensions. This is an instructional resource aimed at advanced undergraduates and beginning graduate students, as the current materials are created for advanced graduate students. CFT is a very interesting theoretical area as it applies to many areas of physics including ferromagnetic materials and condensed matter physics. My particular interest in the subject is because String Theory is a 2 dimensional CFT.

This project proved to be rather challenging as the available resources are very dense. However, it has also been very enlightening to follow through the work of theoretical physicists and see the process of imposing some educated assumptions that conform to the physical world and following through with the math to see what results you get. While challenging, it was truly a pleasure every time I made breakthroughs in my understanding. This work should help me greatly in the future as my plan is to continue into a PhD program where I hope to do research in the field of quantum gravity.

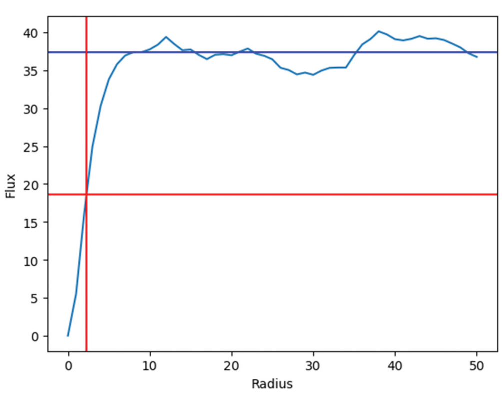
Capstone Research:
Polishing Aluminum for the Creation of Anodic Aluminum Oxide—Investigating the Brytal Process
By Dustin Lewis - Research Advisor: Prof. Hongtao Shi

The goal of the project was to test using the Brytal process to electropolish aluminum for the purpose of creating anodic aluminum oxide (AAO). The experiment involved trialing various configurations of the Brtyal process, which involves running current through a heated salt solution in order to polish the aluminum surface. Following optimization of this process for a smooth surface, anodization through another electrochemical process allows for the creation of the desired oxide layer. Characterization of the roughness of aluminum samples was done primarily with an atomic force microscope (AFM), and imaging of the oxide layer was performed with a scanning electron microscope (SEM). The Brytal process proved effective in obtaining surfaces with roughnesses of less than five nanometers. Some of the most interesting parts of this experiment were the process of learning how to identify and overcome issues that arose. This included a lot of research into established procedures in the literature, as well as some trial and error in the lab. Steps like creating a custom apparatus to polish in proved significant, yet interesting, challenges. The increased familiarity with the different microscope technologies has been helpful, as has the experience with learning to research independently. Particularly highlighted is how much more complex the entire process can be than it seems in articles, particularly since they often discuss only the successful end product and not the multitude of missteps that it took to bring them there.

Following graduation, I'll be moving to Auburn, Alabama to begin my graduate studies at Auburn University, where I'll be pursuing a doctorate in physics. The Auburn program is heavily focused on plasma physics, and while I've not yet committed to a specific lab or project, I'm hoping to perform my research in the field of experimental plasma physics, with an end goal of eventually working at a national lab. I'm glad Sonoma State University has provided the opportunities it has to me as an undergraduate, and look forward to my continued education and career within the field of physics.

Capstone Research:
Measuring Half-light Radius of Galaxies
By Kendall Fletcher - Advisor: Prof. Tom Targett

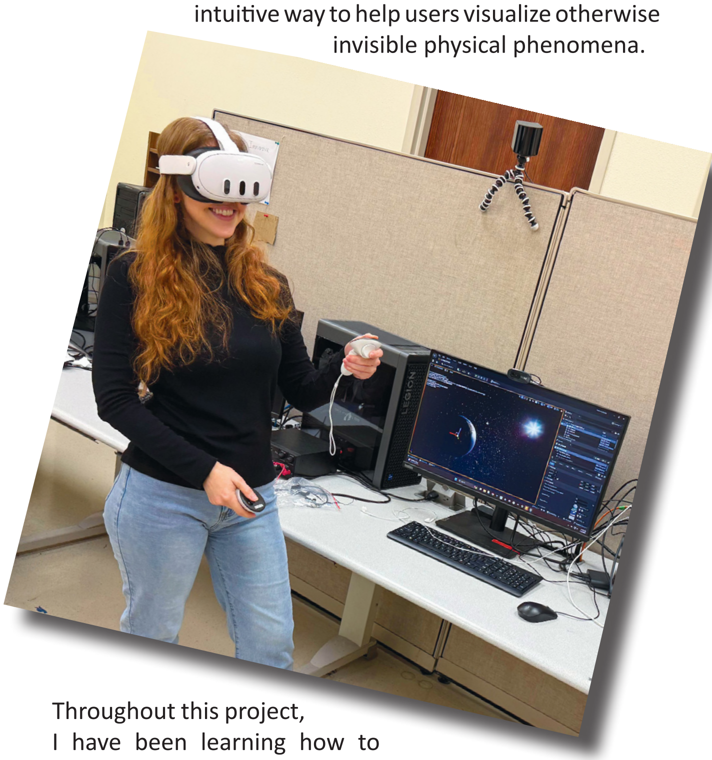
Galaxies come in various shapes and evolve slowly over long periods of time with no clearly defined edge, so the brightness is measured to calculate the true size. I am measuring the sizes of galaxies by calculating their half-light radii. This process is a model-independent check used by astronomers to ensure that their measurements are accurate. In this project, I have created graphs and images of the galaxies in order to correctly calculate the half-light radius. The first step of the process is to make a histogram to visualize the data. This is how astronomers first receive the information from their observations. It is then our job to visualize this data into comprehensible images for research.



This project was very interesting for me, since I was able to experience first hand how much astrophysicists rely on images to tell the story of how these measurements are made. The science, which in the classroom we learn as being heavily math, focused more on the visualization of the process. The coding itself also presented a challenge. For this project I used python, and some steps were more of a struggle than others. For example, writing the code for the pixel radius count was challenging, but being able to push through and get it to work was extremely satisfying. Overall, it was an incredible research experience, and I hope to continue doing research like this as I work towards receiving my PhD.

Capstone Research:
Climate Lens: A Virtual Reality Simulation Modeling Earth's Energy Budget
By Katherine Bradley - Research advisor: Dr. Lynn Cominsky

For my capstone project, I am developing Climate Lens VR, an immersive physics simulation that models the journey of solar radiation as it interacts with Earth's atmosphere and various surfaces. Designed to support conceptual understanding of complex physics topics, the simulation focuses initially on solar irradiance, demonstrating how solar energy intensity decreases with distance from the Sun according to the inverse square law. Users will view Earth from a floating platform in space, observing how solar rays strike the planet's atmosphere. As the project progresses, I will add additional levels modeling Rayleigh scattering and infrared radiation emission, based on the Stefan-Boltzmann law. My goal is to create an engaging, intuitive way to help users visualize otherwise invisible physical phenomena.



Throughout this project, I have been learning how to integrate physics models into Unreal Engine 5 and leverage high-performance VR equipment at Sonoma State's STEM VR Lab. I also built a web-based prototype using JavaScript to test early models. After graduation, I plan to pursue opportunities that allow me to combine physics education, research, and emerging technologies like VR. I am passionate about making abstract scientific concepts more accessible and aim to continue developing tools that enhance science communication and learning.

Capstone Research:
Magnetic Charger On Bicycle
By Joaquin Diaz - Research Advisor: Prof. Hongtao Shi

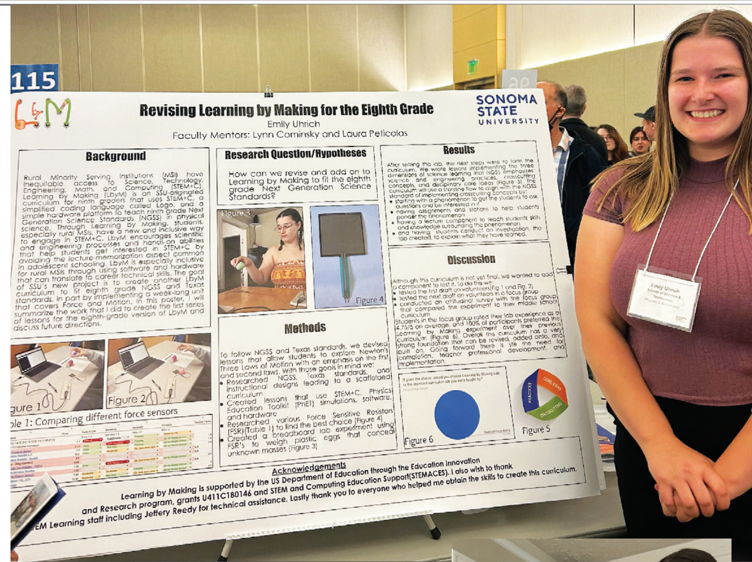
The goal of my project is to build a magnetic charger on a bicycle. The charger will be powered by a small magnetic generator that is placed in the middle of the bicycle frame. The generator works by having two rotating disks that have 12 magnets in them which rotate around coils of wire. The disks rotate by the attachment of a pulley belt which is connected to the back tire of the bicycle so as the back tire turns then so does the disks. The magnets are in alternating fashion (e.g. north pole, south pole, etc.) so when they pass around the coils they create an alternating current. This is then converted into direct current by using diodes, an electronic component that only allows current to flow in one direction, as this is how phones typically charge using a regular power adapter. Wires will then run to a magnetic stand on which one will be able to place their phone and as the bicycle is moving the phone will be charging.

Building this project was a nice experience as I was able to put my physics knowledge into play. I was concurrently taking the electronics course as I was building this project so it was eye opening to see the physics behind some of the components I was using. It was also fun learning how to navigate a CAD software which I used to be able to 3D print most of the components for my project. There were some challenges with this project such as the use of different wires for the coils and making alterations to the 3D printed parts but it was fun learning how to navigate some of these complexities.

After graduation I will be heading back home to southern California. I am hoping to go into industry, so the goal is to find an industry job back home. I do later on have plans to expand my education even further and go to graduate school. I would like to gain some hands-on experience in the workforce for a few years and then look into graduate programs.

Capstone Research:
Revising Learning by Making for the Eighth Grade

By Emily Uhrich - Research Advisor: Prof. Lynn Cominsky



Learning by Making (LbyM) is a current curriculum that exists created by Sonoma State University. It is a program that teaches Science, Technology, Engineering, Mathematics, and Computation (STEM+C) by the ninth grade Next Generation Science Standards (NGSS). This is a unique program in which students can work with their hands, learn lifelong engineering and coding skills, as well as avoid the lecture-memorization that previously dominated adolescent learning. My goal was to create another program within LbyM for the eighth grade NGSS specifically focusing on a week-long unit to cover force and motion.

A majority of my project was finding the right tools for students. This was my first experience with the program so I had to do some background research like completing the ninth grade LbyM curriculum, reading the NGSS for eighth grade, and reading books and articles about scaffolded learning. I then went to work testing sensors and creating a breadboard so that students could work with software and hardware. This was a weeks-long process where I tested multiple types of sensor before landing on a Force Sensitive Resistor so that students could collect data. I ended the semester with a curriculum that starts with a phenomenon to let students observe, proceeds with:

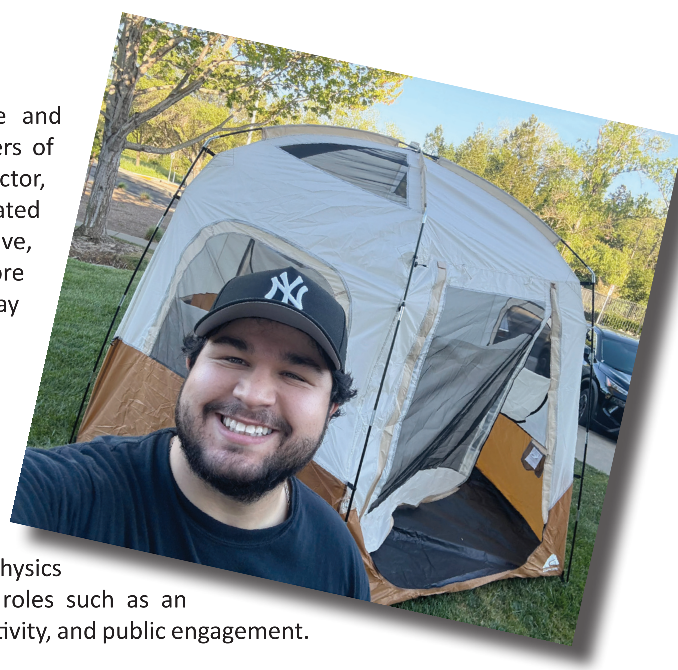
1) exploration activities,

2) a small lecture component to teach knowledge and skills, 3) a lab of my design using force sensitive resistors, and ends with an assessment. Moving forward from undergrad I am exploring opportunities, I am applying to jobs within the University to hopefully stay at SSU! Otherwise I will be going into education.

Capstone Research:
Portable Planetarium

By Logan Rubalcava - Research Advisors:

Dr. Laura Peticolas and Prof. Lynn Cominsky



For my capstone project, I designed and built a portable and affordable planetarium that can be used to bring the wonders of space to schools and educational events. Using a tent, a projector, a laptop, and specially selected projection screen fabric, I created an immersive space experience without the need for expensive, specialized equipment. The goal was to make astronomy more accessible and engaging for kids by providing a fun, hands-on way to learn about the stars and planets.

Throughout the project, I went through many design iterations to balance portability, affordability, and structural integrity. Each version brought new challenges, from finding the right materials to ensuring the structure could be easily transported and quickly assembled. It was a rewarding experience to see the final version come together and to know it could inspire excitement about space. After graduation, I hope to apply my physics education in non- traditional educational settings, pursuing roles such as an exhibit technician or other positions that combine science, creativity, and public engagement.

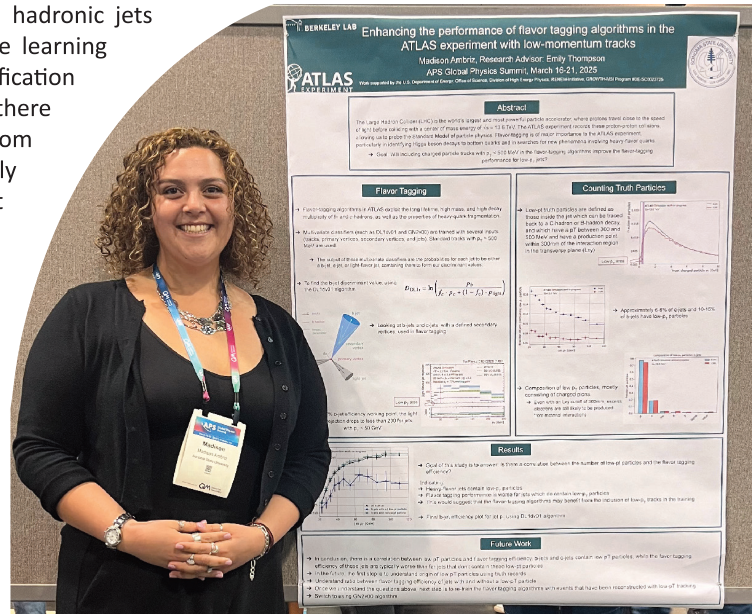
Capstone Research:
Enhancing the performance of flavor tagging algorithms in the ATLAS experiment with low-momentum tracks
By Madison Ambriz - Research Advisor: Prof. Alexandra Miller

The Large Hadron Collider (LHC) is the world's largest and most powerful particle accelerator, where protons travel close to the speed of light before colliding. The ATLAS experiment records these proton-proton collisions, allowing us to probe the Standard Model of particle physics. Flavor-tagging is the identification of jets, I am focusing on identifying bottom quarks, charm quarks, and light-flavored quarks originating from the proton-proton collisions.

Flavor-tagging is of major importance to the ATLAS experiment, particularly in identifying Higgs boson decays to bottom quarks and in searches for new phenomena involving heavy-flavor quarks. Flavor-tagging algorithms in ATLAS take charged particle tracks, primary vertices, and hadronic jets as inputs and train various high-level and low-level machine learning methods to identify heavy-flavor jets. At the 77% b-jet identification efficiency working point of the DL1r flavor-tagging algorithm, there is a drop in the light-jet rejection factor. This may partly result from some decay products of the b- and c-hadrons not being properly reconstructed due to the minimum momentum requirement of 500 MeV in the standard ATLAS track reconstruction. My research is to determine whether including charged particle tracks with momentum less than 500 MeV in the flavor-tagging algorithms can improve the flavor-tagging performance for low-momentum jets.

Some highlights during my project include becoming proficient in coding and data analysis. I was able to learn about jet reconstruction at the LHC while deeply understanding particles physics collisions.

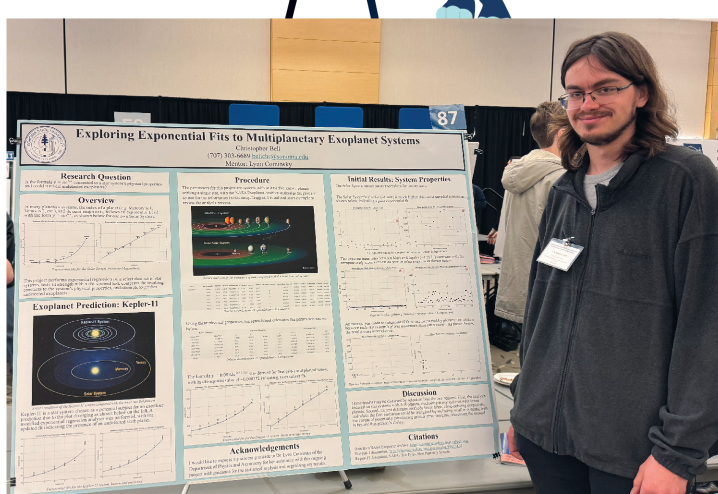
After graduation I plan to work in industry, gaining diverse hands on skills in various disciplines. I hope to eventually attend graduate school for applied mathematics.



Capstone Research:
Exploring Exponential Fits to Multiplanetary Exoplanet Systems
By Christopher Bell - Research Advisor: Prof. Lynn Cominsky

This project explores whether the distances of planets from their stars follow an exponential pattern based on their order from the star, using the formula $y = a\,e^{bx}$. By applying this model to star systems with five or more known planets (including the Solar System), the study analyzes how well the pattern fits using statistical tests and looks for links between the formula's constants and the systems' physical properties. Additionally, this method is also used to test for its use in predicting the presence of undetected exoplanets in these systems.

This project originally began as I explored an interesting trend in planetary orbits I had noticed while doing a worldbuilding project in my free time. As my idle tinkering evolved into a serious project, my exploration for information regarding it uncovered interesting preliminary research that had been published on the topic, and I began seeing potential in this to deliver genuinely interesting results, which it has, and I am interested to see where it will take me from here. Following my graduation, I plan to eventually move on to graduate school and gain a higher degree in physics.



Capstone Research:

Quantum Computing to Solve Complex Problems

By Cliff Williams - Advisor: Prof. Hongtao Shi

There are certain problems that are too complex for classical computers to solve in a reasonable amount of time. For example, RSA (Rivest-Shamir-Adleman) is a widely used public-key cryptosystem that provides a method for secure communication over insecure channels. It relies on the mathematical difficulty of factoring large composite numbers into their prime factors. It would take a classical computer years to decrypt the keys. In 1994 mathematician Peter Shor developed an algorithm using quantum computing logic to solve this problem. Since then, there has been an explosion of research and investment into quantum computing. Other quantum algorithms have since come into existence. For my Capstone project I investigated one such algorithm called Grover's algorithm. This algorithm reduces the number of searches needed to find a number in a list to where N is the list size. A typical search on a classical computer takes on average of searches to find an element in the list. If for example, if we had a list of size of 10,000 it would take a classical computer on average 5,000 searches to find an item in the list, where as a quantum computer would take on the order of 100 searches to find the item.

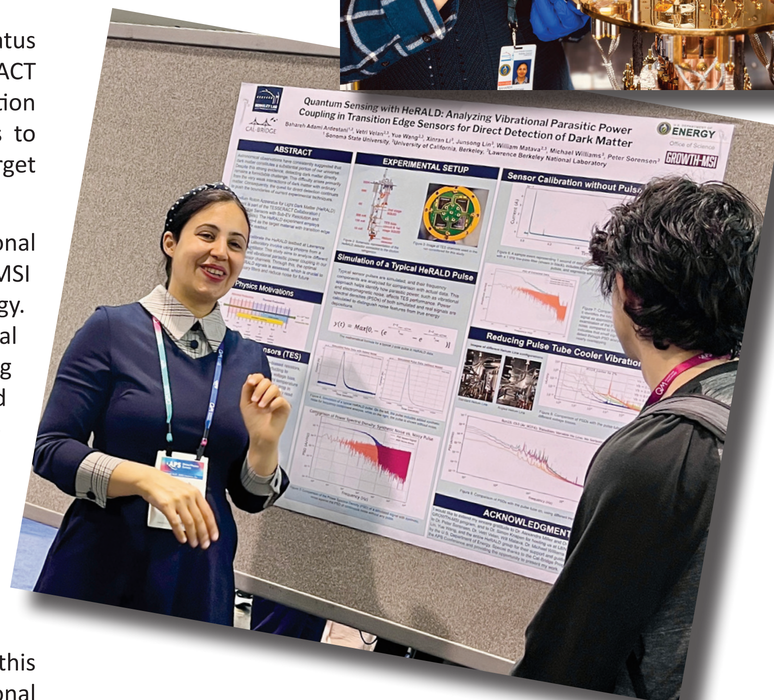
I worked with Dr Shi to strategize on how to approach the research and we developed a plan. My goal was to learn how the quantum algorithm worked and to eventually execute the code against a real IBM quantum computer. The initial part of the project was spent learning the algorithm and understanding the logic. Quantum computers have a basic unit called a qubit. A qubit uses quantum properties such as superposition and entanglement to increase the amount of information within the qubits which can be utilized in various computations. Quantum gates are used to manipulate the qubits to execute the search. There was a lot of trial and error writing the code, but that turned out to be one of my favorite aspects of the project. A very good open-source library, called Qiskit which was built by IBM, is available. This library can be included into Python which gives a user a great set of tools to implement algorithms often referred to as quantum circuits. Once I had the algorithm somewhat figured out, I formalized the procedure and started collecting the data. Initially I executed the code in simulation mode. This allowed me to simulate the quantum algorithm on my computer. I then had a chance to debug and make changes as needed. Data were then collected for both a simulated classical computer search and a simulated quantum computer search. My hypothesis predicted it would take on average to find a number in a list using the classical search. With a quantum search it would take on average searches to find a number in a list. I did 10 runs looking for a random number from lists ranging in size from 4 to 1024. The results matched closely the predictions of the hypothesis. But the real highlight of the project was to execute my quantum circuit against a real quantum computer. IBM has a great setup called the IBM Quantum Platform. It is a web site that gives access to execute your quantum circuits against a real IBM computer. I had access to 3 different quantum computers. In executing my quantum circuit, I started with a list of size 4 in which my implementation of Grover's algorithm was successful in finding the item. But as the size of the list grew the quantum circuit appeared less successful. I suspect that the qubits on the real quantum computers were subject to decoherence which make it more prone to error. More research is needed to investigate this.

I would like to take this opportunity to thank the faculty and staff of the Physics and Astronomy Department at SSU for allowing me to embark upon this amazing learning adventure. As a life-long learner it has been a great experience here at SSU. I have found the faculty to be incredibly knowledgeable and helpful. Also, I have also been very impressed with my fellow students. We live in challenging times, and I think that the education provided here at SSU will help prepare them to meet those challenges.

Capstone Research:
Quantum Sensing with HeRALD: Analyzing Vibrational Parasitic Power Coupling in Transition Edge Sensors for Direct Detection of Dark Matter
By Bahareh Adami Ardestani - Advisor: Prof. Alexandra Miller

Astronomical observations have consistently suggested that dark matter constitutes a substantial portion of our universe. Despite this strong evidence, detecting dark matter directly remains a formidable challenge. This difficulty arises primarily from the very weak interactions of dark matter with ordinary matter. Consequently, the quest for direct detection continues to push the boundaries of current experimental techniques.

I worked on the HeRALD experiment (Helium Roton Apparatus for Light Dark Matter), which is part of the TESSERACT Collaboration (Transition Edge Sensors with Sub-eV Resolution and Cryogenic Targets). The goal of this experiment is to directly detect dark matter using a superfluid helium-4 target with transition edge sensors (TES) for readout.



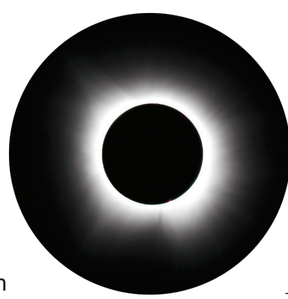
The project was done at Lawrence Berkeley National Laboratory and funded through Dr. Miller's GROWTH-MSI program which is funded by the US Department of Energy. My research focused on analyzing sources of vibrational parasitic power coupling in the TES channels and evaluating how these sources contribute to excess noise. I used photon calibrations from a calcium fluoride scintillator to characterize the signal and noise response in the testbed. From this, I assessed the optimal bandwidth for HeRALD signals, which is essential for designing filters to reduce noise in future experiments.

I presented this work at the APS Global Physics Summit 2025 in Anaheim, where I was recognized as one of the top presenters. Additionally, my proposal to continue this work received an Honorable Mention from the National Science Foundation's Graduate Research Fellowship Program (NSF GRFP).

I will begin my Ph.D. in High Energy Physics at UC Davis in Fall 2025, where I hope to continue contributing to scientific discovery as a scientist.

EdEon's year 2024-2025 in review
By Hannah Hellman

Total solar eclipse



The NASA-funded Eclipse Megamovie 2024 Project recruited hundreds of volunteers to photograph the April 8th, 2024, total solar eclipse. Following the eclipse and over the course of the year we have formally finished the monumental task of collecting data from our volunteers, resulting in nearly two terabytes of eclipse data. The EM2024 team has finished sorting through the data and confirming crucial metadata (such as latitude, longitude, and local time) that must be accurate, or the results of scientific research will not be reliable. As with many things in science research, data accuracy is key. It is worth spending the extra time with your data, and the results are already promising to be spectacular. The text below is taken from the Year 2 Annual Report, submitted by Principal Investigator and EdEon Associate Director Dr. Laura Peticolas:

In Year 2, data collection from the public was completed, resulting in a database of 9,404 photographs of the total solar eclipse taken with 78 cameras (observatories), across the entire path of totality. An additional 13,624 photographs of calibration frames (flats, darks, bias) and photographs of participants' Earth-bound events and camera setups accompanied the volunteers' uploads, totaling 1.19 Terabytes for the entire dataset.

We also held a Kaggle Coding Competition that was open to the public. The competition was established with data from the 2017 dataset, and asked participants to create a Machine Learning model that categorized photographs of total solar eclipses into several different categories. The page for the competition can be found here: *www.kaggle.com/competitions/eclipse-megamovie.*

Community Science event in Ukiah, CA

In October, 2024, EdEon's Director Lynn Cominsky, Associate Director Laura Peticolas, and Communications Specialist Hannah Hellman traveled to Ukiah, CA to hold the first in a series of community engagement events related to the Department of Education Education Innovation and Research grant program-funded STEMACES project.

The EdEon team asked community members what science meant to them and requested input for ways in which we can better facilitate science education and action in rural communities like theirs. Part of the conversation with community members was intended to gauge how we can help facilitate better relationships with science and technology in small communities.

Here is some of what we heard from them:

How do you feel the future of science will impact you and/or your family?

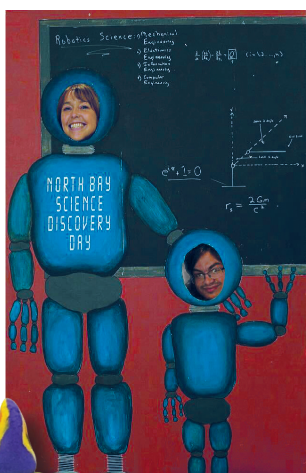
"As educators, we will continue to promote science."
"Greatly!"
"[It will] improve the world for future generations with conservation, medicine, technology, etc."
"I'm worried not enough people will value it."

What does science mean to you?

"Processes that have been proven by research and experimentation."
"Exploration of ideas/hypotheses."
"A framework on which to base our important decisions."
"Good decisions based on evidence"
"Process of exploring ideas to satisfy an individual or group's curiosity."
"Enhancing our environment."
"Informed citizens/hope for [the] future."

STEMACES Summer Institute

EdEon hosted the first-ever STEMACES teacher training Summer Institute in July, 2024. We have hosted many Summer Institutes for our 9^{th} Grade Learning by Making teachers, but this was the first we have had the opportunity to host for our Pilot 8^{th} Grade STEMACES teachers. It was such a joy to get to know our Pilot teachers better and to receive their feedback on our planned activities and educational content. The STEMACES project is now recruiting 8^{th} Grade teachers and schools for the first and second cohorts of the study being conducted by our partner, WestEd, in the Fall of next year.

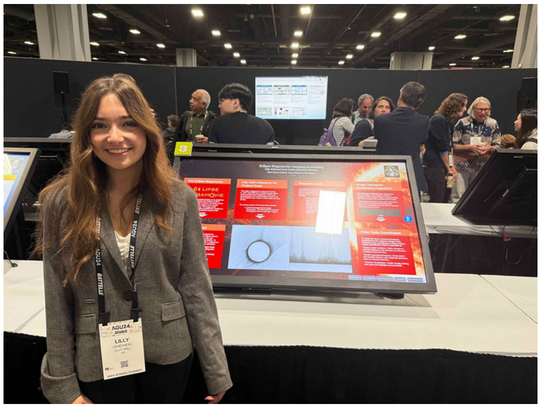


Discovery Day

In March of this year, EdEon's AC Robert Martinez and students Christopher Bell, Logan Rubaclava, and Katherine Bradley attended the public education event North Bay Science Discovery Day. The event was organized by the University of California and held at the Sonoma County Fairgrounds. This huge event saw nearly 12,000 children and adult attendees and featured 107 exhibitors who offered more than 150 hands-on activities. Robert, Christopher, Logan, and Katherine hosted the Pulsar Activity, which has long been a child and adult favorite at events like this one.

N3 Interns Present at Conferences

In May, *Finn Braun and Krista Heinemann* presented at the National Space Society (NSS) International Space Development Conference (ISDC-2024) in Los Angeles, CA. Both Finn and Krista were mentored by Dr. Pascal Lee, Planetary Scientist at the SETI Institute and Chair of the Mars Institute. Under Dr. Lee's mentorship, Finn worked with a CAD program and co-authored the paper "An ATV for the Moon" with Dr. Lee. Krista co-authored the paper "New location for the 'Noctis Landing' candidate human landing site on Mars" in which she used NASA data to refine a possible landing location for future human missions to Mars' surface.



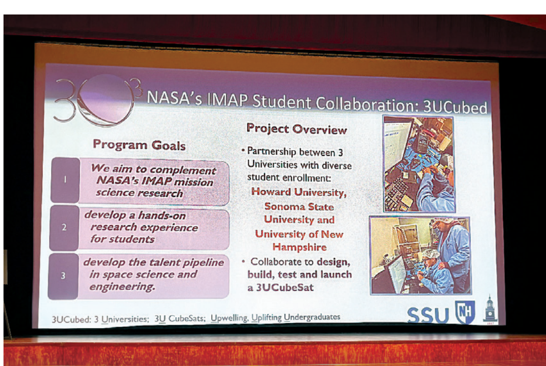
In December, *Lillian Hall* presented at the 2024 American Geophysical Union conference in Washington, DC. Lilly's work involved assisting Dr. Martinez Oliveros and other researchers in implementing a robust pipeline involving image calibration, registration, and co-location.

Isabelle Hsu (2022 intern) went to *Lunar and Planetary Science Conference* with her mentor Dr. Deborah Domingue in 2023. Luke Landy attended but did not present.

CDW (Cubesat Development Workshop) in San Luis Obispo

by Jonathan Perez, Aaron J. Estrada, and Jennifer Ortiz

EdEon students Aaron Estrada and Jennifer Ortiz presented on behalf of the 3UCubed Communications Team from Sonoma State University at the 2025 Cube Satellite Workshop hosted by Cal Poly San Luis Obispo. Their presentation focused on the CubeSat ground station development under NASA's IMAP Student Collaboration program, showcasing the system architecture, UHF communication roles, and rigorous component testing. They detailed the integration of software-defined radio (BladeRF), antenna arrays, and telemetry processing using EnduroSat's onboard computer systems. The experience was both inspiring and rewarding for Aaron and Jen—they received numerous accolades and commendations from faculty, professionals, and fellow students for their work. One particularly memorable moment came after the talk, when a group of CubeSat students from the University of Delaware approached them backstage with enthusiasm and technical questions about our ground station.



"It was an incredible opportunity to represent our team, contribute to NASA's mission goals, and engage with leaders from organizations like NASA and the Canadian Space Agency who are shaping the future of small satellite innovation." -Aaron Estrada

"As one of the few women presenting on technical systems, I felt proud to represent both my team and the growing presence of women in space engineering. The experience strengthened my passion for space science and affirmed my commitment to pursuing innovation in the satellite communications field." - Jennifer Ortiz

Prof. Lynn Cominsky retires after 39 years,
Dr. Laura Peticolas steps into Directorship, and EdEon welcomes Associate Director Dr. Raquell Holmes!

By Hannah Hellman

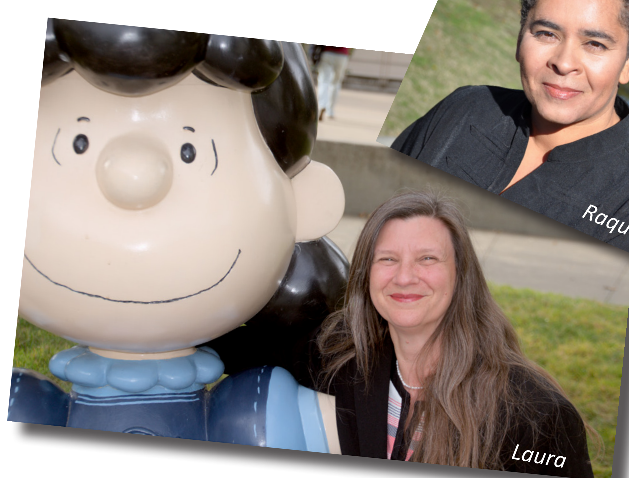
Prof. Lynn Cominsky has served Sonoma State University in one way or another for the last 39 years and will enter the Faculty Early Retirement Program (FERP) in August (despite her retirement not actually being early), in order to continue to support EdEon half-time for up to five years.

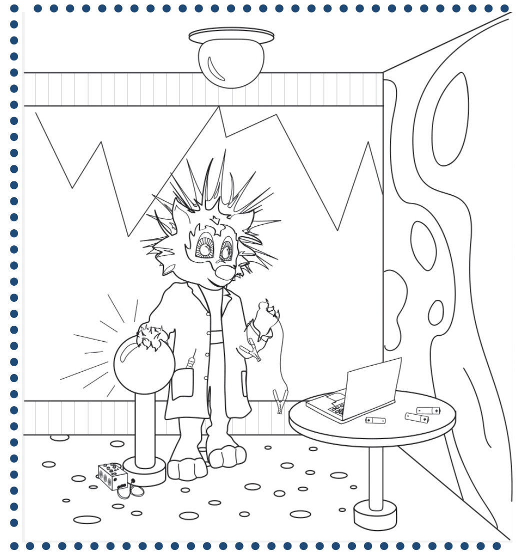
In 1982, Lynn's first experience at SSU was teaching a 4-unit physics class as a lecturer. Lynn joined SSU as tenure-track faculty in Fall 1986 because she greatly appreciated SSU's teaching-centered focus and liberal arts and sciences mission. When she first joined, research grants at SSU were rare, but Lynn would go on to win SSU's first federally-funded research grant soon after signing her contract. Lynn won SSU's Outstanding Professor award in 1993 and began to join several NASA missions as leader of their education programs beginning in the mid 1990s. As a result of this funding, EdEon (known then as SSU's Education and Public outreach group) was born. The group, with the addition of Dr. Laura Peticolas and her projects in 2017, has brought more than $45 million to Sonoma State University as of 2025.

With the support of her late husband Garrett Jernigan and Susan Wandling, Lynn brought the way that scientists do science into the classroom long before the science standards began suggesting this method on a state and national scale in the classroom. Lynn also, as part of her first NASA grant, brought the first email server to SSU, which the university used as its primary IT system for some time. For the last 39 years, Lynn has emphasized and prioritized hands-on learning for students across STEM fields of study. This way of doing science was brought into her national NASA grants as well as here at SSU helping in the creation of the Engineering program (with Dean Saeid Rahimi); the building of a research-grade robotic telescope observatory with NASA funding at the Pepperwood Preserve; writing the grant proposals that created both Science 120 and Science 220 and the library Makerspace. More than any other project, though, Lynn considers some of her most important work to be taking place as part of the NASA-funded Neurodiversity Network (N3). This project both redesigns preexisting NASA educational material for neurodiverse audiences and offers autistic high school students the opportunity to work with NASA scientists.

In November 2017, Laura joined the group after leaving UC Berkeley to work closely with Lynn as the Associate Director. At the end of this summer, Lynn will be retiring as Director, stepping into her new role as Director Emeritus. She will continue to work to serve neurodivergent youth and young adults, support EdEon proposal efforts, and advise on EdEon work. After working closely with Lynn for almost eight years, Laura will take on the leadership of EdEon, bringing funding to SSU and working to improve science education locally and across the US, with a focus on rural, high-need, populations. With the LbyM team, Laura was awarded nearly $8 million from the Department of Education's Education Innovation Research program in late 2023 to continue the work that EdEon's LbyM began. In addition to the STEM+C education development work, Laura has also led the charge to secure NASA funding for Heliophysics research as part of the Eclipse Megamovie 2024 and the Interstellar Mapping of Accelerated Particles Mission's Student Collaboration 3UCubed projects.

As Laura steps into the role of Director, EdEon welcomes Dr. Raquell Holmes to her new role as Associate Director. Raquell is a computational cell biologist and a pioneer in building inclusive, developmental science communities with improvisation. She brings robust experience helping teams to evolve, transition, and enhance creativity and well-being. Over the past 30 years, Raquell's' work has been with national networks of scientists in the computational sciences including biology, chemistry, physics and engineering. She is known for creating multi-racial, collaborative environments in which scientists, engineers and students lead with their passions. As EdEon leadership enters a period of change in the ways we have secured funding, Raquell's networks and expertise in adapting and building in creative ways will offer a distinct advantage in the current funding climate. Her passion is to bring her network of professional relationships nationally to benefit education and research at SSU and Sonoma County. She continues to influence community engagement and professional development nationally through such groups as the Society of Physics Students and Sonoma County conferences.





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