



ACADEMIC PROGRAMS QUARTERLY

Volume 3 | Number 3 | September 2026

Welcome to the September issue of the *Academic Programs Quarterly* (APQ). This edition features a forward-looking program vision, introductions to the incoming graduate fellowship classes, a published research milestone from our academic pipeline, and vibrant community highlights from workshops and summer programs.

The lead article introduces the Defense Programs Academic Alliance (DPAA), a new structure for NNSA's Academic Programs. By consolidating strengths into university consortia aligned with Experimental Sciences, Advanced Simulation and Computing, and Engineering & Technology Maturation, DPAA deepens laboratory-university collaboration, broadens participation, and standardizes awards for long-term predictability—positioning our



We are pleased to introduce the 2026-2027 SSGF and LRGF classes in this issue (pages 3-4).

partnerships for enduring success. Throughout the transition to DPAA, our commitment to our academic partners remains strong.

This issue also welcomes the 2026-2027 classes of the Stockpile Science Graduate Fellowship (SSGF) (formerly the Stewardship Science Graduate Fellowship) and Laboratory Residency Graduate Fellowship (LRGF), both sustaining a robust pipeline to the Nuclear Security Enterprise (NSE). SSGF and LRGF fellows engage in cutting-edge research, collaborate with national laboratories, and receive hands-on training for leadership roles in science and engineering. These fellowships support academic excellence and ensure the NSE benefits from a steady influx of talented, mission-driven scientists and engineers.

We celebrate the research excellence of Eleanor Ronning, a Stewardship Science Academic Alliances alumna whose thesis work is now published in *Nature*: “Magnetic character of the low-energy enhancement in ^{70}Zn .” Her study clarifies how magnetism drives the low-energy boost in the gamma-ray strength function—answering a long-standing question and sharpening predictive models. It’s an inspiring example of how our academic investments produce discoveries that matter.

Don’t miss the highlights at the end of this issue: the 2026 ZNetUS Workshop, the Student Spotlight on Kurt Cantrell (Vanderbilt University) and the hands-on, mission-relevant training, and community programs like the University of California Davis Science Apprenticeship Program and the High Energy Density Summer School held at the University of Michigan.

As we transition to the DPAA, we expect that the cadence and content of this newsletter may change. Nevertheless, we look forward to continuing our engagement with the academic community through new channels and platforms that help share exciting news about our program. Exciting opportunities lie ahead to engage with NNSA and shape the future of stockpile science.

David A. LaGrafte, PhD
Principal Assistant Deputy
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and Evaluation

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2026 CALENDAR

- 10/11-14 [APS Division of Nuclear Physics Meeting](#), Philadelphia, PA
- 11/2-6 [68th Annual Meeting of the APS Division of Plasma Physics](#), Chicago, IL
- 11/15-20 [2026 International Conference for High Performance Computing, Networking, Storage, and Analysis \(SC26\)](#), Chicago, IL

Academic Programs Quarterly (APQ) highlights the academic programs supported by the Department of Energy/National Nuclear Security Administration. APQ is published quarterly by the Defense Programs Office of Research, Development, Test, and Evaluation. Questions and comments regarding this publication should be directed to Terri Stone at terri.stone@nnsa.doe.gov. Learn about the NNSA Academic Programs at <https://www.nnsa-ap.us>.

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*Contractor Support

A New Era for Academic Programs: Introducing the Defense Programs Academic Alliance *by Noah Stevens (Federal Program Manager)*

On behalf of the National Nuclear Security Administration's (NNSA) Office of Research, Development, Test, and Evaluation (NA-11), I am excited to share a bold new vision for our Academic Programs portfolio. Starting in fiscal year 2028, NNSA will relaunch its university research programs under the banner of the Defense Programs Academic Alliance (DPAA). The transition to DPAA is expected to take place over the course of 2026-2027 and will result in an innovative and focused university research program fit for a new era in the Defense Programs mission.

Throughout this transition, NNSA's commitment to our academic partners remains strong. While the name and structure of the program will change, its core objectives will not. The DPAA will build on our academic programs' decades of achievement in advancing relevant scientific research and sustaining a critical workforce pipeline for the nuclear security enterprise. Importantly, it will position NNSA for strong and enduring university partnerships for decades to come. We look forward to continuing the research collaborations that have created such a strong foundation.

To achieve these goals, the DPAA model is anchored around three, five-year funding opportunities aimed at developing university-based consortia aligned to NA-11's core programs: Experimental Sciences, Advanced Simulation and Computing, and Engineering and Technology Maturation. I am excited to share that the first notice of funding opportunity, geared toward supporting new consortia in advanced engineering, will be announced next year for awards starting in FY 2028. Once awarded, these consortia will fill a longstanding gap in university research support to elements across Defense Programs with interests in applied engineering, materials discovery and characterization (e.g., alloys and energetics), and production and manufacturing science. Looking

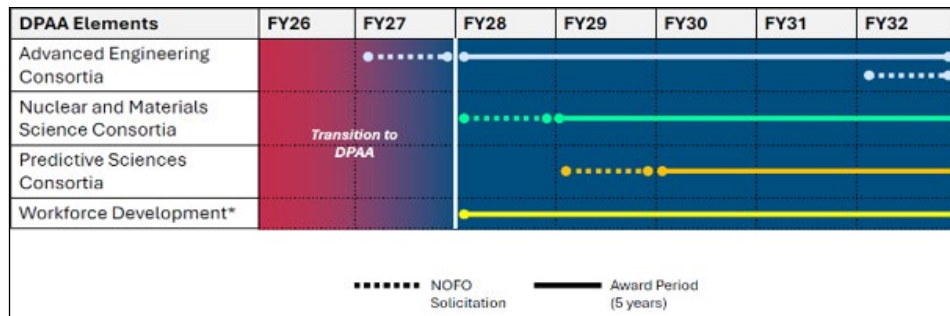


Figure 1. Planned award timeline under the Defense Programs Academic Alliance.

"With NNSA labs as meaningful partners and contributors within the DPAA consortia, on-site research experience for students and lab-university technical exchanges will remain essential components of our program. Likewise, the program will continue to provide support for graduate student fellowships in STEM, which have proven an extremely effective tool for developing the next generation of scientists and engineers—many of whom go on to lead within the nuclear security enterprise."

ahead, similar opportunities will be announced for additional consortia in high energy density, nuclear and materials science (in FY 2029) as well as predictive science (in FY 2030). DPAA awards to university consortia in these research areas will replace the individual grants and centers awarded today under the Stewardship Science Academic Alliance, High Energy Density Laboratory Plasmas Program, and Predictive Science Academic Alliance programs.

NNSA intends for the development of strong consortia to allow a wide range of U.S. universities to partner and aggregate their diverse expertise and capabilities to advance mission-relevant research. We are also committed to preserving the strong linkages to NA-11 programs and NNSA laboratories, plants, and sites that help maximize these

investments. With NNSA labs as meaningful partners and contributors within the DPAA consortia, on-site research experience for students and lab-university technical exchanges will remain essential components of our program. Likewise, the program will continue to provide support for graduate student fellowships in STEM, which have proven an extremely effective tool for developing the next generation of scientists and engineers — many of whom go on to lead within the nuclear security enterprise.

I acknowledge that this change may generate unease among some in our community, particularly at a time of significant uncertainty for higher-education research. Change is not easy, but rest assured that NNSA is not getting out of the game. Instead, we are taking this opportunity to strengthen our academic programs and make them more sustainable for the future. In doing so we will reduce the management burden at NNSA, strengthen the role of Historically Black and Tribal Colleges and Universities in our program, and standardize our award structure to provide greater predictability over the long term.

Since the earliest days of the Manhattan Project, U.S. universities have made profound contributions to atomic science and national security. Today, an innovative and engaged university research base provides our nation with a competitive edge in an increasingly volatile world and is an essential element of our deterrent. I have no doubt that will continue to be the case under the Defense Programs Academic Alliance. We at NNSA are eager to strengthen those partnerships in the years ahead.

Stockpile Science Graduate Fellowship and Laboratory Residency Graduate Fellowship 2026-2027

Classes by The Krell Institute

Eight doctoral candidates will join the Department of Energy/National Nuclear Security Administration (DOE/NNSA) Stockpile Science Graduate Fellowship (SSGF) and Laboratory Residency Graduate Fellowship (LRGF) this fall (Figures 1 and 2). SSGF recipients research high energy density physics, nuclear science and properties of materials under extreme conditions. Each serves a 12-week practicum at an NNSA laboratory. LRGF recipients study engineering and applied sciences, physics, materials, and mathematics and computational science. Their program includes a minimum of two residencies, and fellows are encouraged to collaborate with national lab personnel. All fellows receive tuition, a stipend and other benefits. Summaries of the new fellows' research statements follow.

Stockpile Science Graduate Fellowship

Reliable cross sections for unstable nuclei are critical for constraining nuclear reaction models used in stockpile science, but data for many key radionuclides are unavailable. To deliver high-purity rare-isotope targets for precision reaction measurements, **Katherine Austin** at Michigan State University (MSU) is using aqueous isotope harvesting at the university's Facility for Rare Isotope Beams. Working with Gregory Severin, she will use Nickel-58, Molybdenum-92, Hafnium-174 and Calcium-48 primary ion beams to produce parent isotopes Chromium-48, Zirconium-88, Hafnium-173 and Calcium-47, respectively, which can be harvested to construct generators yielding Vanadium-48, Yttrium-88, Lutetium-173 and Scandium-47. She has assisted in solid-target harvesting experiments, including the recovery of Calcium-47 from irradiated aluminum foils, and evaluated multiple generator designs to yield Scandium-47. In other work, she gained expertise in nuclear detection, radiochemical separations and generator optimization. Once isotopes are harvested, she will collaborate with Los Alamos National Laboratory



Figure 1. 2026-2027 SSGF Fellows (L-R): Megan Ikeya (Princeton), Brendan McCluskey (Princeton), and Katherine Austin (MSU). Not pictured: Levi Hancock

researchers on cross-sectional measurements.

In inertial confinement fusion (ICF), contemporary designs use nanostructured polymer foams to house and distribute fuel and to tailor shock propagation, yet design optimization remains largely empirical. Radiation hydrodynamics simulations can guide design but lack sufficient data on 3D mass density and on constitutive information for the length scales at which pore geometry and wall thickness control hydrodynamic behavior. **Levi Hancock** at the Massachusetts Institute of Technology is closing this gap between predictive simulation and target fabrication. Working with Johan Frenje, he uses ptychographic X-ray computed tomography to reconstruct high-resolution 3D mass density mappings of fusion-relevant foams. The resulting reconstructions approach 20-nanometer resolution and are now informing simulation efforts for capsules shot at the National Ignition Facility (NIF). He will develop a physics-guided machine learning framework that links foam geometry to shock-wave response and enables inverse design of foam microstructure to optimize shock timing, compression symmetry and manufacturability.

Megan Ikeya uses cryogenic liquid jets of her own construction to study high energy density physics and ion-matter interactions under extreme conditions. Unlike foil targets, cryojets enable controlled, statistically meaningful high-repetition-rate experiments. At SLAC National Accelerator Laboratory's petawatt-class laser facility, she built, operated and fielded cryogenic hydrogen and argon jets and demonstrated that they

can be reproducible, high-performance heavy-ion sources by measuring ion energy spectra, divergence and charge states. With Julia Mikhailova at Princeton University (Princeton), she will study how heavy-ion beams deposit energy and damage matter under extreme conditions, knowledge that's vital for understanding metals and alloys used in nuclear and high energy density environments. She will use her experimental results to replace idealized sources in molecular-dynamics models that predict defect production, clustering and lattice disorder. She will also apply for beam time at high-power laser facilities suitable for heavy-ion generation and diagnostics that will enable in situ X-ray probes of radiation damage from heavy ions over time.

Biermann battery magnetic fields can spontaneously arise in high energy density experiments in which high-intensity lasers are incident on solid targets, affecting the global evolution of key plasma parameters such as temperature and density. Dr. William Fox's group, with team members at Princeton University and the University of Maryland, recently achieved the first 3D tomographic measurements of these fields. They found strong fields pervading the plasma, challenging magnetohydrodynamic simulations and suggesting that such fields may influence plasma dynamics. Primarily through experiments at the Omega Laser Facility, **Brendan McCluskey** works with Fox to study the self-generation of these magnetic fields and how they impact heat transport and plasma evolution. He developed a novel analysis technique to calculate plasma density, which enables direct comparison of plasma density evolution to the Biermann fields. He also designed and led experiments at Omega measuring plasma density and temperature. He will combine these data with magnetic field measurements to evaluate the relative importance of magnetic and kinetic transport effects.

Laboratory Residency Graduate Fellowship

To increase ICF yields for a practical power source, researchers will have to mitigate fuel capsule implosion asymmetries and the resulting

residual kinetic energy (RKE). Toward these goals, **Brandan Buschmann** studies low-mode ICF implosion asymmetries with Johan Frenje at the Massachusetts Institute of Technology (MIT) and will extend his research in residencies with Daniel Casey at Lawrence Livermore National Laboratory. In experiments at the Omega Laser Facility, he has sought a quantitative relationship between RKE and asymmetries in direct-drive implosions. He plans the first-ever comparison of such results to prevailing theories and implosion models and proposes experiments relevant to indirect-drive research at NIF. Aiming for a machine learning method to help guide the NIF ignition program, he is further developing an algorithm that reconstructs ICF implosions. Having integrated data from 3D neutron imaging, real-time neutron activation diagnostics and neutron time-of-flight, he intends to include more data types.

In research on ICF, **Erica Garcia Badaracco** uses simplified experiments and models to explore processes that might generate electromagnetic fields and to resolve discrepancies between simulations and experiments. With Eleanor Tubman at the University of California, Berkeley, she studies electromagnetic fields and filament instabilities at the Omega Laser Facility. She focuses on laser-driven plasmas from planar foils, whose simplified geometry allows proton probing of the fields perpendicular and parallel to the foil, leading to an improved model of the electric and magnetic fields. Deploying Thomson scattering, she infers local plasma temperatures and densities, which are clues to the instabilities' seed mechanisms. In residencies at Livermore, she will work with Joseph Ralph at NIF to add plasma dynamics to computational models of X-ray flux in the hohlraum implosion targets and to bring physics models into closer alignment with experiments.

Additive manufacturing (AM) introduces microstructural heterogeneity that can diminish performance in aerospace and defense applications. With Naresh Thadhani at Georgia Institute of Technology



Figure 2. 2026-2027 LRGF Fellows (L-R): Brandan Buschmann (MIT), Georgia Hilburn (Georgia Tech), and Caleb Redshaw (Stanford). Not pictured: Erica Garcia Badaracco

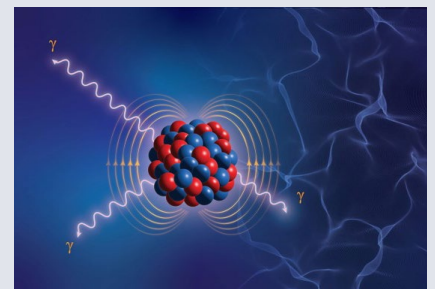
(Georgia Tech), **Georgia Hilburn** investigates the dynamic behavior of an alternative titanium alloy called Ti-5553. Post-processing heat treatments of AM Ti-5553 induce changes between two structural phases, enabling controlled tuning of the phase ratio and the resulting mechanical properties. Previous studies disagree whether such treatments strengthen or weaken the material. Hilburn seeks to resolve this discrepancy by producing AM Ti-5553 samples with a range of phase fractions, characterizing their microstructures and incorporating the data into mesoscale simulations to predict shock-wave interactions, elastic-plastic transitions and spall signatures. She then carries out plate-impact experiments to determine the Hugoniot elastic limit and spall strength and to gather evidence of phase transformations and damage evolution. Residencies with Paul Specht at Sandia National Laboratories will speed experimentation through access to expertise, advanced hydrocodes and more.

Collisionless shocks are relevant to astrophysics and national security. During these events, thermal ions can reach extremely high energies via diffusive shock acceleration (DSA); however, this mechanism affects only ions that are already highly energetic. They are said to have achieved the DSA injection threshold. The dominant process that accelerates ions above this threshold is unclear, particularly for quasiperpendicular shocks. In support of experiments at the Omega Laser Facility, **Caleb Redshaw** will work to identify this process through high-fidelity 3D simulations of collisionless shocks, which until recently carried

a prohibitively high computational cost. With Matthew Edwards at Stanford University, he will evaluate two candidate mechanisms, shock drift acceleration and shock surfing acceleration. In residencies with Hye-Sook Park at Livermore, he will work with the Omega experimental team and have access to high-performance computing. Based on data and observations from the simulations, he will identify signatures of the candidate mechanisms in the experimental data.

Magnetic Character of the Low-Energy Enhancement in ^{70}Zn

A former Stewardship Science Academic Alliances (SSAA) graduate student, Eleanor Ronning, recently published a paper based on her thesis research in *Nature* titled *Magnetic character of the low-energy enhancement in ^{70}Zn* . Dr. Ronning was funded through an SSAA grant led by Professors Sean Liddick and Artemis Spyrou at Michigan State University. This paper describes how an atomic nucleus releases energy by emitting photons, and how the chance of this happening depends on certain nuclear properties. Scientists call this the gamma-ray strength function. They found that for the nucleus of ^{70}Zn , there is a boost in the gamma-ray strength at low energies, which is due to magnetic dipole transitions. This discovery answers a big question about gamma-ray strength functions in nuclei and helps us better predict nuclear behavior. You can find the publication [here](#).



The nature of the low-energy enhancement was conclusively demonstrated using separated β -decaying states at the Facility for Rare Isotope Beams.

Academic Programs Highlights

► Student Spotlight | Predictive Science Academic Alliance Program

Kurt Cantrell (kurt.b.cantrell@vanderbilt.edu) | Vanderbilt University

Degree in Progress: *PhD, Electrical and Computer Engineering* | **Advisor:** *Dr. James Trippe* | **PSAAP Program:** *2025-Present*

Research Topic

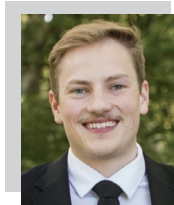
Radiation Effects in Microelectronics

Research

Responsibilities

I joined Vanderbilt University as a PhD student after earning my master's degree in electrical engineering in 2025. I joined the Center for Advancing the Radiation Resilience of Electronics (CARRE) at Oregon State University through the Predictive Science Academic Alliance Program in 2026. My research focuses on understanding the mechanisms leading to failure of electronic devices in harsh radiation environments as well as quantifying how often those failures occur.

Microelectronics are a critical part of every modern system relevant to science and national security. Many of these systems operate in environments where they are exposed to radiation, including outer space. Electronics can experience failures as ionizing



radiation interacts with the materials that make up the device. These can be catastrophic—a single bit in a system can be responsible for a critical function while a power device can even literally blow up.

My work attacks the problem from both sides using radiation transport tools. I gain understanding of how devices fail by simulating the propagation of particles through the microelectronic system. By using data collected with terrestrial facilities such as heavy ion cyclotrons, I build a model of the device which accounts for where the radiation deposits energy. I then take that model and simulate the effect of the space radiation field on the device to predict how and why it will fail. I have improved existing results by better taking into account the properties of the incoming radiation, e.g., in SiC power devices, I have shown much better agreement with neutron data using ion-calibrated models by using a filter that preferentially selects strikes orthogonal to the drain-source junction. My work has directly contributed to

efforts at Sandia National Laboratories to better understand radiation-induced failures in emerging microelectronics technology.

The CARRE is developing a next-generation radiation transport code for understanding radiation effects in microelectronics. My models will be included in the code to better connect the path a particle takes to the resulting electronic failure. They will also be used to better understand the data taken in the lab to validate the CARRE code.

What Students Considering PSAAP Should Know

The PSAAP program facilitates interdisciplinary teamwork across various organizations, including partner universities and national laboratories. Working with groups outside of my background, such as the Verification, Validation, and Uncertainty Quantification (VVUQ) group, has enabled me to rethink established solutions and contribute to new approaches.

► Z-Pinch Network US

2026 Z-Pinch Network US Workshop Highlights Scientific Progress and Future Opportunities

The two-day 2026 ZNetUS Workshop was held in Albuquerque, New Mexico, from August 10-11, 2026. The workshop provided a valuable forum for participants to present scientific results from the two most recent user facility calls and to discuss new ideas for future research directions.

A total of 85 researchers participated in the event that included 33 invited presentations from representatives of government agencies, universities, and industry, along with 27 poster presentations by students ranging from the undergraduate through postdoctoral level.

New this time was the award of two best student posters: Joshua Morgan for his development of an ultra-fast

x-ray imaging camera, and Luke Filor for demonstrating current pulse shortening on a new dynamic switching platform.

The National Nuclear Security Administration (NNSA) supported travel and registration for 22 students and principal investigators, half of whom also participated in the subsequent Z Fundamental Science (ZFS) meeting. The workshop aimed to broaden the ZNetUS user community and encourage new user proposals ahead of the third call for proposals, opening around October 1, 2026. For the first time, research presented at the workshop will be featured in a peer-reviewed special issue of IEEE Transactions on Plasma Science, highlighting the significance and



Best student poster awards: (left-right) Joshua Morgan (Caltech), Luke Filor (Cornell), and Jens Schwarz (Chair, ZNetUS).

impact of the meeting's scientific contributions.

► High Energy Density Summer School | University of Michigan

2026 High Energy Density Summer School

The University of Michigan (UM) welcomed graduate students, postdoctoral researchers, and early-career scientists from around the world for the 2026 High Energy Density Summer School (HEDSS), an immersive program introducing participants to the theory, experiments, and applications that define the rapidly evolving field of high-energy-density physics.

Hosted by the Department of Nuclear Engineering and Radiological Sciences (NERS) and the Center for High Energy Density Laboratory Astrophysics, directed by Professor Carolyn Kuranz, the 10-day program combined expert-led lectures with opportunities to connect with researchers and tour world-class experimental facilities, including the NSF-ZEUS laser and MAIZE facilities. Participants were also treated to a tour of the University of Michigan Football Stadium, also known as *The Big House*.

"HEDSS was quite an amazing experience. Expert scientists in their



HEDSS participants took a break from the classroom and the lab to tour Michigan Stadium, aka the Big House.

respective fields took the time to go through the most fundamental concepts in high-energy density physics in a digestible manner, delivering their lectures to an audience spanning diverse backgrounds and career stages, from undergraduates to senior researchers," said Dalir Kosimov, a PhD student at the University of York.

HEDSS provides a strong foundation in the physics governing matter under extreme conditions. Participants explored topics including plasma physics, shocks, hydrodynamic instabilities, radiation hydrodynamics, inertial fusion, laboratory astrophysics, magnetohydrodynamics, and relativistic systems through lectures delivered by leading researchers.

Beyond the classroom, attendees engaged with faculty, researchers, and fellow participants throughout the program.

"HEDSS provided in two weeks a depth and breadth of study which otherwise can only be built through years of targeted coursework and research," said McKenna Breddan, a

postdoctoral researcher with the UM Computational Autonomy Laboratory. "I highly recommend the summer school to students and young professionals working with high-energy-density systems." By bringing together experts and emerging researchers, HEDSS helps prepare the next generation of scientists to tackle challenges in fusion energy, laboratory astrophysics, national security, advanced materials, and other applications that rely on understanding matter at extreme temperatures and pressures.

The U.S. Department of Energy National Nuclear Security Administration supported the program by providing travel for several students.

► Science Apprenticeship Program | University of California Davis

2026 Science Apprenticeship Program

The National Nuclear Security Administration (NNSA)-supported Science Apprenticeship Program at the University of California (UC) Davis offers local high school students hands-on experience in STEM research, coding, and engineering.



2026 Science Apprenticeship Program: Maddie Goss, Emily Bely, Farah Osmani, Mario Ortiz, Nakoa Burr, Quinten Decker, Christian Palmos, Samuel Ching, Anna Yamaletdinova, Brayden Crouch, Olivia Southwick, and Julien Tientcheu.

"I had so much fun during the UC Davis internship. I was able to experience a professional work environment... I learned to code and was even able to build and fly a rocket. I would recommend this to anyone."

Quinten Decker, Student

"Being able to experience a college campus, high-level instruction and many interactive projects was such a privilege... I was impressed and proud of all of the participants."

Andrea Southwick, Parent

Since 2018, NNSA has supported this internship program in conjunction with the condensed matter physics group at UC Davis, involving faculty mentors, high school instructors, undergraduate and graduate teaching assistants, and support from local drone clubs. The program emphasizes learning through activities such

"The UC Davis summer program had a huge impact on my academic direction... The program helped me discover my interests and motivated me to become more involved in STEM."

Bryce Lu, Alumnus

"That experience taught me how to break down complex physical systems, test variables, and clearly communicate technical behavior. Those same skills now show up in my work as a Risk Associate & Account Engineer."

Alisha Vikash, Alumna

as rocket launches, drone piloting, coding in Python and C, and tours of university physics labs. Students are recruited from computer science and robotics classes, and the program aims to introduce them to college life and advanced STEM topics. For more information, visit <https://taufourlab.faculty.ucdavis.edu/hsap2026/>.