



Department of Physics and Engineering

Alumni Newsletter

Featured Alumnus: William Taylor



William Taylor is a highly accomplished professional with a strong background in engineering and project management. He graduated from the University of Scranton in 2005, earning a Bachelor of Science in Computer Engineering. Soon after graduation, William joined BAE Systems as part of their Engineering Leadership Development Program, where he gained valuable experience through various rotations.

During his time at BAE Systems, William worked on critical initiatives, including the procurement and testing of obsolete components for Boeing Commercial Electronics Proximity Sensor Electronic Unit as a HW Engineer.

William also took on the role of leading the External Fault Design Assurance Testing efforts for the Joint Strike Fighter alternate engine. Additionally, William oversaw the thermal testing of the Propulsion Control System for the Hybrid Electric Bus as a System Engineer. He later was involved in the early development of the Remote Guardian System for the V22-Osprey. William concluded his tenure at BAE Systems in Business Development, where he focused on engineering and demonstrating on-board vehicle power for military and commercial platforms.

Seeking new challenges, William joined Consolidated Edison of New York as a Senior Engineer in their Distribution Engineering Supervisory Control and Data Acquisition (SCADA) Department. In this role, he was responsible for establishing robust communication pathways between the Control Center and field devices, such as overhead and underground switches, and pole-top routers. He developed HMI screens to control these field devices and effectively programmed radios, master sites, and remote terminal units to ensure seamless communication within a 100ms timeframe.

With a desire to engage directly with customers, William transitioned to the role of Customer Project Manager in Energy Services at Consolidated Edison. In this capacity, he worked closely with high-profile customers such as the Metro Transit Authority, hospitals, and NYC skyscrapers. William successfully coordinated the safe and timely installation of new business electric services and managed the repair and maintenance of existing services. He ensured that all electrical installations were compliant with company specifications, operating procedures, and engineering plans.

Driven by his passion for working in a control center environment, William later assumed the position of Senior District Operator in System Operations at Consolidated Edison's Electric Control Center. Here his primary responsibilities included processing primary and bulk feeders ranging from 4kV to 500KV, as well as overseeing substation switching. He prioritized safety, ensuring the continuity of service to customers and preventing equipment damage.

Currently, William holds the position of Project Manager for Distributed Energy Resource Operations at Consolidated Edison. His main focus is to prepare the company to comply with FERC Order 2222. In this capacity, he is responsible for registering, enrolling, and ensuring no inadvertent system impact, allowing an aggregation of DERs (Distributed Energy Resources) to participate in the Wholesale Market. Outside of his professional pursuits, William enjoys traveling the world with his family, playing chess, reading, and engaging in day trading activities.

William expresses deep gratitude to the exceptional Engineering staff at the University of Scranton for their unwavering support, constant encouragement, and for instilling in him the invaluable skill of critical thinking from an early stage. Their guidance and mentorship have played a pivotal role in equipping him with the ability to tackle a diverse range of challenges and solve complex problems throughout his career.





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New Faculty: Geng Liu



Dr. Geng Liu received his BS from The University of Science and Technology of China in Hefei, China, and his Ph.D. from The University of Chinese Academy of Sciences in Beijing, China. Both degrees are in Mechanical Engineering. After receiving his Ph.D., he worked as a postdoctoral researcher at the University of Virginia for four years and then at the University of Maine for two years. Before he joined the University of Scranton, he was an assistant professor of Mechanical Engineering at King's College in Wilkes-Barre, PA.

At King's College, Dr. Liu taught a variety of courses and labs, including Thermal-Fluids course/lab sequence, Manufacturing Systems with Lab, Engineering Materials with Lab, Programming in Sciences and Engineering with Lab, etc. He was the manager of the machine shop and the material test lab in the Engineering Department. He also served as a member of the Campus Safety Committee.

New Faculty: Farshad-Merrikh-Bayat



Farshad Merrikh-Bayat is an Assistant Professor of Physics and Engineering. He received PhD in Electrical Engineering-Control from Sharif University of Technology, Iran in 2009. From 2009 to 2014 he worked as an assistant professor, and then from 2014 to 2021 as an associate professor at the University of Zanjan, Iran. During his career at the university of Zanjan, he was the advisor and co-advisor of numerous graduate students.

From October 2021 to June 2023, he was working as a Sr. Mechatronics Engineer at ASML/Cymer, San Diego, CA. His research field is control theory and optimization. He has published more than 30 journal papers in control theory and applications of optimization. Currently, he is working on the data-driven control of nonlinear dynamical system such as multi-link robots.

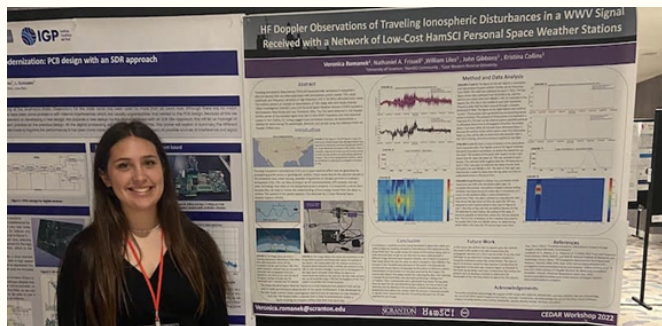




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Students Present Physics Research

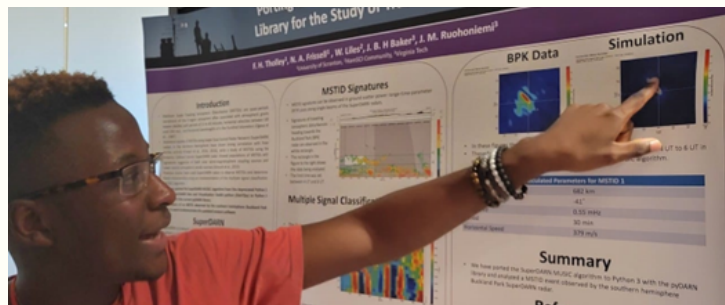
Dr. Nathaniel Frissell and four students presented their research at the National Science Foundation CEDAR Workshop in Austin, Texas, in June and the 2022 Dayton Hamvention, which is the world's largest ham radio gathering that was held in Xenia, Ohio, in May.



Veronica Romanek '23, a physics major from Hampton, New Jersey, presented "HF Doppler Observations of Traveling Ionospheric Disturbances in a WWV Signal Received with a Network of Low Cost HamSCI Personal Space Weather Stations" at the National Science Foundation CEDAR Workshop. Romanek also presented "Traveling Ionospheric Disturbance Observations with the Grape Personal Space Weather Station" at the 2022 Dayton Hamvention. In addition, Romanek participated in the national Youth on the Air (YOTA) Camp in July. The week-long camp, which took place at the Voice of America Museum in Cincinnati, Ohio, allows young people from across the country to meet and learn more about amateur radio.

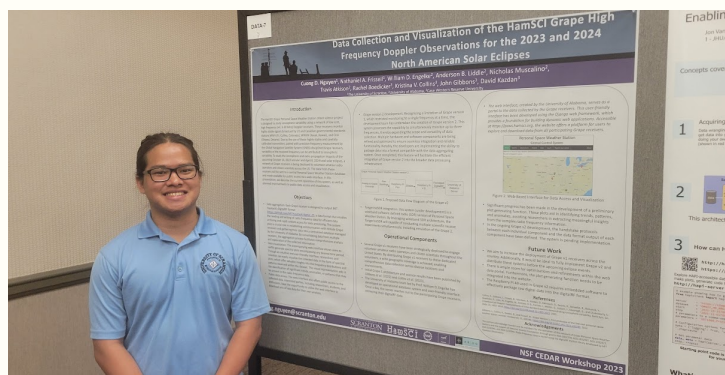
Cuong Nguyen '23, an electrical engineering major from Ashley, presented "An Algorithm for Determining the Timing of Components within the HamSCI-WWV/WWVH Scientific Test Signal" at the National Science Foundation CEDAR Workshop and at the 2022 Dayton Hamvention.

Francis Tholley, '21, G'23, a current software engineering graduate student from Darby who earned his bachelor's degree in computer engineering from Scranton, presented "Porting the MUSIC Algorithm to the SuperDARN pyDARN Library for the Study of Traveling Ionospheric Disturbances" at the National Science Foundation CEDAR Workshop.



At the National Science Foundation CEDAR Workshop, Nathaniel Frissell, Ph.D., assistant professor of physics and electrical engineering at The University of Scranton, presented "Recent Advances in Observing Traveling Ionospheric Disturbances Using Amateur Radio Techniques" and "HamSCI Observations for Ionospheric Measurement." He also presented "First Observations of Large Scale Traveling Ionospheric Disturbances Using Automated Amateur Radio Receiving Network" at the 2022 Dayton Hamvention and "HamSCI Plans for the Study of the 2023 & 2024 Solar Eclipse Impacts on Radio and the Ionosphere" at both events. Dr. Frissell will lead a National Science Foundation grant-supported collaborative research project that will collect and analyze data on the ionospheric variability during the 2023 and 2023 solar eclipses.

Dr. Frissell served as the research advisor for these students and was also the keynote speaker at the national Youth on the Air Camp. In addition to working with Dr. Frissell, these students work with collaborators from other institutions and from around the world. Many of these collaborators are volunteers from the HamSCI Citizen Science project with years of professional experience and advanced academic training. These collaborations provide a unique a community-based research experience that is enriching to both the students and the volunteers.





Featured Internships and REU's

Zainab Shah (CE '25) was awarded an internship at Florida International University in Miami in their Engineering lab as a research assistant. Zainab worked directly with Dr. Arif Sarwat and his team. The projects were a part of the Energy, Power & Sustainability-Intelligence (EPsi) Lab and the Advanced Research on Integrating, Emerging and Existing Systems (ARIES) Project.

The Electric distribution in a Smart Grid gets frequently disrupted and fault restoration is required to maintain reliability of power grid while automation is necessary to facilitate this tool to reduce error. The objective of this project was to convert the manual testing process of GE test cases on FPL's Advanced Distribution Management System (ADMS) using a UI automation tool (TestComplete) to eliminate human errors and reduce run time. Zainab had the opportunity to oversee coding the tests for both respective initiatives.

Overall, much experience was gained from these two months. One of which was being a part of a momentous project, which will change the face of power development and distribution and learning how to code scripts for certain test cases to work and managing a state-of-the-art ADMS system responsibly.

Mitchell Sporing (ME '24) was awarded an internship at Miller Industrial Manufacturing in Glens Fall, NY. Miller provides fabrication, repair, and maintenance services to various industries including pulp and paper, pharmaceuticals, and others. Specializing in ASME pressure vessels, storage tanks, heat exchangers and system components, Mitchell focused on the design, fabrication, and management of more than half a dozen projects. These projects largely involved repairs and replacements to digester internals for the pulp and paper industry.

Mitchell utilized CAD, Excel, and nesting software, as well as knowledge of welding, bending, machining, waterjet, and plasma cutting design to ensure proper ASME code compliant fabrication for all customer projects.

John Nelson (CE '24) was awarded a remote internship at Lumen Technologies. Lumen Technologies is a telecommunications and technology company focused on delivering reliable internet and VOIP services as well as various cloud and security solutions worldwide. During the internship, John was able to work with a team of software engineers focused on developing automation scripts and bots to help various parts of the company run more efficiently.

For his project, John worked to create two automation bots that scanned various ordering systems that Lumen uses for their customers for orders that need to be closed with a completion email sent to the customer. John was able to learn and apply UiPath, an automation software, along with Python, Java, SQL and API queries. Both of Jon's bots were put into production and will continue to be used by Lumen to increase efficiency and productivity.

Logan McGowan (ME '24) spent his summer with SCHOTT AG, Germany's leading manufacturer of specialty glass and ceramics. SCHOTT is responsible for producing a variety of unique glass components, including infrared glass used in missiles being supplied to Ukraine, and laser glass supporting fusion energy breakthroughs in the United States. Logan worked with the company's process engineering team to assist in the production of high-quality glass.

His responsibilities included overseeing the design, configuration, and optimization of chemical processes with the goal of converting raw materials into glass. Logan ensured that the properties of the glass were within the customer's specifications, at which point it was passed along to quality assurance for further inspection. This experience provided Logan with valuable experience in a manufacturing setting and a better understanding of the differences between various mechanical and chemical processes.





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Nasa Lands on Campus

Representatives from NASA met with high school and University of Scranton students, as well as local business owners and manufacturers, to discuss career paths, space technology and ways companies and individuals can support Artemis, a robotic and human Moon exploration program led by NASA.

Campus events, which spanned two days, included a panel discussion on NASA careers with Niki Werkheiser, director for Technology Maturation, Space Technology Mission Directorate, NASA Headquarters; Jason L. Kessler, program executive, Small Business Innovation Research and Small Business Technology Transfer Program, Space Technology Mission Directorate, NASA Headquarters; and Stephanie Yeldell, education integration lead, Space Technology Mission Directorate, NASA Headquarters. University of Scranton physics professor Nathaniel Frissell, Ph.D., moderated the panel discussion on Sept. 22. Earlier that day, Werkheiser met with Scranton students at an Institute of Electrical and Electronics Engineers (IEEE) meeting.



On Sept. 23, NASA hosted the NASA Northeast Pennsylvania Industry Day, a networking event focused on collaboration opportunities with local businesses. The event at the University's DeNaples Center included national and local speakers, presentations, and networking opportunities in collaboration with the Keystone Space Collaborative, Northeastern Pennsylvania Industrial Resource Center, and Northeastern Pennsylvania Alliance Procurement Technical Assistance Center. Local business owners, manufacturers, entrepreneurs, and university representatives attended the free event. U.S. Rep. Matt Cartwright also participated in the **event**.

Retired Col. Douglas H. Wheelock, a NASA astronaut, visited campus on April 6, 2022. Wheelock, who accumulated more than 178 days in space, flew on STS-120 in 2007. In 2010, he served as a flight engineer for Expedition 24 and commander for Expedition 25 during which he conducted three unplanned spacewalks to replace a faulty ammonia pump module. The New York native holds a bachelor's in applied science and engineering from the United States Military Academy in West Point, New York, and a master's in aerospace engineering from Georgia Tech in Atlanta, Georgia. He has earned a very lengthy list of awards including a Bronze Star and the NASA Superior Accomplishment Award.



The event was sponsored by The Mugas Amateur Radio Club, organized in 1975 in the spirit of Father Josef Murgas who pioneered the very first overland wireless voice transmission in 1905 between Wilkes-Barre and Scranton; W3USR, the University of Scranton Amateur Radio Club; and the University's Department of Physics and Engineering.

Dr. Frissell will also lead a NASA effort to study the annular eclipse October 14. Worldwide, amateur ham radio operators will be creating data on the eclipse for use in space physics research. They will gather more data for NASA next April 8 when a total solar eclipse occurs.

"Ionospheric variability such as that studied here also has a direct impact on critical technologies such as satellite navigation (e.g., GPS)," Frissell says, "and high-frequency signals are used to communicate large distances by the U.S. Department of Defense, commercial ships, commercial aircraft, and emergency services when infrastructure such as cell phone networks and satellite communications are unavailable."





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Hayes Family Science Competition

Nearly 200 area students participated in The University of Scranton's annual Hayes Family Science Competition for High School Physics and Engineering Students. The academic competition tested the high school students' knowledge of physics and engineering through a series of quizzes and hands-on challenges. Students competed individually and in teams.

John Lockwood from Delaware Valley High School came in first place in the individual competition, based on a quiz given to all participants and placement in a Jeopardy game of those with highest quiz scores. Noah Beckish from North Pocono High School came in second place. John Ebert from Berwick High School came in third place.



In the team competition, the Delaware Valley High School team placed first. Members of that team were: John Lockwood, Olivia Bogert, Nixon Kameen, Clint Murray, Jess Rhule, John Rivera and Wil Salus. Steve Rhule was their coach. Wyoming Area High School team two came in second place. Members of the Wyoming Area team were: Nathan Ambrosino, Ben Hollister, Andrew Lucas, Joseph Marranca and Jadan Pepe. David Pizano was their coach. Berwick High School team one placed third. Members of the third-place finishing team were: Gabe Hook, John Ebert, Alys Lewis, Karly Kile and Luke Peters. Matthew Shrader was their coach.

Throughout the daylong competition, the students participated in teams in a series of hands-on challenges that tested their skills in several areas of physics and engineering, including a Data Analysis Event, Static Equilibrium Event, an All Power Out Event and a Trebuchet Event, for which the students had to predict the landing point of a basketball launched across the gym by medieval catapult.

Magis Honors Program

The Magis program, an officially approved science honors program, began in the Fall 2019. It has been initiated and run by Dr. Janice Voltzow (Biology) and Dr. Declan Mulhall (Physics and Engineering). The program provides opportunities for students to actively engage in interdisciplinary research in science, technology, engineering, and mathematics. Through a series of seminars, the students complete a thesis with a committee of three faculty to guide them through the process of developing a thesis proposal, conducting their research, and writing their thesis.

Royal Scholars

Dr. Mulhall and four others were successful applicants for an NSF grant for Royal Scholars: Transforming STEM in Northeastern Pennsylvania is providing support to students with demonstrated financial need and academic promise to succeed in STEM disciplines at The University of Scranton. The project is funding 25 scholarships over 5 years for students who are pursuing bachelor's degrees in STEM. The goal of this project is to recruit, retain, and graduate 25 low-income students who have talent or potential in the STEM disciplines of biology, chemistry, computing science, mathematics, and physics/electrical engineering at The University of Scranton. The program has graduated five students into excellent prospects, including a position in Manhattan for Google, and a leadership role at a local children's library. All students continue to be mentored in research and through their STEM major.





Faculty-Student Research Collaborations

Dr. Varonides served as an advisor for two of our recent graduates this past academic year: James Lanning (PHYS '23) and Logan Sellam (PHYS '23). Dr. Varonides also continues his work on an explicit derivation of tunneling current in a Graphene/n-GaAs Schottky-Barrier (SB) diode.

J Lanning, "Analysis of Higher-Order SQUIDs and Hybrid Superconducting Junctions: A Devices Approach", May 2023.

ABSTRACT: This project broadly investigates the common Josephson junction superconducting circuit component and its applications in novel device design from an idealized perspective. Applying the macroscopic quantum model of super-conduction, procedures used to derive the Josephson effect characteristic of the junctions and analyze two parallel-junction interference devices (SQUIDs) are extended to two unique applications: SQUIDs with an arbitrary number of parallel junctions, and hybrid semiconductor junctions. Parallel junctions are found to produce interference patterns described by a product of sine functions, with several periodic maxima equal to the number of junctions. An expression is also developed to describe hybrid junctions in terms of primarily incident electron energy (related to driving voltage) and device temperature, after application of thermodynamic principles to approximate the valence band electron density of the superconductor.

L Selam, "Aharonov-Bohm effect in a 2-Dimensional MOSFET channel", May 2023.

ABSTRACT: Aharonov-Bohm effect in a 2-Dimensional MOSFET channel by Logan Sellam viii We have been interesting ourselves in the interactions between electrons that occur in the Aharonov-Bohm effect. We have a ring at the gate of the MOSFET where a magnetic field is coming out of the page, which is perpendicular to the plane of the channel, this induces a vector potential that circles around the dielectric island. The dielectric island is what causes the splitting of the electrons. As the electron travel from the source to the drain, they are split into two pathways, where one channel picks up an extra phase. The extra phase is due to the vector potential, we call this the Aharonov-Bohm phase or ϕ_{AB} . We are expecting modulation of the final current due to the Aharonov-Bohm phase difference.

Nanoelectronics is a very attractive topic nowadays, so the thought of applying this to a MOSFET could yield interesting results. As we have derived the relationships needed with the vector potential, probability of having an electron on the other side and the extra phase that is picked up, we wanted to push the research further. This research is strongly focused on quantum mechanics as well; therefore, we would also like to apply a potential barrier in the MOSFET adding an extra phase to the channel that is affect by the Aharanov-Bohm phase. This potential barrier would be made from an insulator added in the channel. We now have principles of electromagnetics and quantum mechanics consolidated into one project. Our research provided unique results where the phase of the electron now becomes $\phi = \phi_{AB} + \delta\phi$. Regularly we see a potential barrier represented in a classical way, but we have arranged to change that by setting a high drain-source voltage.

AC Varonides, "Ab-initio calculations of Tunneling Current in Graphene/n-GaAs forward-biased Schottky Diodes", presented at the European Materials society (E-MRS), Strasbourg, France, May 2023.

ABSTRACT: Ab-initio calculations of tunneling current in Graphene/n-GaAs Schottky-Barrier (SB) diodes. The tunneling process is based on electron plane wave incident on the SB barrier of the heterojunction along the growth z-direction. The semiconductor chosen is n-GaAs bulk layer with energy band bending at the interface, where electron and hole accumulation is feasible. We calculate the electronic tunneling current through the quantum barrier formed at the interface due to work function difference at the junction. Our approach consists of an explicit derivation of net tunneling electron current across the junction in both directions under forward bias $V(FB)$ leading to a structure with rectifying properties described by a global diode relation J-V characteristic of the type $J(TU)=J_{00} \exp[(V/V_t)-1]$. The current-prefactor is explicitly derived from first principles and depends on parameters, such as Schottky barrier height, WKB-related transmission coefficient through the barrier, electric field at the junction, carrier effective mass, charge, and energy.





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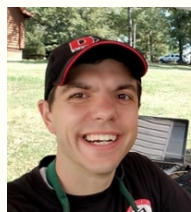
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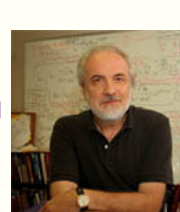
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