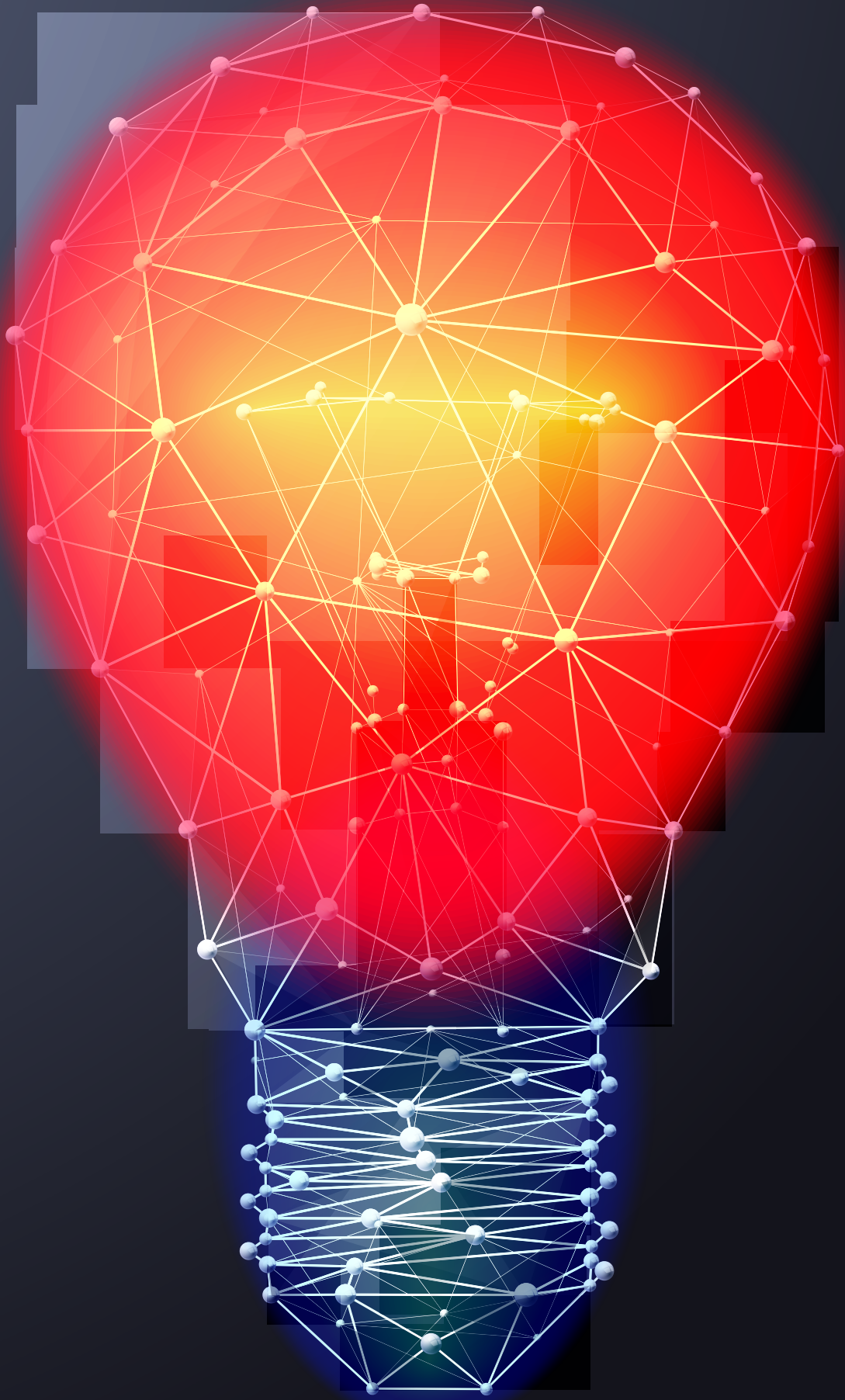




SANDIA LABS
**ACADEMIC
ALLIANCE**
2019
COLLABORATION REPORT



UNM
EDITION





► Sandia's academic alliances establish strategic partnerships to solve science and technology problems of national importance

Sandia's Academic Alliance (SAA) program takes a deliberate approach to building partnerships with universities that combine strengths in key academic disciplines, contain sizable portfolios of relevant research capabilities, and demonstrate a strong institutional commitment to national security.

The SAA Program aims to solve significant problems that Sandia could not address alone, sustain and enrich Sandia's talent pipeline, and accelerate the commercialization and adoption of new technologies.

The Value of Sandia's Academic Alliance Program

University partnerships play an essential role in sustaining Sandia's vitality as a national laboratory. The SAA is an element of Sandia's broader University Partnerships program, which facilitates recruiting and research collaborations with dozens of universities annually.

The SAA program has two three-year goals. SAA aims to realize a step increase in hiring results, by growing the total annual inexperienced hires from each out-of-state SAA university. SAA also strives to establish and sustain strategic research partnerships by establishing several federally sponsored collaborations and multi-institutional consortiums in science & technology (S&T) priorities such as autonomy, advanced computing, hypersonics, quantum information science, and data science.

The SAA program facilitates access to talent, ideas, and Research & Development facilities through strong university partnerships. Earlier this year, the SAA program and campus executives hosted John Myers, Sandia's Senior Director of Human Resources (HR) and Communications, and senior-level staff at Georgia Tech, Illinois, Purdue, UNM, and UT Austin. These campus visits allowed for a history of the partnerships via briefings from the university leadership, tours of research facilities, and discussions of ongoing technical work and potential recruiting opportunities. These visits also provided valuable feedback to HR management that will help Sandia realize a step increase in hiring from SAA schools.

SAA Partners

The Georgia Institute of Technology ▶ *Georgia Tech*

Purdue University ▶ *Purdue*

The University of Illinois Urbana-Champaign ▶ *Illinois*

The University of New Mexico ▶ *UNM*

The University of Texas at Austin ▶ *UT Austin*

The 2019 Collaboration Report

The 2019 Collaboration Report is a compilation of 2019 accomplishments from SAA and Sandia's valued SAA university partners. To learn more about the SAA program, visit www.sandia.gov.



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A C C O M P L

Building the critical skills pipeline

Throughout the past year Sandia co-hosted multiple university events and piloted innovative on-campus internship opportunities to build the skills of students and expose them to the nature of the work conducted at the Laboratories—all with an emphasis on the computer science and cybersecurity disciplines. For example, about 200 students participated in Space Blimp Coding Challenges at Purdue, Illinois, and UT Austin, where space blimps served as simplified substitutes for satellite constellation arrangement, positioning, tracking, tagging, and locating. Students from Georgia Tech, Purdue, North Carolina A&T State University, and Clark Atlanta University also participated in Tracer FIRE (Forensics Incident Response Exercise) Cyber Competitions. The students learned how to analyze a real-world cyberattack on a power grid caused by malware known as CRASHOVERRIDE, which is the second-ever known case of malicious code purpose-built to disrupt physical systems. Beyond the challenge events, innovative programs at Illinois and Purdue provided more than 20 interns with the opportunity to work for Sandia while remaining on campus.

Pictured: Sandia sponsored eight of the 70 teams attending the U.S. Department of Energy's (DOE) fourth collegiate CyberForce Competition in December.



I S H M E N T S

Enabling Sandia's mission campaigns

Sandia formed the AutonomyNM academic research coalition as part of Autonomy for Hypersonics (A4H)—a seven-year, \$35M initiative started in 2017 and funded through the Laboratory Directed Research and Development (LDRD) program. The Sandia-led collaboration seeks to research and develop autonomous systems technologies that will enhance the warfighting utility of hypersonic flight systems. The A4H and AutonomyNM efforts helped attract a related but separate UNM-led, five-year, \$5.5M grant from the National Science Foundation (NSF) to design autonomous systems that are responsive to humans. SAA faculty collaborators also contributed to the development of an autonomous mission-planning solution that generates flight plans in minutes, enhancing the warfighting capability of hypersonics and retaining U.S. leadership in this critical national security area. AutonomyNM collaborators are Sandia, Georgia Tech, Purdue, Illinois, UNM, Stanford University, Texas A&M University, UT Austin, and Utah State University. In addition to UNM, NSF grant collaborators are Purdue, UT Austin, University of Colorado Boulder (UC Boulder), and Sandia.

Pictured: Sandia flies a drone at dusk. Humans might see their roles throughout aviation and aerospace shift if Sandia can simplify manual tasks with artificial intelligence.



A C C O M P L



Facilitating research networks

Sandia initiated the New Mexico Research Spotlight Forum series with UNM, the New Mexico Institute of Mining & Technology (NM Tech), and New Mexico State University (NMSU) to facilitate collaborations between the New Mexico schools and the out-of-state schools in the SAA program. The

bi-monthly event increases faculty knowledge of Sandia program areas and provides Sandia staff the opportunity to learn more about faculty expertise and university capabilities and facilities.

Research Spotlight Forums have focused on topics such as artificial intelligence (AI) and machine learning, engineering mechanics and dynamics, advancing resilience for space systems, quantum information sciences, cybersecurity, and resilient infrastructure.

Pictured: Justin Newcomer briefs attendees on the integral role of technology in Sandia's mission delivery at a 2019 Research Spotlight Forum event.

I S H M E N T S

Exercising leadership in collaborative research

Sandia is participating in numerous joint projects with academia to conduct mission-relevant research for various sponsors. For example, Georgia Tech is leading a consortium of 12 universities and 10 national labs, which received a five-year, \$25M grant to develop enabling technologies to support the DOE/ National Nuclear Security Association (NNSA) nonproliferation mission to detect and characterize nuclear materials production. Sandia received additional funds to support this endeavor and met with Georgia Tech regarding further technical collaborations.

Pictured: Sandia supported the first NNSA Nuclear Security Enterprise Day on March 25, 2019 at Georgia Tech, which sparked great conversations with students about career opportunities available at the national labs.



A C C O M P L

Motivating international engineering education

Sandia provided strong support for the UNM-hosted World Engineering Education Forum – Global Engineering Deans Council (WEEF–GEDC) international conference held in Albuquerque in November 2018. Sandia furnished conference sponsorship, technical leadership panel speakers, an interactive technology demonstration exhibit, Sandia tours for participants, and an SAA Partnerships reception for participants. The theme of the conference was peace engineering — envisioning and working towards a world where prosperity, sustainability, social equity, entrepreneurship, transparency, community voice and engagement, and a culture of quality thrive. The conference was hosted by UNM’s School of Engineering, the Ibero-American Science and Technology Education Consortium, and the Global Innovation Network for Entrepreneurship and Technology. The conference welcomed almost 500 engineering educators, leaders, students, industry representatives, governmental organizations, and non-governmental organizations from 39 different countries to learn, share, and build fruitful and long-term collaborations.

Pictured: Susan Seestrom, Sandia’s Associate Labs Director of Advanced Science & Technology (left), and Nancy Hayden, from Sandia’s Strategic Futures & Policy Analysis team, explore Sandia’s interactive technology demonstration exhibit at the WEEF–GEDC conference.



I S H M E N T S

Presidential Early Career Award for Scientists and Engineers given to Sandians and SAA faculty

In 2019, four Sandia employees and sixteen SAA faculty received the Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE is the highest honor bestowed by the U.S. Government to outstanding scientists and engineers beginning their independent research careers and showing exceptional promise for leadership in science and technology. Former U.S. Secretary of Energy Rick Perry noted, "I am honored to congratulate all of this year's winners as they continue to embark in careers that will maintain America's position as a leader in scientific development and advance the breakthrough technologies of tomorrow."



Pictured: A group of distinguished researchers was honored as recipients of the Presidential Early Career Award for Scientists and Engineers in Washington, D.C. on Thursday, July 25, 2019.





UNM
ALBUQUERQUE, NM

U N M B Y T H E

147 ALUMNI



NEW HIRES
AT SANDIA FROM UNM



246 STUDENTS

\$1.3M

INVESTED AT
UNM BY
SANDIA IN
**TWENTY-FIVE
LDRD* PROJECTS**

\$1.9M

INVESTED AT
UNM BY
SANDIA IN
**FIFTY-TWO
PROGRAM-
FUNDED
PROJECTS**

71

JOINT
SANDIA/UNM
PUBLICATIONS
PRODUCED

60

SANDIANS
HOLD SOME
FORM OF
SANDIA/UNM
**AFFILIATED ROLE
AT UNM****

N U M B E R S

FY19

724 STUDENTS



ON-ROLL AT SANDIA AS
MEMBERS OF THE WORKFORCE

3,094 ALUMNI



31

SANDIANS
SERVE ON A
VARIETY
OF UNM
**EXTERNAL
ADVISORY
BOARD**

4

PROJECTS DONE
IN PARTNERSHIP
WITH NMSBA***
AND THE UNM
**SCHOOL OF
ENGINEERING**

10

PROJECTS DONE
IN PARTNERSHIP
WITH NMSBA***
AND THE UNM
**MANAGEMENT
OF TECHNOLOGY
PROGRAM**

* Laboratory Directed
Research and Development
(LDRD)

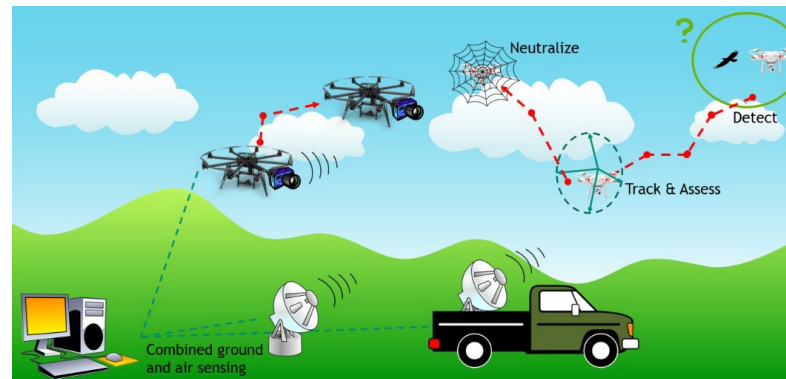
** Including adjunct faculty,
research faculty, lecturers,
and advisors.

*** New Mexico Small Business
Association (NMSBA)

Mitigating unmanned aerial threats

The first award to a Federally Funded Research & Development Center (Sandia) by NATO Science for Peace and Security supports counterterrorism research involving small drones. The \$1.6M award over three years is focused on the development of technology to mitigate the threat of unmanned aerial systems to national security by low, slow, and small threats. The work is led by Sandia's Robotics R&D Manager, Jon Salton, in collaboration with the UNM Electrical and Computer Engineering Department and the Swiss Department of Defence (armasuisse) and Civil Protection. UNM Professor Dr. Rafael Fierro (Electrical and Computer Engineering) was engaged through the contract and will employ two graduate students. Sandia

anticipates hiring two students beginning in summer 2020 with the potential to hire a postdoctoral candidate to split time on this project and others. The NATO programmatic kickoff meeting occurred in the fall of 2019, and the technical kickoff meeting happened the first quarter of fiscal year 2020.



► This notional concept of operations shows how the drone technology could potentially be used to mitigate the threat of unmanned aerial systems.

► Sandia interns built and programmed drones, similar to the quadcopters seen here, to study autonomy and artificial intelligence for hypersonic flight.

Designing autonomous systems responsive to humans

Autonomous systems, found in everything from manufacturing processes to airplanes, drones, and automobiles, are increasingly common. This technology is becoming more affordable and accessible to the masses. The goal of the five-year, \$5.5M National Science Foundation (NSF) Cognitive Autonomy grant titled “Cognitive Autonomy for Human Cyber-Physical Systems: Turning Novices into Experts” is to design autonomous systems that are responsive to humans. Sandia, acting as an industry partner, is providing advice and student support, and UNM (\$3.25M) and Purdue (\$2.25M) are the primary collaborators; additional academic partners include UT Austin and UC Boulder.

Meeko Oishi, UNM Associate Professor of Electrical and Computer Engineering, will lead the UNM effort to optimize human cyber-physical systems for autonomous hypersonic systems as well as support DOD work in human automation systems. This

proposal builds on work from an SAA LDRD project and Autonomy for Hypersonics. Oishi is interested in building on this new program to create a hub for autonomy research at UNM, ideally in alignment with the major initiatives in autonomy going on concurrently at Sandia Labs and Air Force Research Lab. With a critical mass of faculty and students working on rich and timely problems, she’s excited about what could be accomplished in the next five years.



Meeko Oishi
Associate Professor of Electrical
and Computer Engineering

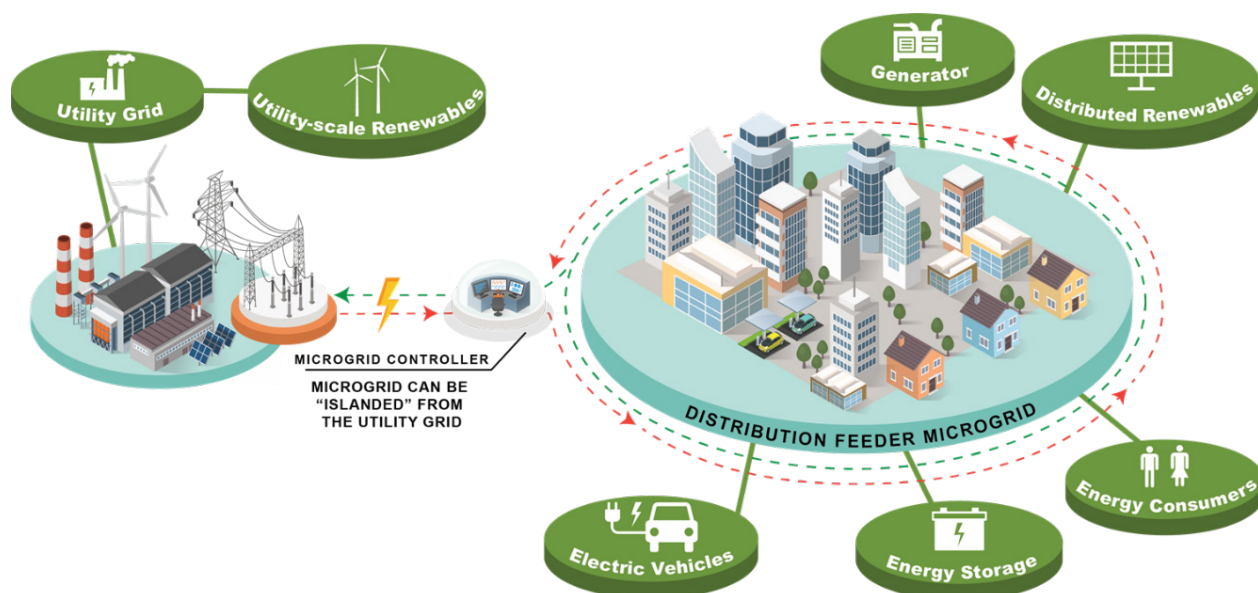


Building a resilient electrical grid

The New Mexico Established Program to Stimulate Competitive Research (NM EPSCoR) is building the state's capacity to conduct scientific research and is training a diverse, well-qualified Science, Technology, Engineering and Mathematics (STEM) workforce. NSF has awarded a "New Mexico SMART Grid Center" Track 1 EPSCoR grant of \$20M over five years, including a partnership between Sandia, UNM, New Mexico Tech, and NMSU. The program seeks to design a future electricity grid that is Sustainable, Modular, Adaptive, Resilient, and Transactive (SMART) utilizing utility and microgrids.

This program's goal is to develop an integrated research and education program that supports a modern electric grid built on the principles of Distribution

Feeder Microgrids, with objectives relating to architecture, networking, decision-support, and deployment. This program also includes collaboration with Los Alamos National Laboratory, Public Service Company of NM (PNM), El Paso Electric, Los Alamos Department of Public Utilities, Microgrid Systems Laboratory, Electric Power Research Institute, NM EPSCoR, NM First, and Santa Fe Community College. According to William Michener, principal investigator for the award and State Director of New Mexico EPSCoR, "Through this grant, we will not only advance research areas of national importance but train a cadre of undergraduate and graduate students in New Mexico to join the STEM workforce." Find more information on the [NM EPSCoR SMART Grid Center](#) online.



Advancing fast reactor licenscing

DOE's Nuclear Energy University Program awarded UNM and Sandia \$800K for three years for "NICSim: Nuclear Instrumentation and Control Simulation for Evaluating Response to Cyberattacks." The NICSim platform aids in investigating the cybersecurity of nuclear power plant instrumentation and control systems by developing and validating a programmable logic controller emulation methodology and developing a reliable, fast running interface that effectively links to a physics-based simulation model within a Matlab Simulink framework.

The collaborative project is being by led by Mohamed S. El-Genk, Distinguished and Regents' Professor of Nuclear Engineering and founding director of the UNM Institute for Space and Nuclear Power Studies. Christopher Lamb, a member of the technical staff at Sandia and a UNM research assistant professor, along with UNM research assistant professor Timothy Schriener, with the Institute for Space and

Nuclear Power Studies, are collaborators on the project. The goal of the Nuclear Energy University Program projects is to maintain U.S. leadership in nuclear research across the country by providing top science and engineering faculty and their students with opportunities to develop innovative technologies and solutions for civil nuclear capabilities.



Mohamed S. El-Genk
Distinguished and Regents'
Professor of Nuclear Engineering



Stopping tragic events before faulty subsurface seals can start them

Sandia researchers and partners from UNM, UT Austin, and the Bureau of Economic Geology are collaborating to ensure seal integrity. This joint LDRD project is addressing critical gaps in the fundamental understanding of the conditions and materials required to ensure seal integrity in subsurface applications. The critical

research will help to prevent faulty seals that contribute to tragic events such as the fatal well blowout in the Macondo Deepwater incident in 2010 in the Gulf of Mexico and the Aliso Canyon natural storage well leak in 2015 that lasted for 118 days and released more natural gas than 80,000 homes would in a year.



An umbrella CRADA with UNM fosters numerous technical collaborations

An umbrella Cooperative Research and Development Agreement (CRADA) is a written contract between Sandia and collaborators seeking to partner in a mutual research area. The umbrella CRADA with UNM outlines nine areas for collaboration including quantum information science; computational science and engineering; cybersecurity; data analytics, systems analysis and intelligence science; nuclear engineering and high-energy density science; advanced materials and devices; energy and water; bioscience for national security; and emerging science and engineering capabilities for national security.

The CRADA immediately launched two projects focused on radiation testing and developing particle detector designs for CERN, the European particle physics laboratory. The agreement also builds on partnerships between Sandia and the Center for Quantum Information and Control, co-located at UNM and the University of Arizona (UA); at the Advanced

Materials Laboratory, a research facility jointly operated by Sandia and UNM; and at the New Mexico EPSCoR SMART Grid Center, a project that includes Sandia, UNM, and several other research institutions. This umbrella CRADA model could serve as a model for other SAA partners in the future.



Diane Peebles
New Mexico
Partnership Manager

Edl Schamiloglu
Special Assistant to the
Provost for Laboratory
Relations at UNM

Creating a SUPER collaboration

A new Memorandum of Understanding (MOU) was signed for the Sandia/UNM Pulsed Power Extreme-condition Research (SUPER) Center. This MOU solidifies collaboration between Sandia's Pulsed Power Sciences area and UNM's Earth and Planetary Sciences and Electrical and Computer Engineering departments. The principal goals of the proposed collaboration are threefold: (1) accelerate technical progress broadly in fields relevant to DOE/NNSA, (2) cultivate a pipeline of experts in the fields of high-energy density science and pulsed power, and (3) attract new graduate researchers to targeted STEM programs at UNM.

Sandia anticipates strong growth in pulsed power activities from refurbishment and improvement projects on current pulsed power facilities SATURN, HERMES,

and Z Machine; development of the new intermediate scale driver Thor; and development of a major next generation facility in the near-term future. A long-term goal of the SUPER Center is to grow a vibrant center of excellence that utilizes Thor, a recently developed intermediate-scale pulsed power platform. The SUPER Center will enable joint research initiatives spanning both Sandia and UNM facilities and provide UNM students unique opportunities to conduct geophysics and pulsed power graduate thesis projects utilizing cutting-edge technology to solve outstanding problems.



▶ Sandia technician Eric Breden installs a transmission cable on the new pulsed-power machine's central powerflow assembly.

Creating new materials for radiation sensing

An LDRD with UNM Professor Adam Hecht titled “Enzymatic Liquid-Membrane Design and Mechanism of CO₂ Capture and Separation” has completed a technical evaluation of a new material for radiation sensing. The project, funded for \$200K over two years, is seeking to understand

technical requirements needed to meet global security needs. Follow-on work will enable an NNSA white paper and proposal. The work has resulted in hiring one year-round graduate student from UNM, Jesus Valencia.



▶ Adam Hecht (far right) is pictured with colleagues at the Defense Threat Reduction Agency-TEAMS detector test site at Sandia.

Sensing nanometer-scale magnetic properties

A Sandia and UNM team built and optimized a diamond magnetic microscope capable of measuring the static and dynamic magnetic properties of hundreds of individual superparamagnetic iron oxide nanoparticles (SPIONs). Using nitrogen-vacancy centers in diamond, the sensitive probes measure magnetic properties of materials at the nanometer scale. This diamond magnetic microscopy platform may ultimately be used to optimize SPION probes for biomedical diagnostic and therapeutic applications. Through a Sandia-sponsored LDRD project, nitrogen-vacancy centers in diamond are being investigated as

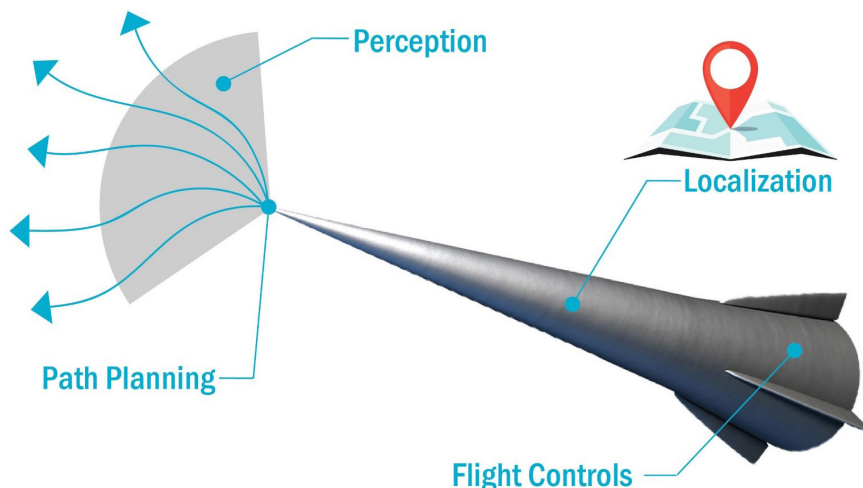
sensitive probes of the magnetic properties of materials at the nanometer scale by Sandia's Mike Lilly and Victor Acosta, UNM Professor of Physics and Astronomy, working in nano-scale magnetometry and MRI with nitrogen-vacancy centers in diamond, molecular imaging with optically-pumped fluorophores, and unconventional techniques in magnetic resonance. If successful, the diamond magnetic microscopy platform may ultimately be used to optimize SPION probes for biomedical diagnostic and therapeutic applications.

Advancing autonomy for hypersonics

Sandia sponsored an Autonomy for Hypersonics (A4H) Field Day at UNM in April 2019.

This event brought together Sandia and its partners in academia, industry, and government to explore autonomous systems research for advanced national security systems. For two days, researchers presented experimental results, proposed new ideas, and discussed progress toward their shared goals. A4H is a seven-year, internally funded R&D effort at Sandia focused on researching, developing, and customizing novel Artificial Intelligence (AI) and autonomous system solutions to work with hypersonic flight systems. The portfolio of research under A4H Mission addresses many issues associated with the challenge of applying AI and autonomy to

national security problems. The research areas include onboard autonomy for advanced hypersonic flight systems, with specific efforts focused on algorithms for perception, localization, path planning, and intelligent flight control. A4H is also researching offboard AI/autonomy solutions to enable rapid mission planning and analysis, and discovering non-intuitive hypersonic engagement tactics and strategies. The A4H Field Day event welcomed about 100 participants with speakers from Sandia, SA Technologies, Inc., Illinois, Georgia Tech, UT Austin, Texas A&M University, UNM, NMSU, Purdue, and University of Arizona.



- ▶ *A diverse set of technologies to be developed at Sandia Labs could strengthen future hypersonic and other autonomous systems.*

Internships fuel research for engineering students

From 2017 to 2019, 41 students have worked in labs around Sandia, in departments including Geomechanics and Energy Systems thanks to the Consortium for Integrating Energy Systems in Engineering and Science Education (CIESESE) internship program. Sandia and UNM's School of Engineering are a part of CIESESE, which is sponsored by the NNSA. CIESESE connects engineering students from five Hispanic-serving institutions with research opportunities with UNM faculty mentors and at Sandia. Often, their work at Sandia becomes the focus of their

graduate research and an opportunity for long-lasting relationships. So far, 10 students have become year-round interns at Sandia. Other program components include a summer program for high school students, a summer program for teachers, and a K-12 energy-themed outreach day. The lead institution for this project is Universidad Ana G. Mendez in Puerto Rico, and the consortium is one of the DOE/NNSA Minority Serving Institution Partnership Programs.

- ▶ *Edgardo Desarden Carrero (right) talks with Melvin Lugo Alvarez. Both are summer interns from the University of Puerto Rico, Mayagüez, studying resilient energy systems at Sandia Labs through the CIESESE program.*

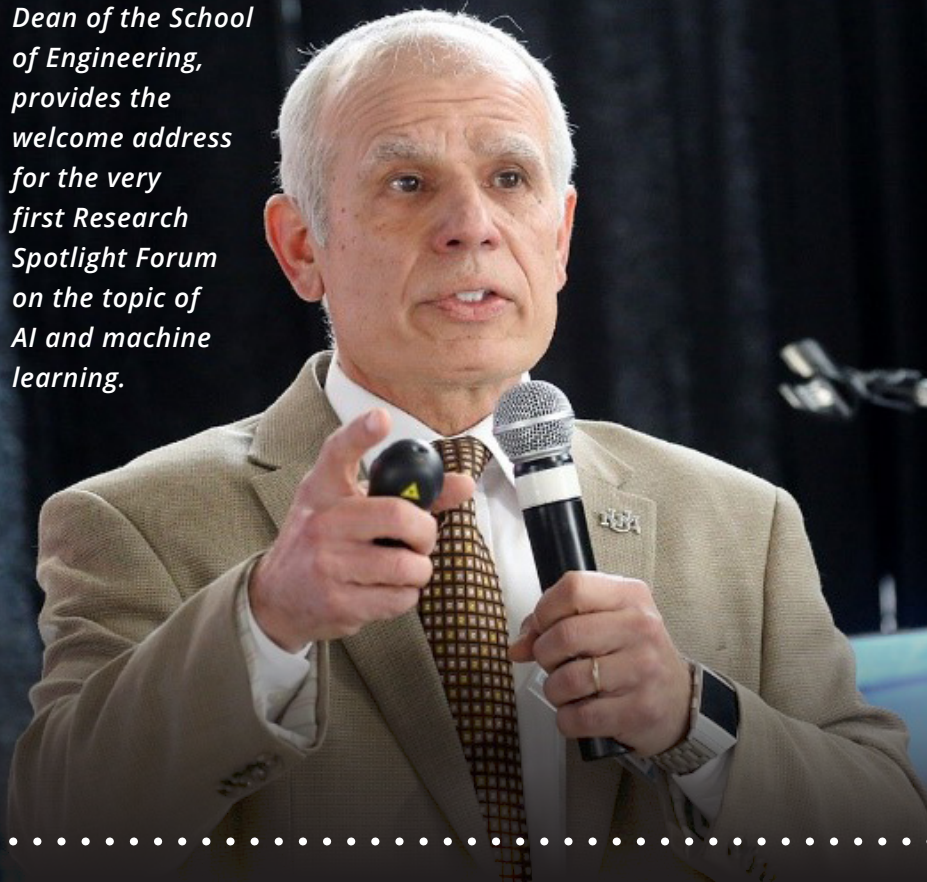


Connecting researchers across institutions

Sandia developed a Research Spotlight Forum series to seed new collaborative relationships with universities by increasing faculty knowledge of Sandia program areas and providing the opportunity for Sandians to learn more about university capabilities, faculty expertise, and their involvement in related programs. With the format of half-day mini workshops, the continuing Research Spotlight Forums are offered

every six-to-eight weeks. Past Research Spotlight Forums focused on topics such as AI and machine learning, engineering mechanics and dynamics, advancing resilience for space systems, quantum information sciences, cybersecurity, and resilient infrastructure. More information on previous and upcoming [Research Spotlight Forums](#) is available online.

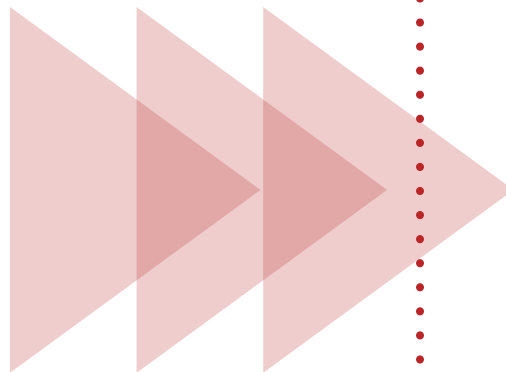
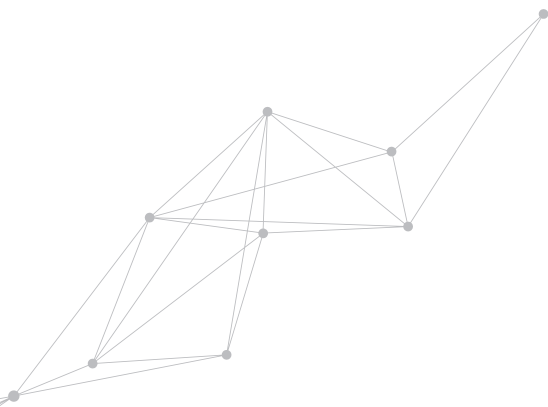
- ▶ *Christos Christodoulou, UNM Dean of the School of Engineering, provides the welcome address for the very first Research Spotlight Forum on the topic of AI and machine learning.*



Increasing community awareness of global security

The UNM/Sandia Global Security Distinguished Lecture Series is a collaboration effort focused on highlighting current topics in global security and increased community awareness. This partnership enables key high-level speakers to engage with the general Albuquerque community, improve awareness of global security issues, and strengthen global collaborations in this very important area. It is also anticipated that the effort

will help bring students and potential hires to consider careers in this area. The inaugural lecture was provided by Dr. Stephen Younger, former Sandia Labs Director, to an audience of about 100 community members. Dr. Younger's lecture, "Looking Beyond the Numbers: A Century's Experience with Arms Control," highlighted the U.S. experience with strategic arms control over the last century.



Challenging the state's undergraduates in multidisciplinary design

A NM Capstone Challenge was implemented for the 2019/2020 academic year with a full-year senior design competition between the NM research universities with the goal of supporting university engineering design course objectives and promoting awareness of Sandia through a multidisciplinary challenge. The Capstone Challenge brings together multidisciplinary teams from key areas such as computer science/ engineering, cybersecurity, electrical engineering, and mechanical engineering. Sandia hopes to use this Capstone Challenge to foster awareness of the national security mission and spark interest in Sandia Labs as a potential employer for engineering graduates.

The 2019/2020 challenge is designed to illustrate Sandia's continuing need for real-time environmental sensing. Each university has sponsored a team of seven students to tackle the design of an integrated sensing device that survives and monitors several critical mechanical environmental parameters. Success will be evaluated in terms of design effectiveness and integration, environment sensing and reporting, and overall creativity. Sandia performed laboratory environmental testing, and then students participated in a virtual presentation session on April 24, 2020, to complete the challenge.

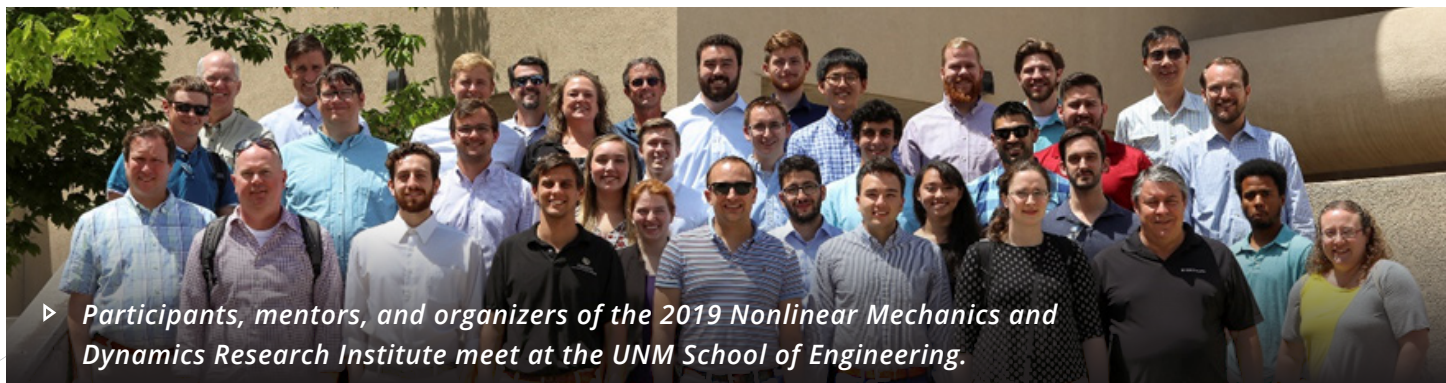


▶ *Students from UNM, NMSU, and NM Tech gather for the 2019/2020 NM Capstone Challenge kick-off.*

Tackling research challenges in nonlinear mechanics and dynamics

The fifth annual Nonlinear Mechanics and Dynamics (NOMAD) Research Institute was sponsored by Sandia Engineering Sciences and hosted by the UNM Department of Mechanical Engineering. This summer program brings together graduate students and researchers from around the world to tackle research challenges in the field of nonlinear mechanics and dynamics with mentors from government, academic, and industrial institutions. The goal of this year's institute was to improve the way experiments and modeling are done in the engineering sciences through better integration. The joint program led by Rob Kuether (Sandia) and Tariq Khraishi (UNM) welcomed a total of 20 students from around the world to Albuquerque to participate in the seven-week-long research program with the support of numerous Sandia and UNM staff who donate their time to the valuable effort. Students

collaborated on one of seven research projects developed by various mentors from Sandia, UNM, and other academic or government institutions. In addition to the research activities, students attended weekly technical seminars, toured Sandia Labs and the National Museum of Nuclear Science & History, and socialized at various after-hour events. The students concluded the program by presenting their research findings at a mini-symposium hosted by the NOMAD organizers. The technical discoveries at NOMAD align with the Engineering Science Research Foundation at Sandia by developing advanced modeling, simulation, and experimental technologies. NOMAD research enhances Sandia and NNSA's position to solve current and future national security challenges. Many of the research teams published their findings as proceedings in technical conferences.



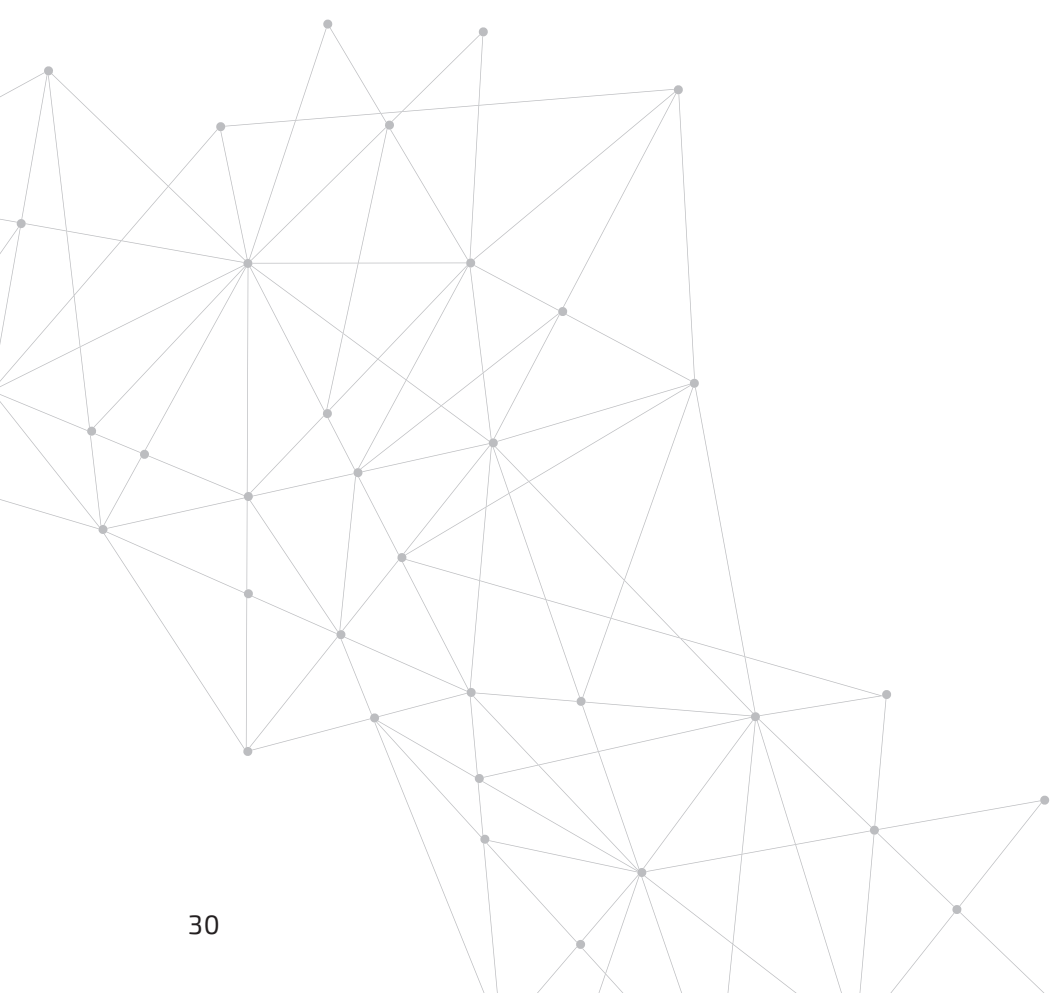
▶ *Participants, mentors, and organizers of the 2019 Nonlinear Mechanics and Dynamics Research Institute meet at the UNM School of Engineering.*



Connecting women and minorities

The Sandia Women's Action Network (SWAN) partnered with UNM to provide cross-institutional opportunities for mentoring and networking to female faculty members. As a part of this effort, Sandia connected with UNM's ADVANCE program to enhance networking between Sandia and women and minority STEM faculty members at UNM. SWAN is a resource focused on positively influencing the work environment, ensuring continued professional development, and assisting the corporate Inclusion, Diversity, Equal Employment Opportunity & Affirmative

Action office in achieving its goal of having a measurable impact in the area of unconscious and implicit gender bias specific to the population of women at Sandia. ADVANCE is a five-year National Science Foundation program at UNM focused on promoting, recruiting and retaining women and minority STEM faculty. In addition, SWAN partnered with UNM's Society of Women Engineers (SWE) chapter to support female students in engineering. In the fall of 2019, they offered a resume review session for SWE members and other student groups were invited.



Providing early career collaboration opportunities

Accelerated Collaborative Research Nucleus (ACORN) is a UNM pilot program striving to connect an early career faculty member at the university with an early career LDRD principal investigator at Sandia. The first award was issued to Sang Lee in the Department of Mechanical Engineering and Sandia Labs researcher Adam Brink for “Multi-fidelity Simulation of Fluid-Structure Interaction Using Machine Learning.” The second award paired Sandia researcher Aaron Olson with UNM’s Christopher

Perfetti in the Department of Nuclear Engineering for “Sensitivity Methods for Monte Carlo Photon/Electron Radiation Transport.” This program will sponsor one new project each year, with each project eligible for three-year funding.

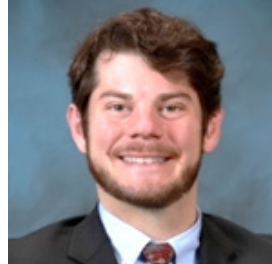
After a successful pilot at UNM, the program was extended to the other NM research universities and is available for consideration at schools across the SAA.



Adam Brink
Sandia National
Laboratories



Sang Lee
UNM Department
of Mechanical
Engineering



Christopher Perfetti
UNM Department of
Nuclear Engineering



Aaron Olson
Sandia
National
Laboratories

ALUMNUS SPOTLIGHT

Gabriel Baduqui

Gabriel Baduqui, UNM alumnus, was honored at the UNM Anderson Hall of Fame Banquet held in March 2019. He received the American Society for Microbiology Hall of Fame Scholarship. Baduqui had no real connections in New Mexico but moved from Arizona



to go to UNM. Through some unique opportunities fostered by the SAA Program, he made connections that culminated in a Sandia internship. Baduqui recently converted to a regular employee.

INTERN SPOTLIGHT

Raymond Fasano

Plasmas, lasers, and the nucleus of an atom are the focal point of Ray Fasano's research at Sandia. Ray obtained his bachelor's degree in Mechanical Engineering from Tufts University and is currently a graduate student in the Department of Nuclear Engineering at UNM. As a graduate year-round intern in the Energy Security Group at Sandia, Ray is currently working under Mohamed S. El-Genk, UNM Distinguished and Regents' Professor, on the NicSim Nuclear Energy University Partnership (NEUP) grant. Fasano previously worked with the Laser Operations and Engineering Group at Sandia and in the Plasma Physics Department at LANL. As an intern at Sandia since 2016, Fasano has grown professionally and technically in the field of nuclear science and engineering.



ALUMNUS SPOTLIGHT

Joshua Stanford

Joshua Stanford interned at Sandia's Primary Standards Lab for three-and-a-half years during his undergraduate and graduate studies. As an intern, he expanded his knowledge of electrical engineering, computer programming, metrology, and 3-D printing. After Joshua graduated with his master's of science degree in May 2019, he started a full-time position as an R&D electrical engineer at Sandia. Sandia has been pivotal to Stanford's continued education and personal growth.



INTERN SPOTLIGHT

Alan Evans

Alan Evans is a graduate R&D student intern in the International Nuclear Security Engineering Group. He graduated with a bachelor's degree in Nuclear Engineering at UNM and wrapped up his master's degree in Nuclear Engineering in December of 2019. Evans worked in the Advanced Nuclear Concepts Group developing new water-loss reduction technologies and currently leads efforts on international nuclear material and facility security systems. Sandia opened doors allowing him to pursue opportunities such as national and international travel and receive mentoring from some of the most experienced professionals in the industry.



INTERN SPOTLIGHT

Ashley Mayle

Ashley Mayle is an undergraduate student studying Computer Science and Psychology at UNM. She is currently pursuing a graduate degree in Computer Science. Mayle works in the Technology Development Group in the Physical Security Department at Sandia as an undergraduate R&D intern. Her work at Sandia has encouraged her to pursue a graduate degree to continue working in R&D.



INTERN SPOTLIGHT

Samuel Gilletly

Sam Gilletly is a graduate student at UNM studying Statistics. Gilletly works in the Math Analysis and Decision Sciences Department as an R&D graduate intern focusing on projects relating to systems analysis, optimization, and modeling/simulation projects for the Departments of Defense, Energy and Homeland Security.



INTERN SPOTLIGHT

Wendy Flores-Brito

Wendy Flores-Brito is a graduate student at UNM studying mechanical engineering. She graduated with an undergraduate degree from Universidad del Turabo (now called Universidad Ana G. Mendez) in Puerto Rico. Flores-Brito started as an undergraduate intern in 2017 and is currently a year-round graduate R&D intern in the Fire Science and Technology Department where she conducts literary research and assists with experimental setup, execution, and data collection and analysis. Working at Sandia has shown her that there is always something new to explore and given her confidence in collaborating with peers and/or coworkers.



INTERN SPOTLIGHT

Bibiana Seng

Bibiana Elisabeth Seng is a recent graduate of UNM's College of Arts and Sciences, where she earned a dual degree in Applied Math and Statistics. She currently works with the Water

Power Technologies Department at Sandia as an undergraduate R&D intern. Her time at Sandia has not only built up her professional network, but also introduced her to the research, review, publishing, and presentation process as she has assisted in writing internal reports and external conference papers. This early career exposure aided her greatly when she presented research on Capitol Hill to New Mexico Senators and Congressmen at an undergraduate research seminar. Seng will be pursuing her PhD in statistics at Penn State, and hopes to one day return to Sandia as a statistician.



STUDENT SPOTLIGHT

Maimuna Hossain

Maimuna Hossain is a PhD student in the UNM Department of Mechanical Engineering, pursuing research in structural dynamics and vibrations. She received her bachelor's degree in Mechanical Engineering from Columbia University, and prior to graduate school, worked as a mechanical engineer in the Satellite Communications Branch at the Tobyhanna Army Depot. During the year, Hossain works on an LDRD project focused on finding the dynamic properties of a structure under vibration. The project successfully produced two conference papers and potential journal papers. As she continues her work, this project will become her thesis for dissertation. According to Hossain, "Working with Sandia has expanded my understanding of structural dynamics for aerospace applications. It exposed me to what it is like to work for the Labs and allowed me to meaningfully combine skills in linear algebra, advanced computation techniques, and mechanical and structural engineering in order to solve technical problems."



Maimuna Hossain
PhD Candidate

UNM Department of
Mechanical Engineering

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