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Los Alamos
NATIONAL LABORATORY

Operational and Mission Highlights

A MONTHLY SUMMARY OF TOP ACHIEVEMENTS

November 2021

Contents

COMMUNITY RELATIONS

NUCLEAR SECURITY

Chlorine Delivery and Detection Project Completed at the Laboratory's Plutonium Facility

On October 29, 2021, Laboratory workers installed and tested the Chlorine Delivery and Detection Project at the Plutonium Facility at TA-55. An essential piece of the 30-pits-per-year weapons mission, this new equipment will improve the effectiveness of recovering plutonium.

To complete this project's installation required a collaboration between the following organizations: Plutonium Infrastructure, Capital Projects, Facilities & Operations (Safety Basis), Weapons Production (including TA-55 Process Maintenance and Decontamination Services [PMDS] and Pit Technologies), and Environment, Safety, Health, Quality, Safeguards, and Security (Radiation Protection).

The project culminated with numerous interfaces, integrations, and coordination efforts. The Pit Technologies team ensured the quality and performance of system components and met all specifications. The Safety Basis team worked diligently to ensure all work was adequately authorized following a rigorous Unreviewed Safety Question review. Additionally, the PMDS team used its experience and knowledge to ensure work package delivery and to complete the installation.

Moving forward, team members are now proceeding through the Design Change Form Closeout and the Management Self-Assessment process; the equipment should be operational in June 2022.

Critical Plutonium Experiments Continue as Z-Machine Waste is Shipped for Final Disposition

A multi-organizational team with members from the Laboratory, Sandia National Laboratories (SNL), the Waste Isolation Pilot Plant (WIPP), and Weston Solutions, Inc., recently shipped seven waste boxes of expended Plutonium Isentropic Compression Experiments (Pu/Z/ICE). Removed from SNL, the waste was unpackaged at LANL and transferred to N3B, where it awaits final disposition to WIPP in southeastern New Mexico.

This waste stream had accumulated over the past eight years from experiments conducted on the SNL Z-machine, and its removal represents a multi-year effort with engagement across the national security complex. Removing this waste stream enables the continuation of critical experiment sets on the Z-machine. These experiments support NNSA's stockpile stewardship program by enabling advancements in plutonium aging science and next-generation plutonium manufacturing science.

Since 2006, the Laboratory has been leading, in collaboration with SNL, the plutonium experimental design efforts on Z-machine. Recent advancements in pulse shaping and drive configurations have increased the programmatic value and benefits of these experiments.

To enable continued execution of these critically important experiment sets, it had become imperative that the waste accumulated from these experiments be removed from SNL. This recent shipment was a culmination of years of planning and collaboration, and it sets the stage for future advancements in plutonium science on the Z-machine.

Laboratory's Mshock Team Completed Experiments that Confirm Theory and Validate Hydrodynamic Models

On October 19–20, 2021, the Laboratory's Multi-shock (Mshock) team successfully executed four consecutive experiments at Lawrence Livermore National Laboratory's National Ignition Facility (NIF). NIF was built to probe fusion ignition with the most powerful laser in the world. Led by Laboratory scientists, the team confirmed what was previously only predicted in theory.

Previous Mshock experiments recorded the disappearance of a leading perturbation following the interaction of successive traveling shock waves. Data from this most recent series imaged the reappearance of the same perturbation at later times, thereby confirming a previously unobserved theoretic prediction. The success of the Mshock experimental campaign is extending the validation of the Laboratory's hydrodynamic modeling capability to the high-energy-density plasma regime.

Mshock is now a well-characterized platform for probing multiply-shocked hydrodynamic regimes. These models underwrite the scientific knowledge base that helps the Lab accurately and safely maintain the nation's nuclear weapons stockpile.

New Laboratory Capability Simulates Damage of Beryllium, Enabling Strength Predictions Under Various Stress States

The Laboratory's Advanced Simulation and Computing program has developed and implemented a new theoretical model that simulates the strength and damage of beryllium, incorporating the critical microstructural defects and the associated evolution mechanisms — it shows how beryllium behaves under stress. The model includes a description of the anisotropic damage (cracks with or against a grain) associated with quickly propagating cracks under complicated three-dimensional stress states, as well as the kinetics of defects (how fast the cracks and dislocations can move).

The new model and simulation capability will enable more accurate performance predictions of components made of beryllium and a host of similar quasi-brittle materials of strategic importance to NNSA. The model has been implemented into the Lagrangian Applications Project code, and it has been applied to simulations of the degradation and damage of a beryllium cylinder undergoing rapid dynamic expansion.

Pit Product-Realization Team Receives Positive Results from Gate Review

NNSA recently signed off on a positive report that addresses the Laboratory's progress in achieving the first production unit (FPU) of plutonium pits, particularly when it comes to successful collaboration that yields effective processes. As part of the MC4597 pit product-realization process, a series of integrated phase gate reviews are conducted, following an integrated phase gate implementation plan issued by the federal program manager.

The MC4597-01 pit product-realization process is in the production engineering stage, with the product pre-pilot production (PPPP) gate review held at the Laboratory on November 2–3, 2021. The MC4597 product realization team (PRT) provided a review that included status of design and releases; qualification status; risk analysis/producibility; impacts resulting from laboratory, technical, and peer reviews; schedules; and costs. The chair and review panel recognized that the PRT has made significant progress toward FPU, as demonstrated by recent successful builds and the comprehensive PPPP gate review.

The panel also recognized that the collaborative environment developed during the PRT represented best practice and was noted by the panel as positive. The judgement of the panel was "continue with conditions" (which was expected). The panel provided preliminary conditions, which were reviewed by the Laboratory, Lawrence Livermore National Laboratory, and Kansas City National Security Campus for feedback to NNSA. Final documentation of the gate review was issued on November 22, 2021.

Plutonium Infrastructure Team Unveils New Space for Equipment Pre-Assembly and Testing

The Laboratory's Plutonium Infrastructure Directorate recently acquired a 2,900-square-foot section of Weapons Production's new warehouse at TA-46. This new space will provide workers supporting the 30-pits-per-year mission a safer, more efficient, and spacious work area to conduct equipment pre-assembly, mockups, and functional testing outside the Plutonium Facility (PF-4). Now available for use, the space includes several staging areas for gloveboxes. The first pre-assembly in this new area is expected to take place in early December 2021.

As the 30-pits-per-year mission moves forward, gloveboxes destined for PF-4 will travel through TA-46 space for pre-assembly and testing. This new space eliminates the need not only for uncleared personnel to enter PF-4 but also provides a place where Lab personnel can test equipment and resolve any potential issues instead of testing said equipment within a radiological area.

Transuranic Waste Shipments Successful in 2021

In FY21, teams from the Associate Laboratory Directorate for Weapons Production and the Associate Laboratory Directorate for Environment, Safety, Health, Quality, Safeguards and Security worked together to ship 1,241 transuranic waste drums to the Waste Isolation Pilot Plant in Carlsbad, New Mexico. These shipments included 730 Triad containers and 511 Triad-N3B containers from Area G. As teams work hard to move out waste drums and make room for future production, the inventory of drums at TA-55 continues to hold at around 30–32%, an all-time low necessary for operations to continue.

SCIENCE, TECHNOLOGY, AND ENGINEERING

Eight Laboratory Technologies Honored with 2021 R&D 100 Awards

Eight Laboratory technologies recently won 2021 R&D 100 Awards. Moreover, five inventions received Special Recognition Awards, including a Gold Award for Corporate Social Responsibility, a Gold Award for Battling COVID-19, a Silver Award for Market Disruptor – Product, and Silver, and Bronze Awards for Market Disruptor – Services.

The winners of the R&D 100 Awards are as follows:

- ADS Codex, an open-source translation tool that enables computer binary information to be encoded and decoded for DNA's four-letter nucleotide alphabet for high-capacity, robust archival data storage;
- CICE Consortium, an open-source software that provides extensive, accurate sea ice modeling across scales;
- Earth's-field Resonance Detection and Evaluation Device (ERDE), a magnetic resonance spectrometer that uses the Earth's magnetic field for rapid, accurate, and safe identification of chemicals;
- Mochi — this open-source tool provides scalable data services for high-performance computing;
- Portable EnGineered Analytic Sensor with aUtomated Sampling (PEGASUS), a miniaturized, fieldable biosensor that makes laboratory-quality analysis of complex samples available in remote or resource-poor areas;
- Quantum Ensured Defense for the Smart Electric Grid (QED) — this technology uses single light particles — photons — to create cryptographic "keys" that "lock" control signals into secret codes to protect the electric grid from third-party infiltration;
- SmartTensors AI Platform, a software that uses unsupervised machine learning to sift through massive datasets and identify hidden trends, mechanisms, signatures, and features buried in large high-dimensional data tensors or a multi-dimensional array; and
- Terra Spotlight, a software that enables rapid change detection using satellite data from different imaging modalities).

The prestigious "Oscars of Invention" honor the latest and best innovations and identify the top technology products of the past year. The R&D 100 Awards span industry, academia, and government-sponsored research organizations. Since 1978, the Laboratory has won more than 178 R&D 100 Awards.

Lab and German Aerospace Center Scientists Collaborate to Collect First-Ever Data on Metal Alloy

During the week of October 18, 2021, Laboratory scientists, in collaboration with colleagues from the German Aerospace Center, collected first-of-its-kind data on the microstructure of an aluminum-copper alloy, centrifugally solidified under varying gravity fields, using the High-Pressure/Preferred Orientation (HIPPO) diffractometer at the Los Alamos Neutron Science Center (LANSCE). Understanding the solidification of liquid metal is important to optimize the microstructure, and therefore material properties, resulting from casting processes. The alloy, Al-10 wt% Cu, solidifies in large crystals, making LANSCE neutrons an ideal probe. These data fill a gap on how gravity affects the casting and the microstructure of this alloy.

Laboratory "SuperCell" Steady Through 110-Megajoule Dose of Pulsed Power

On August 26, 2021, Laboratory scientists and engineers conducted a groundbreaking experiment on a novel device known as the "SuperCell" (a miniature hydrogen fuel cell stack) in the Annular Core Research Reactor (ACRR) at Sandia National Laboratories. In this first experiment of its kind, the Laboratory team shot the SuperCell with a high dose of radiation in the ACRR to determine if the SuperCell's power would remain steady and if radiation might affect its performance.

The SuperCell's power output remained steady, with little-to-no reaction, despite the resultant severe radiation environment. The fuel cell ran for 30 minutes, 26 of those post-irradiation, and there was no abnormal temperature rise or a measureable disruption or loss of power. The results of this experiment exceeded expectations and performance requirements, without any unusual behavior in electrical performance caused by radiation. This bodes well for hydrogen power in a number of applications, including weapons.

A SuperCell is the Laboratory's version of a polymer electrolyte membrane hydrogen fuel cell, or PEMFC. In essence a miniature hydrogen fuel cell stack, the PEMFC puts out the right amount of power for the right amount of time needed — 30 minutes of runtime for this experiment. The ACRR provides a large controlled pulse of neutrons and gamma rays. The pulse dosed the SuperCell with 110 megajoules of neutron energy. At its peak, the ACRR generated more power than the entire state of New Mexico's electrical consumption.

Conducting an experiment at the ACRR like this on a working fuel cell stack has never been done before. This new research will likely open new avenues and experimental capabilities for the Laboratory.

Machine Learning Refines Earthquake Detection Capabilities

A new paper by Laboratory researchers explains how they developed new algorithms to improve earthquake detection. The researchers applied machine-learning algorithms to help interpret massive amounts of ground-deformation data collected with Interferometric Synthetic Aperture Radar (InSAR) satellites, giving them a new way to understand the physics behind tectonic faults and earthquakes.

New satellites are opening a window into tectonic processes by enabling researchers to observe length and time scales previously not possible. However, existing algorithms are not suited for the vast amount of InSAR data flowing in from these new satellites, and even more data will be available in the near future.

The team's new methodology enables the detection of ground deformation automatically at a global scale, with a much finer resolution than existing approaches.

New Models and New Experiments Meet NNSA's High Explosives Challenges

The Laboratory's Office of Experimental Science, Engineering and Technology Maturation Program Office, and the Advanced Simulation and Computing Program have recently formed a partnership. This partnership has demonstrated how high explosives (HE) behave in extreme or off-nominal environments by expanding the modeling and experimental framework to cover regimes often left unexplored because of the challenges associated with them.

Physics and Chemistry of Materials (T-1) researchers Tariq Aslam, Joshua Coe, and Christopher Ticknor have produced highly accurate experiments and models of HE systems. To address the fact that such models are less tested at higher impact pressures because of the HE's reactive nature, the researchers developed a new experiment to access the high pressure of the unreacted HE.

By witnesses the response during the experiment, the researchers inferred the HE's behavior at high pressure with unprecedented accuracy in this regime. With these new designs and applications for HE, the Laboratory is leading the way in creatively improving modeling and experimental abilities into less-tested models.

Plutonium Infrastructure Engineer Honored with American Nuclear Society Service Award

Laboratory scientist Robert F. Penn Jr. of Engineering Project Delivery (ES-EPD) received the American Nuclear Society's (ANS) Milton Levenson Distinguished Service Award. This award recognizes ANS members who have contributed to the vigor of the society or who have made outstanding nontechnical contributions to nuclear science and technology. Penn will receive his award on December 2, 2021.

ANS President Steve Nesbit will make the presentation at ANS's Winter Meeting in Washington, DC.

According to the citation, Penn has provided "untiring and continued support for the mission of nuclear energy for over 45 years with ANS as a leader, an advisor, a hard worker, a friend, and a visionary."

As a project engineer in ES-EPD, Penn currently supports TA-55 capital projects with the Associate Laboratory Directorate for Plutonium Infrastructure. In addition to working for commercial nuclear power plants, Penn has worked for other DOE projects across the United States, including the Oak Ridge National Laboratory ITER Fusion project, DUF6 in Portsmouth, Ohio, and the Idaho National Laboratory Advanced Test Reactor. Penn has been with the Laboratory since 2019.

Other recipients receiving awards at the meeting include former DOE Secretary Ernie Moniz and former Laboratory Director John Browne.

Using Science to Understand the Future of Mountain Watersheds

In a new article published in the Santa Fe New Mexican, Laboratory scientist Allison Aiken of Earth System Observations (EES-14) tells readers about a new project in Colorado designed to better understand mountain watersheds. Current Earth systems models cannot fully address uncertainties related to water flowing in an out of these watersheds resulting from precipitation, evaporation, runoff to streams and rivers, soil absorption, plant uptake, and aquifer storage.

To address these uncertainties, Laboratory scientists and collaborators have launched a unique, large-scale research campaign near Crested Butte, which is high in the Colorado Rockies. Known as the Surface Atmosphere Integrated Field Laboratory (SAIL), this research campaign is funded by DOE, is managed by the DOE Office of Science's Atmospheric Radiation Measurement (ARM) user facility, and is led by Lawrence Berkeley National Laboratory.

The Laboratory leads the overall management and operations of the ARM mobile observatory, which includes an array of instruments designed to study the Earth's atmosphere. Made up of researchers from a variety of scientific disciplines, national laboratories, universities, and government agencies, the SAIL team is studying everything about water in the mountains, such as what exactly falls from the sky, what flows down the Colorado River watershed, and what ends up stored in the area's bedrock.

Over the next two years or so, SAIL will use radars, lidars (remote sensing using lasers), cameras, weather balloons, and other advanced equipment to collect data on precipitation, wind, clouds, aerosols, solar and thermal energy, temperature, humidity, and ozone.

White Honored for Advancement of Women in Nondestructive Testing

The American Society for Nondestructive Testing (NDT) recently recognized Sarah White of Nondestructive Testing & Evaluation (E-6) for her work in encouraging women to enter and thrive in this specialized field. Most NDT supports industrial applications. For example, techniques involving X-rays can determine the structural integrity of bridges.

"Here at the Lab, we apply NDT to nuclear weapons," White said.

White has worked in E-6 for more than 22 years, currently serving as its group leader. To support the nuclear weapons stockpile, E-6 provides R&D and uses advanced methods of inspection and NDA at TA-8's radiological facilities.

White said she had been working on her master's degree in nuclear engineering at the University of Florida when she had elected to take an elective in nondestructive evaluation. Impressed with what she had learned, White focused her career in that direction when she joined the Laboratory.

"When I started, there were only two females in the field here at Los Alamos," she said. "Now women make up about 35 percent of our organization."

Żurek Honored with Two Doctor Honoris Causa Honors in Poland

Wojciech Żurek of the Laboratory's Physics & Condensed Matter and Complex Systems (T-4) recently received two Doctor Honoris Causa honors.

On October 22, 2021, AGH University of Science and Technology presented Żurek with his first Doctor Honoris Causa in Kraków Poland. A few days later, on October 25, Jagiellonian University presented Żurek with a Doctor Honoris Causa honor during an award ceremony in Collegium Novum Assembly Hall during a JU Senate special session, also in Kraków Poland. Żurek received the JU honorary doctorates for

- fundamental research on decoherence, quantum physics, and astrophysics;
- work on non-cloning theorem, together with William Wooters and Dennis Dieks;
- developing the theory of what is now known as the Kibble-Zurek mechanism, conducted in collaboration with Tom W. B. Kibble; and
- longstanding efforts to support the Polish academic community, particularly for helping young Jagiellonian University researchers.

MISSION OPERATIONS

For Fourth Year in a Row, the Laboratory Receives HIRE Vets Medallion Award

On November 10, 2021, U.S. Secretary of Labor Martin J. Walsh bestowed the Laboratory with a gold-level 2021

HIRE Vets Medallion Award during a virtual award ceremony presented by the U.S. Department of Labor.

Since 2018, more than 1,400 employers have earned this award, which demonstrates unparalleled commitment to attracting, hiring, and retaining veterans. The Laboratory has earned this annual award since the program's inception four years ago.

The Laboratory joins 849 other companies from 49 states and the District of Columbia that have demonstrated a commitment to hiring veterans. Recognized companies have long-term career and growth plans that take advantage of the diverse skills acquired by veterans during military service.

Recipients of the 2021 HIRE Vets Medallion Award meet rigorous employment and veteran-integration assistance criteria, such as veteran hiring and retention percentages, availability of veteran-specific resources, leadership programming for veterans, dedicated human-resource efforts, pay compensation, and tuition assistance programs for veterans.

Forty-Three Lab Leaders Graduate from LOMA Leadership and Culture Development Workshops

On October 19–20, 2021, 43 Laboratory leaders participated in Laboratory Operations Management Academy (LOMA) workshops. The LOMA workshops took place at the Crossroads Church in Los Alamos.

Chief Operating Officer Scott Tingey of the Associated Laboratory Directorate for Facilities & Operations contacted each of his counterparts within the Laboratory's other Associated Laboratory Directorates (ALDs) to secure a priority list of four to six potential LOMA participants from these ALDs.

LOMA helps higher-level managers (5 and 6) better understand and thus better support their first-line managers in enacting Safe Conduct of Research (SCoR) principles and passing them down to their work teams. The participants use scenario training to practice these eight principles.

SCoR Principles do not pertain just to research. These eight principles help all employees perform their work safely and more effectively. Created by Battelle, SCoR has a proven record of accomplishment from its use at seven other Battelle-managed laboratories. By adopting a SCoR mindset, employees embrace challenges, reduce accidents and injuries, and avoid falling prey to distractions or taking unnecessary risks.

Information & Technology Deploys Microsoft Teams Software to All Laboratory Employees

At the end of October 2021, The Laboratory's Information & Technology (I&T) organization deployed Microsoft Teams software to all computer users at the Lab. To inform users about the availability of this new application, the Laboratory initiated a communications campaign that included announcements posted on the Lab's internal webpage and directly via email.

Adding Microsoft Teams is part of I&T's larger effort to bring Microsoft Office 365 (M365) online at the Laboratory. A suite of applications, M365 includes Teams, Office, and email in the cloud.

Microsoft Teams offers computer users the option to improve their experience collaborating with colleagues and with other collaborators throughout NNSA, DOE, and other organizations that have adopted Microsoft Teams. An advanced online collaboration tool, Teams combines into a single application chat, meetings, calendar, and document sharing.

All Laboratory employees have also been given access to a training resource called Brainstorm QuickHelp, which provides training videos. This resource will help users maximize their experience as they begin to use Microsoft Teams.

Laboratory's Environmental Management System Recommended for Recertification under ISO 14001

On October 26–28, 2021, the Laboratory hosted an onsite Environmental Management System (EMS) Surveillance Audit by three external auditors from the Lab's site registrar, NSF International. The audit supported ongoing certification for the Laboratory to the International Organization for Standardization (ISO) 14001:2015 EMS standard. The DOE directs all DOE sites to maintain an EMS standard that conforms to ISO 14001:2015 specifications. The Laboratory has maintained continuous certification to this international standard since 2006.

The recent October 2021 Surveillance Audit included visits, observations, and interviews across Operations in seven Laboratory directorates. The results of the audit include one minor nonconformity and seven documented positive practices. The minor nonconformity is related to the Lab's corrective action process for environmental issues. This minor nonconformity will require a corrective action plan within 30 days of the audit's October 2021 closing meeting. The next external registrar onsite Surveillance Audit is planned for June 2022.

Laboratory's HR Division Enables 30+ Oracle iRecruitment Capabilities to Improve HR Operations

As part of its five-year transformation strategy, the Laboratory's Human Resources (HR) Division has developed a roadmap to improve and implement technology that enhances efficiency within HR and provides a better Lab-wide employee experience,

Before HR invests in new Information Technology systems, HR personnel are leveraging existing technologies, such as Oracle iRecruitment, to maximize the system's current capabilities and modernize complex HR resources. For example, implementing some of iRecruitment's features has enabled HR to reduce overall hiring cycling times from 125 days to 69 days. This reduction was part of HR's 60 Days to Hire initiative.

Some of the new capabilities taken from iRecruitment include (1) enabling password resets for external applicants, (2) digitizing offer letters and forms, and (3) entering applicant data in real time. Identifying new system solutions has enabled HR to work more effectively by shifting from paper to digital processes and better protecting personal identifying information.

As a result of enabling 30+ Oracle iRecruitment capabilities, HR has significantly improved its operations, the applicant experience, and the ability of HR employees to conduct work intuitively rather than conform to system limitations.

Laboratory's P-Card Program Receives "Best in Class Purchase Card 2021" Award

The Laboratory's P-Card Program in its Acquisition Services Management Division has received the "Best in Class Purchase Card 2021" award from the University of California and U.S. Bank. The award is chosen from among all 14 University of California campuses and six NNSA sites that participated in the University of California P-Card Program. Award selection criteria comprises annual growth, percentage of spending against operating expense, and speed of payment.

New Webpage Designed to Help Streamline TA-55 Training

In early November 2021, the Associate Laboratory Directorate for Weapons Production (ALDWP) launched a new webpage designed to help hundreds of new employees navigate through the training process, specifically for access to facilities at TA-55. Training requirements vary with respect to accessing buildings at TA-55 or those that support the technical area. To overcome this obstacle, the new TA-55 FOD (Facility Operations Director) Facility Access Training webpage serves a one-stop-shop for all training requirements.

ALDWP's training and mission services group worked on the new webpage, making on the onboarding process easier by pulling together existing requirements for eight facilities and putting them all in one spot. The webpage includes access to training requirements, training flowsheets, training contacts, and links to access forms that must be submitted when trainings are complete. It also features worker emergency responses for each building.

In FY21, ALDWP hired nearly 500 people – 337 external hires and 145 internal hires. The new page includes more than just training information. It has maps showing where the buildings are located, building addresses, and information about parking and shuttle service.

Pajarito Road Bike-Lane Striping Creates Safer Commute for All

Bicyclists and motorists recently celebrated the addition of a designated bicycle lane on a stretch of Pajarito Road, thanks in part to the efforts of Natalie Romero-Trujillo from the Laboratory's Facility System Engineering Utilities & Infrastructure. Romero-Trujillo directed a Logistics' Roads and Grounds crew to add a new white-painted lane, originally suggested by the Bicycle Safety Committee (BSC). With support from the GIS Program team's Bethann McVicker (Infrastructure Program Office Data Group), a map was illustrated that showed where the lanes were needed. The newly

demarcated section of bicycle lane aims to improve the safety of all commuters, bicyclists, and motorists.

Thanks to this improvement, bicycle lanes or adequate shoulder space is now continuous on Pajarito Road from White Rock to TA-3. When the Diamond Drive upgrades are completed, bicycle lanes will extend from Pajarito Road into town over the Omega Bridge and will connect White Rock and the back gate (NM4 and West Jemez Road) via West Jemez Road.

Like Utilities & Infrastructure and Logistics, the BSC supports safe bicycling on Laboratory property and encourages more bicycling by working with infrastructure and transportation professionals to promote projects that enhance bicycling safety, such as the Pajarito Road re-striping.

Reopened Omega Bridge Offers Improved Safety Features

The refurbished Omega Bridge reopened on October 22, 2021. This significant infrastructure project was a collaboration between two Lab directorates in Operations, the Associate Laboratory Directorate for Capital Projects, and the Associate Laboratory Directorate for Facilities & Operations (ALDFO). Craft workers from the ALDFO's Logistics Division executed the work on the bridge. The following improvements will extend the life of the bridge and allow for its continued safe use:

- Installed a permanent fence on the walkway to enhance the safety for pedestrians and bicyclists.
- Repaired and painted the hand railings and other railings.
- Installed a new gutter, which will capture and remove rainwater.
- Repaired potholes.

While crews executed this work, the bridge's walkway and bike path were closed during work hours for the safety of pedestrians and bicyclists. Each day and ahead of a weekend, the crew reopened the path for use. The crew's diligence also was seen in other practices employed during the bridge maintenance, such as flaggers deployed to direct sometimes heavy traffic. Additionally, there were no any safety incidents among the 17-member crew.

The collaborative work of the Capital Projects' Construction Management group, ALDFO's Utilities and Infrastructure Division, and Logistics ensured the smooth execution of this significant infrastructure project. The crew will return to the bridge in early November to replace its expansion joints.

Routine inspection Prompts Closer Look at Chemical Storage

After several months of effort and a revamped way of doing business, personnel have removed nearly 1,500 chemicals from the Engineering Materials (MST-7) group. During a regular chemical inventory at the Target Fabrication Facility, employees came upon a container of solvent last sampled in 2018. They decided to overhaul existing chemical storage conditions and develop a more sustainable approach to chemical management.

MST-7, which performs polymer science, materials characterization, and synthesis in support of national security research, logs more than 6,000 chemicals in the Laboratory's chemical database. As a result of this new approach, a multi-organizational team set out to inventory and identify chemicals no longer needed and stage them for disposal.

Demonstrating that how they do work is as important as what they do, the group has implemented regularly scheduled bi-annual chemical inventories and time-sensitive chemical testing, with a focus on sample management. Group members are working closely with their waste management coordinators to ensure labs remain orderly. They routinely collaborate with members of the Laboratory's RCRA (Resource Conservation and Recovery Act) compliance team to proactively ensure their waste procedures comply with regulations.

TA-55 Crews Cut Through the Waste

Over the weekend of October 30, 2021 Laboratory crews were busy at the Plutonium Facility cutting apart large pieces of metal waste — these pieces were too large to fit on a trolley. This complicated and involved effort, which required much planning, was a collaboration between TA-55 Process Maintenance and Decontamination Service, Nuclear Material Control Accountability, Operational Readiness Implementation Division, and Pit Technologies Division.

Personnel planned this project to coincide with inventory, so as not to interrupt pit production time. The material is now in a manageable size, and it is ready to be shipped to waste processing, where it will be safely

disposed of. This key process will further the pit production mission by making more space available for future production.

UI, IF Recognized for Excellence in Public Works Operations, Management

The Laboratory's Utilities & Infrastructure (UI) and Institutional Facilities (IF) Divisions recently completed the American Public Works Association (APWA) reaccreditation assessment. Such completion means that the UI will receive reaccreditation for another four years and that IF will be recognized as a newly accredited agency. Completing the reaccreditation assessment involved participation from a diverse team made up from members of Engineering Services, Logistics, and Maintenance and Site Services.

Accreditation enables these Laboratory divisions to promote excellence in the operation and management of a public works agency, as well as its programs and employees. Accreditation not only assists the agency in continuously improving operations and management but also provides a valid and objective evaluation of agency programs as a service to the public and the profession.

The Laboratory's UI and IF divisions represent the only federal organizations to have achieved accreditation. To achieve accreditation, 164 practices underwent reviews, from drinking-water treatment to traffic operations. Of these practices at the Laboratory, 161 were found to be fully compliant, with the remaining three considered not applicable.

The Laboratory divisions were recognized for model practices in eight areas, such as strategic planning (as documented in the Laboratory Agenda), diversity in the workplace, well-documented risk management reporting, comprehensive data security procedures, robust safety recognition program, and clearly identified expectations in guiding principles for facilities management.

Additionally, the Laboratory received full compliance in all five practices of the new (to the Lab) Asset Management System chapter on the first attempt. Practices focused on the Laboratory's asset management policy, asset management objectives, asset inventory, asset condition, and asset inspection schedule.

These model practices will be shared as references within the family of APWA accredited agencies.

Upgrades Completed to Detonator Production Facility

Meeting the strict design requirements for detonator parts will now be easier, thanks to the addition of a cleanroom in the detonator production facility located within a secure area at the Laboratory. The new space will enable workers to make detonator components free of airborne particulates, an important feature to customers who contract with the Lab for these products. The work was completed by an integrated project team consisting of members from the following areas:

- Capital Projects
- Facilities and Operations
- Non-Nuclear Production Office
- Weapon Modernization Production
- Weapons Facilities Operations
- Facility Operations Director

The cleanroom was designed and scoped to be a "room within a room," thus creating a controlled environment necessary to produce detonator parts. The legacy building where detonator components are produced could not filter out all the particulates that naturally occur in the ambient air; installing a specialized cleanroom within the building solves this problem.

An integrated project team worked with the vendor to install a standard "off-the-shelf" design to meet the program's specific needs. To ensure it meets the definition of a "cleanroom," workers installed HVAC, exhaust fans, compressed air, and HEPA units into the 40-x-30-square-foot space. Crews also installed standard electrical, water, and fire-protection systems in the new addition. With equipment installed, the new cleanroom is officially up and running — it is ready to meet the needs of the Laboratory's customers.

COMMUNITY RELATIONS

Downed Trees at the Lab Provide Firewood for local Communities

Families from four local Pueblos are looking forward to a warmer winter this year, after collecting the last of 200 cords of wood from trees that fell during the windfall of March 2019. On March 18, 2019, Mother Nature thinned around 3,500 trees on Laboratory property, yielding almost 500 cords of wood. The Laboratory offered this firewood to families from San Ildefonso, Santa Clara, Cochiti, and Jemez Pueblos.

The cleared wood is part of a larger effort between LANL and NNSA to improve forest management and health at the Laboratory. Since the Cerro Grande fire in May 2000, the Laboratory has been working to remove fuel loads and improve fire roads around the 37-square-mile property. Starting in 2010, workers cleared 4,000 acres of land lined with potentially dangerous fuel. Furthermore, three bridges were replaced in Omega Canyon last year to provide firefighters safe access to remote areas at the Laboratory.

NNSA Field Office manager Ted Wyka remarked that DOE is pleased the Pueblos were available to remove the resources from the site. "Providing the available wood to our tribal neighbors who have traditional ties to LANL property helps us to enhance our ongoing relationships with those communities," Wyka said.

Laboratory Scientists Hosted Students in Low-Energy Nuclear Physics

During the week of October 18, 2021, Scientists from the Laboratory's Los Alamos Neutron Science Center (LANSCE) hosted students from the Center for Excellence in Nuclear Training And University-based Research (CENTAUR), an NNSA Center for Excellence in low-energy nuclear physics. Students interacted with Laboratory scientists in nuclear physics, satellite-based measurements, nuclear reaction theory, nuclear forensics, isotope production, detector development, and computing. The CENTAUR collaboration is led by Texas A&M University and includes Florida State, Washington University in St. Louis, Louisiana State University, University of Washington, and the University of Notre Dame.

Laboratory-Supported Regional Partnership School Innovates to Help Students and Teachers

Two new initiatives are helping fourth- and fifth-grade students improve their math skills and educators improve their math-teaching capabilities, thanks to part of a Laboratory-supported Regional Partnership School (RPS) program in Pojoaque.

The new afterschool math program at the RPS has recruited five high school students to work with four Pojoaque Valley Intermediate School teachers and education specialists from the Laboratory's Math and Science Academy. Every week, the collaborators will provide extra math instruction for 30 fourth- and fifth-grade students.

In addition, a $40,000 grant from the LANL Foundation is funding a program that enables teachers to better apply new skills and practices. The program offers quality professional development sessions throughout the school year and for a week in the summer. This program also includes a collaborative process to help teachers put their new skills into practice in their classrooms, as well as work with each other to improve their teaching over time.

The RPS project combines Pojoaque Valley Schools, the Laboratory, and New Mexico Highlands University expertise and resources to improve teaching and learning (particularly in the crucial grades 4–8) in Pojoaque.

Laboratory Volunteers Help STEM Conference for Girls Succeed

More than 75 girls from across northern New Mexico gained better insight into science, technology, and engineering, thanks to the help from 10 female Laboratory researchers and engineers who volunteered as presenters at this year's STEM Pathways for Girls conference. The conference took place October 29–30, 2021.

These Laboratory volunteers ran six hands-on workshops at the event, which was organized by nonprofit STEM Santa Fe. Other Laboratory employees volunteered as workshop assistants and provided general help. Although the opening and closing keynote addresses were streamed online, the workshops were held in person at Santa Fe Community College.

Open to northern New Mexico girls in grades 5 through 8 — the age range the most vulnerable to losing interest in STEM — the event provided hands-on learning, encouragement, and connections to females with similar interests that ultimately aims to boost attendees' interest in STEM.

United States Navy visits Bradbury Science Museum

On November 8, 2021, leadership from the Associate Laboratory Directorate of Weapons Production (ALDWP) hosted a small group of US Navy visitors at the Bradbury Science Museum. The group was from the USS Santa Fe (SSN-763), including its Commanding Officer Matt Pianetta, as well as Rear Admiral Christopher

Engdahl, commander of Expeditionary Strike Group 7/ Task Force 76.

In an effort to express the importance of the connection between the Laboratory and the US Navy, employees shared an overview of the Lab's research and development of parts for nuclear weapons, many of which are used on Navy vessels. The visitors also learned about the Lab's involvement in recruiting and employing military veterans and had a chance to enjoy the various exhibits housed at the Bradbury.

SELECTED MEDIA COVERAGE

Is the Great Neutrino Puzzle Pointing to Multiple Missing Particles?
Quanta Magazine (10/28)
In 1993, deep underground at Los Alamos National Laboratory in New Mexico, a few flashes of light inside a bus-size tank of oil kicked off a detective story that is yet to reach its conclusion.

A Whole New Structure for Silicon
PV Magazine (10/29)
A group of scientists led by the US Department of Energy's Los Alamos National Laboratory has theorized that by altering the structure of silicon to create an allotrope – the same element in the same state, but with a different atomic structure – they could improve its light-absorbing characteristics, and performance as a solar cell.

Mysterious Physics Still Unexplained: MicroBooNE Experiment Shows No Hint of Sterile Neutrino
SciTech Daily (10/30)
New results from the MicroBooNE experiment at the U.S. Department of Energy's Fermi National Accelerator Laboratory deal a blow to a theoretical particle known as the sterile neutrino. For more than two decades, this proposed fourth neutrino has remained a promising explanation for anomalies seen in earlier physics experiments. Finding a new particle would be a major discovery and a radical shift in our understanding of the universe. However, four complementary analyses released by the international MicroBooNE collaboration and presented during a seminar today all show the same thing: no sign of the sterile neutrino.

Business People: Los Alamos National Laboratory Scientist Vania Jordanova was Named a Fellow by the American Geophysical Union
Santa Fe New Mexican (11/1)
She is a member of LANL's Space Science and Applications group and joined the lab in 2006. Jordanova has a master's degree in physics from Sofia University in Bulgaria and a doctoral degree in atmospheric and space sciences from the University of Michigan.

UbiQD Installs Quantum Dot Solar Window Pilots in Commercial Buildings
Benzinga (11/1)
UbiQD, Inc., a New Mexico-based advanced materials company, announced today that it has now installed its electricity-generating windows in three commercial building sites. Headquartered in Los Alamos, New Mexico, UbiQD is licensing technology developed at leading research institutions, including Los Alamos National Laboratory, M.I.T., University of Washington, and Western Washington University.

3D Simulations Improve Understanding of Energetic-Particle Radiation and Help Protect Space Assets
Phys.org (11/2)
A team of researchers used 3D particle simulations to model the acceleration of ions and electrons in a physical process called magnetic reconnection. The results could contribute to the understanding and forecasting of energetic particles released during magnetic reconnection, which could help protect space assets and advance space exploration.

Business People, Nov. 2, 2021
Santa Fe New Mexican — Teya Vitu (11/2)
Los Alamos National Laboratory scientist Vania Jordanova was named a fellow by the American Geophysical Union. Laboratory researchers Bill Daughton, Andrew Gaunt and Cristiano Nisoli received the LANL Fellows Prize for Research and Eva Birnbaum received the Fellows Prize for Leadership. James C. Owen has received the 2021 Distinguished Alumni Award for the College of Engineering from the New Mexico State University Alumni Association. Tracy "Tess" Lavezzi Light has been awarded the 2021 Los Alamos Global Security Medal.

How Long Does a Neutron Live? Physicists Make Most Precise Measurement Yet
CalTech — Staff Report (11/2)
In 2017 and 2018, the UCNtau team performed two bottle experiments at the Los Alamos National Laboratory (LANL). In the bottle method, free neutrons are trapped in an ultracold, magnetized bottle about the size of a bathtub, where they begin to decay into protons.

Underground Tests Explore How Heat Affects Salt-Bed Repository Behavior

Phys.org (11/3)

Scientists from Sandia, Los Alamos and Lawrence Berkeley national laboratories have just begun the third phase of a years-long experiment to understand how salt and very salty water behave near hot nuclear waste containers in a salt-bed repository.

New Studies Enable a Clearer View Inside Cells

The Scientist (11/4)

The researchers incorporated experimental 2D interaction data, simulated physical forces, and Newton's equations of motion to predict the 3D structure of the X chromosome. They didn't stop with 3D, however. They repeated the process at different time points during a process called X chromosome inactivation (XCI), thus adding the fourth dimension to their analysis. The high-resolution modeling, which required analysis of enormous datasets, was made possible by using supercomputers at Los Alamos National Laboratory.

Duke Human Vaccine Institute Awarded $17.5 Million Grant to Continue Work on Pan-Coronavirus Vaccines

The Duke Chronicle (11/8)

The grant will enable DHVI researchers, in collaboration with scientists from the University of North Carolina-Chapel Hill, the Los Alamos National Laboratory, the University of Pennsylvania and Beth Israel Deaconess Medical Center to work on the development of a vaccine that will protect against the MERS-type coronavirus variants.

Quantum Dot Solar Window with 3.6% Efficiency

FocusTechnica (11/9)

It developed the technology with the support of the U.S. Department of Energy's Los Alamos National Laboratory, the Massachusetts Institute of Technology, the University of Washington, and Western Washington University.

A New Theory for Systems That Defy Newton's Third Law

Quanta (11/11)

"That's what no one has thought about before, using these in the context of nonequilibrium systems," said the physicist Cynthia Reichhardt of Los Alamos National Laboratory in New Mexico. "So you can bring all the machinery that we already have about exceptional points to study these systems."

A Vaccine Against Valley Fever Finally Works — for Dogs

Wired (11/11)

In 2019, Morgan Gorris, an Earth system scientist at Los Alamos National Laboratory, used temperature and rainfall data to estimate more precisely where valley fever is endemic, based on the fungus's known behavior in ranges of humidity and warmth. Using those findings, and combining them with different climate-warming forecasts, she modeled how valley fever's range might expand under different scenarios of greenhouse gas emissions.

Is Quantum Computing the Future of AI?

Datanami (11/11)

While running AI applications on quantum computers is still in its very earliest stages, there are many organizations working to develop it. NASA has been working with Google for some time, and there is also work going on in the national labs. For instance, last month, researchers at Los Alamos National Laboratory published a paper called "Absence of Barren Plateaus in Quantum Convolutional Neural Networks," which essentially shows that convolutional neural networks (the type commonly used for computer vision problems) can run on quantum computers.

Underground Tests Dig Into How Heat Affects Nuclear Waste Containers in a Salt-Bed Repository

Focus Technica (11/11)

Scientists from Sandia, Los Alamos and Lawrence Berkeley national laboratories have just begun the third phase of a years-long experiment to understand how salt and very salty water behave near hot nuclear waste containers in a salt-bed repository. Salt's unique physical properties can be used to provide safe disposal of radioactive waste, said Kristopher Kuhlman, a Sandia geoscientist and technical lead for the project. Salt beds remain stable for hundreds of millions of years. Salt heals its own cracks and any openings will slowly creep shut.

ORNL, Los Alamos National Lab & EPB win R&D 100 Award

EE Online (11/12)

R&D 100, the most prestigious innovation awards program for the past half century, has honored Oak Ridge and Los Alamos National Laboratories, along with EPB, with a R&D 100 award for a joint project that is developing technology to protect America's electric grid from cyberattacks.

LANL Wins Tech Awards
Albuquerque Journal (11/14)
Los Alamos National Laboratory has won eight awards for technologies and five for inventions, from the Silicon Valley-based R&D World magazine, for the best innovations of the past year.

Recreating Deep-Earth Conditions to See How Iron Copes with Extreme Stress and Pressure
SciTech Daily (11/14)
New observations of the atomic structure of iron reveal it undergoes "twinning" under extreme stress and pressure. Researchers at Los Alamos National Laboratory contributed to this study.

Scientists Share Data Using Nuclear Radiation Instead of Electromagnetic Signals
Newsweek (11/16)
Engineers have successfully transmitted digital information wirelessly using nuclear radiation rather than the electromagnetic signals traditionally used in wireless communication systems like smartphones.

Tri-Lab Effort Makes Strides Toward Increasing Supply of Ac-225
Axis Imaging News (11/19)
In experiment after experiment, the synthetic radioisotope actinium-225 has shown promise for targeting and attacking certain types of cancer cells. Although researchers have studied this radioisotope's cancer-fighting potential for more than two decades, there's not a U.S. FDA-approved treatment using Ac-225—yet. But with multiple clinical trials now underway, it's likely that both an approved treatment and increased demand for the radioisotope are in the near future—and the U.S. Department of Energy wants to be ready.

Los Alamos National Laboratory Director to Hold Community Meeting Dec. 1 via Zoom
Los Alamos Reporter (11/20)
New Mexicans are invited to attend a community meeting hosted by Los Alamos National Laboratory Director Thom Mason on Wednesday, Dec. 1, 2021, from 6–7 p.m. Mason will give a brief update on the Laboratory's work, science research, and economic impact, and take questions from the audience.

Diverse Satellite Images Sharpen Our Picture of Earth
Santa Fe New Mexican (11/22)
Being able to accurately detect changes to the Earth's surface using satellite imagery can aid in everything from climate change research and farming to human migration patterns and nuclear nonproliferation.

LANL: Global Warming, Not Just Drought, Drives Bark Beetles to Kill More Ponderosa Pines
Los Alamos Reporter (11/22)
In California's Sierra Nevada, western pine beetle infestations amped up by global warming were found to kill 30% more ponderosa pine trees than the beetles do under drought alone. A new supercomputer modeling study hints at the grim prospect of future catastrophic tree die-offs and offers insights for mitigating the combined risk of wildfires and insect outbreaks.

Ultrathin Solar Cells Get a Boost: 2D Perovskite Compound has the Right Stuff to Challenge Bulkier Products
Phys.Org (11/22)
Engineers have achieved a new benchmark in the design of atomically thin solar cells made of semiconducting perovskites, boosting their efficiency while retaining their ability to stand up to the environment. Rice engineers and their collaborators at Purdue and Northwestern universities, U.S. Department of Energy national laboratories Los Alamos, Argonne and Brookhaven and the Institute of Electronics and Digital Technologies (INSA) in Rennes, France, discovered that in certain 2D perovskites, sunlight effectively shrinks the space between the atoms, improving their ability to carry a current.