PHYSICAL SCIENCES

VISTAS

PERSPECTIVES ON SIMULTANEOUS EXCELLENCE | ISSUE 1 2023

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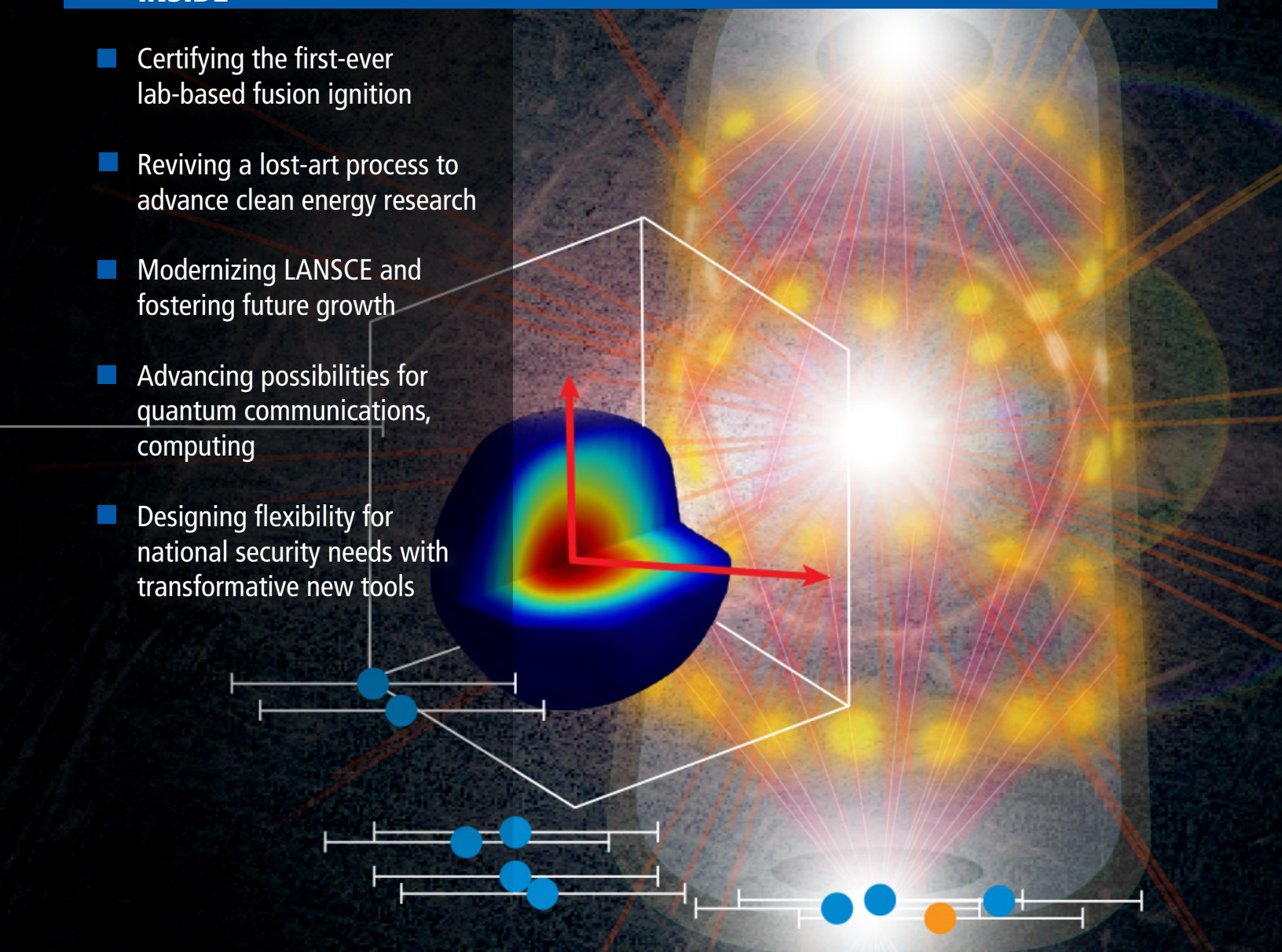

Los Alamos NATIONAL LABORATORY

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On the cover: A three-dimensional reconstruction (foreground) of the neutrons produced during the December record-setting shot at the National Ignition Facility. To create fusion ignition, the National Ignition Facility's laser energy is converted into x-rays inside the hohlraum (background illustration), which then compress a fuel capsule until it implodes, creating a high-temperature, high-pressure plasma.

Erik Luther (foreground) and Michal Pate (both Fabrication Manufacturing Science, Sigma-1) process metal hydrides in a glovebox.

Physical Sciences Directorate

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FROM ELLEN'S DESK

Ellen Cerreta, Associate Laboratory Director for Physical Sciences

Hello and Happy New Year!

In reviewing the articles for this issue of *Physical Sciences Vistas*, I am struck not only by the breadth and the quality of the science and engineering performed across the directorate but also by the outstanding partnerships our staff maintain in order to serve our national security mission. It goes without saying that work at a national laboratory requires partnerships across divisions and directorates. However, I am gratified that, in spite of the challenges posed by social distancing and lack of travel, so much of our work remains tightly coupled to our colleagues outside of the Laboratory.

To this point, highlights of this *Vistas* illustrate not only our scientific and engineering leadership but also our partnerships with fellow National Nuclear Security Administration laboratories and plants and broader Department of Energy facilities, as well as development of our facilities to attract collaborators from all over the world to our Lab. The issue begins with an article highlighting Physics Division's involvement in diagnostic development that led to the measurement of ignition at the National Ignition Facility at Lawrence Livermore National Laboratory. Subsequent articles transition to some of the materials development occurring in Sigma, Materials Science and Technology, and Materials Physics and Applications divisions. This is inclusive of the development of next generation moderator materials as an enabling technology of small modular reactors. These materials will most likely be qualified at a facility at Idaho National Laboratory. The issue also highlights development of novel, additively manufactured foams for next generation weapons. This work is being done in close collaboration with the Kansas City National Security Campus to enable transition of materials development to production in a more agile way. Finally, an article describes Accelerator Operations and Technology Division's hard work to replace the legacy remote instrumentation and control equipment at the Los Alamos Neutron Science Center (LANSCE) with a modern control system. The story discusses how that engineering success will lead to improved sustainability of the beam during operation and thus a better experience for all of our collaborators and partners in the LANSCE user program.

As you read through this issue, I encourage you to consider your partnerships that are important for your work. As you do that, perhaps take some time to examine where you may want to grow those or new partnerships. I ask this, because as I begin my new role with the Physical Sciences Directorate, I will be engaging each of your division offices in examining the directorate's strategic plan. And as part of that exercise, we will be looking to make sure that we stay well connected with our national security partners throughout the DOE Complex, industry, academia, and abroad. ■

Setting off a new era in fusion research

Los Alamos diagnostics used to certify first-ever laboratory-based fusion ignition

This is an exciting moment in science—and, possibly, world history. The Department of Energy announced that on Dec. 5 Lawrence Livermore National Laboratory (LLNL) successfully achieved fusion ignition at its National Ignition Facility (NIF). Los Alamos National Laboratory was among LLNL's collaborating institutions, providing several key diagnostics that provide data on the quality of the implosion, as well as significant contributions over many years to the scientific base building required for this achievement.

Other collaborating institutions included Sandia National Laboratories, the Laboratory for Laser Energetics at University of Rochester, Nevada National Security Site, universities, and international partners.

The fusion breakthrough potentially marks a new era in approaches to clean energy development and national security. The ability to produce in a laboratory setting a self-sustaining, controlled nuclear reaction could give rise to a new source of abundant clean energy. The process is also critical for supporting the science basis of stockpile stewardship by enabling experiments investigating phenomena of weapon interest.

"The achievement of ignition on NIF is one of the most exciting developments in my entire career," said Associate Laboratory Director for Weapons Physics Charlie Nakhleh. "It opens up whole new avenues of laboratory investigation into high-energy-density phenomena that were previously inaccessible. It is a tremendous triumph of expertise, ingenuity, and perseverance."

How fusion works

Nuclear fusion reactions power stars, including our own sun. Fusion occurs when two light nuclei merge to form a single, heavier nucleus. This releases a large amount of energy. Because the mass of the new nucleus is less than the mass of the two original nuclei, that "leftover" mass converts to energy. This differs from fission, which creates energy through the process of splitting atoms, not joining them.

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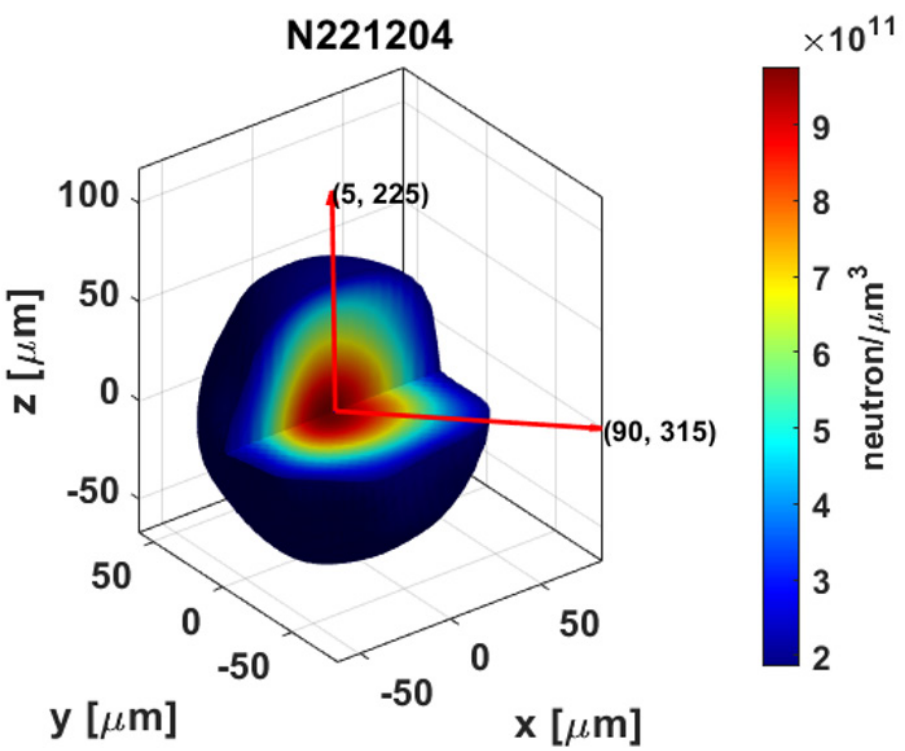
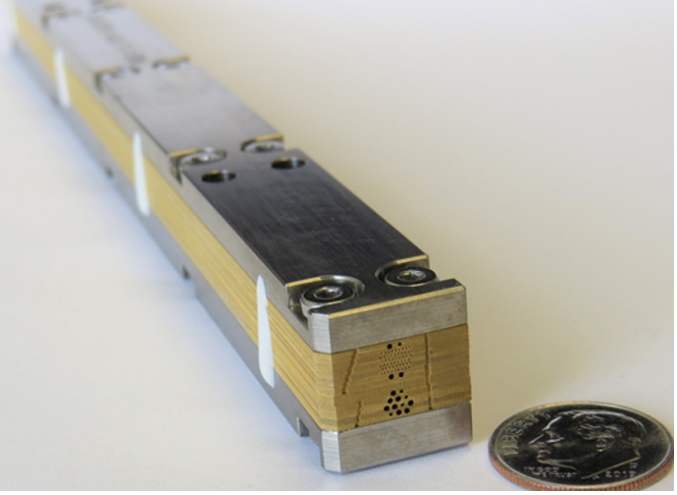
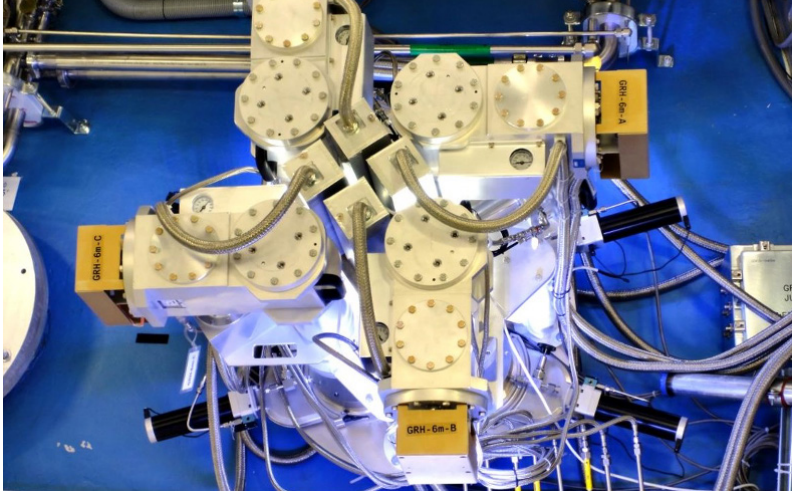


A three-dimensional reconstruction of the neutron emission during stagnation on the record-setting N221204 shot at the National Ignition Facility.



A neutron imaging system aperture. The aperture consists of an array of pinholes and penumbra to image neutron and gamma sources in the implosion.



The gamma reaction history diagnostic at the National Ignition Facility. The diagnostic consists of four identical gas Cherenkov detectors.

Los Alamos diagnostics continued ...

The amount of energy produced by fusion is key. The LLNL experiment produced 3.15 MJ of fusion energy output from delivering 2.05 MJ of laser energy to the target—a gain of 1.54. NIF is roughly the size of a football stadium, and the achievement required 192 laser beams to deliver the 2.05 MJ to a small fuel pellet to produce the fusion ignition.

Proving the point

Complex diagnostics were key to confirming the December landmark experiment as well as the performance of experiments leading up to it. Los Alamos plays a lead role in developing and fielding key high-end diagnostics for the experiments at NIF.

These include the neutron imaging system (NIS) and gamma reaction history (GRH) measurements. The two diagnostics are considered transformative for understanding fusion by the National Diagnostic Working Group, an organization directed by the National Nuclear Security Administration. "Both diagnostics were crucial in guiding the experiments to increased performance and showed key signatures of the transition into the ignition regime," said Hermann Geppert-Kleinrath (Thermonuclear Physics, P-4).

The teams working on NIS and GRH were recognized with a 2021 LANL Small Team Distinguished Performance Award and the DOE Secretary's Honor Award, among others.

Advanced instrumentation

NIS captures neutron images and reconstructs both the burning fusion fuel and the unburnt, cold fusion fuel distributions. The NIS team is led by Verena Geppert-Kleinrath (Dynamic Imaging and Radiography, P-1) and includes Mora Durocher, Matt Freeman, Chris Danly, Landon Tafoya, and Emily Mendoza (all P-1) and Valerie Fatherley, Carl Wilde, and Justin Jorgenson (all P-4).

To help capture the shape and distribution of the ignition hot spot, NIS includes an array of pinholes and penumbra. The pinhole aperture was machined and characterized by a team led by Derek Schmidt and includes Tom Day, Nikolaus Christiansen, John Martinez, and Lynne Goodwin (all Engineered Materials, MST-7).

GRH provides a time-resolved measurement of the fusion reaction rate, or reaction history. The GRH team consists of Yongho Kim, Kevin Meaney, Cathleen Fry, Zaarah Mohamed, Robert Dwyer, Justin Jorgenson, Tana Morrow, and Hermann Geppert-Kleinrath (all P-4). ■

Get the details

The Laboratory played a critical role in achieving ignition at the National Ignition Facility. This included researchers collaborating and contributing from Weapons Physics (ALDX), Global Security (ALDGS), Simulation and Computation (ALDSC), Physical Sciences (ALDPS), Weapons Engineering (ALDW), and the Deputy Director's Office for Weapons (DDW). Funding: The Los Alamos portion of the work was supported by the Office of Experimental Sciences, Inertial Confinement Fusion Program (LANL Program Managers Ann Satsangi and Joseph Smidt). The work supports the Lab's Stockpile Stewardship mission area and its Nuclear and Particle Futures capability pillar. Technical contact: Hermann Geppert-Kleinrath

Collaboration between Lab's materials, manufacturing communities

Reviving a lost-art process **to advance climate and clean energy research**

Imagine safe, reliable, efficient, and easy-to-maintain technology generating energy where it's needed but impossible or impractical to deploy—a spacecraft hurtling through the universe, an isolated outpost in the Arctic. That's the transformational role planned for small-scale nuclear reactors.

Given the importance of these devices to the nation's energy and nuclear security, the Lab's Civilian Nuclear Program has, over the last decade, focused on developing and demonstrating technologies for small-scale nuclear reactor applications. Several private-public partnerships are actively seeking to design and build efficient space- and terrestrial-based microreactors.

The Laboratory has a rich and diverse history in this field, going back to the 1960s, including contributions to the Compact Nuclear Power Source and KRUSTY (Kilowatt Reactor Using Sterling Technology) heat pipe reactor concept. In addition, Los Alamos has made significant contributions by developing technologies, like hydrides, for compact reactors.

Moderating materials for major impact

The deployment of economically feasible microreactor and space reactor concepts that use fuel enrichments of less than 20% relies on the development of solid moderators. Such materials slow down (or "moderate" the speed of) the neutrons produced in a nuclear chain reaction. They are essential in small reactor cores, which due to the physics involved, are less efficient than reactors with larger cores.

Los Alamos is driving the development of solid moderators for micro and space reactors, leveraging its expertise in materials science and industrial-scale manufacturing.

In a small-scale reactor—one used to propel a rocket or to be transported by ground to its destination—a solid material with high hydrogen density is required. At Los Alamos, metal hydrides are the moderator materials of choice for these applications. Metal hydride moderators that can retain high hydrogen density—almost as much as the hydrogen density of water—enable extremely light and compact reactors. In addition, hydride moderators allow designers to achieve compact designs using high-assay low-enriched uranium—eliminating proliferation concerns associated with the use of highly enriched uranium.

Yet, "hydriding is a lost-art process that has not been conducted at scale for more than 50 years," said Erik Luther (Fabrication Manufacturing Science, Sigma-1).

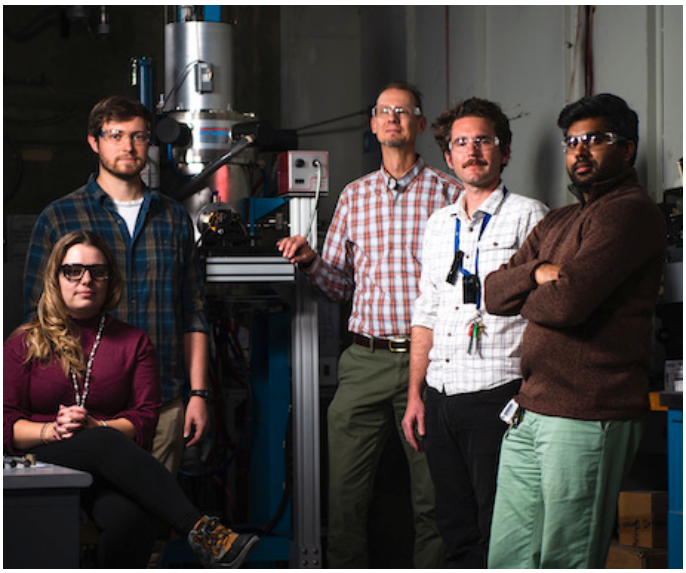
Now, thanks to innovative research and experimentation by a collaborative team consisting of members of Sigma and Materials Science and Technology divisions, advances have been made in how to reliably process these brittle materials that have unique fabrication challenges.

The endeavor has its origins in a 2015 Laboratory Directed Research and Development project into the multiscale kinetics of self-regulating nuclear reactors.

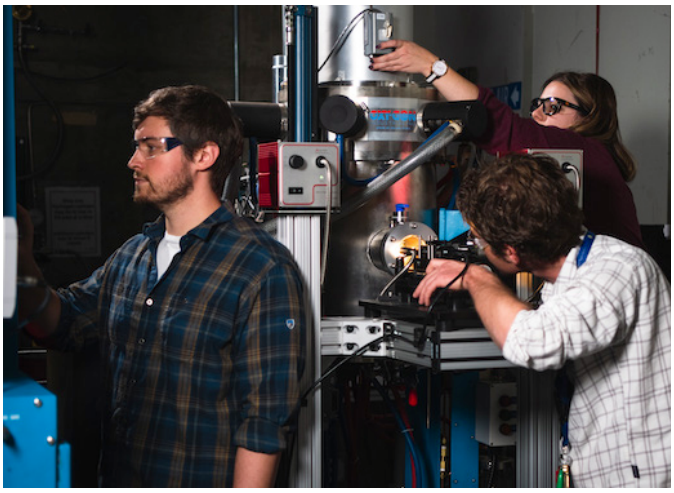
The team's results include several provisional patents and collaborations targeted at understanding in-reactor performance of hydrides. These studies are enabling the fabrication of moderator materials at scale based on improved understanding of the physical changes that occur during their processing.

For example, Sigma, Materials Science and Technology, and Nuclear Energy and Nonproliferation researchers are using neutron diffraction at the Los Alamos Neutron Science Center to model the performance of hydride moderators in typical microreactor operating conditions. Material has also been fabricated for several irradiation experiments at Idaho National Laboratory's Advanced Test Reactor and at the Massachusetts Institute of Technology's reactor.

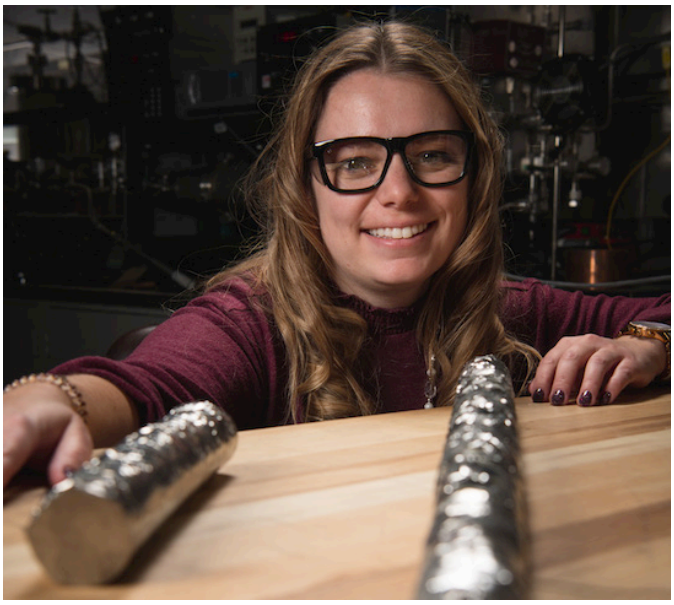
"Efforts at Los Alamos on moderators have provided microreactor designers with an important piece of technology to support next generation designs with improved performance," said National Technical Director for the Microreactor Program John Jackson. ■



The Hydrides Team includes (from left) Caitlin Kohnert, Michal Pate, Erik Luther, Tom Nizolek, Aditya Shivprasad, and (not pictured) Mike Torrez.



Michal Pate, Caitlin Kohnert, and Tom Nizolek prepare a furnace for a metal hydriding run.



Caitlin Kohnert is shown with high purity zirconium crystal bar feedstock.

Innovative approaches to hydride development

The direct hydride process used by Sigma and Materials Science and Technology researchers involves diffusing hydrogen into ductile metal to convert it to a hydride. The resulting material transformations are significant, resulting in volume expansions up to 20%.

Some of the early processing runs resulted in "fairly dramatic failures with large cracks running through hydrided parts as the material essentially tears itself apart during fabrication," said Tom Nizolek (Finishing Manufacturing Science, Sigma-2). To address this issue, the researchers now monitor the hydriding process with in situ infrared and optical imaging. "The results have allowed us to develop new processing routes that avoid cracking and reduce processing time."

Other members of the team have focused on a powder metallurgy route to produce hydrides. Their technique of using powder hydrides as source material for components potentially allows for improved in-reactor performance.

"The powder metallurgy process enables us to fabricate near-net shape parts of metal hydrides and composites, which can go beyond typical direct hydrided parts into advanced fuel concepts and even shielding applications," said Aditya Shivprasad (Materials Science in Radiation and Dynamics Extremes, MST-8), co-developer of this technique.

Get the details

Participants include members of Sigma and Materials Science and Technology divisions. Funding for the Los Alamos work is provided by the DOE Nuclear Energy Microreactor Program and NASA Space Nuclear Propulsion and NASA Fission Surface Power programs. The Los Alamos Laboratory Directed Research and Development Program and the Innovation Network for Fusion Energy also support efforts in this area. The work supports the Lab's Climate and Clean Energy Lab Agenda Critical Outcome and Materials for the Future capability pillar. Technical contacts: Erik Luther and Tarik Saleh

Modernized LANSCE control system fosters future growth

Improvements embody robustness of legacy system

Martin Pieck (standing) and Pilar Marroquin oversee beam activity in the Central Control Room of the Los Alamos Neutron Science Center.

After 50 years of dedicated and dependable service, the Los Alamos Neutron Science Center (LANSCE) control system has arrived at a major milestone. The original remote instrumentation and control equipment (RICE) has been replaced with a modern customized control system.

This feat is the result of 11 years of technical leadership by accelerator instrumentation and control experts who steward the LANSCE control system. The improved operations and diagnostics—installed all along the half-mile length of the accelerator—enable experiments across the scientific spectrum, from fundamental to national security research.

According to Instrumentation and Controls (AOT-IC) Group Leader Martin Pieck, the system's faster and upgraded diagnostics provide accelerator operators with superior "insight" of beam activity. This, in turn, allows them to optimize the beam's performance with higher precision during start-up and operation. It also allows for rapid troubleshooting and recovery. In addition to this improved functionality, the system also affords improved maintainability, sustainability, and growth into the future.

AOT-IC staff performed this replacement effort—consulting with physicists, operators, and subject matter experts to ensure the machine continued to perform as needed to deliver on the Lab's mission demands—and executed the work while accommodating the beam run cycle, which lasts for roughly eight months of the year.

"While the magnitude and complexity of this accomplishment is difficult to comprehend, the sheer number of computerized systems that were deployed to replace RICE provides a small taste," Pieck said.

This included more than 40 data network switches, tens of thousands of feet of fiber optic cabling, redundant master timer systems, 105 distributed timing systems, 108 industrial control systems, 61 fast data acquisition systems, and 41 diagnostic systems.

Novel technology from the get-go

The Los Alamos Meson Physics Facility, as LANSCE was called when it began operation in 1972, was one of the first major accelerators designed for computerized control.

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Modernized LANSCE continued ...

"The original system's lengthy operation is a testament to the original design staff and generations of instrumentation and controls technicians, engineers, and scientists that kept it operational," Pieck said.

RICE designs were manufactured in-house using discrete parts, with electronics cards wire wrapped or soldered by hand. The novel approach of distributing control and instrumentation in a modular format along the accelerator beam lines—an early resemblance of a distributed computerized network—allowed operation of the accelerator from a centralized control room. RICE's most notable characteristic was its ability to synchronize data acquisition with each accelerator beam pulse occurring 120 times per second. RICE could issue a parallel read request across 72 distributed modules, which then provided a transverse snapshot of the accelerator, providing "vector data," which was state of the art at the time. The engineers and scientists in the late 1960s, however, did not explicitly list 50 years of lifetime as a design requirement for RICE. "They should marvel at how long their initial design lasted," said AOT-IC Deputy Group Leader Heath Watkins.

Simon Johnson (foreground) and Vince Kutac inspect instrumentation and controls equipment.

Expertise leveraged for a modern replacement

AOT-IC initiated multiple specific upgrade projects to replace each of RICE's integral architecture functionalities. This included its network infrastructure and timing synchronization. Embedded controllers using real-time operating systems and field programmable gate arrays replaced the previous industrial controls, which has significantly improved performance.

One specific challenge was developing a fast data acquisition system that could monitor pulsed waveforms, communicate directly with the event-based timing system, and correlate accelerated particle data with specific beam parameters.

Finally, using variations of the newly developed industrial controls and fast data acquisition capabilities, the entire RICE-based beam instrumentation and diagnostics were upgraded as well.

"While the new control system provides high-speed data and more control to the facility the original focus that RICE established for distributed and modular control of the LANSCE accelerator—essential to its flexible and reliable operation—will remain for years to come," Watkins said. ■

From left, Deepak Rai, Lori Kennel, and Lucas Montoya review a custom module for the instrumentation system.

Get the details

Over the course of the control system modernization, funding has been provided by the LANSCE-Refurbishment and LANSCE Risk Mitigation projects, with $7.235M over the past three years from the Lab's Recapitalization Project completing the work. Participants include members of Instrumentation and Controls' (AOT-IC) controls software and hardware teams. Technical contacts: Martin Pieck and Heath Watkins

Quantum light source offers new possibilities for communications, computing

A quantum light source recently developed by researchers at the Center for Integrated Nanotechnologies (MPA-CINT) presents new capabilities for quantum communication and computing.

As described in *Nature Communications*, the technological advancement enables the integration of two-dimensional material-based quantum light sources into existing fiber optic communication networks for practical implementation of quantum cryptography and metrology applications. Light sources may also play a role in quantum computing networks.

Conventional light sources emit many photons simultaneously. Lasers also emit photons simultaneously, though they do so in a single color (wavelength) and in one direction. In today's fiber optic communication networks, laser light pulses, each containing millions of photons, are used to encode the information being transmitted. As a result, information can easily be stolen by splitting some photons of the light pulses.

In quantum communication, however, information is encoded in the phase of a single photon, making information impossible to steal. This new communication scheme requires light sources capable of emitting a stream of single photons at regular intervals. A "quantum" light source cannot be created by simply dimming the conventional light sources and lasers—no matter how much one dims such light sources, the probability of two photons emitted at the same time is always finite. Quantum light sources should also produce photons at the wavelength compatible with existing fiber communication networks (i.e., 1.35 or 1.55 μm).

The research team recently realized a quantum light source with operating wavelength tunable across O and C telecommunication bands by placing atomically thin molybdenum ditelluride ($MoTe_2$) semiconductor layers on top of an array of strain-inducing nanometer-sized pillars. Fiber optic communication is mainly conduced in these bands because they offer lowest transmission loss across distance. Hanbury Brown and Twiss experiments conducted at 10 K reveal clear photon antibunching with 90% single-photon purity. The photon antibunching can be observed up to liquid nitrogen temperature (77 K). Because the pillars can be fabricated via electron beam lithography, the quantum light sources can be placed to a desired location with nanometer precision.

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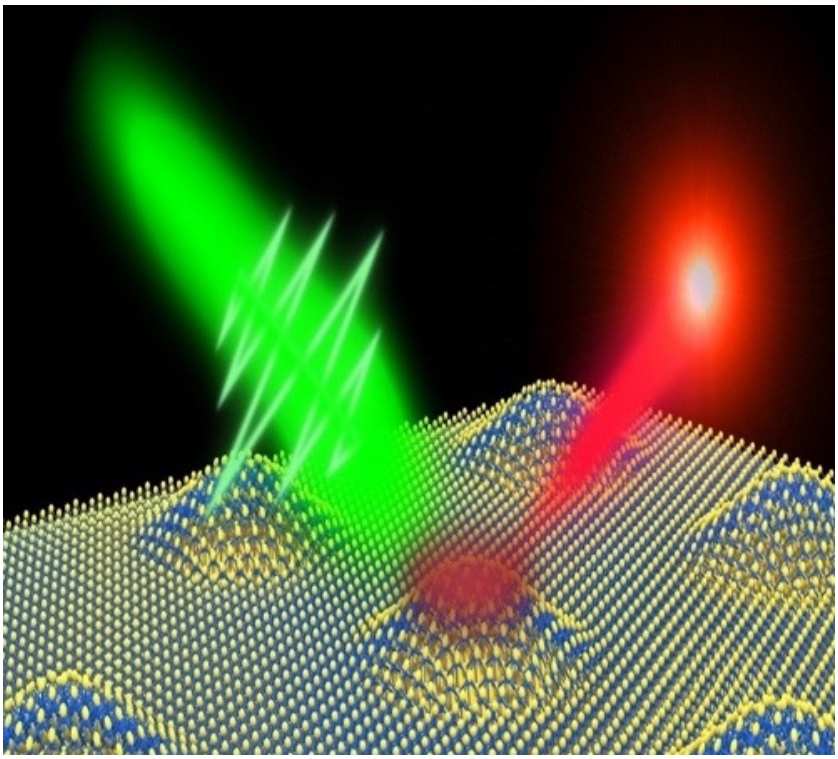


Illustrated is an atomically thin $MoTe_2$ layer (blue and yellow lattice) on strain-inducing nanopillars as site-controlled telecom-wavelength quantum emitters for coupling to optical fibers with minimal loss. Single photons (red) are generated upon optical excitation (green).

Quantum light source continued ...

In addition to quantum communication applications, facile layer-by-layer device fabrication allowed by the two-dimensional nature of the $MoTe_2$ provides an opportunity to integrate these light sources into emerging quantum computers as a key element for forming a quantum network. Because a stream of single photons can have intensity fluctuations smaller than the fundamental fluctuation limit possible for a laser light (i.e., shot-noise limit), fiber-coupled quantum light sources can also enable ultrasensitive absorption/reflection measurements for chemo/bio sensing applications. ■

Get the details

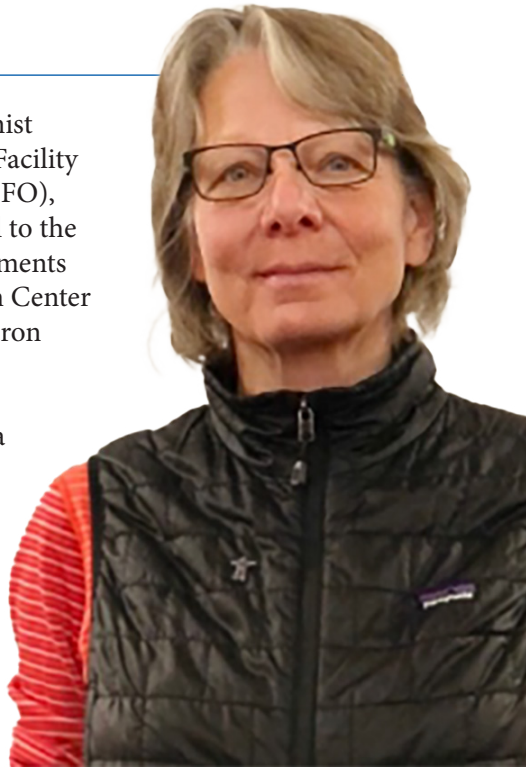
This work was supported by the DOE Office of Science, Office of Science Basic Energy Sciences Program, the Laboratory Directed Research and Development Program, the Quantum Science Center, and a Laboratory Director's Postdoctoral Fellow Award. The work supports the Lab's Global Security mission area and its Materials for the Future capability pillar. Reference: "Site-controlled telecom-wavelength single-photon emitters in atomically-thin $MoTe_2$," *Nature Communications*, 12, 6753 (2021). Authors: Huan Zhao, Michael T. Pettes, Yu Zheng, and Han Htoon (all Center for Integrated Nanotechnologies, MPA-CINT). Technical contact: Han Htoon

Inclusivity tip

Did you know you can hold more accessible meetings in tools such as Webex and Microsoft Teams, thanks to closed captioning? Live closed captioning is enabled automatically in these tools, but you may need to manually turn them on for meeting attendees. Having closed captions automatically enabled makes meetings more accessible to your deaf and hard-of-hearing colleagues, and takes the burden off of people having to specially request these accommodations during a virtual meeting.

MEET SYLVIE ADAM

Industrial Hygienist, OSH Deployed Services (OSH-DS)



As an industrial hygienist deployed to LANSCE Facility Operations (LANSCE-FO), Sylvie Adam is integral to the safety review of experiments performed at the Lujan Center and the Weapons Neutron Research Facility.

Adam is a member of a team of subject matter experts who systematically review the individual samples and the experimental protocols run at the accelerator's different flight paths. "It's a thorough and tight review process," she said. Adam is also serving as the acting Occupational Safety and Health-Deployed Services (OSH-DS) deputy group leader.

Prior to joining the Laboratory in 2018, Adam worked as an industrial hygienist in New York City and Seattle, where she earned her master's degree in the discipline from the University of Washington. Passionate about nature and the outdoors, Adam originally considered a career in environmental health before turning her focus to industrial hygiene. In this role, she said she feels she can make concrete contributions. "Prevention is cheaper than injuries and illnesses and I want to play a part in planning and controlling hazards in our complex work environment," she said.

Those contributions can range from ensuring electrical workers are not exposed to contaminants while doing their jobs to ensuring modifications to the Coherent Captain Mills experiment remain within established safety parameters. She is also helping two new industrial hygienists integrate into the work on the Los Alamos Neutron Science Center (LANSCE) mesa. To be successful, Adam said, requires building relationships with her colleagues, "so they know who to go to and when to go to us."

LANSCE offers the opportunity to work with individuals from a wide range of backgrounds, "from people who are true New Mexicans to international postdoctoral researchers to members of the user program," she said. "You know you're helping people doing unique things in a unique environment, producing unique results." ■

Essential elements combine to **transform Lab's large-scale 3-D printing capabilities**

For many Los Alamos-relevant applications, materials must not only meet stringent thermo-mechanical requirements, but also perform in harsh environments or at long time scales not usually considered in industry. These factors—coupled with the design and manufacturing agility afforded by additive manufacturing—make three-dimensional printing an attractive option for both component development and manufacturing support, and motivates research into printing materials that are not otherwise available "off the shelf" as feedstocks.

One such example, important for current and future stockpile applications, is syntactic foams. These composites of rigid hollow spheres made of carbon or glass and polymer binder are used as lightweight structural materials. These foams are often manufactured via time- and space-consuming molding processes that lead to product variability and require careful machining due to their brittle nature.

Now, collaborations between Los Alamos design and production agency partners, advances in materials science and processing of polymers and composites, and investments in production-scale equipment have enabled the realization of transformative large-scale printing capabilities. The team draws on experience with both traditional and advanced manufacturing techniques, materials chemistry, and engineering to apply these tools for a variety of research and programmatic efforts.

Collaborations accelerate technology readiness for future program developments

To modernize the manufacturing process of syntactic foams, Engineered Materials (MST-7) researchers, in close collaboration with production partners at Kansas City National Security Campus, have developed reactive laser sintered foam (REALfoam). This material is manufactured via selective laser sintering, which enables a tightly controlled cross-link and post-cure process, with benefits to performance, safety, manufacturing time, and integration with modern production agency capabilities. The team's rapid progress in formulating and scaling up REALfoam was the cornerstone of a successful Level 2 Milestone under the Additive Coordination Team (ACT) in the Advanced Manufacturing Development Program.

Recently an EOS Integra P450 selective laser sintering printer was added to the Laboratory's suite of EOS printers, machines identical to those at the Kansas City production facility. As a result, the new ACT thermoplastics project is further developing selective laser sintering for a large range of Los Alamos applications

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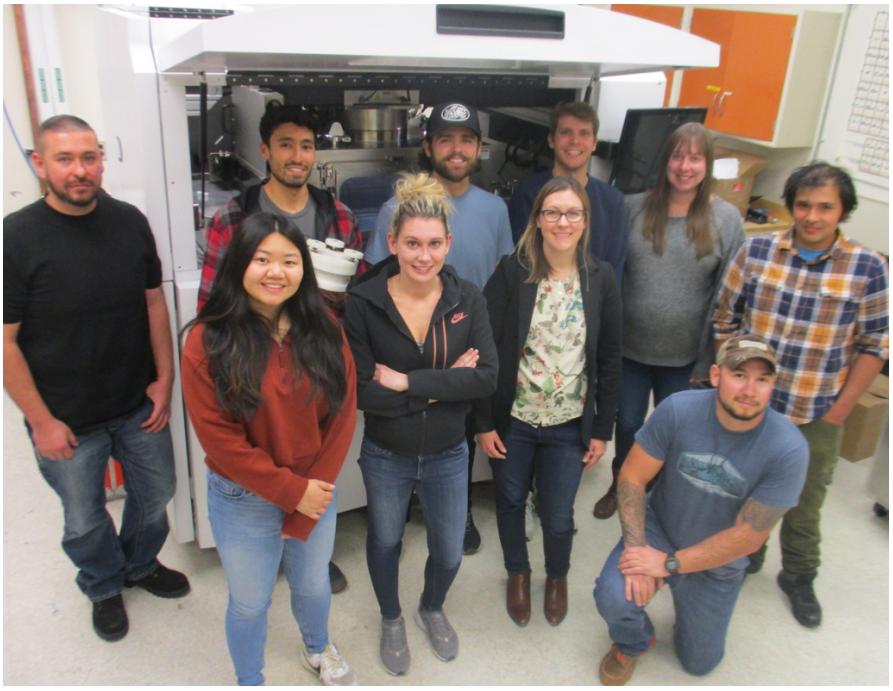
The new tools enable design flexibility, advanced materials, and production at scale for national security applications.



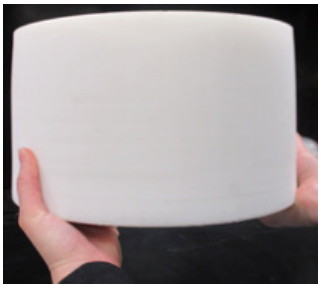
Members of the Engineered Materials Team are photographed in front of the new EOS P450 selective laser sintering system that combines open source features enabling accelerated research and development with volumes and speeds relevant to production.

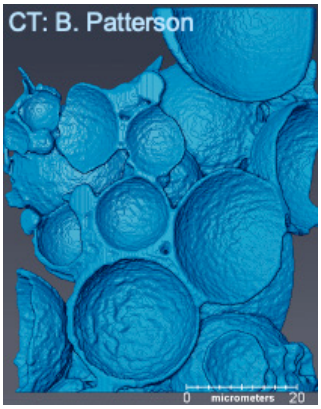
Essential elements combine continued ...

through an integrated approach to feedstock production, characterization, and component printing. The project leverages design, materials science, and manufacturing expertise with collaborators at Kansas City, Sandia, Pantex, Livermore, and Savannah River. Through the use of identical tools, shared processing knowledge, and collaborations on materials development, the MST-7 team is able to accelerate both technology and manufacturing readiness levels of additively manufactured components. The work targets more efficient production, enhanced performance, and/or improved aging characteristics over traditionally manufactured counterparts.

The team has already demonstrated successful prints and pilot components for materials of programmatic interest. Partnerships with industry and the ability to tailor feedstocks enable quick-turnaround prototypes for local testing needs. The higher temperature, high-build-volume, and open source parameter capabilities of the new selective laser sintering printer support not only direct component production but also the printing of tooling for other manufacturing processes. Examples include printed molds as well as preforms/mandrels for extrusion printing processes like direct ink-write, with ongoing support and collaboration from Kansas City. Printed tooling allows for increased design agility and drastically reduced lead times in comparison to machining of traditional tooling.

The MST-7 team's collaborative approach also extends to documentation and archiving of material and process pedigree to facilitate technology transfer with its partner labs. To that end, the team has worked closely with Laboratory leads for standing up a Complex-wide shared database through the Granta software platform, rounding out a modernized research and development approach for technology maturation and science-based qualification efforts. ■





Some of the novel materials developed by the team (e.g., filled polymers and REALfoam, a low-density rigid syntactic foam) and robust, quick-turnaround tooling supporting component development and testing.

Get the details

The technical team includes Rachel Collino, Joseph Torres, Cade Willis, Anthony Sanchez, Paul Peterson, Alex Hatmaker, Sam Roybal, Estevan Sandoval, Natasha Story, Ashleigh Chov, and Jillian O'Neel (Engineered Materials, MST-7) and Matt Dirmyer (Chemical Engineering and Diagnostics, C-CDE). Reference: "(U) Materials considerations for structural mounts and improved process routes via selective laser sintering," *Weapons Engineering Symposium Journal*, 2022. Funding: This work was funded by the Additive Coordination Team and Advanced Manufacturing Development (LANL Program Manager Will Boncher, Weapon Stockpile Modernization, Q-DO; Federal Program Manager Hannah Gardiner, Office of Engineering and Technology Maturation, NA-115). The work supports the Lab's Nuclear Deterrence mission area and its Weapons Systems and Materials for the Future capability pillars. Technical contacts: Rachel Collino, Joseph Torres, Matt Dirmyer

Don't wait—**keep your workspace straight!**

Routine housekeeping improves safety and workflow

Over the past two years, the Physical Sciences Directorate has reclaimed more than 75,000 square feet of space from clutter, with these areas now used for work supporting the Lab's mission.

This past year alone, in a series of clean-up days that took place at 6 locations across the directorate, 21 truckloads of waste were disposed of properly. Nearly four tons of metal and a ton of wood were recycled. Barcoded property, excess furniture, nonfunctional equipment with Freon or oil, unclassified shred boxes, and recyclables were collected and disposed of or salvaged.

"Routine housekeeping helps work environments function more efficiently and builds pride in the workplace," said Molly Hogan-Loechell, who with Janice Salazar (Integration Program Office, ESHQSS-INT) coordinated the clean-up events.

The effort required the expertise and dedication of many—from property specialists; waste management coordinators; electrical safety officers; and industrial hygiene, radiation protection, salvage, and operations specialists to building managers; deployed environmental professionals; and document control, craft, and division points of contact. In particular, the directorate's property specialists played a critical role in ensuring all went smoothly and according to proper procedure.

The scale of effort is a vivid example of the benefit of staying vigilant about preventing the accumulation of clutter, according to Hogan-Loechell (Performance Assurance, IQPA-PA), who is the directorate's contract assurance specialist.

"Keeping your workspace in order is easier when housekeeping is done regularly," she said. ■

Need a leg up with clean up?

If you need help with getting your workspace in order, pass on your request to your responsible line manager or division leader. The directorate plans to offer clean-up days throughout the year and can help coordinate the necessary resources.

Clean-up days relied on the contributions of many. Above, Ross Vargas (Property Management, LOG-PM) assists with activities at the Los Alamos Neutron Science Center. At right, Angel Jimenez (foreground) loads items to be salvaged and Ted Keppner sorts metals between storage drums. Both are members of Sigma Operations (Sigma-Ops).

"Routine housekeeping helps work environments function more efficiently and builds pride in the workplace."
Molly Hogan-Loechell

Clockwise from top, Vicente Garcia (left) and Julian Martinez (both Logistics Heavy Equipment Roads and Grounds, LOG-HERG) pause during the Sigma clean-up day to show their support for the initiative. Controlled items, such as these computers, were separated from other office equipment and processed by property specialists. Items that could be reused by others at the Lab or materials that could be recycled were sorted, binned, and processed accordingly. Molly Hogan-Loechell, who helped coordinate the housekeeping events, keeps tabs on progress at the Sigma clean-up day.

Early morning visitors to the
Los Alamos Neutron Science Center.

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