LDRD

Quarterly Highlights

Mission Agility | Technical Vitality | Workforce Development

FY23 Q1

FEATURED HIGHLIGHTS FOR Q1

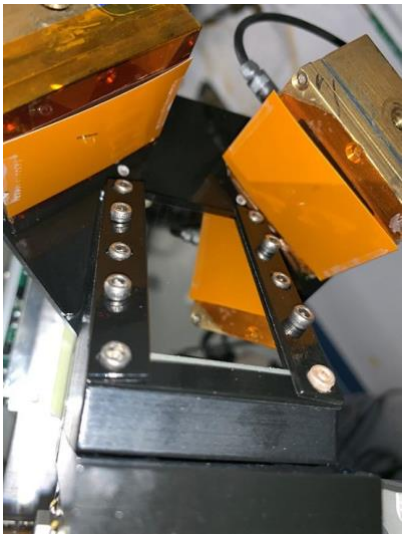
SDRD
SITE-DIRECTED RESEARCH & DEVELOPMENT

An envisioned meshed network of ground and UAV methane detection modules.

Fighting climate change with UASs

Methane gas emission has been recognized as a heavy contributor to climate change by the current administration. Researchers at the NNSS have developed a preliminary detection system to monitor methane levels, pairing the emerging technology of micro-electronic mechanical systems, also known as MEMs, to Unmanned Aircraft Systems (UASs), allowing for easily deployable and reliable source identification, localization, and data collection. Read more…

- **Technical Vitality, Mission Agility**



Closeup of the R&D 100 award-winning XRPBS.
(Photo courtesy of NNSS)

SDRDs lead to R&D 100 success

The X-Ray Polarizing Beam Splitter (XRPBS) is just one of several technologies put forth by the NNSS that have won a prestigious R&D 100 award. In fact, over half of the entries submitted by the NNSS actually got their start as SDRD projects. Read more…

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Sandia National Laboratories

Jenna Schambach, Sandia Labs' technologist,
preparing a sampling core on an Arctic microbe sampling trip in Alaska.
(Photo by Tess Hogancamp)

Burping bacteria: Identifying Arctic microbes that produce greenhouse gases

As greenhouse gases bubble up across the rapidly thawing Arctic, Sandia researchers are trying to identify other trace gases from soil microbes that could shed some light on what is occurring biologically in melting permafrost in the Arctic. Sandia bioengineer Chuck Smallwood and his team recently spent five days

collecting lakebed soil and gas samples. They were joined by international collaborators. Read more…

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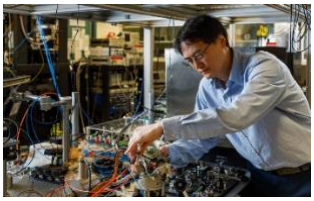

Sandia atomic physicist Jongmin Lee examines the sensor head of a cold-atom interferometer that could help vehicles stay on course where GPS is unavailable. (Photo by Bret Latter)

Navigating when GPS goes dark

Words like “tough” or “rugged” are rarely associated with a quantum inertial sensor. The remarkable scientific instrument can measure motion a thousand times more accurately than the devices that help navigate today’s missiles, aircraft and drones. But its delicate, table-sized array of components that includes a complex laser and vacuum system has largely kept the technology grounded and confined to the controlled settings of a lab. Atomic physicist Jongmin Lee wants to change that. Read more…

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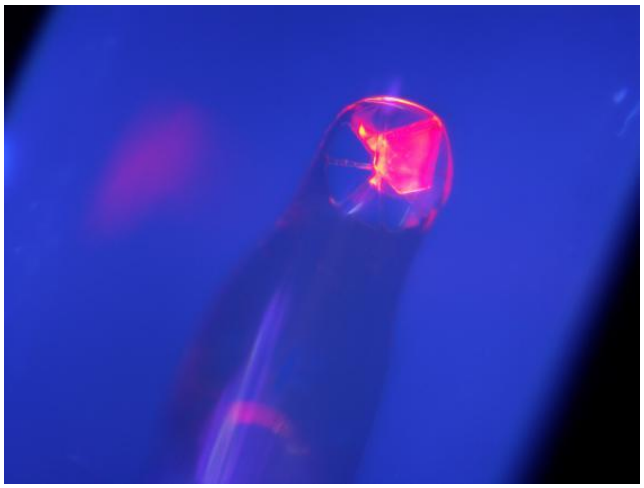
Lawrence Livermore National Laboratory



A new compound of curium is a radioactive, rare, and costly element shown above during crystallography experiments at LLNL. Crystals of this curium compound are uncolored under ambient light but glow intensely pink-red when exposed to ultraviolet light. (Image by Gauthier Deblonde/LLNL)

Going big: Unlocking the study of some of the rarest and most toxic elements on Earth

The synthesis and study of radioactive compounds are naturally difficult due to the extreme toxicity of the materials involved, but also because of the cost and scarcity of research isotopes. Read more…

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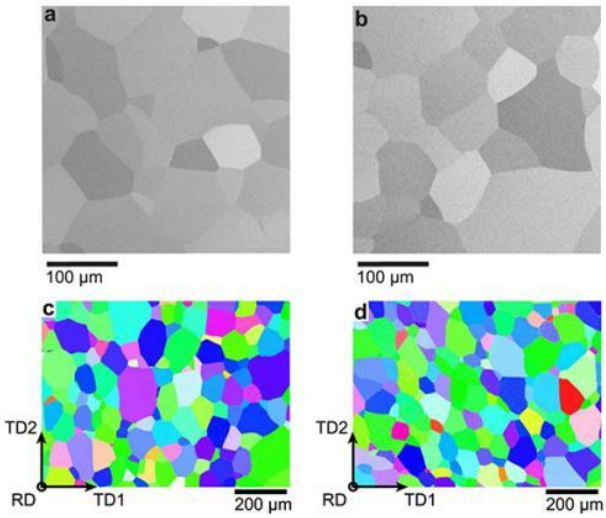

In a recent study by a multinational team including current and former LLNL scientists, researchers used synchrotron x-rays to track discrete slip avalanche events in titanium held under load at room temperature to examine causes of "dwell fatigue" in titanium alloys.

LLNL physicist probes causes of life-shortening 'dwell fatigue' in titanium

"Dwell fatigue" is a phenomenon that can occur in titanium alloys when held under stress, such as a jet engine's fan disc during takeoff. This peculiar failure mode can initiate microscopic cracks that drastically reduce a component's lifetime. Read more…

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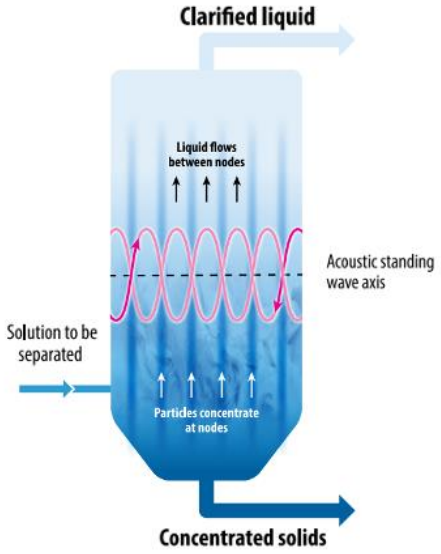
Los Alamos
NATIONAL LABORATORY



Ultrastep is a continuous-separations technology that uses ultrasound instead of filters.
(Image courtesy of LANL)

Sound Solutions

LANL researcher Jim Coons worked with a cross-divisional team to develop a filtration method called UltraSep that does not require the use of filters. This new technology uses ultrasonic waves and gravity to continuously separate flowing solutions into solid and liquid components. UltraSep is gaining interest across multiple industries that could benefit from this type of filtration, including biofuels, plutonium facilities, and even craft beer. Read More….

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Mars Perseverance Sol 546 - SuperCam Camera: This SuperCam Remote Micro-Imager (RMI) image shows the Red Mountain target, which was analyzed on September 2 (sol 546) as part of a campaign to detect frost at Jezero Crater. The small 'pits' seen in the center of the image were created by LIBS laser shots. (Image Courtesy: NASA/JPL-Caltech/LANL/CNES/IRAP)

Searching for frost at Jezero Crater

Mars Perseverance was recently able to detect frost on Mars using a combination of Mars Environmental Dynamics Analyzer (MEDA) and SuperCam instruments. MEDA collects temperature and humidity data while SuperCam utilizes two different types of remote-sensing techniques to study the geology of nearby rocks. The techniques involve 'zapping' the rocks with high powered lasers, to enable Laser-Induced Breakdown Spectroscopy (LIBS) and the Raman spectroscopy, which work together to analyze reflected light as well as the elemental and mineralogical composition of the rocks. In addition, a microphone records the LIBS laser shot to analyze the hardness of the rock at different depths. The acoustic signal recorded from a recent LIBS shot could be used to indicate frost layers as thin as ~10 microns. Read more…

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AMAZING LDRD HIGHLIGHTS

TINY ULTRA POROUS CRYSTALS COULD TRANSFORM CANCER TREATMENTS: Sandia senior scientist explores how metal-organic frameworks can be used as sensors > **Technical Vitality, Workforce Development**

SUPPORTING LDRD BY GROWING ACADEMIC PARTNERSHIPS: Sandia expands university agreements to meet surging demand for national security science and engineering > **Mission Agility, Technical Vitality, Workforce Development**

2022 HIGHLY CITED (TOP 1%) LANL RESEARCHER DISCOVERS THAT PEROVSKITE RESEARCH YIELDS PROMISE: Perovskite research advances offer new possibilities for devices such as solar cells > **Mission Agility, Technical Vitality, Workforce Development**

LANL RESEARCH SOLVES LONGSTANDING PHYSICS PROBLEM: Anti-butterfly effect enables new benchmarking of quantum-computer performance > **Mission Agility, Technical Vitality**

LLNL RESEARCHERS STUDY RIFT VALLEY FEVER VIRUS: Immune responses could be bolstered by drugs to help people recover from brain infections caused by an emerging pathogen, Rift Valley fever virus > **Mission Agility,Technical Vitality**

GOING DEEP: NEW GROUND MOTION MODEL MORE ACCURATELY SIMULATES EARTHQUAKES, EXPLOSIONS: LLNL scientists and researchers from Mondaic created a new seismic tomography 3D model > **Mission Agility, Technical Vitality**

GRAPHITE CHANGES TO HEXAGONAL DIAMOND IN PICOSECONDS: LLNL scientists' new findings on the graphite-diamond phase transition > **Mission Agility, Technical Vitality**

STEM WOMEN INSPIRING THE NEXT GENERATION: Exceptional NNSS computing and data scientist given senator's Women in STEM Award for December > **Workforce Development**

This newsletter, published quarterly, features LDRD and SDRD work done by Lawrence Livermore, Los Alamos, Nevada National Security Site and Sandia. To see a PDF with all articles referenced in this newsletter or review past issues, visit NNSA-LDRD.lanl.gov and click on the Quarterly Highlights tab.

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National Nuclear Security Administration