

Year in Review

07-08

Los Alamos maintains a science capability that supports present and emerging missions and that anticipates and delivers innovations to protect the nation. Multidisciplinary teams tackle extraordinarily complex problems, including ensuring the safety and reliability of the nuclear deterrent, understanding the energy-climate nexus, and protecting against weapons of mass destruction. The Lab conducts science that matters to the nation.

National Security Education Center created from merger of Lab institutes

The National Security Education Center was created by merging five LANL institutes—Engineering, Materials Design, Multiscale Materials Studies, Information Science and Technology, and Advanced Studies. Benefits are expected to include enhanced academic cooperation, scientific collaboration and scholarship, and technical workforce development.

Conversion process to turn CO₂ into fuels could combat global climate change

A chemical process to remove CO₂ from the air and turn it into fuels was proposed by two Los Alamos scientists. Such a process would allow people to drive hydro-carbon-powered vehicles, which spew heat-trapping CO₂ into the atmosphere, but they would be able to do so without contributing to global warming. To remove the CO₂, air would be blown over a liquid solution of potassium carbonate. The chemical would absorb CO₂, which could be turned into fuels such as methanol and gasoline through a new series of chemical reactions. Under the proposal, extraction and conversion would be powered by nuclear energy, which produces no CO₂.

Sequestering CO₂ in under-ground rock subject of Lab assessment

Sequestration of CO₂ in porous underground rock formations was proposed as the best short-term option for reducing CO₂ climate impacts. Lab scientists are conducting a comprehensive program to assess the safety and effectiveness of the process. The program employs laboratory experiments to understand the geochemistry of sequestration



Goal 7
National security science lab

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systems, field studies to quantify natural CO2 flux in the ecosystem, and CO2-PENS, a computer model designed to optimize site selection and development.

Strategies for containment of avian influenza pandemic modeled

Research groups at the Lab and other institutions in the U.S. and Europe cooperated to create individual-based, stochastic simulation models of measures designed to contain a pandemic of avian influenza. Results will help guide selection of the optimal mix of intervention strategies. Medical interventions include vaccination and use of antiviral agents, including identified contact prophylaxis. Nonpharmaceutical interventions include travel restrictions and school closures.

Roadrunner supercomputer is fastest in world, breaks one-petaflop barrier

The Roadrunner high-performance computer at Los Alamos National Laboratory is now the world's fastest. The computer, developed in partnership with IBM and housed at the Laboratory, reached a petaflop of sustained performance. Roadrunner will play a key role in maintaining the U.S. nuclear deterrent, contribute to solving our global energy challenges, and open new windows of knowledge in basic scientific research fields.

During the research phase, the LANL team used video-game techniques to develop the new approaches to numerical simulation to take full advantage of the leap in processing speeds provided by Roadrunner and other ultrafast computers.

Geology sheds light on proliferation of life in Africa amid environmental threats

Fossil evidence from an African rift valley may explain the rapid proliferation of plants and animals on the continent during an era of widespread and rapid continental breakup, catastrophic volcano activity, and other environmental threats to life, according to Lab research. A theory advanced by a Lab researcher proposes that fortuitous characteristics of Africa's geographical position during this era may account for this otherwise surprising fact.

Long-distance triggering of earthquakes by seismic sound waves confirmed

Lab research produced evidence that sound waves can set off earthquakes. Acoustic triggering would explain a phenomenon in which seismic activity at locations hundreds and thousands of miles apart are linked. Higher-frequency waves that transmit much of an earthquake's energy from the epicenter are viewed



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as unlikely to initiate seismic activity at such distances. A proposal that low-frequency sound waves might possess this capability was initially met with considerable skepticism, but experiments now confirm that sound waves can—at least on a laboratory scale—trigger earthquakes.

First ultra-low-field magnetic resonance images of the human head acquired

Lab researchers made a breakthrough in magnetic resonance imaging by taking the first image of a human head using an ultra-low-field system. Dispensing with the requirement to generate extremely high magnetic fields, ULF MRI devices possess several advantages, including reduced acquisition and operating costs, the ability to be used on patients with metal implants, and elimination of the confining tube of conventional devices, facilitating their use during image-guided surgeries and biopsies.

Industry and academia collaborative agreements exceed \$80 million

Sponsored research attracted more than \$80 million under 87 collaborative agreements with industry and academia. The sponsored research areas include nonfederal work for others, cooperative research and development, and user facilities.

MaRIE Signature Science Facility will offer science solutions for investigating materials in radiation extremes

MaRIE (matter-radiation interactions in extremes) was designed at Los Alamos to deliver materials-centric national security science solutions. MaRIE, selected as a LANL signature experimental facility, will support investigation of a broad range of scientific questions relevant to Lab's core mission, yet be flexible enough to accommodate future scientific needs and attract students, post-docs, collaborators, and visitors.

Partnership with Procter & Gamble surpasses \$30 million

The Laboratory's partnership with Procter & Gamble, established in the mid 1990s with a single project, grew to include more than 15 projects. It now covers research within seven technical divisions with a total value exceeding \$33 million.



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