

Lawrence Livermore National Laboratory

Unique Facilities and Centers

One-of-a-kind experimental facilities, world-class computing resources and specialized centers of expertise at Lawrence Livermore National Laboratory enable researchers to achieve science and technology breakthroughs that strengthen the nation's security, well-being and prosperity.

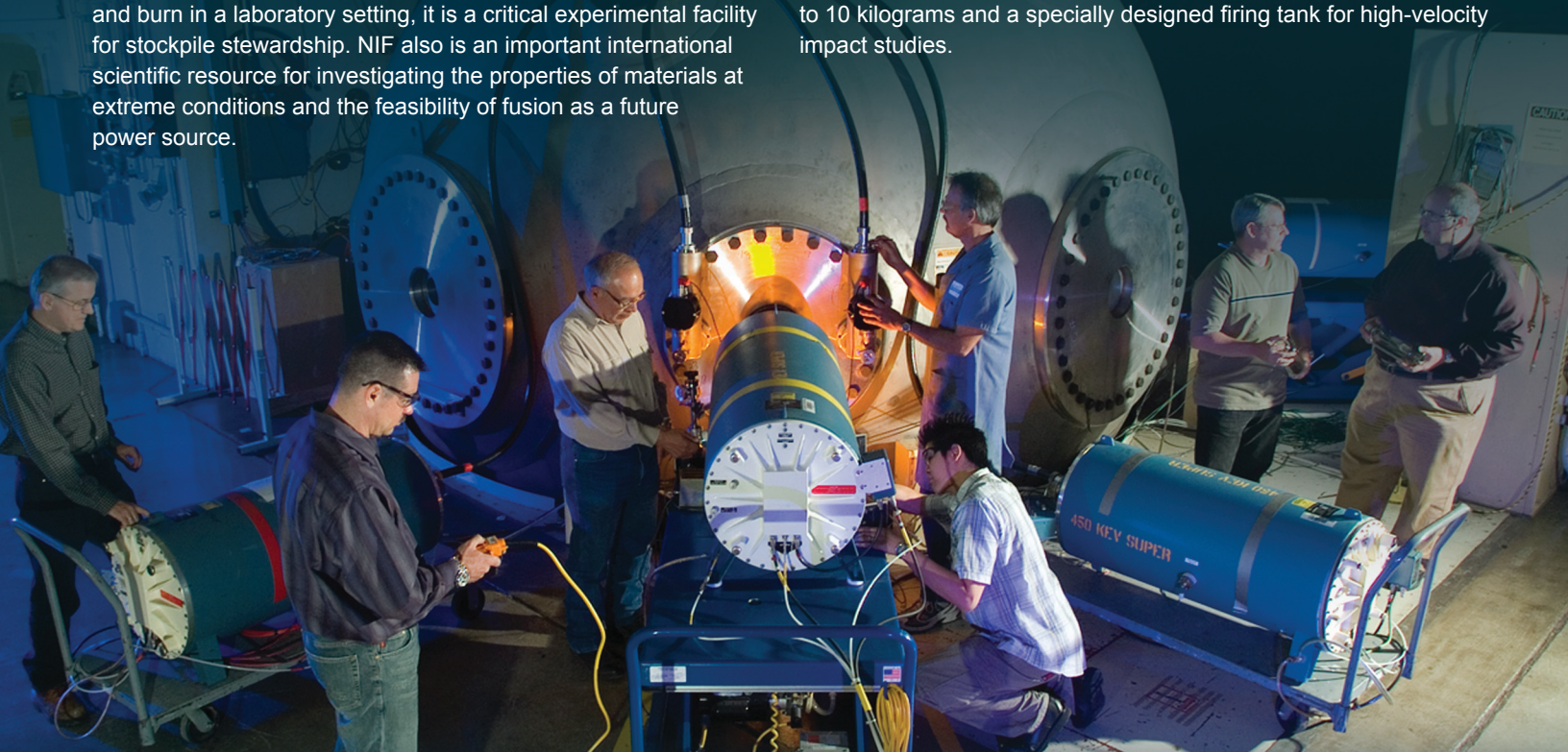
Modern scientific research is built upon the triad of theory, experiment and simulation—theory to pose an explanation of a phenomenon of interest, experiment to collect data and observations about the phenomenon that either confirm or refute the theory, and simulation to mathematically extend the reach of theory and experiment and yield otherwise unattainable insights and predictive capabilities. In order to carry out its national security mission, LLNL has designed and constructed a host of one-of-a-kind experimental facilities and has collaborated with industry to develop and deploy successively more powerful and more capable supercomputers. These resources have been integrated to create a number of centers of excellence that provide unique capabilities for solving problems of scientific and national security importance. Some of LLNL's special facilities and centers are highlighted below.

National Ignition Facility (NIF). The 192-beam NIF is the largest and most energetic laser system in the world. As the only facility capable of creating the conditions necessary for fusion ignition and burn in a laboratory setting, it is a critical experimental facility for stockpile stewardship. NIF also is an important international scientific resource for investigating the properties of materials at extreme conditions and the feasibility of fusion as a future power source.

Terascale Simulation Facility (TSF). The Laboratory is home to 22 supercomputers, including three of the world's fastest—Dawn, BlueGene/L and Purple—for a combined peak computing power of 1,689 teraflop/s (10^{15} floating point operations per second). These amazing machines can perform trillions of operations per second, such that a calculation that took an entire day in 1995 now takes only one second. Dawn is the initial delivery system of Sequoia, a 20-petaflop/s (10^{18} flop/s) machine that will be delivered in 2011.

Contained Firing Facility (CFF). Experiments using up to 60 kilograms of high explosive can be conducted in this modern hydrodynamic test facility. Located at Site 300 (the Laboratory's remote experimental test site), the CFF provides full containment of all explosive debris for high-quality environmental management.

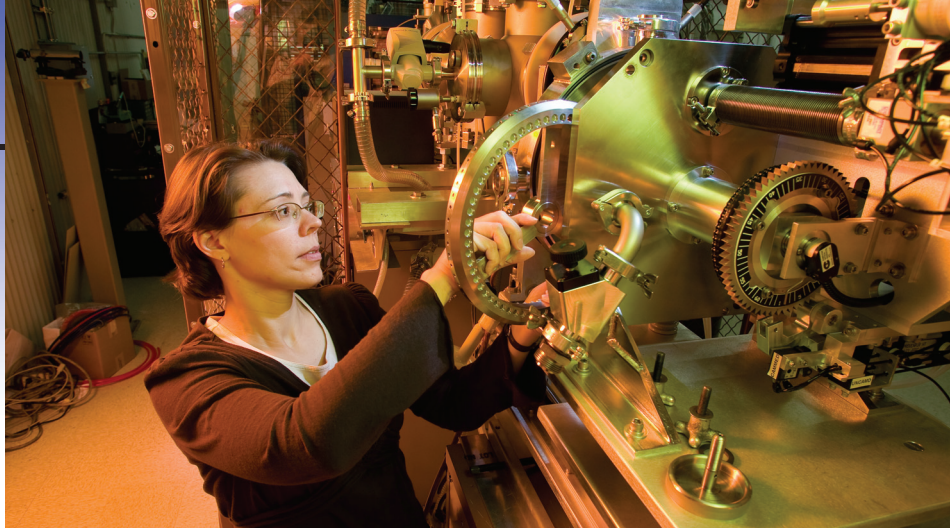
High Explosives Application Facility (HEAF). HEAF is a state-of-the-art facility for the research and development, synthesis and formulation, and characterization and testing of explosives. It has seven fully contained firing tanks for testing explosive quantities up to 10 kilograms and a specially designed firing tank for high-velocity impact studies.



With its High Explosives Application Facility, the National Nuclear Security Administration named LLNL a Center of Excellence for high-explosives research and development.

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The Center for Accelerator Mass Spectrometry performs more than 25,000 measurements per year, identifying isotopic compositions and relative abundances for research in archaeology, climatology, forensic dating, and many other fields.



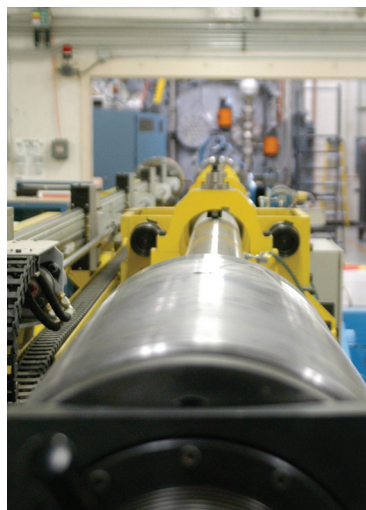
Joint Actinide Shock Physics Experimental Research (JASPER) Facility. Located at the Nevada Test Site, the 30-meter-long JASPER two-stage gas gun is used to study the fundamental properties of plutonium. JASPER fires a small projectile at a velocity of up to 8 kilometers per second. The projectile's impact sends a shock wave through the target, creating pressures more than six million times atmospheric pressure and temperatures hotter than the surface of the Sun.

Jupiter Laser Facility. The Jupiter Laser Facility provides a unique platform for the use of ultra-intense and petawatt-class lasers to explore laser-matter interactions. The facility includes the Titan, Janus, Callisto, Europa and Comet lasers and associated target chambers.

Superblock. LLNL's Superblock is a highly secure and safe facility that houses modern equipment for research and engineering testing of nuclear materials, including plutonium, uranium and tritium.

National Atmospheric Release Advisory Center (NARAC). NARAC is a national resource for predicting the spread of hazardous materials released, accidentally or intentionally, into the atmosphere. NARAC provides plume predictions within minutes of a release for emergency managers to use in responding to the incident.

Forensic Science Center (FSC). The FSC offers unmatched capabilities for analyzing ultra-trace levels of virtually any compound in any sample matrix. Expertise and instrumentation are available for complete chemical and isotopic analysis of



The 30-meter-long JASPER two-stage gas gun is used to study the properties of plutonium shocked to extreme temperatures and pressures.

nuclear, inorganic, organic, and biological materials. The FSC also develops new techniques and instruments for forensic analysis in the laboratory and the field.

Center for Accelerator Mass Spectrometry (CAMS). CAMS is the world's most versatile and productive accelerator mass spectrometry facility. With its ability to precisely measure the isotopic compositions of extremely small samples and determine relative isotopic abundances at exceedingly low levels, CAMS is used for research ranging from paleo-climatology and carbon-cycle dynamics to DNA repair and drug metabolism. For example, it can find one atom of carbon-14 among a quadrillion (10^{15}) other carbon atoms and has similar sensitivity for a dozen other elements as well.

For more information, contact the LLNL Public Affairs Office, P.O. Box 808, Mail Stop L-3, Livermore, California 94551 (925-422-4599) or visit our website at www.llnl.gov.

LLNL is managed by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy, National Nuclear Security Administration, under Contract DE-AC52-07NA27344.

LLNL-BR-423449



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