

Lawrence Livermore National Laboratory

Industry Partnering and Technology Transfer

Through a vigorous industrial partnering effort, science and technology breakthroughs made in the course of the Laboratory's mission research are transformed into products and capabilities that create new industries and help grow the U.S. economy.

In today's highly competitive marketplace, rapid creation and commercialization of scientific advances and innovative technologies are key to the continued prosperity of the United States. Scientists and engineers at Lawrence Livermore National Laboratory (LLNL) have achieved numerous science and technology breakthroughs that have led to new industries, spurred economic growth and benefited the national welfare.

The connection of scientific research and technology development to a strong and vibrant economy is widely recognized. Since the 1940s and continuing today, the federal government has been the primary funding source for basic scientific research in the U.S. Legislation enacted in the 1980s directed the national laboratories to actively seek opportunities for transferring technologies developed under federal funding to the private sector. LLNL has embraced this charge and has an impressive track record of creating successful commercial partnerships and entrepreneurial ventures based on Laboratory-developed technologies.

Leader in Technology Innovation and Technology Transfer

LLNL is a leader among the national laboratories in patenting its intellectual property and licensing its technologies to industry. Over the past decade, Laboratory inventors typically file 100–150 records of invention and are awarded 50–75 patents each year.

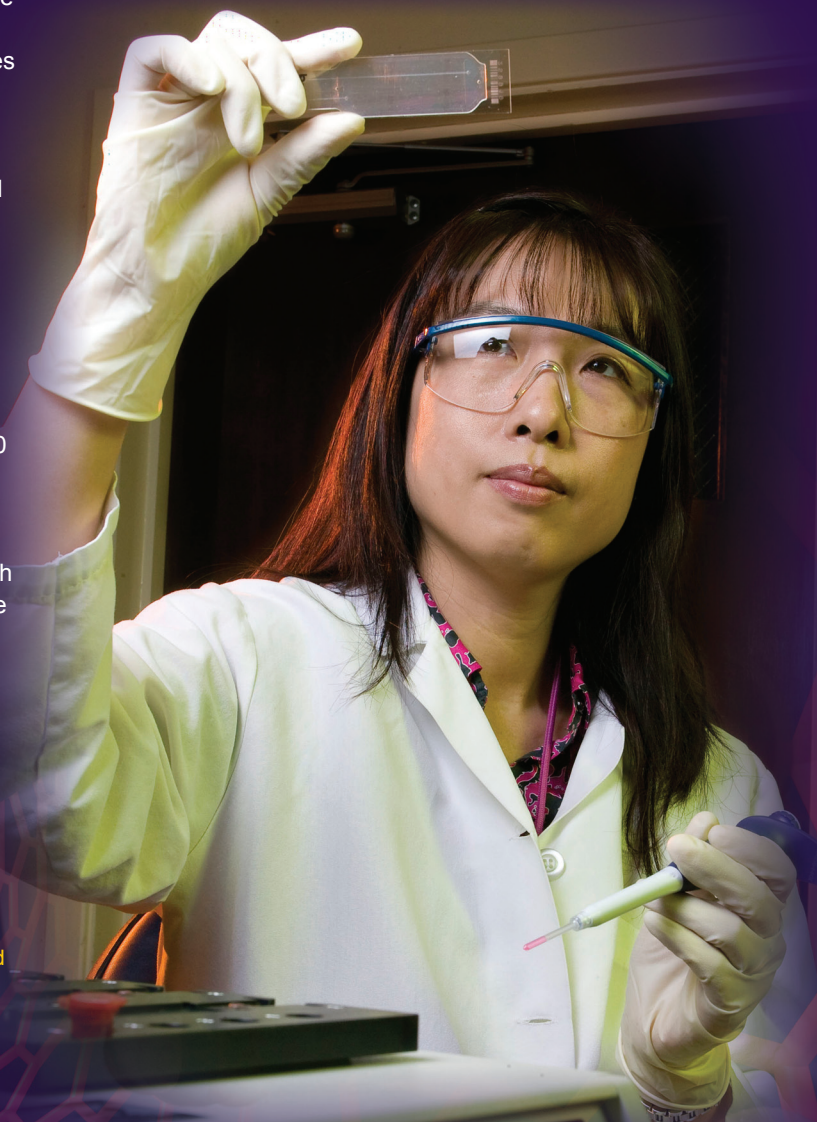
LLNL technologies regularly receive R&D 100 awards, bestowed annually by *R&D Magazine* on the 100 most innovative ideas with potential for broad impact, revolutionary change and marketplace success. Since 1978, the Laboratory has received 135 of these "Oscars of Invention."

In the past several years, LLNL has seen dramatic growth of its technology transfer activities, including a sevenfold increase in

The Lawrence Livermore Microbial Detection Array allows medical professionals, law enforcement and others to detect within 24 hours pathogens on a priority screening list as well as other already-sequenced bacteria and viruses in a sample.

its sale of Laboratory patents to industry. Typically, several new cooperative research and development agreements (CRADAs) are executed each year along with 60–70 new commercial licenses for Laboratory-developed technologies and software.

LLNL currently has active commercial licenses with more than 100 companies as well as dozens of active CRADAs. Licensing and royalty income in recent years has topped \$8 million annually, representing more than \$300 million in annual sales of products based on Laboratory technologies. Laboratory-licensed



technologies have enabled the launch of numerous new businesses that are helping drive economic growth locally, regionally and beyond.

Technology Transfer Highlights

LLNL science and technology breakthroughs transferred to industry have already created billions of dollars in cost savings and market expansion, and current industry partnerships will help position the nation for continued leadership in the 21st century global economy.

Notable success stories include:

- **DYNA structural response code:** Allowed the auto industry to ensure vehicle safety with minimum full-scale crash testing.
- **Chromosome painting:** Enabled the field of molecular diagnostics and study of the human genome.
- **Rapid DNA analysis:** Took the PCR technique for DNA amplification out of the lab and into commercial applications for health care and biosecurity.
- **Micropower impulse radar:** Made radar affordable for use in consumer products such as home security systems.

Current initiatives promise similarly transformative changes for the future. Of particular note:

- **Hydrogen storage technologies:** Potential to make hydrogen-powered vehicles a practical reality.
- **Electromechanical battery:** Highly efficient solution for alternative energy systems without the need for electrical power.
- **Carbon nanotube membranes:** Can provide abundant fresh water at far lower cost (up to 70 percent less) than current technology.
- **Carbon capture and sequestration innovations:** Possibility for leadership in major new zero-carbon industry.
- **Compact proton accelerator:** Potential to make the most advanced form of radiation therapy for cancer treatment readily available in hospital settings.

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-432893



Membranes made from Laboratory-developed carbon nanotube technology can be used to rapidly and cheaply desalinate water.

- **In-vivo tissue imaging:** Enables disease diagnosis in living tissue, without the need for biopsy.
- **Artificial retina:** Potential to restore vision to millions of people affected by macular degeneration and other eye diseases.

Mechanisms for Partnering

The LLNL Industrial Partnerships Office, with its staff of scientists, engineers, attorneys and entrepreneurs, is the conduit through which the Laboratory connects industry partners with Livermore-developed technologies. A number of mechanisms are available by which LLNL can partner with and transfer technology to the private sector. In addition to technology licenses, work for others agreements and CRADAs, the Laboratory offers several unique partnering arrangements. For example, LLNL works with university entrepreneurship centers and business schools, making technologies prime for business development available for students to use in business plan competitions. The Laboratory also has an "entrepreneurs in readiness" program in which entrepreneurs searching for new opportunities and who understand market needs are matched with LLNL technologies ready for commercialization, the result hopefully being a new start-up company.