



Robert
Larsen

Research Highlights . . .



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Potential therapy for autoimmune diseases

DOE's [Pacific Northwest National Laboratory](#) has launched a collaboration with two U.S. companies and Russian scientists to develop a more effective treatment for autoimmune diseases, such as rheumatoid arthritis and multiple sclerosis, which afflict nearly 50 million Americans. The collaboration represents the latest commercial venture between a former Russian weapons facility, a DOE national laboratory and U.S. industry under DOE's Initiatives for Proliferation Prevention program. The Russian scientists have created unique humanized antibodies to gamma interferon, a protein that when overproduced triggers and exacerbates various autoimmune conditions. Until recently, most treatments employed antibodies derived from mice, which were effective but could be used only one or two times before the human body rejected them.

[Staci Maloof, 509/372-6313,
staci.Maloof@pnl.gov]

Revolutionary LNG technology launch

Pacific Gas and Electric Company, in collaboration with DOE's [Idaho National Engineering and Environmental Laboratory](#) and other industry partners, have unveiled a first-of-its-kind small-scale natural gas liquefaction facility located in Sacramento. When operational, the facility will produce clean, safe and cost-effective transportation fuel for the heavy-duty vehicle market. One of the revolutionary aspects of the technology developed by INEEL researchers, is that it dramatically reduces the LNG plant's size and cost. Standard LNG plants cost about \$10 million to build and occupy 5-to 6-acre sites. When this prototype technology is fully developed, plant cost is expected to be about \$450,000 to build and will occupy a space of about 240 square feet.

[Teri Ehresman, 208/526-7785,
ehr@inel.gov]

How does zero light bill sound to you?

Most people would like a lower, or no, utility bill. Zero Energy Building homes may make it possible to have zero energy costs with the ability to produce as much energy as is used on an annual average basis. DOE's [Oak Ridge National Laboratory](#) recently announced an effort to construct up to up to twenty [Habitat for Humanity](#) houses with energy-efficient building technologies. Some of the homes will be DOE Building America homes, which save 50 to 70 percent on energy requirements, and some will be Zero Energy Building homes. All of the homes will exhibit to builders, utilities and homeowners the integrated technologies available today, or in the near future.

[Fred Strohl, 865/574-4165,
strohlhf@ornl.gov]

Supernova models take on third dimension

Astrophysicists at [Los Alamos National Laboratory](#) have created the first 3-D computer simulations of [supernovae](#), the spectacular explosions that mark the death of stars, using a suite of sophisticated simulation software and computers at the National Energy Research Scientific Computing Center in Oakland, California. The work is the latest milestone in an investigation of supernovae at Los Alamos that spans more than three decades and part of the larger Supernova Science Center effort, which includes scientists from the University of Arizona, the University of California Santa Cruz and Lawrence Livermore National Laboratory. DOE Office of Science funds the Supernova Science Center.

[Bill Dupuy, (505) 665-9179,
wdupuy@lanl.gov]

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EUVL reaching commercialization, VNL user facility on track

Intel, the founding member of the Extreme Ultraviolet Lithography Limited Liability Corp., has placed an order for the first beta version of alithography tool based on technology developed at Sandia through a historic labs-industry partnership.

An unprecedented \$250 million Cooperative Research and Development Agreement in 1997 between the Intel-led consortium and the Virtual National Lab—Sandia, Lawrence Livermore and Lawrence Berkeley national laboratories—led last year to integration of the first full-field EUVL chip-patterning tool, the Engineering Test Stand, at Sandia.

"It's no longer just a VNL technology," says Glenn Kubiak, leader of the Nanoscale Science and Engineering Section at Sandia's California lab site. "It's becoming a truly commercially available technology, with an order from the world's largest exposure tool manufacturer (ASML)."

In keeping with this transition from a pre-competitive phase of collaborative research with industry, the VNL is poised to begin a technology maturation phase by offering access to a Resource Development Center (RDC) at the VNL beginning next year.

In the RDC, research agreements are anticipated from integrated circuit manufacturers, the EUV group, semiconductor equipment manufacturers such as ASML, and Sematech, the advanced manufacturing and development consortium.

Since celebrating completion of the Engineering Test Stand last year, says Kubiak, efforts have focused on making upgrades to enable reliable access to chip companies that will use the tool for process development and learning. Individual companies can practice exposing wafers with circuit patterns using the exposure tool. Equipment manufacturers, meanwhile, will study the tool environment to reduce contamination of the optical system and investigate the EUV light source.

EUV patterning, or lithography, is considered an extension of the current approach to reducing and printing circuit patterns on wafers. However, EUV light is more than 10 times shorter in wavelength, requiring the use of reflective image-reduction surfaces and photomasks, since this wavelength would be absorbed by traditional clear lenses.

This next-generation approach was undertaken because the chip-making industry faced insurmountable physical limits along its path of doubling the number of transistors that can be packed into a chip every 18-24 months, a pace that has driven the business over the past 30 years.

Patterning wafers with shorter wavelengths of light enables finer features, and thus, more densely-packed transistors. That translates into better performance, with clock speeds of up to 10 GHz or faster— compared to the best speeds today of 2.4GHz.

The beta tool ordered by Intel is expected to be delivered in 2005, and the first commercial chip production with EUVL should take place in 2006-07. ASML anticipates it will be used to image critical layers in integrated circuits with feature sizes below 45 nm.

Submitted by DOE's Sandia National Laboratory

WALKING THE TALK' ON PARTNERSHIPS

As director of Argonne's Center for Transportation Research, Robert Larsen oversees a \$15 million budget. His staff includes 38 full-time researchers working on DOE transportation programs in hybrid electric vehicle powertrains, advanced diesel and spark-ignition engines, alternative-fuel vehicles and infrastructure technology, and vehicle simulation and energy-consumption modeling.



Robert Larsen

Yet Larsen believes that just as important as studying cars and engines is building bridges. Since joining Argonne in 1984, he's been a strong proponent for "establishing good working relationships that bridge the gap between industry and government, especially with the Society of Automotive Engineers."

Larsen's emphasis on collaboration has led to his ongoing participation in the 80,000-member SAE, which he considers the most influential organization of its kind in the world. "I've tried to be an ambassador for the public sector," he says. "I frequently remind my SAE colleagues of the importance of bringing the government in on things early on and in a positive way. Most are accustomed to dealing with government in the regulatory arena. However, when they come into contact with the side of government that is focused on developing technology and addressing public policy issues, many are frankly surprised to find how similar we are. They come to realize that our perspectives may differ, but the way we work and what we care about are very much the same. I'd like to think that this realization has been a factor in a number of very successful projects we've had with multiple, major industrial sponsors."

On a personal level, Larsen enjoyed the new insights he gained on the SAE governance processes. "One of the great learning experiences was coming to understand the management process of a large technical society."

Submitted by DOE's Argonne National Laboratory