Once penniless, Sandia researcher is 'most promising'.

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DOE Pulse

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Labs' data sets validate efficiency models

The National Energy Technology Laboratory and Sandia National Laboratory are working on producing high-quality data sets to help validate a computer model that would predict the environmental performance of natural gas turbines using coal or biomass fuels. The project entails defining detailed temporal, spatial measurements in tightly controlled conditions to determine the accuracy of Large Eddy Simulation computer codes. The effort supports development of new simulation methods that can handle the complex flow and chemistry that occur when fuels are burned in gas turbines. If successful, this effort could allow for low-cost evaluation of innovative concepts needed to meet emissions targets for various fuels.

[David J. Anna, 412/386-4646, anna@netl.doe.gov]

New technology treats dairy wastes, odors

An unconventional treatment method for cow manure has been brought to Northwest dairies, where a demonstration project is showing it can convert waste lagoons into treatment facilities. The lagoons have traditionally been used to store large amounts of manure and liquid effluents from dairy herds until the wastes can be pumped onto fields where crops utilize the manure's nutrients. InStreem, developed by Battelle and brought to the region by DOE's Pacific Northwest National Laboratory, transforms lagoons into extended aeration systems, establishing conditions favorable for both aerobic and anaerobic degradation of wastes. In addition, InStreem can reduce an annoying problem common to all dairies—odor.

[Dawn White, 509/375-3688, dawn.white@pnl.gov]

NREL's team continues work with Avant!

At DOE's National Renewable Energy Laboratory, the Center for Transportation Technologies and Systems' battery thermal management (BTM) team is working with integrated-circuit software maker Avant! to incorporate lithium-ion, NiMH, and lead-acid battery models in Saber, a computer program used to model electrical circuits. The BTM team plans to develop a battery pack model in Saber capturing individual battery behaviors such as voltage, state of charge, capacity, power, and temperature. The team will use the Saber battery models in conjunction with the vehicle systems simulation tool ADVISOR to evaluate the impact of battery to battery variability on vehicle performance. Results are expected by the end of October.

[Sarah Holmes Barba, 303/275-3023, sarah_barba@nrel.gov]

Spinach protein offers hope for blind

Spinach, touted by Popeye for its ability to strengthen the body, may prove even more valuable for restoring vision. Researchers at DOE's Oak Ridge National Laboratory and the University of Southern California hope to learn whether a protein from spinach could replace a non-functioning light receptor in the eye. The project is geared toward people who suffer from age-related macular degeneration or retinitis pigmentosa. Although the neural wiring from the eye to brain is intact in people with these diseases, their eyes lack photoreceptor activity. The researchers propose replacing these non-functioning photoreceptors with a spinach protein that gives off a small electrical voltage after capturing the energy of incoming photons.

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DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

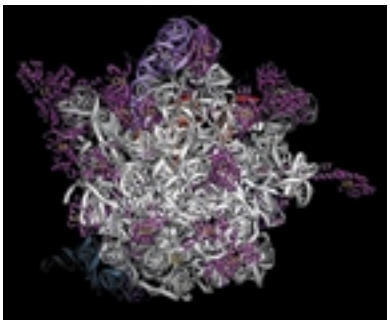
Ribosome research encompasses early life, antibiotic resistance

Biologists from around the world, working at the Structural Biology Center at DOE's Argonne National Laboratory, have discovered that the basic mechanism for operating the human protein factory called the ribosome has been preserved for billions of years among all organisms, from humans to bacteria.

The researchers used the exceptionally brilliant X-rays at Argonne's Advanced Photon Source, which allows examination of ribosome components at resolutions high enough to determine the position and interaction of individual atoms.

Knowledge of the ribosome's structure is also helping scientists understand how many antibiotics attack certain parts, or functions, of the bacterial ribosome. Pharmaceutical and biotechnology companies can use this valuable information to develop new antibiotics to fight the growing problem of bacterial drug resistance.

Three groups of researchers—from Yale University, the Medical Research Council in the United Kingdom, and the Weizmann Institute in Israel - created complete, high-resolution models of the bacterial ribosome's two main structural parts.



The images are the culmination of four decades of work by biologists in elucidating how the ribosome creates proteins. Ribosomes are composed of many separate molecules that work together to manufacture a cell's proteins—large molecules that give our cells structure and initiate and speed up chemical reactions.

Using the techniques of X-ray crystallography, each biology team directed brilliant X-ray beams from the APS synchrotron onto crystallized samples of the subunits.

Many biologists believe that in the early days of the Earth, when life was beginning to emerge 3.5 billion to 4 billion years ago, RNA was both the primary genetic material and the main catalytic substance that sped up the first protein-synthesizing reactions. Today, DNA is the primary genetic material, but RNA still is critical for making proteins by way of the ribosome.

Submitted by DOE's Argonne National Laboratory

Once penniless, Sandia researcher is 'most promising'

Alfredo Morales

When Alfredo Morales arrived in Los Angeles from Nicaragua in 1985, he was 16, broke, and spoke no English.

On Oct. 13, at a black-tie dinner in El Paso, Texas, the former penniless immigrant—now bilingual and degreed, with eight patents applied for and one granted—will receive the 2001 "Most Promising Scientist" award from the Hispanic Engineer National Achievements Award Conference.

"In my 29 years at Caltech, I consider Alf one of the two or three best undergraduates I have worked with," says his undergraduate research mentor, Professor John Bercaw. Morales graduated from the California Institute of Technology with a grade-point average of 4.0.

At Harvard, where Morales earned his PhD in chemistry, he discovered how to make nanowires at a controlled cross-sectional dimension and length. In 1997 he joined a group at DOE's Sandia National Laboratories that makes micromachines, he says, because "I wanted to work with short-term deliverables" rather than on projects with results expected in the far future.

Morales's other work at Sandia includes recent funding to start a nanotechnology project and participation in Sandia's Center for the Study of Emerging Threats.

In helping summer students at Sandia, he emphasizes developing a model of the system being studied not only to get an idea of expected behavior but of what could go wrong. "The interesting science you read about isn't planned. It's almost always totally unexpected. Something happened in an experiment and someone realized, because of the model they had made, that it shouldn't have happened. Because of that awareness, a discovery is made."

His research philosophy, he says, is, "Make, measure, or explain something no one else has made or measured before; learn to talk about it; and surround yourself with the best people, even if they're smarter than you."

Submitted by DOE's Sandia National Laboratories