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Amines key to large-scale CO2 capture

Researchers at DOE's National Energy Technology Laboratory have taken steps to explain chemical mechanisms that cause monoethanolamine (MEA) to degrade as it removes CO_2 from power plant flue gas. Industry has used MEA to remove CO_2 for decades but it degrades, the process becomes inefficient, and the residue is a hazardous chemical waste. By using combined gas chromatography-mass spectrometry, combined gas chromatography-Fourier transform infrared absorption spectrophotometry, and industrial samples, researchers say they may soon have some answers. If so, MEA absorption would be better positioned for use in large-scale CO_2 capture and sequestration of the greenhouse gas.

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A top supercomputer en route to PNNL

DOE's Pacific Northwest National Laboratory will soon be home to the world's most powerful Linux-based supercomputer after a recent contract award to Hewlett-Packard Company. The $24.5 million, 8.3-teraflop HP supercomputer will replace an IBM supercomputer located in the William R. Wiley Environmental Molecular Sciences Laboratory. Calculations that currently take a month to complete should be done in one day. PNNL scientists and EMSL users will apply the supercomputer to address issues in biological systems, subsurface transport, material design, atmospheric chemistry and combustion. The supercomputer also will be vital to better understand systems biology, including structural biology, genomics and proteomics. The supercomputer is expected to be fully operational in early 2003.

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Neutrons mean neutral, right?

An experiment conducted at DOE's Thomas Jefferson National Accelerator Facility is shedding new light on the neutron. The experiment has shown that a neutron's center is slightly positive and has a small negative charge at its surface contrary to the textbook understanding of the neutron, the neutral particle of the atom. Using this data, the locations and interactions of quarks, the smaller, particles that make up neutrons and protons may be more well understood. New insights into how neutrons and protons arrange themselves to form atomic nuclei could also be gained.

[Linda Ware, 757/269-7689, ware@jlab.org]

SLAC, former Soviet scientists reach forward

Researchers from the DOE's Stanford Linear Accelerator Center begin working this summer with scientists from Russia and Armenia thorough grants from the U.S. Civilian Research and Development Foundation. The CRDF promotes scientific and technical collaboration between the U.S. and the countries of the former Soviet Union to help scientists, particularly those with past nuclear weapons work, find productive careers at home rather than see them emigrate to would-be nuclear proliferant countries. A principle focus of the SLAC researchers will be the study of polarized photocathodes. Using specially designed photocathodes, polarized electron beams can be generated for acceleration in the SLAC linac. Polarized electrons allow a wider range of, and more accurate, high-energy measurements. Such technologies will be crucial for the successful operation of future linear colliders.

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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).

Ames Lab researchers aid real-life crime scene investigations

On the hit television series "CSI," crime scene investigators have all kinds of high-tech equipment to help them piece together shreds of evidence and catch the bad guys. In real life, researchers at Ames Laboratory are providing technical assistance to Midwestern criminalistic laboratories to do the same thing – help forensic scientists find new and better ways of analyzing crime scene evidence.

The technical assistance is being provided through the Midwest Forensic Research Center at Ames Lab. The center, now in its third year, is stepping up those research efforts thanks to $3 million in federal funding received earlier this year.

Carl Bessman, criminalist with Iowa Criminalistics Lab

One of the center's early successes was a collaboration with the Iowa Division of Criminal Investigation's Criminalistics Laboratory to build a climate-controlled chamber for development of latent fingerprints. Using a standard laboratory glove box found in a typical research setting, Ames Lab researchers and machinists customized the equipment so that it gives forensic scientists precise control over temperature and humidity within the chamber when fuming fingerprints with cyanoacrylate (Super Glue). The chamber allows criminalists to use the built-in rubber gloves to add or remove evidence. Using the glove box, the Criminalistics Laboratory has been able to process a much higher volume of evidence. The device was so successful that a second unit was built for the local Story County Sheriff's office and plans for building the unit have been made available to crime labs throughout the Midwest.

In a related project, researchers built a vacuum chamber that makes it possible to develop fingerprints on the surfaces of items, such as plastic garbage bags, that have previously been difficult if not impossible to process.

Still another project was coordinated in conjunction with the Veterinary Diagnostic Laboratory at Iowa State University's College of Veterinary Medicine. A database of potential disease agents that could be used by bioterrorists was compiled and included information on everything from symptoms and what test samples are needed to who the specialists on those diseases are and what diagnostic labs are testing for those agents. The database is available online to veterinarians throughout the country who are serving in the front lines of defense against bioterrorism.

Submitted by DOE's Ames Laboratory

For JLab physicist, soccer was fun, but quarks pay the bills

Jefferson Lab's Rolf Ent

Rolf Ent did not start out wanting to be a physicist. Soccer was the main love of his boyhood but practically he knew finding a job playing soccer would not be an easy life, all that running, outside in the rain and all that traveling and if he were an athletics teacher, he would be teaching soccer, not playing it.

Growing up in the Netherlands afforded Rolf the opportunity to study hard in school and try out many different subjects but science was the most interesting to him. His interest has taken him to the DOE's Thomas Jefferson National Accelerator Facility in Newport News, Virginia where is a leader of one of the three experimental areas where scientists can conduct research into the basic building blocks of nature, quarks.

As a experimental hall leader, Rolf has to juggle many duties. Collaborators come to Jefferson Lab to use the facility to conduct their research about the structure of matter down at the fundamental level. These collaborators come from all over the world and expect a well-oiled machine when they arrive, some after planning their experiment for many years. To make sure the researchers are happy, Rolf manages a staff of scientists and technical specialists who work together seven days a week, 24 hours a day. So a thunderstorm can bring in a crew to fix a problem at midnight and a hurricane can have all hands manning the sand bag brigade. Rolf also must understand the physics of the experiment being conducted.

It's a demanding job but one he relishes. He considers himself a hard core physicist doing something useful for mankind. And he likes the fact that he is seeing some really practical uses for mathematics–using it to figure out the nature of matter.

Submitted by DOE's Thomas Jefferson National Accelerator Facility