BROOKHAVEN NATIONAL LABORATORY

Laboratory Link

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Building 130, P.O. Box 5000
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Phone: 631 344-5658 Fax: 631 344-3654
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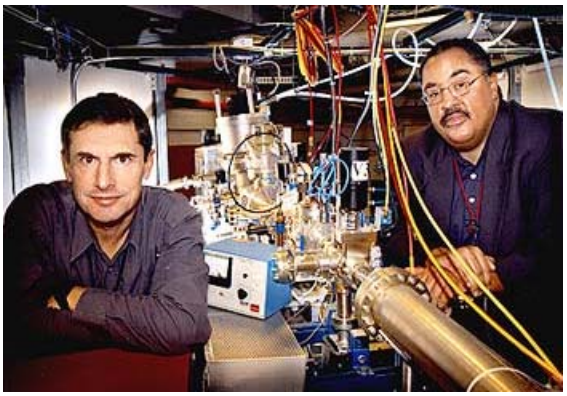
Coal-Purifying Bacteria

- Scientists at the U.S. Department of Energy's Brookhaven National Laboratory have developed strains of bacteria able to live in harsh environments while chowing down on carbon-rich materials such as coal. The bacteria could be used to yield more-efficient, cleaner-burning coal.

- When combined with a slurry of coal, these new microbes break down the coal's complex molecules to form simpler ones, and also remove sulfur and heavy-metal contaminants. The resulting cleaner coal can be burned or converted to liquid or gaseous fuel much more efficiently than untreated coal, while producing fewer environmentally undesirable by-products.

- Chemist Mow Lin and retired natural products chemist Eugene Premuzic were recently awarded a patent for this work. Previously, Lin and Premuzic developed bacterial strains that digest oil, for which they also attained a patent. The team also received an R&D 100 Award last October for their method of recovering silicate byproducts from geothermal wells.

New Welding Technique Developed at Brookhaven Lab



Physicist Ady Hershcovitch (left) and Michael Greene from the Lab's Office of Intellectual Property & Industrial Partnerships, pictured in front of the plasma window mounted on a beam line at the National Synchrotron Light Source.

- Ady Hershcovitch, a physicist at Brookhaven Lab, developed a new technique for use in electron-beam welding. The development, called a plasma window, is expected to provide substantial savings to manufacturing industries. In addition, the equipment will cost less than it does today.

- Electron-beam welding has many advantages over other welding techniques. One is the ability to make welds that are deeper and narrower than conventional welds. A second is higher welding speeds, which are due to the high melting rate associated with the concentrated heat source.

- Electron-beam welding has commercial applications in many fields including medicine and the manufacture of semiconductor, aircraft, and automobiles.

- The plasma window will be extremely energy efficient and will more than double production rates over traditional vacuum electron welding.

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Scientists Discover New Material that Expands Under Pressure

- Most materials get compacted or fall apart under pressure, but a team including BNL scientists has discovered some materials that expand. These unusual materials may have applications as "molecular sponges."

- For example, one application would be to set up a "trap door" mechanism for locking up chemical or radioactive pollutants. When the pressure is increased and the material gets bigger, the pores get bigger, too. So the researchers can try to squeeze large ions or molecules such as hydrocarbons, mercury, lead, or even radioactive strontium into the pores. Then, when the pressure is released, the pore would get smaller and trap the pollutants inside. The scientists plan to continue their studies to see if this approach will work. The research is being conducted at Brookhaven's National Synchrotron Light Source.

Brookhaven Lab Explores Anti-Terrorism Initiatives

- Following the attacks of September 11, the Lab has established an anti-terrorism working group to identify and develop advanced capabilities and expertise that may help to preserve the safety and enhance the long-term security of the United States and its people.

- The working group represents most of the scientific disciplines within the Laboratory. Many of the group's ideas emphasize improved means to prevent and protect against attacks and to provide emergency response if prevention and protection should fail. Approaches and technologies currently being explored include:
  - Sensors used for the early detection of nuclear, chemical, and biological agents and explosives, including the ability to detect trace quantities of these materials. Radiation detectors could be used to check baggage at airports and other transportation centers.
  - A one-of-a-kind chemical sensor used to locate and identify chemical spills or ground contamination from a safe distance.
  - Methods to detoxify nerve gas agents using an enzyme that can degrade such compounds. This work could lead to topical lotions that protect the skin.
  - Structural studies of viruses to determine how these organisms attack the human body. This work may help scientists design vaccines and antidotes against biological weapons and aid in identifying these agents. Similar studies of chemical agents may also help design countermeasures for chemical weapons.
  - A magnetic imaging tool designed to locate and map iron structures hidden in debris to aid in search-and-rescue missions.
  - Materials studies that could lead to "smart" buildings that are more resistant to terrorist acts involving explosives and chemical and biological agents.
  - Techniques to model and track aerosols and chemicals as they move through air, and identify and assess sources and trajectories of these atmospheric contaminants.

For additional information on any of these stories, see "news" at http://www.bnl.gov .

Upcoming Events Open to the Public:

- *Gospel Extravaganza, February 2, 7 p.m., Berkner Hall.* In honor of Black History Month, BNL will present a gospel concert. The program will include performances by The Long Island Voices Foundation Mass Choir, the Wings of Faith Choir, the Joy of Lift Ensemble, Rosemary Rogers, the Spiritual Stars, and The First Baptist Church Dance Ministry of Riverhead. Tickets $15 at the door.

Due to heightened security, everyone who visits the Laboratory must have a photo ID.