NEWSLINK

FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER MARCH 2001 VOL. 17, NO. 3

NCAUR's Plant-Animal By-product Uses Offer Industry Opportunities

Can you imagine nonfattening food additives made from sugar? Or biodegradable plastic milk jugs and soda bottles made possible by a bioengineered fungus? Or vitamins, rubber, and drugs produced by a fungus bioengineered from one that produces toxins in stored grains? From making a low-calorie sweetener from corn to managing hog manure odors, the broad R&D efforts at the **Agricultural Research Service's (ARS) National Center for Agricultural Utilization Research (NCAUR)** continue to solve agricultural problems and improve our lives today.

Technician Melinda Nunnally examines an assay plate to determine which enzymes break down corn fiber.

"We're trying to develop new bioconversion strategies to produce valuable chemicals and fuels from renewable agricultural commodities," said Mike Cotta, Ph.D., research leader at NCAUR's Fermentation Biochemistry Research Unit (FB) in Peoria, Illinois. The mission is almost accomplished. Fermentation biochemistry scientists have developed a number of bioprocess and metabolic engineering technologies that may expand biofuel feedstocks and add value to agricultural wastes. Many technologies are available for further development.

Fungi for the Future

One of the FB's greatest successes is its lab-scale conversion of corn fiber into xylitol, a sugar alcohol that is useful as an alternative natural sweetener in foods and gums. Currently, makers of some sugarless gums pay only $3 per pound for the minty-flavored xylitol, which has one-third fewer calories than sugar but the same sweetening power; and diabetics can process it without using insulin.

The fungus *Rhizopus oryzae* may have a future in biodegradable plastics, serving as a "workhorse" to convert grain and other renewable agricultural resources into environmentally friendly solvents and plastics—and reducing landfill buildup. "The research on utilization of agricultural products, such as cornstarch and fibrous crop residues, bodes well for both farmers and consumers," said **Floyd P. Horn**, ARS administrator. ARS has applied for patent protection on an invention that can team microbes more cheaply with the machinery to produce more lactic acid, the building block of polylactic acid (PLA) plastic. There is also a CRADA in place with a large corporation.

Licensing Opportunities

In conjunction with the U.S. domestic beet and cane sugar industries, NCAUR researchers have also developed a powerful new microbe strain that can produce a product called alternan, a potential alternative to gum arabic, a key

Please see ***NCAUR****, p. 2*

Army's PMCD Destroys Chemical Warfare Material

If you've ever wondered what happens to the stockpiles of munitions or aging chemical weapons in the U.S., rest assured, America. **The U.S. Army Program Manager for Chemical Demilitarization (PMCD)** is committed to the careful disposal of all chemical warfare-related materials, as well as ensuring maximum public safety and compliance with local environmental standards.

The Chemical Stockpile Disposal Project (CSDP) oversees the disposal of these unused weapons—many of which are 40 years old or more—built to deter other countries from using chemical weapons of their own. Guarded in eight secure storage areas in the U.S. and formerly on Johnston Island in the Pacific, these obsolete weapons could put these areas and their guards at risk.

"More than 90 percent of the chemical stockpile is now under contract for destruction," reports **James L. Bacon,** PMCD Program

Please see ***PMCD****, p. 2*

INSIDE

This issue of NEWSLINK focuses on **Chemical Technologies.** The April/May issue will focus on **Biotechnology**.

FED LABS FLASH

Technology transfer news, notes, and events within the federal lab community

Mason Named to Lead SNS Project

Dr. Thom Mason has been named to lead construction of the $1.4 billion **Spallation Neutron Source (SNS)** project in Oak Ridge, Tennessee.

The SNS is the world's largest civilian research project. When completed in 2006, it will become the world's research center for making a variety of materials stronger, lighter, and cheaper.

Mason has worked for the SNS project since 1998 as director of the project's Experimental Facilities Division. His responsibilities included management of more than $250 million of the project's technical components, research development, and preoperation portions, as well as planning for approximately $150 million of the project's conventional facilities.

Mason has been recognized for his key role in keeping the SNS project on time and on budget. **Jim Decker**, Acting Director of Science for the Department of Energy, said, "Thom is a superb choice to lead the SNS. He has demonstrated sound management of target and instrument systems. His management skills combine with his focus on the facility's scientific output to ensure strong and continued support by the international community."

For more info: Bill Madia, 865-576-2900

Bacon Honored by ARS

Charles Wilson Bacon, a **U.S. Department of Agriculture (USDA)** microbiologist, has been named "Distinguished Senior Research Scientist of the Year" for 2000 by the ARS. It is the top scientific honor given by ARS, the chief scientific research agency of the USDA. Bacon is being honored for conceiving, developing, and implementing biological control research to prevent plant disease and to control fungal toxin production in plants.

A supervisory microbiologist and research leader for the Toxicology and Mycotoxin Research Unit in Athens, Georgia, Bacon focuses his research primarily on the growth, physiology and biochemistry of toxic fungi. "Dr. Bacon leads a group of ARS scientists whose creativity is nationally recognized and whose research efforts, individually and combined, have led to many important research findings," ARS Administrator **Floyd P. Horn** said. "His research has

NCAUR *from p. 1*

ingredient (as well as thickener and emulsifier) in food. Currently, FB scientists are trying to develop new versions of alternan that include small amounts of proteins, which are believed to offer emulsifying capacity. ARS inventions on alternan are available for licensing.

A number of these new diverse technologies out of NCAUR's eight nationwide research units may well drive down production costs and increase volume in various industries. The potential new products from agricultural resources promise other numerous benefits as well. Industry partners in both research and development are encouraged. NL

For more info: Mike Cotta, 309-681-6500, cottama@ncaur.usda.gov. For info on tech transfer opportunities at NCAUR: http://ott.arsusda.gov

PMCD *from p. 1*

Manager. Plans are in place to meet the requirements of the Chemical Weapons Convention—destroying all identified chemical warfare materiel by April 2007. **Sandia National Laboratory, Oak Ridge National Laboratory,** and **Idaho National Engineering & Environmental Laboratory** assisted during various stages of the project.

Via the congressionally mandated Cooperative Threat Reduction Program in 1991, PMCD's Chemical Weapons Destruction Support Program assists the Russian Federation in the safe destruction of its chemical weapons stockpile. The destruction facility to be installed at Shchuch'ye in the Krugan region will be monitored to ensure safe weapon destruction and to prevent the proliferation of chemical weapons. There is also a project to dispose of all U.S. non-stockpile material including, for example, former production facilities and recovered, buried or miscellaneous warfare materiel.

Headquartered at Aberdeen Proving Ground, Maryland, PMCD's comprehensive program is dedicated to excellence in completing its remaining six-year mission in its demilitarizing program. Bacon said, "We're making chemical weapons history… a thing of the past." NL

For more info: James Bacon, james.bacon@pmcd.apgea.army.mil; www.pmcd.apgea.army.mil

influenced the development of all aspects of research scientists at major universities that study toxic fungi that affect forage plants and other crops."

For more info: Sharon Dunham, 301-504-1611, sdunham@ars.usda.gov

Army Technology Benefits Commercial Businesses

The **U.S. Army's Edgewood Chemical Biological Center (ECBC)** has signed a licensing agreement with Purified Microenvironments to market one of the Army's technologies to commercial customers.

The Army uses the transportable glovebox and filtration system to safely analyze and classify unknown materials that may be toxic or harmful. The system is portable and can be used at incident or recovery sites of suspected hazardous materials.

Purified Microenvironments, a manufacturer of gloveboxes, was so impressed by the portability of the Army's glovebox and filtration system that it wanted to make them available to its customers.

The Army currently uses the glovebox in conjunction with its Mobile Analytical Laboratory System (MALS), a self-contained, fully functional, analytical mobile laboratory.

For more info: Jim Allingham, 410-436-4347, jamesallingham@sbccom@apgea.army.mil

DOE Urges Energy Savings Through Contest

The **U.S. Department of Energy** (**DOE**) has called on the energy industry to participate in a nationwide competition for new power plant technologies that could relieve the growing strain on America's electricity supplies. The new effort, termed the Power Plant Improvement Initiative, is targeted at advanced clean coal technologies. The DOE has offered $95 million in matching funds as an incentive.

For more info: www.fe.doe.gov

NIST Announces New ATP Proposal Process

A new, streamlined proposal submission and review procedure has been announced by the **National Institute of Standards and Technology (NIST)** for the 2001 Advanced Technology Program (ATP). Deadlines will be eliminated, as proposals submitted to ATP will be evaluated throughout the year. Further, a new "gated" proposal process allows companies to submit their proposals in stages. According to ATP officials, both changes are expected to significantly accelerate and simplify the application procedure for many companies. ATP, which provides co-funding for new and innovative industrial research projects, expects to have approximately $60.7 million available in fiscal year 2001 for first-year funding of new projects that can run as long as five years. NL

For more info: www.atp.nist.gov

Technology Transfer on the World Wide Web

The Department of Chemical Engineering at Carnegie Mellon

http://www.cheme.cmu.edu/info/

The Department of Chemical Engineering at Carnegie Mellon, one of the premier engineering departments in the country, is committed to achieving excellence in education and research by stressing quality, innovation, and visibility in its programs. All faculty in the department are actively engaged in research that offers educational opportunities to students seeking to address challenging problems in the process industries and in new, emerging technologies.

Argonne National Laboratory Chemical Technology Division (CMT)

http://www.cmt.anl.gov/mission.html

The Chemical Technology Division (CMT) is one of eight engineering research divisions at **Argonne National Laboratory (ANL)**, one of the U.S. government's largest science and engineering research centers. The University of Chicago oversees the laboratory on behalf of the **DOE**. Argonne's mission is to conduct basic scientific research, to operate national scientific facilities, to enhance the nation's energy resources, and to develop better ways to manage environmental problems. Argonne has the further responsibility of strengthening the nation's technology base by developing industrial technology and transferring that technology to industry.

Oak Ridge National Laboratory Chemical Technology Division

http://www.ornl.gov/divisions/ctd.html

The division's mission is to create innovative solutions through chemical, radiochemical, and biochemical science and technology systems for chemical technology. NL

FLC Web Site

We continually update our web site with new technologies categorized into 15 industry topic areas. Simply go to *www.federallabs.org* and click on TECHNOLOGIES. New entries are added weekly!

LOOK FOR NEW WEB SITE DESIGN TO DEBUT MAY 1!

TECHNOLOGY WATCH

Federal laboratory technologies available for technology transfer

What's in the Smoke?

A critical issue for the **U.S. Army** is the safety of soldiers and the environment from emissions produced by its various weapons systems. Studies to determine the environmental emissions and related health impacts produced by guns and ammunition, including pistols, rifles, grenade launchers, tank guns, mortars and explosives, are performed at the **Aberdeen Test Center (ATC),** located at Aberdeen Proving Ground, Maryland. Chemists and engineers are working together to battle many technological challenges for performing necessary chemical analyses in unique military situations.

Depending on the type and size of each item tested, ATC utilizes one of three unique test chambers to install sampling systems for the chemical analysis of emissions during testing. An emission characterization chamber (ECC) was set up to sample the emissions of small weapons firings. Second, instrumentation was set at various locations within an enclosed firing barricade to sample the emissions of large caliber weapons firings. Finally, ATC designed a large octagon test chamber (LOTC) to test bulk explosives such as C4, dynamite, grenades, and other high explosives. The findings will be used to modify current Army training and test practices.

ATC conducts analyses of the various sample gases collected during testing using state-of-the-art instrumentation, such as a Fourier transform infrared spectrometer, a gas chromatography mass spectrometer, and an ion chromatograph.

For more info: Robert Durgin, 410-278-3714, rdurgin@atc.army.mil; www.atc.army.mil

Clockwise l to r: ATC's emission characterization chamber, ATC's large octagon test chamber (LOTC), Bottom: Emissions test in ATC's modified large caliber firing barricade.

Toroid Cavity Imager Provides Inside Story

ANL's toroid cavity imager (TCI)—an imaging device based on nuclear magnetic resonance (NMR) technology—identifies and locates chemical compounds inside closed containers by measuring how the contents respond to a magnetic field. The technology was originally developed as an NMR analytical tool and then used to safely examine stored nuclear wastes. It also has potential applications for nondestructive inspection of the contents of any type of container or package that can be placed inside a cylindrical test chamber, such as packaged foods (for freshness), industrial materials (for safety), and shipped or mailed items (for safety and security).

ANL's TCI accurately quantifies a container's contents, with up tresearcho one-micrometer spatial resolution and with high sensitivity distinguishing among chemical elements and compounds. Moisture, by-products from degradation and spoilage, and chemical shift reactions are detected and measured instantly, without destroying the package or product. This technology has been used on a laboratory scale to study ion diffusion in batteries and various catalytic reactions. Suitably scaled, the technology is applicable to any container of any size.

For more info: Shari Zussman, 630-252-5936, zussman@anl.gov

Patents Filed for Multi-use High Density Liquids

Naval Surface Warfare Center Indian Head Division researchers have filed several patent applications for customizable, high density liquid oxidizers, liquid fuels, and liquid propellants. These energetic liquids have been preliminarily evaluated with broad ranges of their ingredients' concentrations, and can be reformulated by altering the formulations' ingredient concentrations. This in turn could potentially satisfy various physical, chemical, cost, energy content, safety, and other desirable requirements.

These formulations consist of industrially available primary ingredients or their chemical precursors. Theoretical performance calculations predict not only high energy content, but reduced flame temperatures for longer engine lifetimes. Diverse applications exist for these energetic liquids formulations, including:

- Commercial, hobby, and DOD rocket systems
- Drag racing supercharger oxidants (N_2O replacement)
- Breathable air supply systems
- Air bag inflation systems
- Fuel cells for unmanned underwater vehicles
- Restart of jet engines after flameouts
- Oil well borings: epoxy liner curing

For more info: Dr. J. Scott Deiter, 301-744-6111, DeiterJS@ih.navy.mil

Molecular Traps Snare Chemicals from Process Streams

New microporous materials, named Sandia octahedral molecular sieves (SOMS) by their discoverers at **Sandia National Laboratories**, could be useful in microelectronics fabrication and other industries where purification of, or extraction from, liquid process or wastestreams is a significant or costly problem. They also could help capture for reuse a variety of valuable materials (such as chromium, cobalt, and nickel) from industrial effluents.

Sandia's Tina M. Nenoff examines vials of recently crystallized SOMS powder.

Chemically, a SOMS is a tiny sponge that sucks up divalent cations (atom groups with a +2 charge) into its microscopic pores and snares them at negatively charged bonding sites that have been vacated by ions with weaker charges—a process called ion exchange. (Home water softeners use ion exchangers to remove iron from tap water.)

The size of openings on their crystalline surfaces can be adjusted precisely by altering the recipes followed to make them. Researchers are able to select the sizes of ions or molecules to from 4 to 15 angstroms (an angstrom is one ten-millionth of a millimeter) and dictate what gets into the pores and what can't.

Additionally, the SOMS collapse into a dense glasslike material called perovskite when heated to about 500°C. Bricks made from the densified SOMS are impervious to leaching and are stable in high pH, radiation, and heat, which might make them ideal for disposal.

For more info: John German, 505-844-5199, jdgerma@sandia.gov

Lighting the Way to New Industrial Chemicals

A chemist at the **DOE's Ames Laboratory** is experimenting with safe and simple chemical reactions that could bring about a big change in how industrial chemicals are produced, making the process more efficient, economical, and environmentally friendly.

While many photochemical reactions are initiated by ultraviolet light, **Andreja Bakac** uses readily available visible light from a lamp or the sun for her photooxidation experiments with hydrocarbons—chemical compounds that make possible the gas for our cars and the heat for our homes.

Plentiful as they are, hydrocarbons are basically lifeless and won't react on their own. Bakac says this class of compounds could become an important feedstock for the chemical industry if they could be made more reactive. The standard method uses heat to drive the chemical reaction. However, Bakac noted, "Light is typically a lot cheaper than heat, and it's perfectly clean environmentally."

> Light is typically a lot cheaper than heat, and it's perfectly clean environmentally

Simple air is the oxidant for Bakac's hydrocarbon oxidation reactions. "Air or oxygen, that's as innocuous as oxidants get," she said. "That's what's so wonderful about this approach and what makes it so attractive."

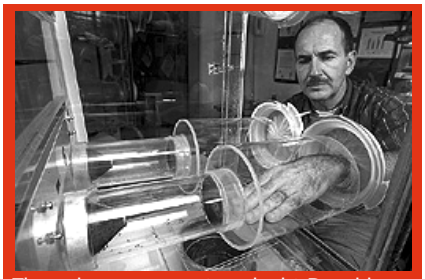
In addition to light and air, Bakac uses a brilliant-yellow aqueous solution of uranyl ions as a photosensitizer to absorb the light needed to drive the oxidation reactions. Should the experiment eventually be considered for industrial applications, depleted uranium would be used. In depleted uranium, the amount of the fissile uranium—the isotope that splits apart—has been reduced to well below natural levels.

For more info: Andreja Bakac, (515) 294-3544

More Than Bad Luck Attracts Mosquitoes to Humans

Anyone who spends more money on calamine lotion than hot dogs and hamburgers is acquainted with mosquitoes. For example, it's become New Jersey's unofficial state bird! But what is it that initially causes the attraction of this little pest to our arms, neck, and legs?

With an eye to developing trap lures, **Agricultural Research Service (ARS)** scientists are testing individual chemical scents for their attractiveness to mosquitoes. One research chemist, **Ulrich R. Bernier**, has developed a technique that uses tiny glass to absorb some scents, thus identifying mosquito-attractive organic compounds from humans. To date, he has found more than 340 different human scents that qualify.



Through a screen, entomologist Donald Barnard safely demonstrates the attraction of female yellowfever mosquitoes to his hand in an olfactometer.

Bernier has combined different blends and combinations of scents and screened them at different levels to see which draw mosquitoes. In laboratory tests, he can attract about 90 percent of the mosquitoes to one particularly alluring mixture. He is impressed, considering a human arm and hand attract about 70 percent of the same mosquitoes.

Finding the right chemical scent is important, because what may be attractive to one species may not be for another. Ultimately, a better understanding of mosquito attraction should help in the development of more effective, environmentally safe repellants for protection from insects that prey on both humans and livestock.

For more info: Ulrich R. Bernier, 352-374-5931, ubernier@gainesville.usda.ufl.edu

TECH WATCH continued on p. 7

SPOTLIGHT ON SUCCESS

Success stories from the federal lab community

Argonne's Collaboration on Radioactive "Seeds" Helps Startup Medical Company Grow

When faced with the technical challenges of working with radioactive materials, one of **SourceTech Medical's (STM)** first tasks was to identify a laboratory that could help. STM, an Illinois-based startup company established in April 1998, approached **Argonne National Laboratory** for assistance. The task was to develop a new method of producing radioactive medical "seeds" about the size of a grain of rice, containing radioactive iodine for use as permanent implants in treating early-stage prostate cancer. Demand for radioactive seeds by the medical industry has significantly outpaced worldwide production capacity, and STM identified a marketing opportunity if the company could develop a technically competitive seed and reliable manufacturing method.

In July 1998, STM entered into a reimbursable R&D agreement with Argonne, whereby costs are paid entirely by the lab. Argonne agreed to help STM develop the technology necessary to deposit radioactive I-125 onto substrates that could then be sealed inside the titanium capsules that form the seeds.

"Argonne's reputation in the field of nuclear chemistry and its laboratory resources made the lab an ideal candidate as a collaborative partner," said **Michael Drobnik**, STM's Director of Manufacturing.

"For our small, startup company, working with Argonne was very cost-effective, because we were able to tap into the Department of Energy's expertise and advanced facilities without a lot of up-front spending on expensive laboratory equipment and other overhead items. This was critical in STM getting off the ground quickly."

Once Drobnik, a chemist, completed required radiation worker training and safety reviews at Argonne, he began performing lab experiments in collaboration with Argonne's Chemical Technology Division personnel. This industry/laboratory team successfully completed the investigative work in July 1999. STM has finished construction of a new facility in Carol Stream, Illinois and is currently manufacturing and distributing I-125 seeds in the United States.

Argonne chemist Luis Nuñez (left) and Michael Drobnik, Director of Manufacturing for SourceTech Medical, discuss the Argonne-developed process for making radioactive seeds for treatment of prostate cancer.

"The technical collaboration has been a very positive experience for SourceTech Medical, and we are looking into additional working agreements with Argonne on future projects," says Drobnik.

Added Argonne chemist **Luis Nuñez**, "The Chemical Technology Division has been interested in developing its nuclear technology in the medical field. Our association with SourceTech Medical has provided a good avenue to achieve both their goals and ours." NL

For more info: Catherine Foster, 630-252-5580, cfoster@anl.gov; Luis Nuñez, 630-252-3069, nunez@cmt.anl.gov

TECH WATCH *continued*

C36—A New Class of Buckyballs Means More Useful Compounds

Researchers at the **Lawrence Berkeley National Laboratory (LBNL)** have synthesized and isolated carbon 36 (C36) fullerenes for future use designing new materials. The researchers have also produced solid C36 – the first time a solid fullerene—commonly called a "buckyball"—smaller than carbon 60 (C60) has been synthesized. The fullerenes, which can join in several different structures, bind together covalently to form a hard, polymerized solid.

Both C36 and C60 fullerenes are composed of five- and six-member rings of carbon atoms, but the C36 version has a higher percentage of five member rings. This difference makes it more chemically reactive than its C60 counterpart and gives it the ability to form a large variety of stable compounds. For example, C36 fullerenes can be coated with other elements to form Teflon-like balls. C36 fullerenes—and proposed solids composed of them—are also expected to have higher superconducting transition temperatures than their C60 counterparts. Moreover, when some of the carbon atoms are substituted with other elements, such as nitrogen, selected bonds get shorter and the superconducting transition temperatures are predicted to increase further. By achieving these higher transition temperatures, the commercial practicality of superconductors can be improved.

The many possibilities for materials designed from C36 fullerenes include: halogenated C36 molecules for lubricants; C36 materials to trap radioactive tracers inside for medical imaging; covalently linked, hard, solid films of C36 molecules for catalyzing chemical reactions; and magnetic atoms, trapped in stable, covalently bonded C36 fullerenes, for use in recording devices. C36 -based materials also can be used for infrared detectors and other optical or electronic applications.

For more info: Technology Transfer Department, 510-486-6467, ttd@lbl.gov

Diverse Thermoset a Possible Chemical Cure-all

The **NASA Langley Research Center** has developed liquid crystal thermosets that have the potential to be used in such applications as insulation, sealants, and even as a substitute for stainless steel in surgical instruments.

As a thermoset, it maintains its form after final high temperature cure, yielding high performance material with improved mechanical and thermal properties. This technology offers significant advantages over traditional liquid polymers. Compared with existing materials, liquid crystal thermosets exhibit low viscosity at low melt temperatures. The combination of its low coefficient of thermal expansion, low viscosity, and excellent barrier properties makes this new technology useful for coatings, films, and other applications that demand high performance.

Additionally, it is useful for cryogenic applications (e.g., liquid hydrogen and oxygen fuel tanks) and other applications that involve extreme temperature changes. It also provides an excellent barrier that is resistant to acids, bleaches, chlorinated solvents, alcohols, and hydrocarbon fuels. The innovation in this technology is the use of advanced end-group chemistry, which controls the crossinking, resulting in a crystalline network.

Liquid crystal thermosets are made from commercially available material and processed using conventional methods, thus increasing their cost-effectiveness.

For more info: Diane Hope, 757-864-7294, d.l.hope@larc.nasa.gov

Lab Seeks Partners for Selective Hydrocarbon Oxidation Methods

Three scientists at **LBNL** have developed a selective procedure that favors oxidation of unsubstituted alkanes, alkenes, aromatics, and cycloalkyls in solvent-free zeolites under dark thermal conditions or under irradiation with visible light.

Heinz Frei, Fritz Blatter, and **Hai Sun** have found that these small but abundant hydrocarbons are oxidized to their corresponding carbonyl analogs. This new, energy-efficient, environmentally sound method drives highly selective thermal oxidation and photooxidation reactions from molecular oxygen, using visible light in a zeolite medium. The process selectively oxidizes hydrocarbons almost completely without substantial production of by-products.

With this method, investigators have produced acrolein from propylene, benzaldehyde from toluene, and cyclohexanone from cyclohexane. LBNL is seeking industrial partners to license this method for selective hydrocarbon oxidation in the manufacture of bulk or fine chemicals. NL

For more info: Technology Transfer Department, 510-486-6467, ttd@lbl.gov

COMING ATTRACTIONS

April 20, 2001
Southwest BioPartnering Expo
Tempe, AZ

Bioscience companies and research labs will showcase their technologies to investors and strategic partners. Vendors, service providers, and nonprofit organizations will display their technologies, products, and services to potential customers.

www.azbiocluster.org

April 30-May 4, 2001
2001 FLC National Meeting
Burlington, VT

With a theme of "FLC and Beyond," this year's meeting is unique because the FLC is partnering with the TransAtlantic Technology Forum (TTF) to offer attendees a variety of educational sessions focused on tech transfer practices and processes from around the world—offering the chance to learn new ways of conducting tech transfer. Basic and advanced training will be offered.

Sherry Nacci, 856-667-7727 or www.federallabs.org

April 24-26, 2001
Process Industries Exposition (PIE)
Houston, TX

More than 5,500 chemical processing industry (CPI) representatives from all sectors of the industry will attend this meeting. Subject areas to be featured include safety and environmental issues, process control and automation, and maintenance and retrofit issues. Visit the FLC at Booth 1418!

www.processexpo.com

June 24-28, 2001
Air & Waste Management Association 94th Annual Conference & Exhibition
Orlando, FL

Network with colleagues from around the world and find solutions to environmental problems at one of the largest environmental exhibitions anywhere. You can also choose from approximately 200 critical management and technical sessions. Register by May 15 and save.

412-232-3444, www.awma.org

August 13-17, 2001
IBC's 6th Annual World Congress Drug Discovery Technology 2001
Boston, MA

One of the largest annual gatherings and networking events for pharmaceutical and biotechnology drug discovery researchers and executives worldwide. Projected attendance of more than 4,000 people and 300 exhibit booths.

www.drugdisc.com

June 12-13, 2001
Technology Showcase
Aberdeen Proving Ground, MD

A comprehensive exposition of the diverse technology resources available within the Aberdeen Proving Ground (APG) is planned. The two-day program will showcase the diverse testing, engineering, training, and research ongoing at APG.

410-278-4639, ssanders@atc.army.mil

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Check out some new and exciting changes to NEWSLINK in the April/May edition!

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