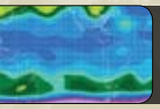
FLC NewsLink
November 2008
The Newsletter of the Federal Laboratory Consortium for Technology Transfer

Thermal capacitance calorimeter (without a sample) inside a small furnace heated to 1000 °C (1832 °F). Thermocouples are inserted through the top insulation panel to record the temperature of the furnace, sample, and steel slug throughout the test.

T2 INSIDE

ARS's Mosquito & Tick Repellant 3


NOAA Discovers Fifith Largest Ozone Hole 6

Oak Ridge Develops Super Computer 6

T2 EVENTS

Seventeenth Annual Advanced Licensing Institute (ALI)
Concord, N.H.
January 6-9, 2009

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FLC Southeast Regional Meeting
Jacksonville, Fla.
January 21-23, 2009

•

2009 AUTM Annual Meeting
Orlando, Fla.
February 2-14, 2009

•

World's Best Technology Showcase
Arlington, Texas
March 24-25, 2009

•

FLC National Meeting
Charlotte, N.C.
May 4-7, 2009

T2 FACT

Albert J. Parkhouse, an employee of Timberlake Wire and Novelty Company in Jackson, Michigan, created a coat hanger in 1903 in response to coworkers' complaints of too few coat hooks. He bent a piece of wire into two ovals with the ends twisted together to form a hook. Parkhouse patented his invention, but it is not known if he profited from it. Schuyler C. Hulett received a patent in 1932 for an improvement that involved cardboard tubes screwed onto the upper and lower portions to prevent wrinkles in freshly laundered clothes. Three years later, Elmer D. Rogers created a hanger with a tube on the lower bar that is still used today.

- Mary Bellis, About.com

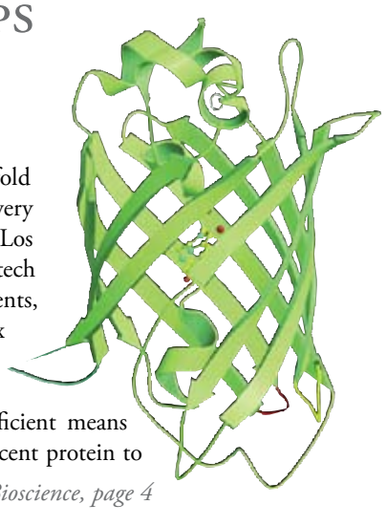
National Institute of Standards and Technology Introduces New Method for Fireproofing Material

In a high-temperature blaze, how well a fireproofing material shields a building's important steel structures from heat is important information for builders selecting high-performance, fire-resistive materials and for scientists conducting computer simulations that investigate fires. Researchers Dale Bentz, Robert Zarr, and guest researcher Daniel Flynn at the National Institute of Standards and Technology (NIST) and their colleagues have developed a technique for measuring a key thermal property of fire-resistive materials at high temperatures. The measurement technique has already been adopted commercially and incorporated into a national standard.

In creating computer simulations to study the collapses of the World Trade Center buildings on Sept. 11, 2001, NIST researchers needed to know important properties of the fireproofing materials that protected structural steel columns. One key property was the thermal conductivity of the material: How quickly does heat transfer through it? Thermal insulation has a low thermal conductivity, and metals have a high thermal conductivity. There are long-established methods for measuring thermal conductivity under ambient conditions, but a material's thermal conductivity can change markedly when it is subjected to extremely high temperatures that cause important chemical and structural changes. Traditional methods for

See Fireproof Material, page 4

Los Alamos Helps Bioscience Researchers



Scientists who study how proteins assemble and fold into distinct shapes will soon see shape-shifting in the very methods they use thanks to a partnership between Los Alamos National Laboratory (LANL) and Theranostech Inc. Theranostech will package the "Split GFP" reagents, part of the Green Fluorescent Protein (GFP) Toolbox developed by Los Alamos biochemist Geoffrey Waldo. The Toolbox provides researchers with an improved, more flexible, cost-effective, and efficient means to analyze proteins. The Toolbox uses green fluorescent protein to

See Bioscience, page 4

Lab in the Spotlight:

Health and Environmental Effects Research Lab

The National Health and Environmental Effects Research Laboratory (NHEERL), headquartered in Research Triangle Park, N.C., plays a vital role in the scientific research mission at the Environmental Protection Agency (EPA).

NHEERL formulates and implements a comprehensive research program to investigate the effects of environmental pollutants and other anthropogenic stresses on human health and the ecosystems in which we live.

NHEERL conducts research under the EPA's

See NHEERL, page 5

Fed Labs Flash | News From Around the Consortium

Starting a New Day Around the Globe with Sustainable Energy Solutions

Could a cup of coffee jump start both you and your car in the morning? Is it possible to run a college dormitory in Africa on locally available fuel sources? Two universities are answering these questions, thanks to the Environmental Protection Agency's (EPA) People, Prosperity and the Planet (P3) program, which demonstrates that protecting the environment can also be economically profitable. The P3 program also provides key technical assistance moving the developed and developing world toward sustainability. EPA awarded 43 P3 grants for a total of $880,000 to student teams representing 40 universities in 24 states.

As part of the 43 Phase I grants and six Phase II grants to winning teams from last year, a team from Appalachian State University is designing a coffee wastewater treatment system that produces ethanol and biogas for possible use as car fuels. Gonzaga University students are building an educational center and dormitory in Kenya, where students will learn how to implement sustainable water filtering technology and identify local energy sources.

"The beauty of the People, Prosperity and the Planet program is that it harnesses one of our most abundant natural resources: student brain power," said Dr. George Gray, assistant administrator for EPA's Office of Research and Development. "Through innovation and creativity, these student teams turn environmental challenges into opportunities that protect the environment, build new businesses, and create new careers."

The University of California-Davis was one of the 2008 P3 Award winners. The students designed and constructed an efficient means of producing plastic from wastewater.

Bacteria used in wastewater treatment processes have been shown to store a compound that can be made into a biodegradable plastic within their cell walls. The production process to create it is less polluting than the process to create plastic from petrochemicals.

An American Association for the Advancement of Science panel will evaluate the projects and make recommendations to EPA, who will choose the winners. The P3 Award includes the possibility of additional funding up to $75,000 that gives students an opportunity to further develop their sustainable designs and move them to the marketplace. The next P3 Award competition will be held on the National Mall in Washington, D.C., as part of the National Sustainable Design Expo, April 18-20, 2009.

Information about the P3 winners and their projects can be found at <www.epa.gov/ncer/p3/current/index.html>.

For more about EPA's P3 Award program, go to <www.epa.gov/p3/>.

FAA Enters CRADA with Network Centric

The Federal Aviation Administration (FAA) has recently entered into a Cooperative Research and Development Agreement (CRADA) with the Center for Network Centric Product Support (NCPS) Research, LLC. The collaborative research is in weather.

The objectives of this research are to establish a network centric airborne web server test capability on an FAA Technical Center aircraft for use in Next Generation Air Transportation System Net-Enabled Operations and System Wide Information Management tests. The focus of this activity will be to demonstrate an airborne network node using IP addressable protocols that will facilitate the real-time collection, processing, and synchronization of atmospheric and other related data in support of 4-D weather cube and weather in the cockpit development and demonstrations.

The government's Principal Investigator is Thomas E. Ryan at 202-385-7141. The point of contact for the collaborating party is David Loda, Center for NCPS Research, LLC, 860-221-9500.

This CRADA was awarded on October 23, 2008, and has a duration period of 36 months. The results are expected to be a series of real-time demonstrations of this network centric airborne communications capability focused on weather, along with a continuous feed of aircraft weather probe information to the National Oceanic Atmospheric Administration and FAA databases.

More info: Deborah Germak, 609-485-9862

ARL-Devised Data Assessment System Receives U.S. Patent

Simulations based on high performance computing (HPC) physics are used by Army programs to evaluate the feasibility of various designs and to focus the physical experiments that need to be performed. The time and cost savings of using HPC simulations has been widely recognized by the Army. The results of these simulations are typically interpreted via scientific visualization, the process of producing images and animations that reflect the quantities being calculated.

Members of the U.S. Army Research Laboratory's (ARL) Computational and Information Sciences Directorate have devised totally new ways to explore these complex datasets and have implemented an Augmented Virtuality Scientific Data Assessment System. The focus of this work is to add aural and tactile dimensions to the data and to use both physical and virtual objects together to provide additional detail and context to the simulation. This system, called the Multi-Sensory Environment for Scientific Data Assessment (MESDA), recently received a U.S. patent and is currently in use at ARL at Aberdeen Proving Ground, Md.

MESDA allows for additional computed values to be represented by using positional sound that varies in pitch and volume with the data. Low frequency vibrations, which are not audible, are also used to represent additional dimensions of data. To give context to the simulation and to show detail that may not be present in the virtual representations, physical objects are added and "mixed" with the computer-generated images. MESDA allows for a greater number of calculated values to be analyzed simultaneously.

For example, effective stress on a projectile can be represented as time varying color and overlaid on the actual projectile. Pressure can be represented as a sound that varies in pitch, and the amplitude of a tactile vibration can vary with the energy. An observer can intuitively understand how these quantities correlate to each other.

These three-dimensional images are projected onto a standard rear projection screen as well as a unique transparent screening material. This material, known as "transfilm," preserves the polarization of the projected images. Physical objects are placed between the rear projection screen and the transfilm to produce a "reality sandwich" of virtual-physical-virtual objects. This technique allows virtual objects to be placed in front of physical objects, a feat impossible to achieve with standard projection.

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Tech Watch | *Laboratory Techs Ready for Transfer*

PNNL Protoemics

Researchers at Pacific Northwest National Laboratory (PNNL) have applied advanced proteomics methods to identify potential new biomarkers of pre-diabetes and type 2 diabetes mellitus, both of which are characterized by high blood glucose and are associated with obesity. The new biomarkers may result in a more accurate test for both disorders.

The current gold standard for diagnosing pre-diabetes and type 2 diabetes is the oral glucose tolerance test (OGTT), which is used to determine patients' blood glucose levels before and after glucose intake. However, the OGTT is inconvenient, requires fasting, and is not highly reproducible. With more development, scientists believe that the biomarkers identified in this work may hold the key to earlier detection of pre-diabetes and type 2 diabetes.

Advantages

- Improved accuracy in diagnosing pre-diabetes and type 2 diabetes
- Early detection allows for early diagnosis and treatment

More info: ron.thomas@pnl.gov

Co-extraction of Cesium and Strontium

Idaho National Laboratory (INL) has developed a method for co-extraction of cesium and strontium from acidic solutions using a mixture of commercially available crown ether and calixarene extractants that exhibit high radiation and chemical stability.

This is an efficient solvent extraction process for the simultaneous removal of cesium and strontium from dissolved spent nuclear fuel and acidic nuclear waste streams. Combined use of these two extractants in one process represents a novel approach to partitioning these elements in a single, convenient manner. Simultaneous solvent extraction of these radioactive elements is desirable for waste management concerns because the process provides purified cesium and strontium in a form easily concentrated or solidified, high levels of decontamination, high removal factors and a simplified chemical scheme. Removal of cesium and strontium from commercial spent nuclear fuel waste streams has numerous benefits.

This process will be more easily employed and produces less secondary wastes than that of current cesium/strontium extractants under consideration. It would replace existing solvents used in competing small-scale tests that have negative attributes in a large-scale process.

More info: Gary W. Smith, 208-526-3780

Agricultural Service Develops Natural Mosquito and Tick Repellent

Agricultural Research Service (ARS) scientists Charles Cantrell, Jerome Klun, and Stephen Duke have isolated a natural compound, callicarpenal, from the American beautyberry that has been shown to repel mosquitoes, ticks, and fire ants. Callicarpenal, an all-natural insect repellent, is an alternative to commercially available synthetic repellents and is more effective than currently available natural repellents on the market.

Callicarpenal is as effective as DEET, and more effective than picaridin (Bayrepel) in the bioassays used against mosquitoes, and is also as effective as DEET and picardin against the deer tick.

It could be a good alternative to synthetic repellents such as DEET and picaridin, and could be marketed as an all-natural repellent. Natural pesticides (repellents) are typically less harmful to the environment, more specific to particular insects, and public perception is typically better.

Certainly DEET and picaridin are excellent repellents; however, the industry is searching for "natural" alternatives that are better accepted than DEET. Callicarpenal is potentially a safer and perhaps more effective insect repellent. The market potential is huge because 38 percent of Americans use a DEET-based product every year.

Using aerosols or creams, it could be applied topically.

The compound would have to be registered with the EPA. In addition, inexpensive methods for developing this compound are needed.

More info: June Blalock, 301-504-5989, license@ars.usda.gov

Fireproof Material, from page 1

measuring thermal conductivity at high temperatures have not been adequate.

NIST's Dale Bentz and his colleagues developed a "slug calorimeter" technique to obtain the thermal conductivity information at elevated temperatures. With this technique, they use a thin square slab of steel material known as a slug and sandwich it between slabs of the fireproofing material of interest. Guard insulation surrounds the sides of the sample so heat flows preferentially through the sandwich when it is placed in a high-temperature furnace. Three temperature probes inserted into the steel slug measure the heat flowing to the steel. Combining this data with the known heat capacities and densities of the steel slug and the fire-resistive material, the researchers can determine the material's thermal conductivity at various temperatures.

Experimental setup of slug calorimetry method: Fireproofing material of interest sandwiches a platelike steel slug. Measuring heat flow through the slug can provide information on the thermal conductivity of the material.

Following the successful demonstration of this method at NIST, two large U.S. testing labs, Intertek and Southwest Research Institute, have worked with NIST to develop their own in-house slug calorimeters as a testing service to their clients, and a third U.S. company, Anter Corporation, recently introduced a commercial version of a slug calorimeter called the FireLine 1000™. ASTM International (formerly the American Society for Testing and Materials) has published a standard (ASTM E 2584) detailing how to conduct thermal conductivity measurements with the new method. Possible applications beyond steel fireproofing material, Bentz said, involve measuring the thermal conductivity of wood-based materials, as well as the insulating materials used to protect spacecraft such as the space shuttle.

Bioscience, from page 1

measure the quantity and the solubility (a measure of activity) of proteins.

These easy-to-use reagent kits will be sold to academic and noncommercial scientists to research, for example, the molecular conditions that cause Alzheimer's or other diseases involving proteins.

Previously, Waldo distributed hundreds of these tools piecemeal to researchers upon request.

However, he can no longer keep up with the skyrocketing demand, so the partnership, an exclusive license signed in June 2008, will make the tools available for purchase from a commercial vendor. In addition to helping Theranostech diversify its product portfolio, LANL sees this type of partnership with a small, New Mexico-based company as a valuable investment in the local community that also helps LANL scientists market their discoveries.

LANL sees the potential for a stronger future relationship with Theranostech. Los Alamos also has separate GFP Toolbox licenses for in-house use with large pharmaceutical companies directly involved in protein research and pharmaceutical development.

Waldo engineered Split GFP so that it doesn't require a lot of expensive equipment and doesn't alter protein behavior. "Split GFP is the easiest to use and most stable in-vitro protein assay kit in the world right now," said Waldo.

Another incarnation of the Split GFP system—the so-called in-vivo Split GFP assay—allows characterization of proteins in living cells, a major breakthrough that could shed light on problems that have perplexed protein researchers for years.

For example, Split GFP used in vivo to monitor factors affecting aggregation of tau protein in neurons, will pave the way for similar work on other diseases of protein aggregation, or clumping, such as Alzheimer's.

With such fertile ground, plans are underway to release a kit-ready form of the in-vivo Split GFP assay for use in multiple types of cells, as well as an optimized version for screening protein expression in living bacteria such as *E. coli*, the workhorse used by many to express recombinant proteins.

A major advantage of the LANL Split GFP technology is that, unlike other protein assay kits, it can be used in both the test tube and in living cells. With these tools, scientists can move seamlessly from living cells to the test tube without skipping a beat.

Budget Continuing Resolution and More Good Press for Tech Transfer

by Gary Jones, FLC Washington, DC Representative

Greetings from D.C. With everyone in Washington, and elsewhere presumably, focused on either the looming election or the declining stock market, there's not a lot of attention being paid to other policy or legislative matters. One of the major points of business Congress did finish (sort of) before recessing to campaign was the continuing resolution (CR) for the FY 2009 budget including, of course, the R&D component. The news is mixed, depending on which department you are interested in.

President Bush signed the CR into law on September 30, effectively providing flat funding for most departments and agencies through March 2009, along with full year funding for the three agencies whose appropriations bills were actually completed on time: the Departments of Defense, Homeland Security and Veterans Affairs (plus funding for military construction).

The CR language for the other departments and agencies indicates that funding levels will be "Such amounts as may be necessary, at a rate for operations as provided in the applicable appropriations Acts for fiscal year 2008 … " This apparently eliminates the additional funding levels provided in the supplemental bill this summer (see the September "DC on T2" column) for NASA, the DOE Office of Science, NSF and NIH.

As reported by the American Association for the Advancement of Science (AAAS) in its tracking of the R&D budget, the three departments with full year funding all "receiv[ed] substantial increases for their R&D portfolios…[while] most federal programs will continue to operate at or below 2008 funding levels for several months …"

The AAAS analysis notes that, given the CR, we enter FY 2009 with an R&D budget of $147 billion (a 2 percent increase over 2008, due largely to increases in DOD R&D), with funding for basic and applied research increasing by only 0.4 percent—which, when adjusted for inflation, represents a decline in research funding for the fifth year in a row. Further, the CR puts on hold any increases envisioned for the three agencies under the Administration's American Competitiveness Initiative (DOE Science, DOC NIST and NSF). See the AAAS site for a thorough overview of the CR impacts on each agency's R&D budget.

On a completely different topic, in my August column I highlighted a report published this summer that stated, in so many words, that federal technology transfer is an essential component of U.S. innovation and competitiveness. As that newsletter was going to press, *Business Week* published an article focusing on the collaborative efforts at two specific labs, Sandia National Lab and Los Alamos National Labs, as representative of the collaborative efforts across the federal lab environment, with a similarly positive conclusion.

As stated in the article, "[P]ublic-private collaborations such as [those noted] are earning praise in many quarters. They're just what Congress had in mind two decades ago when it began pushing the nation's hundreds of national labs to transfer more of their know-how to U.S. companies (emphasis added)." To be fair, the article does note what the author considered to be certain challenges to working with the federal labs, but by and large it is another positive article on the role of federal labs (and federal tech transfer) in national innovation and economic growth. Take a look.

You can find the AAAS R&D budget analysis at <http://www.aaas.org/spp/rd/upd908.htm> and the *Business Week* article at <http://www.businessweek.com/magazine/content/08_38/b4100062751339.htm>.

Gary can be reached at gkjones@federallabs.org.

NHEERL, from page 1

Office of Research and Development (ORD), which provides the basis for the formulation of environmental policies and programs. The National Health and Environmental Effects Research Laboratory is the EPA's focal point for scientific research on the effects of contaminants and environmental stressors on human health and ecosystem integrity. Its research —toxicological, clinical, epidemiological, ecological, and biogeographic—helps the EPA identify and understand the processes that affect our health and environment and to evaluate the risks that pollution poses to humans and ecosystems.

NHEERL conducts a multidisciplinary research program that strives to reduce the uncertainties inherent in assessing risk. These uncertainties vary in scope from fundamental scientific questions requiring sustained, long-term research strategies to congressionally mandated investigations that demand an immediate response. Accordingly, NHEERL balances long- and short-term research objectives, combining elements of both basic and applied sciences to provide a unique blend of research capabilities.

To improve the scientific underpinnings of EPA's risk assessments and regulatory policy decisions, NHEERL scientists create and apply biological assays and toxicologic assessment methods; predictive pharmacokinetic/pharmacodynamic models; ecosystem function theory; and advanced extrapolation methods. Long-term research components define and characterize toxicological hazards, quantify dose response and other important cause-effect relationships, and assess the integrity and sustainability of ecosystems. NHEERL also provides national and international leadership in identifying and resolving important human and ecological issues and by influencing the research planning and priorities of other research organizations.

The impact of NHEERL's efforts can be felt far beyond the EPA by enabling state and local governments to implement effective environmental programs, assisting industry with setting and achieving environmental goals, and collaborating with international governments and organizations on issues of environmental importance. In addition to its own internal research focus, the laboratory fosters cooperative research projects with academic and other scientific institutions. NHEERL also administers an extramural program through cooperative agreements, contracts, and interagency agreements. These collaborative mechanisms draw upon the expertise of preeminent researchers in academia, industry, and other government organizations.

NHEERL is organized into nine research divisions, each of which specializes in a different field of health or ecology research. The five health divisions are centrally located in Research Triangle Park, N.C., while the four ecology divisions are strategically situated in ecologically significant geographic regions across the United States. By coupling the functional roles of the divisions with its multidisciplinary research philosophy, NHEERL is able to sustain a responsive program that offers specialized skills in many distinct areas while retaining

NHEERL, page 6

NOAA Research Reveals Fifth Largest Ozone Hole

In September, the ozone hole over Antarctica, which fluctuates in response to temperature and sunlight, grew to the size of North America in a one-day maximum that was the fifth largest on record since National Oceanic and Atmospheric Administration (NOAA) satellite records began in 1979.

NOAA scientists, who have monitored the ozone layer since 1962, have determined that this year's ozone hole has passed its seasonal peak for 2008. Ozone data is available online.

The primary cause of the ozone hole is human-produced compounds called chlorofluorocarbons, or CFCs, which release ozone-destroying chlorine and bromine into the atmosphere. Earth's protective ozone layer acts like a giant umbrella, blocking the sun's ultraviolet-B rays. Though banned for the past 21 years to reduce their harmful buildup, CFCs still take many decades to dissipate from the atmosphere.

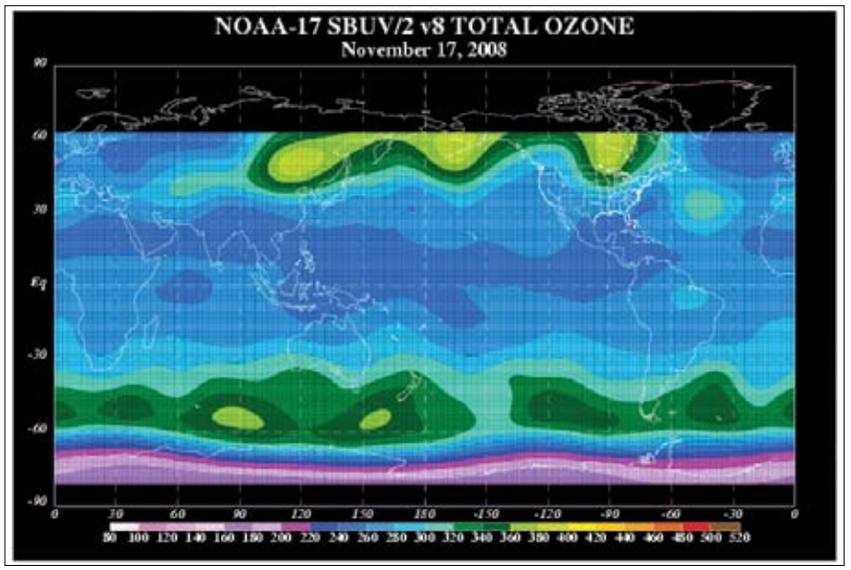
According to NOAA scientists, colder than average temperatures in the stratosphere may have helped play a part in allowing the ozone hole to develop more fully this year.

"Weather is the most important factor in the fluctuation of the size of the ozone hole from year-to-year," said Bryan Johnson, a scientist at NOAA's Earth System Research Laboratory in Boulder, which monitors ozone, ozone-depleting chemicals, and greenhouse gases around the globe. "How cold the stratosphere is and what the winds do determine how powerfully the chemicals can perform their dirty work."

NASA satellites measured the maximum area of this year's ozone hole at 10.5 million square miles and four miles deep, on September 12. Balloon-borne sensors released from NOAA's South Pole site showed the total column of atmospheric ozone dropped to its lowest count of 107 Dobson units on September 28. Dobson units are a measure of total ozone in a vertical column of air.

In 2006, record-breaking ozone loss occurred as ozone thickness plunged to 93 Dobson units on October 9 and sprawled over 11.4 million square miles at its peak. Scientists blamed colder-than-usual temperatures in the stratosphere for its unusually large size. Last year's ozone hole was average in size and depth.

Starting in May, as Antarctica moves into a period of 24-hour-a-day darkness, rotating winds the size of the continent create a vortex of cold, stable air centered near the South Pole that isolates CFCs over the continent. When spring sunshine returns in August, the sun's ultraviolet light sets off a series of chemical reactions inside the vortex that consume the ozone. The colder and more isolated the air inside the vortex, the more destructive the chemistry. By late December the southern summer is in full swing, the vortex has crumbled, and the ozone has returned—until the process begins anew the following winter.



The 1987 Montreal Protocol and other regulations banning CFCs reversed the buildup of chlorine and bromine, first noticed in the 1980s.

"These chemicals—and signs of their reduction—take several years to rise from the lower atmosphere into the stratosphere and then migrate to the poles," said NOAA's Craig Long, a research meteorologist at NOAA's National Centers for Environmental Prediction. "The chemicals also typically last 40 to 100 years in the atmosphere. For these reasons, stratospheric CFC levels have dropped only a few percent below their peak in the early 2000s."

"The decline of these harmful substances to their pre-ozone hole levels in the Antarctic stratosphere will take decades," said NOAA atmospheric chemist Stephen Montzka of the Earth System Research Laboratory. "We don't expect a full recovery of Antarctic ozone until the second half of the century."

NOAA understands and predicts changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and conserves and manages our coastal and marine resources.

NHEERL, from page 5

sufficient flexibility to adapt to changing research priorities. Other locations include the Human Studies Facility in Chapel Hill, N.C.; the Atlantic Ecology Division in Narragansett, R.I.; the Gulf Ecology Division in Gulf Breeze, Fla.; the Mid-Continent Ecology Division in Duluth, Minn.; and the Western Ecology Division in Corvallis, Ore.

NHEERL Director Hal Zenick recently received the EPA 2008 Presidential Meritorious Executive Rank Award. In November 2008, Gerald Ankley, Ph.D., a researcher with the Mid-Continent Ecology Division, received the Founder's Award, the highest award recognized by the Society of Environmental Toxicology and Chemistry (SETAC).

More info: www.epa.gov/nheerl/

Oak Ridge Computer Rated World's Fastest for Science

A Cray XT high-performance computing system at the Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL) is the world's fastest supercomputer for science. The annual ranking of the world's top 500 computers (www.top500.org) will be released Tuesday in Austin at an annual international supercomputing conference.

The Cray XT, called Jaguar, has a peak performance of 1.64 petaflops (quadrillion floating point operations, or calculations) per second, incorporating 1.382 petaflops XT5 and 266 teraflops XT4 systems. Each component of the Jaguar system is separately ranked second and eighth on the current list of Top 500 supercomputers in the world.

"This accomplishment is the culmination of our vision to regain leadership in high performance computing and harness its potential for scientific investigation," said Undersecretary for Science Raymond L. Orbach. "I am especially gratified because we make this machine available to the entire scientific community through an open and transparent process that has resulted in spectacular scientific results ranging from the human brain to the global climate to the origins of the Universe."

ORNL Director Thom Mason said the real value of the new machine will be measured by the scientific breakthroughs that will now be possible.

"We are proud to be home to the world's most powerful computer dedicated to open science, but we are more excited about the ability of Oak Ridge and the Department of Energy to take a leading role in finding solutions to scientific challenges such as new energy sources and climate change," Mason said.

In June, a DOE supercomputer named Roadrunner at Los Alamos National Laboratory was the first to break the petascale barrier. Built with advanced IBM cell processors, Roadrunner helps ensure the reliability of America's nuclear weapons stockpile.

Oak Ridge Super Computer, page 8

Lab Classifieds | *Available Technologies, Facilities, and Partners*

NETL Coal Tech

Researchers at the Department of Energy's National Energy Technology Laboratory (NETL) have developed a unique software module that can couple with computational fluid dynamics (CFD) codes to model the complex chemical reactions that occur between coal particles and flowing gases during the coal gasification process. The carbonaceous chemistry for continuum modeling (C3M) module provides unprecedented insight into the chemical kinetics and thermodynamics of a coal gasification unit, which could be invaluable to commercial plants attempting to design and optimize such technology.

More info: Diane Newlon, roberta.newlon@netl.doe.gov

Extracting DNA

The Naval Research Laboratory (NRL) has successfully developed a magnetic microbead support that enables the capture of genomic targets in a single step. The microbead is functionalized with a phosphorous branched dendrimer linker that covalently binds DNA capture probes, allowing hybridization of the target directly onto the bead. The targets can then be recovered through heat denaturation in small elution volumes for direct analysis. The robust bond between capture probe and microbead permits regeneration of the probe even after repeated cycles at high temperatures (up to 100°C) and salt conditions (3-5 M NaCl), providing a reusable universal platform for sequence-capture or background subtraction. NRL is seeking patent licensees or CRADA partners.

For further information, contact the Technology Transfer Office at the Naval Research Laboratory, techtran@utopia.nrl.navy.mil.

FAA CRADA OP

The FAA's William J. Hughes Technical Center is interested in entering into a Cooperative Research and Development Agreement (CRADA) with small business organizations to enhance, manufacture, and market a technology entitled SUN keyboard system translator (SunKeyST).

SunKeyST allows virtually any keyboard or pointing device to transparently interface to a SUN Microsystems workstation without the need for additional hardware or software support.

More info: Deborah Germak, 609-485-9862, deborah.germak@faa.gov

Preventing Tissue Ischemia

Nitric oxide (NO) plays an important role as a major intrinsic vasodilator by increasing blood flow to tissues and organs. Disruption of this process leads to peripheral vascular disease, ischemic heart disease, stroke, diabetes, and many more significant diseases. Additionally, the inventors discovered that this regulation requires interaction with thrombospondin-1's cell receptor CD47. Researchers at the National Institutes of Health (NIH) have discovered that the matrix protein thrombospondin-1 blocks the beneficial effects of NO, and prevents it from dilating blood vessels and increasing blood flow to organs and tissues. The inventors have also shown in both mice and pigs that by targeting thrombospondin-1 and/or CD47, blood flow can be dramatically increased to ischemic tissues. The same therapeutics also were found to protect tissues from ischemia/reperfusion injury.

More info: Charlene A. Sydnor, Ph.D.; 301-435-4689; sydnorc@mail.nih.gov

NAVY CGI

The Naval Air Warfare Center Training Systems Division (NAWCTSD) has partnered with the National Institute of Justice in developing a computer-generated imagery (CGI) based use of force training simulator. The final objective of this project is the development of a prototype use of force training system that can be commercialized and marketed to law enforcement agencies at a reasonable cost. System scenarios provide a high level of interaction between the trainee and the simulator through the incorporation of speech recognition and CGI-based scenario content.

More info: Sunny Simmonds, 407-380-4699

Secure Transactions

Idaho National Laboratory (INL), operated by the Battelle Energy Alliance, LLC (BEA), under contract with the Department of Energy (DOE), is offering the opportunity to license, develop, and commercialize new technology to ensure secure, encrypted wireless communications and financial transactions.

The system, commonly called the Wireless Sentinel, also secures designated use areas – detecting unauthorized cell phones and permitting only authorized wireless devices to operate in the zone.

By using the Wireless Sentinel to discover and authenticate wireless devices approved for entry into sensitive areas, an organization can allow approved device use while simultaneously discovering and disallowing non-approved devices.

More info: Charity Follett, 208-526-9353

Learning by Doing

New instructional approaches and tools are offsetting the demand on information workers. The most profound of these new learning technologies use databases and software to enable adaptive "learning by doing." With these technologies, the learner is presented a logical sequence of problems or simulations where they are first instructed, then coached, and then allowed to practice solo. To reduce the time and cost associated with creating these processes, Idaho National Laboratory has created a tool called SimGen.

More info: Charity Follett, 208-526-9353

NIST Comm

National Institute of Standards and Technology (NIST) researchers successfully demonstrated a prototype approach to maintain two-way communications with first responders as they make their way in building fires, and mine and tunnel collapses. These and other disasters in enclosed environments are often rife with radio dead spots and conditions that can severely weaken signals. Assembled from off-the-shelf microprocessors and other standard hardware, the relays incorporate NIST-developed software that monitors the status of radio communication signals. The algorithms embedded in the software rapidly assess the strength of received signals so the device can automatically alert first responders to lay down the next relay before they walk out of range and lose the radio signal.

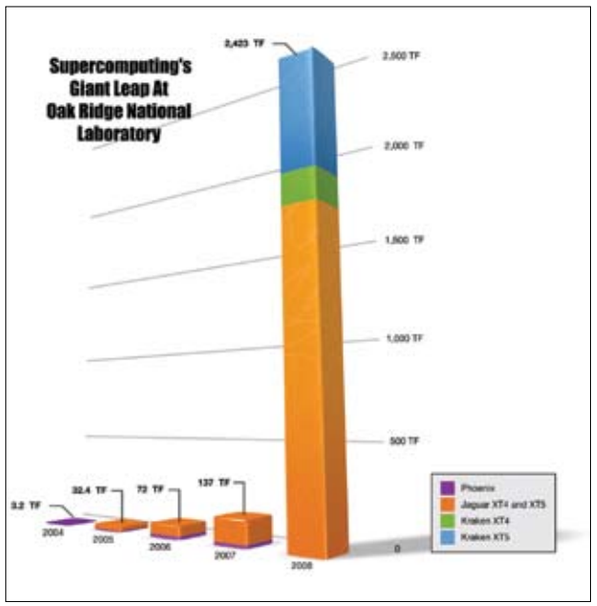
NIST is interested in sharing its prototype and underlying concepts with businesses and organizations working to improve the quality and reliability of first responder communication systems.

More info: www.itl.nist.gov/rtm/

Oak Ridge Super Computer, from page 6

Beginning as a 26-teraflop system in 2005, ORNL embarked upon a three-year series of aggressive upgrades designed to make its machine the world's most powerful computing system. The Cray XT was upgraded to 119 teraflops in 2006 and 263 teraflops in 2007. In 2008, with approximately 182,000 AMD Opteron processing cores, the new 1.64-petaflop system is more than 60 times larger than its original predecessor.

Thomas Zacharia, the laboratory's associate director for computing and computational sciences, says petascale machines like Jaguar help advance critical scientific application areas by enabling researchers to get answers faster and explore complex, dynamic systems. In a matter of few days, Jaguar has already run scientific applications ranging from materials to combustion on the entire system, sustaining petaflops performance on multiple applications. A calculation that once took months can now be done in minutes. A 2008 report from the DOE Office of Science, America's largest funder of basic physical science programs at universities and government laboratories, said six of the top ten recent scientific advancements in computational science used Jaguar to provide unprecedented insight into supernovas, combustion, fusion, superconductivity, dark matter and mathematics.



Supercomputing speeds shot skyward in 2008 as Oak Ridge National Laboratory's Cray XT5 Jaguar supercomputer attained a peak performance of 1.64 petaflops, a number that seemed astronomical only a few years ago.

The DOE's Office of Science makes Jaguar available to scientists in academia, industry, and government to tackle the world's most complicated projects.

Through the agency's Innovative and Novel Computational Impact on Theory and Experiment program, which allocates the supercomputer's resources through a peer-reviewed proposal system, researchers allocated more than 140 million processor hours to 30 projects.

To date, the computer simulations on Jaguar have focused largely on addressing new forms of energy and understanding the impact on climate resulting from energy use.

For example, INCITE projects have simulated enzymatic breakdown of cellulose to make production of biofuels commercially viable, as well as coal gasification processes to help industry design near-zero-emission plants. Combustion scientists have studied how fuel burns, which is important for fuel-efficient, low-emission engines. Computer models have helped physicists use radio waves to heat and control ionized fuel in a fusion reactor. Similarly, engineers have designed materials to recover energy escaping from vehicle tailpipes. Simulation insights have enabled biologists to design new drugs to thwart Alzheimer's fibrils and engineer the workings of cellular ion channels to detoxify industrial wastes.

Jaguar's superlative speed is matched by substantial memory that allows scientists to solve complex problems, sizeable disk space for storing massive amounts of data and unmatched speed to read and write files.

High-speed Internet connections enable users from around the world to access the machine, and high-end visualization helps them make sense of the avalanche of data Jaguar generates.

Twice a year, the Top 500 list ranks powerful computing systems on their speed in running a benchmark program called HPL, for High-Performance Linpack.

In June 2007, Jaguar solved the largest HPL challenge ever—a matrix problem with nearly 5 trillion elements. The achievement highlights Jaguar's skill in balancing processor speed and system memory.

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