FLC NEWSLINK
October 2008
The Newsletter of the Federal Laboratory Consortium for Technology Transfer

Satellites show sources and sinks of atmospheric carbon dioxide across Earth, measured here in 2003. High concentrations are shown in red and lower concentrations are shown in blue.

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ARS Grows Useful, Famous Grass p. 6

T2 EVENTS

Annual Conference on Ecosystems Restoration and Creation
Plant City, Fla.
November 6-8, 2008

•

PACK EXPO International 2008
Chicago, Ill.
November 9-13, 2008

•

15th World Congress on Intelligent Transport Systems
New York, N.Y.
Nov. 11-20, 2008

•

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

•

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

T2 FACT

Chester Greenwood, born in Farmington, Maine in 1858, invented earmuffs at the age of 15. While testing a new pair of ice skates, he grew frustrated at trying to protect his ears from the bitter cold. After wrapping his head in a scarf, which was too bulky and itchy, he made two ear-shaped loops from wire and asked his grandmother to sew fur on them. He patented an improved model with a steel band which held them in place, and with Greenwood's Champion Ear Protectors, he established Greenwood's Ear Protector Factory. He made a fortune supplying Ear Protectors to U.S. soldiers during World War I.

- Mary Bellis, About.com

NASA Study Illustrates How Global Peak Oil Production Could Impact Climate

by Kathryn Hansen, NASA Goddard Space Flight Center

The burning of fossil fuels—notably coal, oil and gas—has accounted for about 80 percent of the rise of atmospheric carbon dioxide since the pre-industrial era. Now, NASA researchers have identified feasible emission scenarios that could keep carbon dioxide below levels that some scientists have called dangerous for climate.

When and how global oil production will peak has been debated, making it difficult to anticipate emissions from the burning of fuel and to precisely estimate its impact on climate. To better understand how emissions might change in the future, Pushker Kharecha and James Hansen of NASA's Goddard Institute for Space Studies in New York considered a wide range of fossil fuel consumption scenarios. The research, published Aug. 5 in the American Geophysical Union's Global Biogeochemical Cycles, shows that the rise in carbon dioxide from burning fossil fuels can be kept below harmful levels as long as coal emissions are phased out globally within the next few decades.

"This is the first paper in the scientific literature that explicitly melds the two vital issues of global peak oil production and human-induced climate change," Kharecha said. "We're illustrating the types of action needed to get

See Global Oil Impact, page 4

Dr. Theresa Baus of the Naval Undersea Warfare Center Newport Division discusses the efforts of American technology transfer with an attendee at COPENMIND in Copenhagen, Denmark, September 2, 2008. Dr. Baus also serves as the FLC Northeast Regional Coordinator.

Navy Lab Crosses the Atlantic to Discuss T2

by Mary L. Sylvia
Naval Undersea Warfare Center Division Newport

Reaching out to the technical community is always an exciting experience, but this seems especially true when engaging those from other nations. At COPENMIND 2008, Naval Undersea Warfare Center Division Newport had such an opportunity. Dr. Theresa Baus, Office of Research and Technology Applications (ORTA) Representative and head of Division Newport's Technology Partnership

See Crossing Atlantic for T2, page 5

Lab in the Spotlight:

Columbia Environmental Research Center

The Columbia Environmental Research Center (CERC) provides leadership and scientific information for the U. S. Geological Survey (USGS) by addressing national and international environmental contaminant issues and assessing the effects of habitat alterations on aquatic and terrestrial ecosystems, including large-river floodplains, coastal habitats, wetlands, and lakes.

Located in Columbia, Mo., CERC is one of 18 biology science centers in the USGS. The Center provides broad expertise in toxicology,

See Columbia Environmental, page 6

Fed Labs Flash | *News From Around the Consortium*

Lab Announces Selection of Partner for Venture Acceleration Initiative

by Mig M. Owens

Los Alamos National Laboratory (LANL) and its operating contractor, Los Alamos National Security, LLC, plan to partner with ARCH Venture Partners and Verge Fund for the Los Alamos Venture Acceleration (LAVA) Initiative.

The initiative is a pilot program aimed at strategically spinning off technology-based companies from LANL, with an emphasis on establishing new businesses in northern New Mexico. The partners will negotiate an agreement with a contribution by LANL valued at up to $1 million over three years, and a contribution of time and effort from the combined ARCH-Verge team of 20 investment professionals, including 8 located in New Mexico. ARCH Venture Partners is a venture capital firm in existence since 1989 with more than $1.5 billion total capital under management, and Verge Fund is an Albuquerque-based venture capital fund that invests in seed-stage, high-growth ventures in New Mexico.

"The Venture Acceleration Initiative is an innovative program in a comprehensive Laboratory strategy to increase the impact of our cross-cutting R&D in creating technology jobs in the regional economy," said Duncan McBranch, LANL's Science, Technology, and Engineering Directorate deputy principal associate director. "We are excited to partner with ARCH and Verge in this initiative because they have an unmatched combination of national reach, local depth, and a sustained track record of excellence in fostering new company growth in New Mexico."

More info: Belinda Padilla, 505-667-9896, or bee@lanl.gov.

State & Local Fusion Centers

Many states and larger cities have created state and local fusion centers to share information and intelligence within their jurisdictions as well as with the federal government. The Department of Homeland Security (DHS), through the Office of Intelligence and Analysis, provides personnel with operational and intelligence skills to the fusion centers. This support is tailored to the unique needs of the locality and serves to help the classified and unclassified information flow, provide expertise, coordinate with local law enforcement and other agencies, and provide local awareness and access.

As of March 2008, there were 58 fusion centers around the country. DHS has provided more than $254 million from FY 2004-2007 to state and local governments to support the centers.

DOE Solicitation for $8B for Clean Coal Technologies

The Department of Energy (DOE) today announced a solicitation for up to $8 billion in federal loan guarantees for projects that employ advanced technologies that avoid, reduce or sequester emissions of air pollutants or greenhouse gases in the areas of coal-based power generation, industrial gasification, and advanced coal gasification facilities. This marks the third round of solicitations for DOE's Loan Guarantee Program, which encourages the commercial use of new or significantly improved energy technologies and is an important step in paving the way for clean energy projects. This solicitation will make available $6 billion in loan guarantee authority for incorporating carbon capture and storage (CCS) or other emissions-reducing carbon technologies into industrial gasification activities, retrofitted and new coal-based power generation facilities. An additional $2 billion in loan guarantee authority will be made available for advanced coal gasification projects, which convert coal cleanly into electricity, hydrogen, and other valuable energy products.

"The Department's fossil energy loan guarantees will provide key early support for technological innovation to curb CO2 emissions," Under Secretary of Energy Clarence "Bud" Albright, Jr. said. "The successful deployment of these clean coal projects will provide our nation with a greater degree of energy and economic security."

New Developments in the Use of Lights to Scare Birds From Aircraft

Every year, the U.S. civil aviation industry reports over $600 million in direct and indirect costs due to aircraft collisions with wildlife. Approximately 97.5% of these collisions involve birds. Vision is a primary sensory pathway in birds, and recent research indicates that aircraft lighting can play a potential role in increasing a bird's ability to detect approaching aircraft and, subsequently, reduce bird-aircraft collisions.

In an effort to learn more about how birds detect and respond to approaching objects, National Wildlife Research Center (NWRC) scientists partnered with representatives from Precise-Flight, Inc. and California State University. The researchers filmed and timed the responses of two representative species—the brown-headed cowbird and the mourning dove—relative to vehicle approach and different vehicle-lighting treatments. In experiments conducted at the NWRC Ohio Field Station, researchers found that mourning doves were alert to the vehicle approach on average three seconds before brown-headed cowbirds. However, the cowbirds exhibited avoidance behavior sooner (on average one second) before mourning doves. The findings are consistent with each species' anti-predation behavior; mourning doves generally feed on the ground and rely on vegetation cover and their own color as a camouflage; they wait until a predator is near before bursting into flight.

In contrast, brown-headed cowbirds react by improving their view of an approaching threat via high perches or flocking. Other results from the experiments have direct implications for the design of aircraft lighting systems. Researchers found that ambient light affected how quickly the birds responded to the approaching vehicles under different lighting treatments.

This new information presents an opportunity for Wildlife Services and its partners to work with industry to design aircraft lighting systems that detect ambient light conditions, then tailor the lighting output to one more readily discerned by birds under those conditions (e.g., via light color, pulse rate, or a combination of effects). More research is forthcoming, but the scientists have already seen their initial findings employed by a commercial airline in a field trial, and they have presented their most recent findings before representatives of a major aircraft manufacturer.

More info: nwrc@aphis.usda.gov

FLC NewsLink

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Tech Watch | *Laboratory Techs Ready for Transfer*

NETL's Coal Gasification

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.

C3M works in conjunction with a CFD code, such as NETL's Multiphase Flow with Interphase eXchanges (MFIX) software or the commercially available FLUENT platform. The CFD code calculates the basic physical and chemical properties of the system, such as temperature, pressure, velocity, and composition of the gases during the coal gasification process.

C3M uses this data to calculate rates and heats of reactions and mass transfer effects. Using visualization software, designers can view a movie showing how chemical species evolve with time throughout the reactor. This can reduce design time and avoid the expense of the build-and-test method. The C3M code has recently been applied to the design of an advanced hydrogasification process in collaboration with Arizona Public Service.

U.S. and international patents are pending on C3M. *More info*: Diane Newlon, roberta.newlon@netl.doe.gov, or www.netl.doe.gov.

FAA, SunKeyST

The Federal Aviation Administration'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 is an essential tool in support of real-time simulations conducted at the FAA's Research Development and Human Factors Laboratory (RDHFL). The device allows virtually any keyboard or pointing device to transparently interface to a SUN Microsystems workstation without the need for additional hardware or software support. SunKeyST currently translates FAA air traffic control (ATC) enroute and terminal input devices into SUN computer language. The device is highly portable and operates without the need for special interface software to be loaded onto the SUN system.

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

Computer-Generated Imagery and Speech Tech for Simulation Training

The Naval Air Warfare Center Training Systems Division (NAWCTSD) has partnered with the National Institute of Justice, the research, development and evaluation agency of the Department of Justice, in developing a computer-generated imagery (CGI) based use of force training simulator.

The simulator incorporates CGI with weapons tracking and speech recognition. While CGI has been widely used in military training simulations, most law enforcement cognitive judgment simulations remain video-based.

CGI-based applications for law enforcement are now becoming more feasible given advances in affordable and realistic avatar rendering, including expressive face technologies.

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. The prototype will include a full continuum of force options (e.g., conductive energy device, handgun, OC spray) needed for decision making in a variety of situations.

The system design approach leverages from military training systems and is built around commercial off-the-shelf software and hardware readily available to federal, state, and local law enforcement agencies. Technological advances achieved during the development of this prototype system will provide enhancements for military small arms and close combat training systems as well. The prototype is expected to be ready in December 2008.

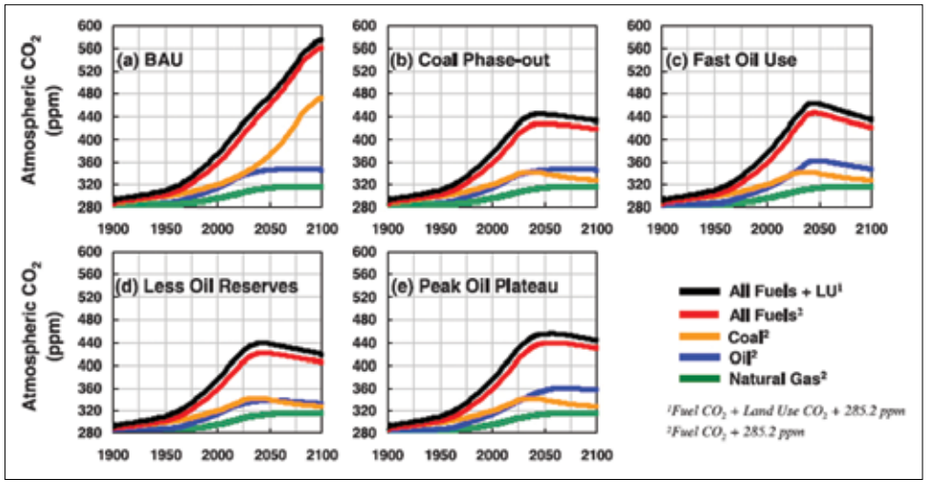
More info: Sunny Simmonds, 407-380-4699

Global Oil Impact, from page 1

to target carbon dioxide levels."

Carbon dioxide is a greenhouse gas that concerns climate scientists because it can remain in the atmosphere for many centuries, and studies have indicated that humans have already caused those levels to rise for decades by burning fossil fuels. Also, carbon dioxide accounts for more than half of all human-caused greenhouse gases in the atmosphere.

Previously published research shows that a dangerous level of global warming will occur if carbon dioxide in the atmosphere exceeds a concentration of about 450 parts per million. That's equivalent to about a 61-percent increase from the pre-industrial level of 280 parts per million, but is only 17 percent more than the current level of 385 parts per million.



Atmospheric carbon dioxide changes over time for the study's five fossil fuel scenarios: business-as-usual (a), coal phaseout (b), and oil use and supply (c-e).

The carbon dioxide cap is related to a global temperature rise of about 1.8 degrees Fahrenheit above the 2000 global temperature, at or beyond which point the disintegration of the West Antarctic ice sheet and Arctic sea ice could set in motion feedbacks and lead to accelerated melting.

To better understand the possible trajectory of future carbon dioxide, Kharecha and Hansen devised five carbon dioxide emissions scenarios that span the years 1850-2100. Each scenario reflects a different estimate for the global production peak of fossil fuels, the timing of which depends on reserve size, recoverability and technology.

"Even if we assume high-end estimates and unconstrained emissions from conventional oil and gas, we find that these fuels alone are not abundant enough to take carbon dioxide above 450 parts per million," Kharecha said.

The first scenario estimates carbon dioxide levels if emissions from fossil fuels are unconstrained and follow "business as usual," growing by two percent annually until half of each reservoir has been recovered, after which emissions begin to decline by two percent annually.

The second scenario considers a situation in which coal emissions are reduced first by developed countries starting in 2013 and then by developing countries a decade later, leading to a global phase-out by 2050 of coal emissions that reach the atmosphere. The reduction of emissions to the atmosphere in this case can come from reducing coal consumption, or from capturing and sequestering the carbon dioxide before it reaches the atmosphere.

The remaining three scenarios include the above-mentioned phaseout of coal, but consider different scenarios for oil use and supply. One case considers a delay in the oil peak by about 21 years to 2037. Another considers the implications of fewer-than-expected additions to proven reserves due to overestimated reserves, or the addition of a price on emissions that makes the fuel too expensive to extract.

The final scenario looks at emissions from oil fields that peak at different times, extending the peak into a plateau that lasts from 2020-2040.

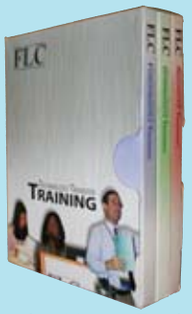
Next, the team used a simplified mathematical model, called the Bern carbon cycle model, to convert carbon dioxide emissions from each scenario into estimates of future carbon dioxide concentrations in the atmosphere.

The unconstrained "business as usual" scenario resulted in a level of atmospheric carbon dioxide that more than doubled the pre-industrial level and from about 2035 onward levels exceed the 450 parts per million threshold of this study. Even when low-end estimates of reserves were assumed, the threshold was exceeded from about 2050 onwards. However, the other four scenarios resulted in carbon dioxide levels that peaked in various years but all fell below the prescribed cap of 450 parts per million by about 2080 at the latest, with levels in two of the scenarios always staying below the threshold.

The researchers suggest that the results illustrated by each scenario have clear implications for reducing carbon dioxide emissions from coal, as well as "unconventional" fuels such as methane hydrates and tar sands, all of which contain much more fossil carbon than conventional oil and gas.

"Because coal is much more plentiful than oil and gas, reducing coal emissions is absolutely essential to avoid 'dangerous' climate change brought about by atmospheric carbon dioxide concentration exceeding 450 parts per million," Kharecha said. "The most important mitigation strategy we recommend – a phase-out of carbon dioxide emissions from coal within the next few decades – is feasible using current or near-term technologies."

Technology Transfer Training DVD Set



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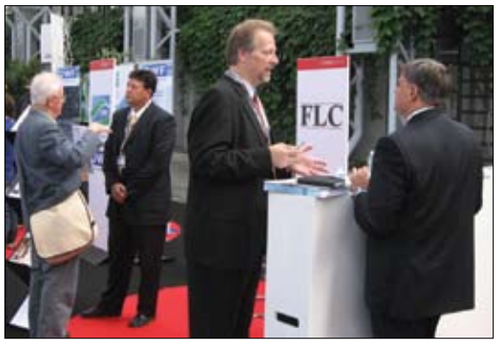
FLC Takes U.S. Tech Transfer Global

by Gary Jones, FLC Washington, DC Representative

Greetings from DC. In early September the FLC participated in a unique global technology transfer event designed to facilitate collaboration between researchers from university and government institutions and industry representatives from across the globe.

COPENMIND, launched earlier in the year with the goal of raising 'the global standard for research collaborations, technology transfer and knowledge exchange', held its inaugural event in Copenhagen, Denmark, on September 1-3, 2008, attracting over 125 research institutions and 1,500 industry representatives from more than 50 countries worldwide.



FLC Chair Scott Deiter (Second from left) and FLC Washington D.C. Representative Gary Jones (Third from left) discuss technology transfer during COPENMIND in Copenhagen, Denmark, September 2, 2008.

Although I typically don't devote column space to specific trade shows or conferences we attend, I thought that COPENMIND might be of interest given some of the unique attributes of this particular show and opportunities it afforded the FLC and its members.

COPENMIND 2008 is the first of three planned annual events -- all based around particular technological themes and the needs to bring researchers and developers together to meet pressing global needs in these broad-based areas; the 2008 theme was Clean Tech (broadly defined under topics such as climate, energy, water, waste, agriculture, etc.), 2009 Energy, and 2010 Health. Although launched and held in Europe, one of its most unique features was its geographic reach; with research and industry representation from the U.S. and Canada, South America, Europe, Asia, Africa and Oceana. It was truly a global tech transfer event.

The primary benefits to our participation were 1) the ability to promote the FLC and its member labs to a broad international industrial audience in a single event, and 2) to engage with other similar technology transfer organizations from outside the U.S. to learn from each other and begin to develop stronger relationships for potential future interactions. Through our booth space and session presentations, we had the opportunity to highlight U.S. federal lab capabilities and promote the FLC as an entry point to finding potential federal lab partners, as well as engage organizations such as ProTon Europe (an association of Knowledge Transfer Offices from Public Research Organizations in the EU) and ASTP (the Association of European Science and Technology Transfer Professionals) among many others. In addition, based on discussions with other participants, we also anticipate an increase in international attendance at future FLC meetings.

Several issues became blatantly apparent to me during the conference and as I reflected on it later for this column. First, while it may be obvious to us that the U.S. federal government has world-class research capabilities with many opportunities for industry partners to take advantage of those capabilities via technology transfer actions, many non-U.S. attendees that I spoke to at the conference were somewhat surprised to learn this fact. They understand about U.S. university research institutions, but government labs as a source of collaboration was a new concept for many. While recognizing that we have a mandate to focus on partners that will 'manufacture substantially in the United States', the fact is that due to global realities and necessities many of our agencies and labs have active international tech transfer programs, with partners from outside the U.S. Raising the visibility of our members' capabilities at a conference such as COPENMIND supports those efforts.

Second, as we engaged industry throughout the 3-day event, the one item they seemed most interested in was our Technology Locator Service. It's clear that this tool, while valuable to potential U.S. partners, grows in value as we move abroad and engage folks that have less experience and understanding of the U.S. federal lab system. Highlighting this valuable tool and the FLC as an entry point to U.S. federal technology transfer was an important outcome of this event. Based on interactions at COPENMIND, I expect there to be a noticeable increase in queries to the locator service in the near term.

As noted, next year's theme is Energy, followed by Health in 2010. Like any 'first-time' event, COPENMIND has some lessons to learn from its inaugural event, but expects to improve on its success this year and offer another 'global tech transfer' platform for 2009 and beyond. You can find out more about the event at the COPENMIND web site (www.copenmind.com).

Gary can be reached at gkjones@federallabs.org.

Crossing Atlantic for T2, from page 1

Enterprise Office (TPEO), and Thomas Ramotowski, a chemist from Division Newport's Devices, Sensors, and Materials Research and Development Branch in the Sensors and SONAR Systems Department, were our laboratory's representatives. I conducted an interview with Dr. Baus upon her return from COPENMIND and captured her thoughts on the event.

MS: How was your experience at COPENMMIND?

Dr. B.: Overall, the experience was positive. It was interesting to see how many Division Newport projects were of interest to universities from all over the world. For example, our anti-fouling research that seeks environmentally friendly ways to protect structures from the harsh underwater environment had applications to work being done by a university in South America that is exploring ways to help the salmon farming industry. The cages used to contain the salmon get damaged with biological matter adhering to them (a.k.a, "gunked up"), so they are also exploring ways to mitigate that problem while not affecting the salmon population.

The breadth of "outreach" of the COPENMIND was interesting, since there was such a wide range of organizations and nations represented. We had on one side of our booth the Tokyo University of Science and on the other the VTT Technical Research Centre of Finland. VTT folks were interested in situational awareness, which is similar to our Navy laboratory's combat systems work (both commercial and military use). Many folks who stopped by our booth were curious as to why we were there. Press covering the event also asked "why?" This gave us a great opportunity to explain not only how organizations work with a Navy lab, but to explain the mere fact that they can.

MS: What value-added was there for DIVNPT's tech transfer program?

Dr. B.: There was definitely value in attending. Not only did we promote Division Newport work and technologies, but as FLC representatives we promoted Navy, DOD, and all government labs. We emphasized that research partners did not have to be a U.S. company or U.S. university to enter into a CRADA (Cooperative Research and Development Agreement). Many of our conversations included all aspects of tech transfer – above and beyond the clean technologies [the event theme] – to include medical devices (e.g., our "non-contact" blood pulse waveform monitor) and other technologies our laboratory is exploring for transfer into the commercial sector. People visiting the booth were quite willing to share contact information and provide various leads for potential partnership connections.

MS: In keeping with the "Clean Tech" theme of this year's event, what laboratory technologies did you and Mr. Ramotowski showcase?

Dr. B.: Our anti-fouling work [mentioned above] had a great deal of interest. We also showcased our environmentally friendly chromate-free corrosion protection systems for aluminum and steel and the accelerated life-cycle test vessel, used to test efficacy in days instead of years. We provided visitors with handouts of these capabilities and research. Some are patented inventions

Crossing Atlantic for T2, page 8

A Little-Known Grass Gains Research Fame

by Don Comis and Marcia Wood, Agricultural Research Service

David Garvin may be the first U.S. scientist to pursue research using a wild grass known as "purple false brome," *Brachypodium distachyon*, as a model plant.

Garvin, a plant geneticist with the ARS Plant Science Research Unit in St. Paul, Minnesota, learned of the short-statured plant's possibilities from researchers working in Europe. Early in 2002, he started his own investigations to explore its potential to serve as a model, or surrogate, for its close relatives—including wheat, rye, and barley.

Unlike these familiar crops, *Brachypodium* has a small genome—about one-fiftieth that of wheat, for instance.

Garvin's goal—then and now—is to use *Brachypodium* to speed discovery of genes that will improve wheat's resistance to diseases such as rusts, Fusarium head blight, and others that can cause dramatic yield losses.

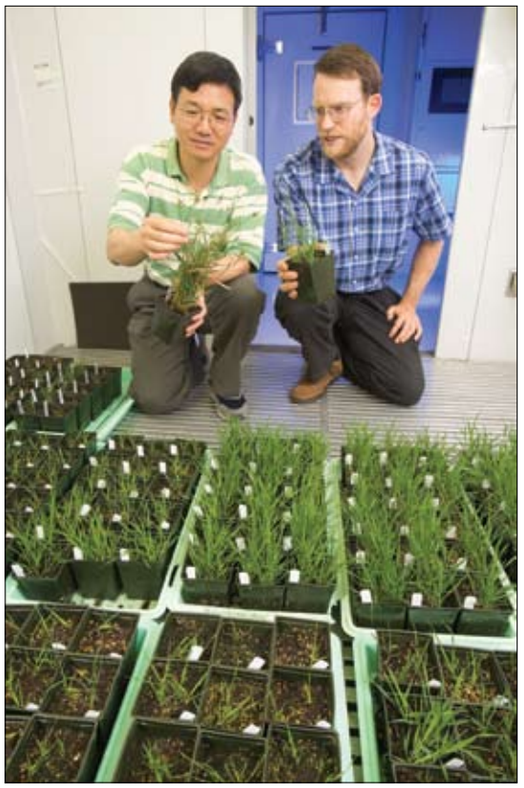
"Since *Brachypodium* is closely related to wheat, barley, and other small grains," Garvin said, "pinpointing genes for important traits such as disease resistance in *Brachypodium* should help us quickly find those same genes in these major crops. We expect their functions and relative locations on *Brachypodium* and wheat chromosomes to be about the same."

Garvin's work attracted the attention of plant molecular biologist John Vogel at the ARS Western Regional Research Center in Albany, California, near San Francisco. Vogel saw the value of using this new model plant to improve energy crops such as switchgrass—a *Brachypodium* cousin. Vogel's intent: To discover how to more quickly and inexpensively break down the plant cell walls that make cellulosic ethanol costly to produce.

With other ARS colleagues, Garvin and Vogel have made ARS a world leader in getting *Brachypodium* adopted as an international model for grass-crop research. Seeds of *Brachypodium* plants that Garvin developed specifically for research have been sent freely to scientists in 25 states and 20 nations. According to Garvin, these genetic stocks are now being used for innovative genetic, genomic, physiological, and molecular biological research for grass-crop improvement.

And, thanks to his lab and greenhouse experiments, some of these research-ready plants now have an impressive seed-to-seed turnaround time of less than eight weeks.

One of Garvin's genetic stocks, for example, was chosen for use in an international venture to sequence the *Brachypodium* genome. Based at the Department of Energy's Joint Genome Institute in Walnut Creek, California, the project will reveal the structure of all the plant's genes and other genetic material. Garvin, Vogel, and Michael Bevan of the John Innes Center in the United Kingdom are co-directors of this genome journey, which has already yielded a rough draft and is expected to produce an improved version sometime this year.



Geneticist Yong Gu (left) and molecular biologist John Vogel examine transgenic Brachypodium plants in a growth chamber. The plant in Gu's hand is setting seed.

***Brachypodium*—Transformed!**

In their California laboratories and greenhouses, Vogel, geneticist Yong Gu, and research leader Olin Anderson—all with the Genomics and Gene Discovery Research Unit—have used Garvin's plants in groundbreaking experiments.

Vogel, for instance, was the first to report the successful shuttling of new genes into *Brachypodium* via a bacterium, *Agrobacterium tumefaciens*. This biotech approach offers more precision than another popular method—one that relies on a gene gun to blast genes into plant tissue.

A good model plant accepts, and activates, genes that scientists move into it. The process, called "transformation," allows researchers to learn more about the genes—what they do inside the plant, and how they might be enhanced or perhaps silenced.

"An efficient transformation system is an absolute requirement for a model system," said Vogel, who recently hit a transformation rate of about 60 percent. It's among the highest reported for any grass.

For the most part, grasses remain very resistant to accepting genes that scientists—using techniques of modern biotechnology—would like to give them. "Grasses are notoriously difficult to transform," said Vogel. That makes the hard-won transformation rate for *Brachypodium* even more noteworthy.

A Map Takes Shape

Garvin's genetic stocks were just as essential to experiments that have yielded the first-ever physical map for *Brachypodium*. The map, developed by Yong Gu in collaboration with Ming-Cheng Luo at the University of California-Davis, depicts the location of neighboring, or contiguous, stretches of *Brachypodium* DNA.

The California team has pried yet

ARS's Useful Grass, page 8

Columbia Environmental, from page 1

ecology, biology, microbiology, organic chemistry, hydrology, and remote sensing. These technological and scientific skills are contained within four broad focus areas: environmental toxicology and chemistry, ecological research, large river ecology and information technology.

Cooperating with federal and state agencies, academia, industry, native tribes, and nongovernmental and scientific organizations has brought CERC to the forefront in addressing current and emerging natural resource issues, both nationally and internationally.

Over its 42-year history, CERC has addressed contaminant research in support of sound natural resource management of the nation's aquatic and terrestrial ecosystems. CERC has a unique capability for conducting both focused and large-scale multidisciplinary studies of contaminated environments. The Center views contamination problems in the context of multiple environmental stressors to understand how contaminants move through the natural environment. CERC also identifies potentially sensitive environments, and assesses the effectiveness of remedial activities, emphasizing projects that integrate scientific disciplines on larger geographic areas.

Researchers at CERC conduct small- and large-scale studies on national and international environmental contamination. CERC's multidisciplinary scientists collaborate to discover how pollutants move through the environment, identify potentially vulnerable environments, and evaluate the effectiveness of remedial activities. Scientists also assess how habitat alterations affect aquatic and terrestrial ecosystems, such as lakes, large river flood plains, coastal habitats, and wetlands. For an integrated approach to complex resource problems, research projects are staffed with team members from seven science branches.

CERC is located on a 33-acre site southeast of Columbia, in a climate conducive to year-round outdoor studies. The heart of CERC is a 26,000-square-foot building with a central wet

Columbia Environemental, page 8

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

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/

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.

ARS Lubricant

Agricultural Research Service (ARS) scientists in Illinois have developed a way to make a vegetable oil-based material using several natural compounds. The technology can be used in formulation of biobased-industrial lubrication fluid, potentially replacing petroleum-based fluids. One of ARS's compounds can be poured at cold temperatures—a property required by the lubrication industry. The compounds also have structures that have the potential to be used to form a new type of surfactant. Many other commercial lubricants and surfactants are available.

More info: Richard J. Brenner, CRADA.OTT@ars.usda.gov, 301-504-6905

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 Fuel Cell

The Naval Research Laboratory has developed a microbial fuel cell (MFC) capable of harvesting energy in aerobic environments such as a water column or air/water interface.

The replacement of commonly used membranes with nanoporous membranes results in an MFC capable of generating ~1μW that can be connected easily in series or parallel for additional power generation. These MFCs operate by passive nutrient diffusion and thus eliminate energy-draining pumps needed in other MFCs.

More info: techtran@utopia.nrl.navy.mil.

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

Jumpstart Software

The National Institute of Standards and Technology (NIST) has developed two demonstration software packages that show how Personal Identity Verification (PIV) cards can be used with Windows and Linux systems to perform logon, digital signing and verification, and other services.

The demonstration software, written in C++, will assist software developers, system integrators and computer security professionals as they develop products and solutions in response to Homeland Security Presidential Directive 12 and the FIPS 201-1 standard.

The software is available at http://csrc.nist.gov/groups/SNS/piv/download.html.

Crossing Atlantic for T2, from page 5

and in some cases we discussed our research using a commercially available compound to minimize the adverse affects of the harsh marine environment on materials that get exposed.

We promoted the tech transfer of a number of our dual use capabilities such as unmanned undersea vehicles (UUVs) for use in monitoring the marine environment as well as for situational awareness, and our survival test facility that is available to industry and academia to assess the environment's impact, such as fog, salt spray and mildew, on marine objects and instrumentation. We also promoted a suite of material test fixtures and apparatus that we have patented that may be used to test composite as well as biological materials for manufacturing and during design/product development purposes.

MS: Would it be worth the laboratory's time and resources to attend the next COPENMIND, why or why not?

Dr. B.: Yes. The next COPENMIND will have an energy focus. Division Newport does a great deal of research in this area especially in power for undersea vehicles. We have expertise in fuel cell development, battery management systems, lithium-ion batteries, etc. It will be a great opportunity to promote much more of our work, and we very much look forward to it.

ARS's Useful Grass, from page 6

more genetic secrets out of Garvin's plants. The researchers analyzed a portion of the plants' activated genetic material, or RNA, contained in bits of roots, stems, leaves, and other tissue snipped from seedling and fully grown *Brachypodium*. Their experiment identified indicators of active genes, or ESTs (short for expressed sequence tags). These ESTs act like signposts to guide scientists to genes that were actively working inside the tissue.

ESTs quicken the hunt for genes of interest. The Albany scientists identified more than 20,400 ESTs and posted them on the publicly available GenBank website, an encyclopedia of genomic information from the world's plants, insects, worms, humans, and other forms of life.

"This was the first significant genomic resource for *Brachypodium*," said Vogel. "Until then, GenBank had only nine *Brachypodium* ESTs."

"Ready access to genetic and genomic research materials such as genetic stocks, maps, genes, and the genome sequence is required to make a stand-out model plant," Garvin said. "We're giving scientists worldwide that type of access. For the past 6 years, we've shared Brachypodium seeds, provided practical information and research data, and worked cooperatively with a large community of interested plant researchers here and abroad.

"All this has helped transform *Brachypodium* from a relative unknown to a worldwide favorite for grass-crop research."

Columbia Environmental, from page 6

laboratory, augmented by specialized research buildings. Two 1,100-foot-deep wells provide an uncontaminated water source suitable for maintaining invertebrates and both cold and warm water fishes. The water supply facilities can formulate test waters that simulate a wide range of environmental conditions, from acid-sensitive lakes and streams to saline estuaries.

CERC is the only USGS laboratory capable of conducting research on highly toxic compounds, such as dioxin. The CERC facility also houses an effluent treatment system.

Small ponds, for investigating the intricate relationships among organisms in freshwater habitats, and constructed streams, for studying plant and animal communities in flowing waters, augment CERC's facilities.

CERC also uses mobile research laboratories to evaluate onsite contaminants. CERC researchers conduct specialized toxicological and ecological studies in Field Research Stations throughout the central United States.

The Center was established in 1959 at the Denver Wildlife Research Center of the U.S. Fish and Wildlife Service and was called the Fish Pesticide Research Laboratory (FPRL). In 1966, the University of Missouri deeded 33 acres to the Fish and Wildlife Service, and the FPRL moved to its present location. USGS absorbed the Center in 1996. In 1998, the laboratory was re-christened the Columbia Environmental Research Center.

As CERC matures, its research programs have broadened in scope to an integrated approach for even more complex resource problems. These complexities encompass factors associated with the biological significance of degraded water quality that often include physical landscape alterations, invasive species, and ecosystem restoration activities.

More info: www.cerc.usgs.gov/

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