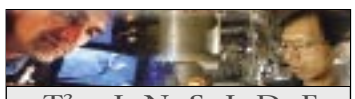
FLC
# NEWSLINK
A Publication of the Federal Laboratory Consortium for Technology Transfer

February 2005



T² INSIDE



T² FACT

*In 1620, Dutch physicist Cornelis Jacobszoon Drebbel invented what is considered the first submarine. The toughest challenge facing Drebbel's invention was the ability to replenish air within the submersible for its more than 10 mariners. To overcome this obstacle, Drebbel used air tubes, supported on the surface by floats, to bring oxygen to the submarine as it navigated below the surface of the Thames River.*

T² EVENTS

National Design Engineering Show
Chicago, Ill.
March 7-10, 2005

•

World's Best Technologies 2005
Arlington, Texas
March 28-30, 2005

•

2nd Annual Global Bioexecutive Program
Module 1:
*Capitalizing Innovation*
Berkeley, Calif.
April 7-8, 2005

•

Mini-Conference on Human Factors in Complex
Atlantic City, N.J.
April 28-29, 2005

•

FLC National Meeting
*Mission Driven Partnerships*
Orlando, Fla.
May 1-6, 2005

•

NSTI Nanotech Conference and Trade Show
Anaheim, Calif.
May 8-12, 2005

•

2005 Technology Transfer Society Meetings
Kansas City, Mo.
Sept. 28-30, 2005

# Stevenson-Wydler Innovation Act Crucial to FLC Evolution

*by Harold Metcalf, FLC Alumni*

In *Federal Technology Transfer 2004*, FLC Chair Ed Linsenmeyer wrote about the unparalleled research and development (R&D) resources in the more than 700 participating laboratories and research centers, representing almost every federal department and agency, that conduct $70 billion in R&D annually and employ more than 100,000 scientists and engineers.

The FLC could never have evolved into a "national treasure" of that proportion without two critical pieces of policy legislation: the Stevenson-Wydler Technology Innovation Act of 1980 (Public Law [P.L.] 96-480) and the Federal Technology Transfer Act of 1986 (P.L. 99-502).

Neither Act likely would exist without the vision and dedicated commitment of several technology transfer champions in the Department of Defense (DOD) and a dozen of its laboratories, who organized the DOD Consortium for Technology Transfer in 1971.

In establishing the Consortium, they used the only fragment of policy available at the time—one element of the DOD Domestic Action Program that encouraged technical assistance to the local civilian community.

One of the early critical policy development linkages that played an important role in support of the DOD Consortium (and its evolution into the FLC in 1974) was one between DOD laboratories and the National Science Foundation's (NSF) Intergovernmental Science Program (ISP).

The NSF housed a DOD Consortium representative in its Washington office and provided grant funding, support services and prestige.

These facilitated coordination and cooperation among the DOD Consortium and the civilian agency laboratories, and strongly influenced the policy development and total involvement of all federal laboratories—the very concept that led from the DOD Consor-

*See Stevenson-Wydler, page 4*

# Volpe Plans and Tracks Traffic

A new technology will give a real-time bird's-eye view of train traffic and could be transferred to many other applications.

The Railroad Traffic Planner is a computerized stringline scheduling tool that presents the locations of multiple trains over time.

Its development by the Volpe National Transportation Systems Center and the Massachusetts Institute of Technology (MIT) for the Federal Railroad Administration (FRA) began in 1996 as part of a project to explore the benefits of various "knowledge display interfaces" available with computers.

Massachusetts Bay Transportation Authority (MBTA) Commuter Rail Service and Guilford Rail System planners helped design and test early versions of the application, which helps them more effectively analyze and modify train schedules to meet their customers' needs.

*The Railroad Traffic Planner, developed by Volpe and MIT, helps analyze and modify train schedules, and could be used to monitor coolant temperature, fuel level, braking, and ride quality.*

The Fulcrum Corporation joined the team in 2003 to transfer this technology to additional railroads. The North Shore Railroad (NSHR) and the Paducah and Louisville Railway (PAL) are the

*See Volpe Plans Traffic, page 4*

# Researcher Introduces New Body Armor

*by Sue Baker, AFRL Public Affairs*

*Senior Airman David Jensen (left) and Airman 1st Class Brian Corso, both of the 386th Expeditionary Security Forces Squadron Viper Flight, observe the surrounding area for threats to aircraft landing and taking off. The low-cost, higher-performance, and lighter ceramic Small Arms Protective Inserts developed by the Air Force Research Laboratory will fit into personal flak vests, like those worn by the soldiers pictured, to protect them from assault and other weapons fire.*

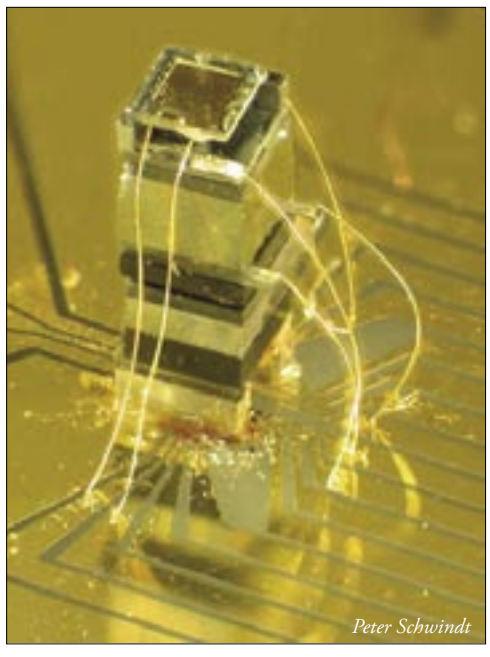
Thanks to a bit of luck, timing and serendipity, 2nd Lt. T.J. Turner of the Air Force Research Laboratory has used a new material to make advanced, lightweight body armor for Department of Defense warfighters.

Teaming with a local industrial partner, Excera Materials Group of Columbus, Ohio, Lieutenant Turner took only 18 months and $110,000 in laboratory funding to move from a research and development project to an actual Small Arms Protective Insert (SAPI) that can save lives. "A $750,000 Navy Phase II Small Business Innovative Research project also helped us with development costs," Lieutenant Turner said.

Joining the Materials and Manufacturing Directorate as a mate-

*See New Body Armor, page 4*

# NIST's Atom-based Detector Senses Magnetic Fields




*The NIST chip-scale magnetometer sensor is about as tall as a grain of rice. The widest block near the top of the device is an enclosed, transparent cell that holds a vapor of rubidium atoms.*

*From NIST Public Affairs*

A low-power magnetic sensor about the size of a grain of rice that can detect magnetic field changes as small as 50 picoteslas—a million times weaker than the Earth's magnetic field—has been demonstrated by researchers at the National Institute of Standards and Technology (NIST). Described in the Dec. 27 issue of Applied Physics Letters, the device can be powered with batteries and is about 100 times smaller than current atom-based sensors with similar sensitivities, which typically weigh several kilograms (about 6 pounds).

The new magnetic sensor is based on the principles of a NIST chip-scale atomic clock announced in August 2004. Expected applications for a commercialized version of the new sensor could include hand-held devices for sensing unexploded ordnance, precision navigation, geophysical mapping to locate minerals or oil, and medical instruments.

*See NIST's Atom-Based Detector, page 6*

# DC on T²

*by Dave Appler,*
*FLC Washington, DC Representative*

The FLC has a long history of trying to find ways to provide new technologies to help the physically handicapped.

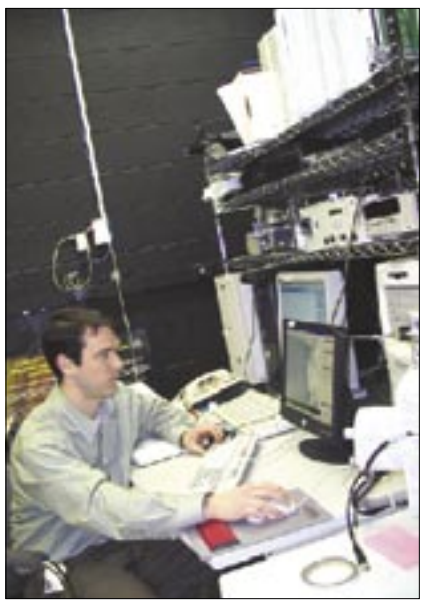
Several predecessors in my job, as well as myself, have had long-term interactions with the assistive technology (AT) community. For the last two years, I have helped the Department of Commerce (DOC) organize an assistive technology showcase and seminar at its main building in conjunction with the anniversary of the Americans with Disabilities Act.

A DOC study partly funded by the FLC produced the first "Technology Assessment of the U.S. Assistive Technology Industry" in February 2003. The study reveals some interesting facts about this multibillion dollar industry that is growing at an annual double-digit rate.

*See DC on T², page 5*

# Fed Labs Flash | *Technology Transfer Notes*

## AFRL Researcher Works With Nobel Laureate



*Dr. Mark Pender analyzes research data from his computer in the Materials and Manufacturing Directorate's Survivability and Sensor Materials Division of AFRL. Recently, Dr. Pender was honored to work with Dr. Richard Smalley, a Nobel Prize recipient, as part of an ongoing collaboration between ML and Rice University.*

Dr. Mark Pender of the Air Force Research Laboratory's Materials and Manufacturing Directorate (AFRL/ML) recently spent 10 weeks at Rice University in Texas exploring carbon nano-materials with Nobel Prize recipient, Dr. (Professor) Richard Smalley and his research team.

Dr. Pender's research focused on synthesis and manipulation of single wall carbon nanotubes (SWNTs) and optimizing the parameter space for the substrate growth of SWNTs by catalytic chemical vapor deposition. His visit was part of an ongoing collaboration between ML and the university, aimed at better understanding nano-material characteristics and applications.

"SWNTs are highly promising nano-materials, but the tools and methods for growing and manipulating them are far from mature," Dr. Pender explained. "The time I spent at Rice gave me a great opportunity to do research with experts in the field, improve ML's knowledge base, and examine nano tools and methods. I gained a broader view of the exciting research underway at Rice and the rapidly evolving field of nanotechnology, in particular, SWNTs. I also learned more about inspired academic research (management, goals, focus) from someone (Dr. Smalley) who has obtained science's most highly regarded prize."

Dr. Pender received a B.S. in chemistry from the University of South Carolina in 1995 and a Ph.D. in organic chemistry from the University of Pennsylvania in 2000. He completed post-doctoral research at Princeton University, and is currently in his second year as a National Research Council Associate.

## Sandia's Nanotech Facility

*by David Gibney, HDR Architecture, Inc.*

Sandia National Laboratories (SNL) is currently designing its Center for Integrated Nanotechnologies (CINT) Core Facility.

The facility will support some of the world's most advanced research on applied nanotechnology. The fan-shaped plan for CINT links three distinct laboratory bays with office/support spaces via primary and integral service corridors.

Each lab space is designed for different types of nanotechnology research, and incorporates advanced building features to provide critical control of micro-level vibration, ambient temperature, and contaminant-free air.

The CINT design embraces Native American regional architecture with a curved façade featuring dry stack stone.

The CINT Core Facility was designed with sustainable design, construction, and operation as requirements. Using the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, CINT Core will minimize water use, be energy efficient, use locally available building materials made with recycled content, and have a rigorous indoor environmental quality control system.

The 97,000 sq. ft. facility in Albuquerque, N.M., was designed by HDR Architecture, Inc. and is being constructed by Hensel Phelps Construction Company.

SNL occupancy is scheduled for summer 2005.

## DOD's Enviro-Funding

The Department of Defense, through the Environmental Security Technology Certification Program (ESTCP), will be funding environmental technology demonstration and validation in the following topics:

- Unexploded Ordnance (UXO) Detection, Discrimination, and Remediation
- Characterization, Control, and Treatment of Range Contamination
- Remediation of Contaminated Groundwater
- Remediation of Contaminated Sediments.

Pre-proposals from both the federal and non-federal sectors are due by March 10, 2005.

More info: www.estcp.org/opportunities/solicitations/index.cfm

## NAVY's Energy Leadership

The Department of Navy (DON) became the first U.S. government agency honored with a Platts Global Energy Award, which recognizes the energy industry's best of the best.

DON's energy program was presented with the Industry Leadership Award for its extraordinary leadership and achievement in energy management.

William Tayler, director, DON Shore Energy Office, accepted the award for the Navy. "Being the first federal agency to receive this honor really underscores our team's commitment to conservation and being good stewards of the environment."

## Water Filter Could Help Millions Around the World

*from the Communications Department of Lawrence Berkeley National Laboratory*

Lawrence Berkeley National Laboratory (LBNL) scientist Ashok Gadgil is developing a cheap and effective way to provide safe drinking water to 60 million Bangladeshis who live under the specter of arsenic poisoning.

His idea is to create arsenic filters from coal ash, the fine gray powder that accumulates at the bottom of furnaces at all coal-fired power stations, waiting to be discarded.

"It's just coal ash, nothing fancy," says Gadgil, a scientist at LBNL's Environmental Energy Technologies Division. "But it could save so many lives."

Arsenic poisoning in Bangladesh, called one of the largest mass poisonings in human history, is expected to cause 10 percent of all future adult deaths in the impoverished nation of 130 million.

For reasons not entirely understood, the shallow tube wells that people depend on for water have dangerous concentrations of the toxic substance which, if ingested over long periods of time, leads to debilitating lesions, cancer, and death.

*Ashok Gadgil hopes to decontaminate water with simple filters made of ash coated with a compound that attracts arsenic.*

Although still in the investigational stage, Gadgil's technique would involve coating the ash with a compound that attracts arsenic, filling teabag-sized pouches with the powder, and distributing the filters throughout the countryside, one per family per day.

Water drawn from any one of the millions of contaminated wells that dot Bangladesh could then be poured through the filter and safely consumed.

It's difficult to believe that one person, armed only with a handful of ash and a few promising lab tests, can derail a catastrophe looming on the other side of the globe. But Gadgil is uncommonly driven when it comes to finding affordable ways to provide safe drinking water to thousands of people. In November, he received an award from San Jose's (Calif.) Tech Museum of Innovation, which honors people who use technology to help humanity, for developing a water purification system that kills bacteria with ultraviolet light.

The system, called UV Waterworks and marketed by WaterHealth International, Inc., is used daily by about 300,000 people in Mexico, the Philippines, and several other countries. Several systems will soon be installed in his native India. And money is currently being raised to install the system in tsunami-stricken regions of Sri Lanka and India.

Now Bangladesh weighs just as heavily on his mind.

"The magnitude of the problem is overwhelming. We have to develop a solution that is affordable and effective," said Gadgil.

After receiving $5,000 in seed funding from LBNL's Technology Transfer Department in 2003, Gadgil set out to develop a filter that meets these criteria. His options quickly narrowed. He needed a material that has a high surface-to-volume ratio, is pathogen-free, and is available in large quantities at low cost.

Then he remembered coal ash, the leftovers that amass at coal-fired power stations. An additional $20,000 in seed funding from the Blue Planet Run Foundation helped him advance the work.

*See Lifesaving Water Filter, page 6*

FLC NewsLink

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# Tech Watch | *Laboratory Techs Ready for Transfer*

## AFRL's Spectropolarimetric Reflectometer

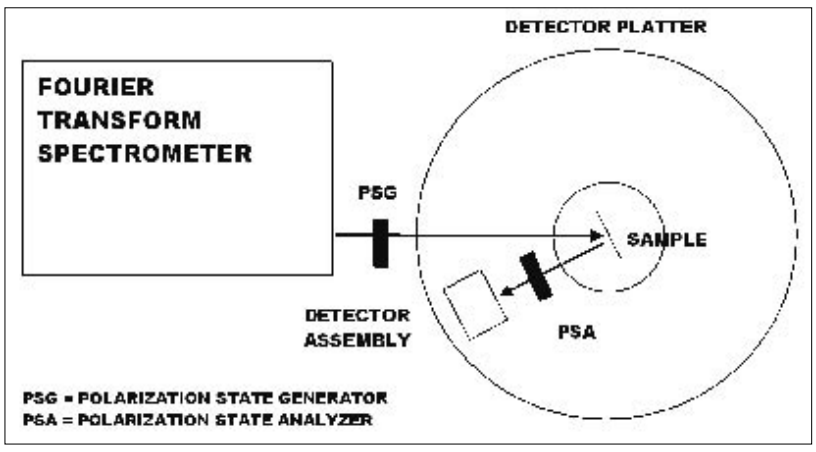
*by Dr. Dennis Goldstein*

Many sensor systems rely on reflected light from natural or manmade sources to obtain the energy for their detector elements.

The light that is reflected may be polarized. The ability of the sensor to detect and process the reflected energy may depend upon knowledge of the reflection characteristics of the materials.

An instrument is needed that measures the polarization of reflected light over broad regions of the visible and infrared to evaluate polarized reflection properties of materials.

An instrument that measures polarization properties of materials in transmission has been designed and patented by members of the Air Force Research Laboratory (AFRL).




*Bistatic configuration*

The infrared spectropolarimeter (Patent No. 5,045,701) is based on a Fourier transform infrared (FTIR) spectrometer containing a dual rotating retarder Mueller matrix polarimeter in the sample compartment.

Measurement of polarization properties of transmissive samples is possible with this instrument. Measurements are made over large wavelength regions in the infrared (wavelengths of 2.5 micrometers and greater).

The current invention extends the concept of using a polarimeter in conjunction with a Fourier transform spectrometer by incorporating a modern Fourier transform spectrometer that is capable of measurements from the ultraviolet to the far infrared, and adds the capability to measure samples in reflection.

***Features***

The spectropolarimetric reflectometer is based around a commercial Fourier transform spectrometer.

The spectrometer must be one which generates radiation from the ultraviolet to the far infrared; it must be computer-controlled; and it must have a software system that allows insertion of control over the instrument, control over additional hardware, and data processing. In the present embodiment, we are using a Bio-Rad FTS-6000 with the Win-IR Pro software system.

The spectrometer is configured with three sources, three beamsplitters, and three detectors, whichmake the useful wavelength range from the ultraviolet to approximately 25 micrometers in the infrared.

The Bio-Rad spectrometer serves as a radiation source for the polarimetric portion of the instrument. The radiation generated by the spectrometer is brought out through the spectrometer's external port.

***Potential Applications***

This invention is protected under Patent No. 6,618,145. Possible commercial application of polarimetric reflection properties of materials includes robotic vision, laser cutting and welding, and telecommunications.

*More info*: Mary Donohue-Perry, AFRL, 850-882-8591, ext. 1252

## FAA's Smoky Technology

A new patent has been issued to the Department of Transportation entitled "Reference Sample for Generating Smoky Atmosphere," Patent No. 6,812,834.

The patent, submitted by FAA inventors Richard E. Lyon and David R. Blake, located at the William J. Hughes Technical Center, Atlantic City, N.J., involves a reference sample for testing fire detectors and a method of testing utilizing the reference sample.

The reference sample comprises a fused mixture of pellets of the plastics usually found in aircraft cargo holds, with a heating element embedded in the sample.

The pellets are in a plurality of layers with the composition of each layer being homogeneous, but the thicknesses and porosities of the layers differing from each other.

When the heating element is energized, the layers of pellets, which have previously been fused into porous masses, begin to smolder, thereby generating a smoky atmosphere that as nearly as possible simulates the atmosphere in an aircraft cargo hold when there is a fire.

In addition, a flammable liquid can be poured onto the sample and ignited, simultaneously with the energization of the heating element, by a separate ignition source to provide a flaming fire atmosphere.

*More info*: Deborah Germak, Program Manager, FAA Technology Transfer, 609-485-9862, deborah.germak@faa.gov

## Where's the Good Beef?

*Animal Physiologist Mohammad Koohmaraie uses an electronic testing machine to measure the tenderness of a sample sheared from a cooked steak.*

Agricultural Research Service (ARS) researchers at the Roman L. Hruska U.S. Meat Animal Research Center in Clay Center, Neb., developed a beef carcass image analysis system that operates online in a beef packing plant to objectively determine the yield of saleable meat.

ARS scientists developed and tested a prototype of the system and established a CRADA with IBP, Inc. (now known as Tyson Fresh Meats, Inc.) to further develop the technology.

These efforts eventually led to a patent application (granted in June 2004) jointly filed by ARS, IBP, and an equipment vendor.

To facilitate industry-wide implementation of the system, ARS scientists and IBP agreed to make the technology widely available to industry.

ARS scientists have published scientific papers on the system, and have provided data and reports about the system to packing companies, producer groups, and the meat science community.

Two of the four major U.S. beef packing companies are implementing this system, and the other two are considering implementation.

Additionally, one niche beef company has implemented the system.

The beef packing industry has relied on human graders to subjectively assign yield grades to beef carcasses. However, because of the subjectiveness of human grading, the industry has been interested in implementing instrument-grading technologies for many years.

Field testing has demonstrated that the ARS image analysis system can assess USDA yield grade—the industry standard for characterizing yield differences between carcasses—more accurately and precisely than human graders.

This system is expected to save the U.S. beef packing industry $15 million dollars annually. Ultimately, the system should allow for more efficient cattle production, which will improve the profitability of beef production and the competitiveness of U.S. beef in the global marketplace.

The lead inventor for this project is Mohammad Koohmaraie, Animal Physiologist.

*More info*: Bryan Kaphammer, 970-492-7028, bryan.kaphammer@ars.usda.gov; or Tara Weaver-Missick, 301-504-6965, twm@ars.usda.gov

*Stevenson-Wydler, from page 1*

tium to the FLC.

Dr. Frank Hersman, head of the NSF ISP, made four major contributions to policy development. First, he advised the DOD Consortium leadership that no matter how dedicated they were and how hard they worked, the program would never succeed unless it was institutionalized by federal legislation.

Second, because the NSF's work and influence cut across all R&D in DOD and civilian agencies, all federal laboratories needed to be included in technology transfer, which was the concept of the FLC.

Third, NSF funded several significant grants, which were monitored by the DOD Consortium representative, for the purpose of influencing policy development and legislation. These grants included:

- One with the Council of State Governments for studies that resulted in an endorsement by all state governors that federal laboratory resources be available to help solve pressing problems in the civilian sector. One Council study pointed out that "if the DOD laboratories were pinned down to their national security mission only, they were not being utilized in the true sense for 'national security' purposes, if that term is understood to equate with the national interest."
- A second that funded the National Action Conference on Technology Transfer in June 1972. This conference, attended by 200 representatives from government, academia and industry, resulted in a resolution that federal laboratories provide active assistance and leadership in solving pressing domestic problems.

Fourth, in 1974 the Chair of the DOD Consortium presented a summary of the participating laboratories' accomplishments during the first two years to the NSF Director and representatives from other government departments. These successes became an important database for the NSF, the FLC, and others seeking policy legislation.

Six years passed before the Stevenson-Wydler Technology Innovation Act was passed in October 1980. During these years, the FLC leadership was directly and actively involved with supportive members of Congress, seeking legislative underpinning for the FLC.

joThe Stevenson-Wydler Act incorporated many of the FLC's ideas and intentions. The nearly ten-year effort and hard-fought successes of the FLC and its members greatly influenced the content of this bill and its acceptance by Congress. In the fall of 1981, the General Accounting Office assessed the implementation of the Act and found that many laboratories had established an in-house Office of Research and Technology Application (ORTA) as specified in Stephenson-Wydler.

The stated purpose of the Federal Technology Transfer Act of 1986 was to improve the transfer of commercially useful technologies from federal laboratories to the private sector. It amended the Stevenson-Wydler Act to allow federal laboratories to enter into cooperative research with private industry, universities and others, and established a dual employee award system of royalty-sharing and cash awards.

This law made it possible for the basic intentions of the Stevenson-Wydler Act to be realized and legislatively affirmed the FLC's role as an essential, integral part of the federal laboratory system and of the American industrial-academic-government technology establishment.

From 1971 to 1980, the original 12-member DOD Consortium evolved into the FLC and grew to 190 members. During the next six years, until the Federal Technology Transfer Act of 1986 was enacted, the FLC grew to 328 members from ten federal departments and agencies. By 1994, the FLC had grown to 600 members representing 16 federal departments and agencies.

This year, the FLC proudly celebrates the 25th anniversary of the Stevenson-Wydler Act, which laid a sound policy foundation that was then reinforced and strengthened by the Federal Technology Transfer Act of 1986, thus making it possible for the FLC to live up to its reputation as "a national treasure."

FEDERAL LABORATORY CONSORTIUM
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FOR TECHNOLOGY TRANSFER

*Volpe Plans Traffic, from page 1*

*The GPS-enabled cell phone in weather-resistant pod and battery pack that connects to locomotive power supply.*

demonstration sites for the enhanced system.

A low-cost Asset Tracking System, which provides real-time train positions and speeds using GPS-enabled cellular telephone technology, has also been incorporated.

Additional features will be included, such as sensors that monitor coolant temperature, fuel level, braking, ride quality, and unauthorized entry. E-mail and text message alerts will also be generated to provide warnings when needed.

The goal of this project is to promote the use of cost-effective technology to provide safety, security, and productivity benefits in the railroad industry.

Stringline diagrams have been used in the railroad industry for many years, but have been traditionally drawn with paper and pencil or actual string on a tack board.

This software tool has many advantages over traditional methods, such as automatic speed and time calculations that greatly facilitate train schedule development. Data from the asset tracking component enables users to compare actual performance to the scheduled times and speeds.

The real-time locations and speeds from the Asset Tracking System can also be viewed through map-based displays on Internet browsers and cellular telephones, making it open to a wide variety of applications.

*More info*: Mary Lee, Volpe National Transportation Systems Center, 617-494-3157, mary.lee@volpe.dot.gov

*New Body Armor, from page 1*

rials research processing engineer in 2002, Lieutenant Turner, who had just completed a Ph.D. in high-deformation materials at Cornell University, already had been thinking about a body armor system.

"In May 2003, Dr. Charles Browning, our director, challenged our unit's company-grade officers to come up with workable 6.2 (basic and applied research and development) projects he would fund with directorate monies," Lieutenant Turner said. "He wanted us to look at rapid-response kinds of things, especially with regard to current, real-world threats."

Originally, the lieutenant's idea was to create a lightweight, composite (layered) panel with external angled tiles that would cause bullets to tumble and stop instead of piercing armor plating on tanks and aircraft.

But along the way, the project took on new dimensions and was applied to body armor inserts for personal flak vests worn by troops deployed to war zones overseas.

"We wanted to focus on body armor first because it's a worst-case scenario – not only because you have to stop the bullet, you also have to stop the pressure wave it generates enough not to kill the person," Lieutenant Turner said.

"Someone here put me in touch with Excera, which makes a unique, metallized ceramic material (boron carbide) by floating a ceramic in an aluminum bath that gives it hardness plus increased fracture toughness," Lieutenant Turner said. "Those are the two most important characteristics of good ballistics materials – hardness to break the bullet open and stop it, plus fracture toughness to permit multiple shots in the same area without harming the wearer."

There are two other desirable qualities for ballistics materials: stiffness and durability in the field, Lieutenant Turner added, "If a soldier drops this material – called ONNEX – while unloading it from a truck, or takes fire and drops down on his/her stomach, the curved vest plate, called a SAPI, isn't going to crack or break.

"Backed by high-ballistics fibers called Dyneema and Rhino lining (for truck beds), the combination of materials will break assault-type bullets (AK-47, M-16) plus catch any stray bullet pieces before they hit the person or someone else." ONNEX also is estimated to have ten times the fracture toughness of materials used previously, and will not break as easily as pressed ceramic materials, Lieutenant Turner said.

"We worked from May 2003 to now to characterize this material, which I think will be the next generation of body armor," Lieutenant Turner added. His group's work with ONNEX under the program run by onsite contractors UES and UDRI at the Materials and Manufacturing Directorate, coupled with development work by Excera—which included extensive ballistics tests in August at H.P. White Army Proving Ground in Maryland – has resulted in an Army contract to build an initial, low-rate number of plates for the next three to four months.

According to Lieutenant Turner, other applications for the new material might include engines, flight controls, sensors, and the Defensive Fighting Position (structural protection against sniper attacks).

"We need to go out to the user community to determine their needs," said Lieutenant Turner. "The Deployable Defensive Panel System group at Tyndall AFB, Fla., is looking at this possibility, and we're working with them. Because the new material is lightweight, it even could go on flat panels for Army Chinook helicopters.

"It will be encouraging when you hear from the first person coming back who has worn the armor and been saved as a result," Lieutenant Turner said. "Nobody's wearing it yet, but we're trying to get it to some Air Force units this fall for a form, fit and function test, to give us feedback on the configuration and put the SAPI plates through operational exercises."

The Army, which will eventually be the primary user of the new armor, will perform additional laboratory and field tests on the SAPI plates. "When we get them back, we'll x-ray them to see if they're still o.k.

The idea is to deliver the best product to the guys and women who are taking the bullets—they're the only ones who really matter," said Lieutenant Turner.

*Inside the FLC*

# FLC Selects Stories for *Federal T² 2005*

Members of the FLC met in Charlotte, N.C., January 20-21 to review submissions for the 2005 edition of *Federal Technology Transfer*.

Over 50 federal laboratories and research centers from across the country submitted more than 100 articles describing their technology transfer success stories.

*Mary Archuleta of the Air Force Research Laboratory and FLC Communications Chair Al Jordan of NASA Marshall Space Flight Center review submissions for* Federal Technology Transfer 2005.

From transportation to medicine to communications, these stories highlight technologies and expertise that are now on their way to the marketplace.

Of high potential impact and human interest, they demonstrate the scope and value of federal research and development.

The 2005 edition will once again use full-color photos and illustrations to showcase this scope and value on both national and global levels.

Communications Chair Al Jordan met with Bob Charles of the Army Medical Research and Materiel Command and Mary Archuleta of the Air Force Research Laboratory to select the best and brightest of the 112 submissions.

Of those submissions, 32 were selected for inclusion.

Of the ones not selected, most simply had not reached the appropriate level of transfer maturity. Charles noted that "Many of these have great promise and potential and will be great for future editions."

In the meantime, congratulations to the selected. Your work will make the 2005 edition a dynamic publication and a resource for all those in the technology commercialization business.

The publication is set for printing and distribution in mid-April.

Distribution of the 2004 issue exceeded 9000 copies, including mailings to individuals and organizations from government, industry, and academia.





*DC on T², from page 1*

There is very little corporate R&D (among a fairly fragmented industry base), which provides the federal laboratories with opportunities to transfer technology. While that is true, reaching this fragmented industry can be challenging. But, whoever said technology transfer was easy?

There are several resources in the AT field that can help labs connect the technology transfer dots. First is the Rehabilitation Engineering Research Center (RERC) on Technology Transfer at the State University of New York at Buffalo.

The RERC is funded by the Department of Education (DoEd) to develop and promote better methods and processes for technology transfer to the AT community.


Second, there are all the other RERCs covering AT-related subjects such as universal design, technologies for children with orthopedic disabilities, low vision and blindness, wheeled mobility, technology access for land mine survivors, etc.

You can link to these resources at <http://www.ncddr.org/cgi-bin/mysql/grantee-rerc.cgi?showdetail=contact_www>.

We have a statutory mandate in the FLC to work with the DoEd's National Institute on Disability and Rehabilitation Research (NIDRR) to facilitate technology transfer from federal labs to the AT community. NIDRR also funds all of the RERCs.

I think the biggest challenge and biggest potential payoff in this regard is to transfer technology from federal labs doing great work in the physical and biological sciences in agency mission areas unrelated to AT. Applying the labs' work in areas such as sensors, microelectronics, robotics, advanced materials, etc., can have a tremendous impact on the AT community.

Some might say, "Should our lab try to transfer technology to a market segment outside our primary mission focus, and can our efforts make a difference?" I would answer that with an important anecdote.

Many of our most seriously wounded troops from Iraq and Afghanistan are coming to the Army's Walter Reed Hospital here in Washington for recovery and rehabilitation. Many of these fine young people have lost one or more limbs, sight, hearing, etc. In a recent newspaper article, an Army orthopedic surgeon was quoted: "One of my patients is an Army artillery captain who lost part of his leg above the knee.

"We were able to provide an artificial limb and rehabilitate him to the point where he can pass the physical test to the extent that he can go back on full active duty in the artillery. He has worked very hard and, at his request, is getting prepared to return to an artillery unit in Iraq."

The surgeon said that ten years ago, without the technology transfer successes in this area, he would have left the military and his chosen career behind.

Obviously, this story shows that the federal labs can make a difference by transferring technology to the AT community—with the benefit of providing people the opportunity to lead fully productive lives.

*NIST's Atom-Based Detector, from page 1*

Like the NIST chip-scale clock, the new magnetic sensor can be fabricated and assembled on semiconductor wafers using existing techniques for making microelectronics and microelectromechanical systems (MEMS). This offers the potential for low-cost mass production of sensors about the size of a computer chip. The researchers believe that the mini magnetometer, when packaged with associated electronics, will measure about 1 cubic centimeter or about the size of a sugar cube.

Magnetic fields are produced by the motion of electrons either in the form of an electrical current or in certain metals such as iron, cobalt and nickel. The NIST miniature magnetometer is sensitive enough to detect a concealed rifle about 12 meters (40 feet) away or a six-inch-diameter steel pipeline up to 35 meters (120 feet) underground.

The sensor works by detecting minute changes in the energy levels of electrons in the presence of a magnetic field. A tiny sample of the element rubidium is heated within a sealed, transparent cell to form a rubidium vapor. Light from a semiconductor laser is transmitted through the atomic vapor. In the presence of a magnetic field, the amount of laser light that is absorbed by the atoms changes and this is detected by a photocell. Larger magnetic fields produce proportionally bigger changes in the atomic energy levels and change the absorption by the atom.

The key advantages of the new sensor, said Peter Schwindt, one of the NIST developers, are its accuracy and sensitivity given its small size. So called "fluxgate" magnetometers achieve equivalent or better sensitivity but are much less accurate and much larger.

They also detect only the portion of a magnetic field pointing along the sensor, while the atomic magnetometers detect the total field strength, a desirable capability for many magnetic imaging and search applications. Superconducting quantum interference devices (SQUIDs) are more sensitive, but must be cryogenically cooled, making them substantially larger, power-hungry, and more expensive. "Magnetoresistive" devices like those used in heads that read computer hard drives are small and cheap, but are typically less sensitive and less accurate. A separate NIST research group has developed a new magnetoresistive magnetic sensor.

The research was funded by the U.S. Defense Advanced Research Projects Agency (DARPA-MTO).

*Lifesaving Water Filter, from page 2*

Coal ash is composed of particles that measure between 1 and 10 microns in diameter, much smaller than a 100-micron-diameter human hair.

This means that even a small volume of the powder boasts a lot of surface area, maximizing the opportunity for surface reactions to snare arsenic.

After obtaining some ash from India, he assembled Team Arsenic, which includes fellow LBNL scientists Lara Gundel, Yanbo Pang, Christie Galitsky, Duo Wang, and Anna Blumstein. They developed a way to coat each ash particle with ferric hydroxide, a chemical that reacts with arsenic and forces the element to precipitate onto the particle.

Initial tests indicate this specially treated coal ash makes a very powerful filter. After spiking lab water with so much arsenic that its concentration soared to an extremely toxic 2400 parts per billion (ppb), the filter lowered the water's arsenic concentration to 10 ppb. The Bangladeshi standard for safe drinking water is 50 ppb.

Gadgil estimates that five grams of this material could render about three gallons of Bangladeshi well water — with an average arsenic concentration of 400 ppb — safe to drink.

Closer to home, the California Energy Commission's Public Interest Energy Research program recently awarded Gadgil $250,000 to explore whether a variation of this technique can help the state comply with an Environmental Protection Agency rule effective in 2006 that tightens the U.S. arsenic drinking water standard from 50 ppb to 10 ppb. Currently, 600,000 California residents consume water with concentrations above 10 ppb.

Currently, the cost of arsenic removal at small municipal water systems ranges from $58 to $327 per household per year. Gadgil estimates his method would cost less than $1 per household per year, not including the one-time cost of the reactor for removing the arsenic from water.



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