

## T2 INSIDE

NASA, Google  
Create Virtual  
Exploration **2**

SPAWAR's  
Medical  
Microsensor **3**

Addressing the  
Shortage of  
Scientists **6**

## T2 EVENTS

FLC Midwest Regional Meeting  
Bloomington, Ind.  
August 18-20, 2009

FLC Northeast  
Regional Meeting  
Princeton, N.J.  
September 14-16, 2009

FLC Mid-Atlantic  
Regional Meeting  
Gettysburg, Pa.  
September 15-17, 2009

2009 ACRM-ASNR  
Joint Educational Conference  
Denver, Colo.  
October 7-11, 2009

ISPIM Innovation Symposium  
New York, N.Y.  
December 6-9, 2009

## T2 FACT

In 1850, when Joel Houghton patented a wooden machine with a hand-turned wheel that splashed water on dishes, it was hardly a workable machine, but it was the first patent. In 1886, Josephine Cochran proclaimed in disgust, "If nobody else is going to invent a dishwashing machine, I'll do it myself." And she did. Cochran invented the first practical (did the job) dishwasher. She founded a company to manufacture these dishwashers, which eventually became KitchenAid.

- Mary Bellis, About.com



Sean Smith

### Astronaut Safety

The Max Launch Abort System (MLAS) test vehicle features fixed fins and drag plates to inexpensively, yet effectively, simulate deployable fins or other aerodynamic devices that would be used on an operational launch vehicle. Pictured to the left is the MLAS that will be launched July 8 at NASA's Wallops Flight Facility, Wallops Island, Va.



July 2009

# FLC NEWSLINK

The Newsletter of the Federal Laboratory Consortium for Technology Transfer

## NASA GIVES ASTRONAUT SAFETY MAX ATTENTION

by Keith Henry and Rebecca Powell

NASA's next generation of spacecraft will have the safest-ever astronaut escape system, a modern-day version of the reliable Apollo system.

Like Apollo, the Orion launch abort system will swiftly propel the crew capsule away from the nose of the Ares I rocket and out of harm's way in case of an emergency on the launch pad or during ascent to orbit.

Also—as was the practice at times during development of key Apollo elements—while

NASA engineers are working on the Orion launch abort system, another NASA team is investigating an alternate launch abort concept.

The alternate system, called Max Launch Abort System (MLAS), was successfully tested in a simulated pad abort test at NASA's Wallops Flight Facility, Wallops Island, Va., July 8.

MLAS was named after Maxime (Max) Faget, a Mercury-era pioneer. Faget was the designer of the Project Mercury capsule and holder of the patent for the "aerial capsule emergency

separation device," commonly known as the escape tower.

The unpowered test was part of an assessment by the NASA Engineering and Safety Center (NESC) of a potential alternate launch abort system concept that could be used for future piloted spacecraft. The prototype, used in the test to evaluate the means to safely propel a spacecraft and its crew from an errant rocket, represents a departure from the tower launch abort

See *Astronaut Safety*, page 4

## FUEL EMISSIONS LAB ENTERS NEW AGE FOR VEHICLE INSPECTION AND MAINTENANCE



Joe Gray is the director of Berkeley Lab's Life Sciences Division and Associate Laboratory Director for Life and Environmental Sciences.

The second generation of onboard diagnostic (OBD) technology has been

required by the Environmental Protection Agency (EPA) on light-duty vehicles and trucks (LDV/Ts) since 1996 model year (MY) vehicles.

OBD is designed to monitor, detect and indicate faults in critical emission control components/systems and emission-related components.

Inspection and maintenance (I/M) programs are currently present in 36 states in the U.S., the British Columbia and Ontario provinces in Canada, and in several European Union countries. As a result of increasingly stringent emission standards, OBD has been implemented

See *Vehicle Inspection*, page 4

## NREL AND FORD TEAM UP TO DEVELOP "COOL" CARS

by Heather Lammers

"Summer in the city" means settling into a hot car, cranking the air conditioning, and hoping the sun will duck behind a cloud while you wait to cool off.

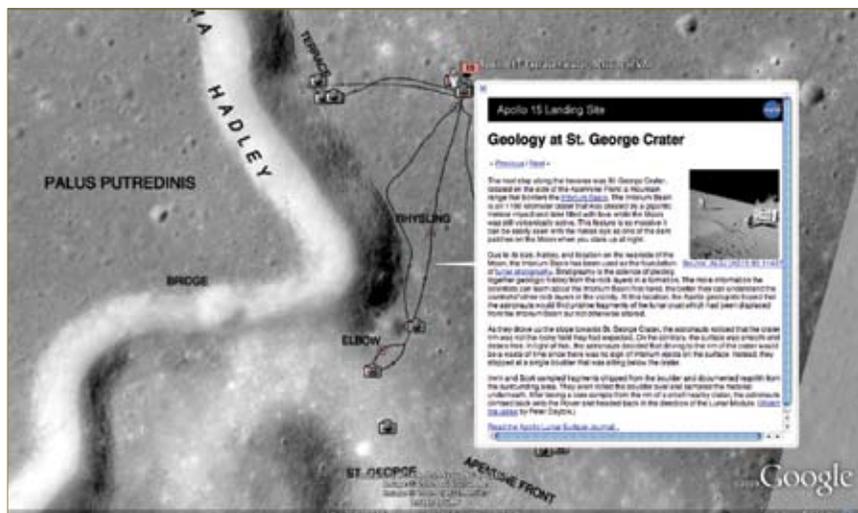
What you may not know is how much energy and gasoline it takes to cool a sun-soaked automobile on a hot summer day.

A 2002 National Renewable Energy Laboratory (NREL) analysis discovered that the U.S. uses 7 billion gallons of fuel per year for light-duty vehicle air conditioning.

See *NREL, Ford*, page 5

# FED LABS FLASH | NEWS FROM AROUND THE CONSORTIUM

## NASA AND GOOGLE LAUNCH VIRTUAL EXPLORATION OF THE MOON



Entries from the Apollo lunar surface journal are embedded as pop-up windows for all Apollo crew traverses. Shown here is an entry from the Apollo 15 mission.

Forty years ago on July 20, 1969, the world watched as the crew of Apollo 11 took the first steps on the surface of the moon.

To celebrate this historic occasion, NASA and Google announced the launch of the Moon in Google Earth, an interactive, 3D atlas of the moon,

viewable with Google Earth 5.0.

The announcement was made during a press conference at the Newseum in Washington, which featured remarks by Apollo 11 astronaut Buzz Aldrin; Alan Eustace, a Google senior vice president; Andrew Chaikin, author and space historian; and Anousheh Ansari, the first

female space tourist. With the Moon in Google Earth, users can explore a virtual moonscape, follow guided tours from astronauts Buzz Aldrin and Jack Schmidt, view high-resolution “street view” style panoramic images, and see previously unreleased footage captured from the lunar surface.

Whether rediscovering iconic moments from the history of lunar exploration or learning about them for the first time, the Moon in Google Earth enables users to better understand the moon and mankind’s relationship to it using an immersive, 3D experience.

The result of a close collaboration with NASA, the Moon in Google Earth showcases current and historic content about the moon. All NASA data sets used in the Moon in Google Earth are included on a nonexclusive basis.

“Today’s announcement builds on the ongoing relationship with Google that Ames Research Center initiated in November 2006, when we signed a Space Act Agreement to foster collaboration with our Silicon Valley neighbor,” said

S. Pete Worden, director of NASA’s Ames Research Center at Moffett Field, Calif. “We’re excited to be a part of this latest chapter in Google’s efforts to bring virtual exploration of the moon to anyone with a computer.”

## FAA SAFETY FORUMS

On July 21, the FAA held the first meeting in what will be a series of 12 nationwide regional airline safety forums to reduce risk at regional airlines. “I’m pleased to report that airlines and unions are responding positively to the recent Call to Action from Secretary of Transportation Ray LaHood and me to push safety initiatives forward now,” said FAA Administrator Randy Babbitt. The forum was attended by 65 safety executives representing airlines and unions. The discussions focused on air carrier management responsibilities for crew education and support, professional standards and flight discipline, training standards and performance, and mentoring. The FAA will collect effective airline best practices and innovative ideas.

## NIH CENTER FOR INTERVENTIONAL ONCOLOGY OFFERS VENUE FOR COLLABORATIONS

A new Center for Interventional Oncology has been established at the National Institutes of Health Clinical Center (CC). It offers new and expanded opportunities to investigate cancer therapies that use imaging technology to diagnose and treat localized cancers in ways that are precisely targeted and minimally or noninvasive.

The center is a collaboration involving the CC, NIH’s clinical research hospital in Bethesda, Md., the National Cancer Institute, and the National Heart, Lung, and Blood Institute.

Bradford Wood, M.D., a CC senior investigator, is chief of the new center. “The Center for Interventional Oncology will help foster advances in an emerging field for minimally invasive, image-guided methods for treating localized

cancers,” he said. “It will also help bridge the gap between emerging technology and the everyday practice of medicine. Advanced imaging methods have ushered in an era of early detection of cancers that are frequently localized to a single organ. Today, oncology treatments typically use systemic therapies such as chemotherapy, surgery, and radiation, which are well-suited for widespread disease, but may also cause widespread side effects.”

The new center is intended to provide a forum for and encourage collaborations among research and patient-care experts in medical, surgical, and radiation oncology and interventional radiology, noted John I. Gallin, M.D., CC director. “The Clinical Center provides an exceptional environment for this type of collaborative research and patient care.”

## GEOINT TECHS SHOWCASED

Government and industry representatives showcased their latest technology at this year’s fifth annual Geospatial Intelligence (GEOINT) Technology Days, June 2-4. Co-sponsored by the National Geospatial-Intelligence Agency (NGA) and the U.S. Geospatial Intelligence Foundation (USGIF), the Tech Days demonstrations displayed the latest developments of advanced geospatial intelligence and offered a comprehensive look at technologies industry and government are developing for the GEOINT community.

More than 1600 industry and government representatives attended the event during the three-day period. NGA is a Department of Defense combat support agency and a member of the national intelligence community. The agency’s mission is to provide geospatial intelligence.

## FLC NewsLINK

FLC NewsLink is published 11 times a year by the Federal Laboratory Consortium for Technology Transfer and the FLC Communications Committee.  
FLC Communications Co-Chairs:  
Al Jordan & Sara Miller  
Layout & Design: Tom Grayson  
Copy Editor: Denise Bickmore  
Staff Contributor: Lauren Pafumi  
Subscriptions: tgrayson@utrs.com  
Article submissions: tgrayson@utrs.com

*Opinions or views expressed in FLC NewsLink are those of the contributors and do not necessarily reflect those of the FLC, its officers, or its representatives.*

FLC Headquarters  
1001 Connecticut Ave., NW, Suite 735  
Washington, DC 20036  
202-296-7201

FLC NewsLink  
950 North Kings Highway, Suite 208  
Cherry Hill, NJ 08034  
856-667-7727 856-667-8009 fax  
www.federallabs.org

# TECH WATCH | LABORATORY TECHS READY FOR TRANSFER

## CATIONIC POLYMERS

Researchers at Los Alamos National Laboratory (LANL) have developed a new class of stable, water-soluble cationic polymers that possess quantum yields of 14% in water, among the highest ever reported.

The straightforward synthesis of these conjugated polymers and their stability in water make them good candidates for chemical and biological sensor applications. The sensitivity of these polymers to pH in the range between 6 and 7, and the tunability that they exhibit make them ideal candidates for dynamic biological sensing applications. LANL is seeking partners interested in licensing this technology.

### Applications

- Polyelectrolyte self-assembly
- Chemical sensors
- Biological sensors
- LEDs

### Advantages

- Facile synthesis
- Good yield
- Low cost
- High quantum efficiency

Available both exclusively and nonexclusively

More info: David Pesiri, 505-665-7279, pesiri@lanl.gov

## NCI ANTIBODY LIBRARY

Invented by National Cancer Institute inventors Dimitar S. Dimitrov and Weizao Chen, and available for licensing and commercial development, is a highly diverse domain antibody (dAb) library providing antibodies that bind with high affinity to a variety of antigen targets. Antibody diversity is inherently limited by using only three CDRs of either light chain variable domain (LCDRs) or heavy chain variable domain (HCDRs).

This novel dAb library is designed using light chain variable domain 3 (LCDR3) and heavy chain variable domain (HCDR3), which are of primary importance for creating binding site diversity in the human immune system. The library contains 2.5 x 10<sup>10</sup> dAbs. Human naturally occurring LCDR3s were grafted onto HCDR1 of m0.

These antibodies are of very small size (15-17 kDa), high stability and can be expressed at high levels as monomers. The library can be used for the selection of antibodies to any antigen, including cancer and viral antigens, and exhibit such properties as good penetration, stability, solubility, high levels of expression (at potentially low cost), and low level of immunogenicity or toxicity.

More info: Michael A. Shmilovich, Esq.; 301-435-5019; shmilovm@mail.nih.gov

## MEDICAL MICROSENSOR FOR MONITORING SHOCK AND TISSUE HEALTH

Assessing the condition of a patient in order to provide optimal care requires quick detection of vital signs, especially when treating shock. Patients with severe injuries or with diabetes in a low-sugar state are subject to hemorrhagic and hypoglycemic shock, respectively, which are life-threatening conditions.

Monitoring the severity of these conditions at home, in the field, or in transport to medical care is difficult because of the number and type of instruments required. Currently, the two methods used to monitor shock are invasive and may negatively impact the patient's health.

Additionally, in combat and accident scenarios, the removal of dead tissue may be necessary to save the patient's life.

The current procedure to test the viability of tissues is inaccurate and often leads to needless removal of viable tissue. Overcoming these invasive and inaccurate methods is critical to improving a shock victim's chance of survival.

Space and Naval Warfare Systems Center Pacific (SPAWAR Pacific) has developed a handheld medical



A pH reading is used to monitor shock and test viability of tissue.

microsensor device for digitally monitoring and rapidly processing the medical condition of a patient vulnerable to shock or tissue damage in order to deliver optimal patient care.

The technology consists of a single subdural microprobe with multiple sensors for simultaneously measuring/monitoring pH, blood gases and temperature; detecting

the presence of severe infection in the body; as well as providing information on a patient's vital signs used to identify heart and kidney failure.

The microprobe communicates wirelessly with an electronic reader for real-time monitoring.

Another application of the sensor is monitoring tissue pH for assessment of tissue health where severe injury or frostbite has occurred.

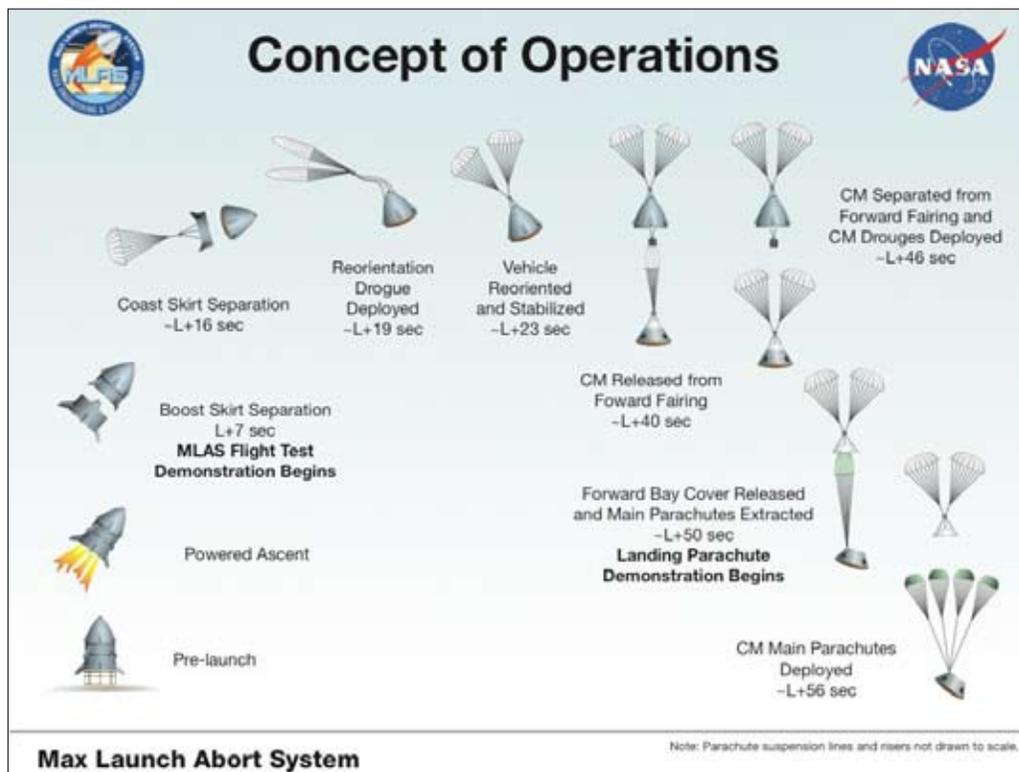
For more information, contact Darin D. Oelkers, TechLink, 406-994-772, darin@montana.edu; Dan Swanson, TechLink, 406-994-7736, dss@montana.edu; or Stephen Lieberman, SPAWAR Pacific, 619-553-2778, t2@spawar.navy.mil.

**FLC Technology Locator**  
*Personalized 1:1 Assistance!*

*Need assistance locating information on federal technologies, federal laboratory expertise, or collaboration possibilities?*

*Contact the FLC Technology Locator,  
Frank Koos, at 856-667-7727*

Astronaut Safety, from page 1



system used during Apollo launches and retained for the Constellation Program. A primary objective of the MLAS test is to provide the NASA workforce with additional direct implementation experience in flight testing a spacecraft concept useful in the Agency's future efforts to design, optimize and test spacecraft.

The bullet-shaped MLAS concept will not replace the Orion abort system.

NASA's Constellation Program has three years toward designing the Orion crew exploration vehicle and the Ares launch vehicles that will return humans to the moon to live and work. The spacecraft designs are based on the technical principles established during the Apollo and Space Shuttle programs—yet they incorporate the latest technology to expand the spacecraft's operational flexibility. The Orion launch abort system offers a proven method of pulling the crew out of danger in the event of an emergency on the launch pad or during the climb to Earth orbit.

MLAS is of potential interest because it is theorized to have aerodynamic

performance benefits, weight savings and be relatively simple in some spacecraft applications. Much of the potential gains would be accomplished by eliminating the launch abort tower, which also means eliminating the attitude control motors.

The MLAS demonstration vehicle consists of a full-scale composite fairing, a full-scale crew module simulator and four solid rocket abort motors mounted in the boost skirt with motor mass simulators in the forward fairing. Test items of interest began at the seven-second mark with burnout of the solid motors.

The test is primarily a demonstration of unpowered flight along a stable trajectory, MLAS vehicle reorientation and stabilization, followed by crew module simulator separation from the MLAS fairing, stabilization and the parachute recovery of the crew module simulator.

Data from the MLAS pad abort test has the potential to help the Orion Project in several ways. MLAS is the first demonstration of a passively stabilized launch abort system on a vehicle in this size and weight class.

It is the first attempt to acquire full-scale aero-acoustic data—the measurement of potentially harmful noise levels due to the capsule moving through the air at high speeds—from a faired capsule in flight. It also is the first to demonstrate full-scale fairing and crew module separation and to collect associated aerodynamic and orientation data. In addition, data from the parachute element will help validate simulation tools and techniques for Orion's parachute system development.

The NESAC, located at NASA's Langley Research Center, Hampton, Va., is an independently funded NASA program that draws on technical experts from across all NASA centers to provide objective engineering and safety assessments of critical, high risk projects.

NESAC partners in the MLAS effort include Northrop Grumman Corporation. The company developed and produced the MLAS composite fairing, fins, drag plates, and motor cage structure. Company personnel based in Wallops Island, Va., performed the structures and mechanism assembly, as well as provided vehicle integration and flight test support. Northrop Grumman's subcontractor, Ensign Bickford Aerospace and Defense, Simsbury, Conn., provided pyrotechnic separation system mechanisms. Jacobs Technology, Tullahoma, Tenn., and partner Airborne Systems, Santa Ana, Calif., provided landing systems design and support.

Wallops contractors who supported the demonstration include Hawk Institute for Space Sciences, Computer Sciences Corporation, VT Griffin and Honeywell Technical Solutions, Inc.

For images and video, visit: [www.nasa.gov/centers/wallops/missions/mlas.html](http://www.nasa.gov/centers/wallops/missions/mlas.html).

Vehicle Inspection, from page 1

in existing I/M programs to replace traditional, tailpipe emission measurement equipment. This paradigm shift represents an opportunity to streamline I/M programs further by conducting remote vehicle inspections of OBD-equipped vehicles.

To support its I/M stakeholders, the EPA's Office of Transportation and Air Quality (OTAQ) examined the possible methods of performing remote vehicle inspections: cellular- or satellite-based, long-range data transmission; wireless, short-range data transmission; and a portable, plug-and-play device.

Based on this examination, the EPA-OTAQ determined that the plug-and-play device option needed to be examined further, since other options have previously been or are being explored.

As a result, the EPA-OTAQ's National Vehicle and Fuel Emissions Laboratory (NVFEL) collaborated under a Cooperative Research and Development Agreement (CRADA) with Davis Instruments, Inc., a U.S. company based in Hayward, California, to develop a portable, plug-and-play OBD device. Based on Davis Instruments' Carchip, an OBD-compatible flight recorder, NVFEL and Davis Instruments created the Carchip Green, which is designed to retrieve and transfer OBD I/M parameters needed to perform remote OBD I/M vehicle inspections.

Carchip Green connects to the standardized OBD connector on all OBD-equipped vehicles and collects the status checks (i.e., readiness status), the condition (i.e., pass or fail), and the presence of fault codes for the monitored emission control components/systems.

Carchip Green can be connected to a desktop or laptop computer with resident Carchip software to retrieve, format, store and transmit the OBD I/M-related data.

There are several possible scenarios for implementation of Carchip Green into existing OBD I/M programs:

- Point-to-point delivery
- Third-party distribution
- Wireless access point.

Carchip Green is anticipated to significantly enhance OBD I/M programs by reducing administrative costs while increasing public convenience, fleet coverage, and acceptance of OBD I/M programs and remote vehicle inspections.

## RESEARCH & DEVELOPMENT FUNDING ON POSITIVE TRACK

by Gary Jones, FLC Washington, DC Representative



Greetings from D.C.

"I have made it a priority of this committee to get a comprehensive reauthorization bill to the President's desk before July 31st." Thus spoke Senator Mary Landrieu (D-La), Chair of the Senate Committee on Small Business and Entrepreneurship, in early June on the topic of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) reauthorization. By the time this column goes to press (it was written in early June), we will know if the committee has succeeded. If so, you can stop reading, the following will be moot; if not, then that means the SBIR reauthorization journey continues.

The SBIR and STTR programs were established in 1982 and 1992, respectively, to support innovative research by U.S. small businesses and must be reauthorized periodically. Without reauthorization, SBIR expires July 31 and STTR at the end of FY09.

One of the sticking points in the reauthorization process has been the extent to which venture capitalists (VCs) (or VC-backed small businesses) might participate in the programs.

Since 2002, guided by a policy directive from the Small Business Administration (SBA), small businesses in which VCs have a controlling interest have effectively been excluded from the SBIR program. There has been much debate during reauthorization on the issue of whether VCs should be allowed "back in," as well as the impact of their exclusion on the effectiveness of the SBIR program generally.

Several recent actions highlight this issue and may give some clues about where the debate (i.e., legislation) is headed.

In May, the National Research Council (NRC) released a study looking at the impact of the 2002 SBA policy directive on the SBIR program at the National Institutes of Health (NIH) (arguably, the agency where the VC issue has greatest impact). Venture Funding and the NIH SBIR program conclude that "consideration should be given either to restoring the de facto status quo ante eligibility requirements for participation in the SBIR program or to making some other adjustment that will permit the limited number of

majority venture funded firms with significant commercialization potential to compete for SBIR funding." Senator Landrieu responded that the study will "provide us another source of information to consider as we make difficult but vital decisions around SBIR reauthorization."

On June 4, Senator Landrieu's committee hosted a roundtable on SBIR reauthorization. As reported by the Kauffman Foundation, after considerable back-and-forth, "[T]he final suggestion from [Dr. Charles Wessner], which was supported by many others at the roundtable, was to reauthorize the programs, allowing all firms access to funds, no matter how they are backed, and for agencies to have the discretion of who ultimately receives these funds rather than the legislature."

Add to this the fact that two top positions at SBA have been filled (or are about to be) by former venture capitalists; actions leading *The Wall Street Journal* to suggest that this might possibly have "sealed the deal for venture capitalists who are hoping the SBIR program broadens its policy to include venture-backed companies."

Of course, the relevant House committees will have their say on the VC and other issues before a final reauthorization bill makes it to the President's desk; but, the discussion does seem to be headed toward the finish line.

As stated above, this column may be moot by the time it goes to press—on the other hand...maybe not.

Venture Funding and the NIH SBIR Program can be found at ([http://www.nap.edu/catalog.php?record\\_id=12543](http://www.nap.edu/catalog.php?record_id=12543)); the Kauffman Foundation blog at (<http://entrepreneurship.org/PolicyForum/Blog/post/2009/06/05/SBIRSTTR-Reauthorization-Focus-of-Roundtable-Discussion.aspx>); and *The Wall Street Journal* blog at (<http://blogs.wsj.com/venturecapital/2009/05/22/obamas-sba-nomination-nods-in-favor-of-vc-industry/tab/print/>).

Gary can be reached at [gkjones@federallabs.org](mailto:gkjones@federallabs.org).

*NREL, Ford, from page 1*

It takes roughly 9.5 percent of U.S. imported crude to produce this much gasoline.

"When operating the air conditioning system to cool down your car, it is the largest auxiliary energy drain on cars today," said Senior Engineer John Rugh. "If we can lessen the amount of fuel used to power A/C, we can realize significant reductions in our oil and fuel usage."

In December 2008, a project to study and develop high-efficiency thermoelectric heating and cooling systems for cars was announced by the Department of Energy (DOE). As partners in the project, NREL will team up with Ford to research efficient ways of cooling vehicles based on the science of thermoelectrics. This public-private collaboration is possible thanks to a Cooperative Research and Development Agreement (CRADA).

NREL is a key partner in the Ford CRADA because NREL has been working for years to understand how cooling techniques affect fuel use, as well as thermal comfort. NREL has key knowledge and tools in the thermoelectric cooling system research.

Imagine sitting your car under a row of the intense lights typically used to illuminate sports

stadiums — just to see how hot your car can get. That's essentially what happens to a passenger car in NREL's Vehicle Climate Control Laboratory (VCCL).

The VCCL was developed to simulate the heating that takes place as the passenger cabin is exposed to sunlight, changing temperatures and humidity — all while the cabin interior is cooled using an air-conditioning system monitored by sensors linked to a computer.

"The reason the VCCL is such a great lab is that we can consistently create the effects of the sun warming a car, study the climate that is created and repeat as needed," Rugh said.

But having a warm car is only half the equation. It doesn't matter how hot it gets as long as no one needs to be in the car.

Meet ADAM, the VCCL's most sophisticated test subject. ADAM, the ADvanced Automotive Manikin, is basically a human-sized sensor that measures heat at 120 independently controlled zones. As ADAM "sweats" or "shivers," corresponding data go into a computer model that simulates human responses.

"ADAM is an ideal test subject because we don't have the safety issues of exposing a living person to the heat of a car and because he's very consistent. We can repeat tests all day long without him getting tired," Rugh said.

The physiological model that controls ADAM is linked to another NREL computer model that predicts human comfort in various temperature settings. Working with researchers at University of California, Berkeley, NREL developed a way to translate data into

*See NREL, Ford, page 8*



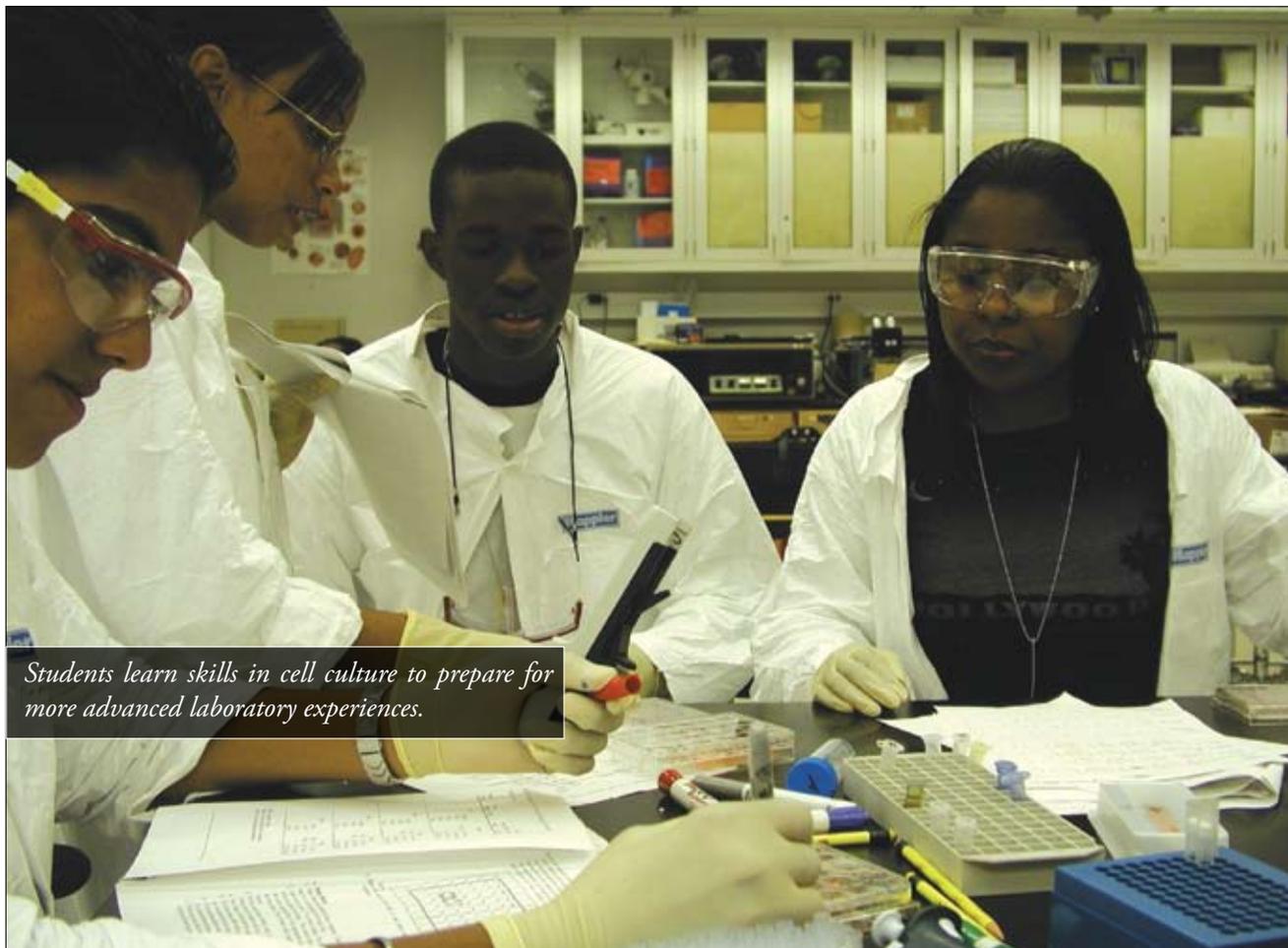
*NREL Engineer Charlie King works with ADAM, the ADvanced Automotive Manikin. If the research proceeds as planned, ADAM will be used to help determine how to cool the people in the car rather than cooling the car itself.*



**FLC Technology  
Transfer Desk  
Reference**

*Order your copy (\$5)  
Call the FLC at  
856-667-7727*

# WALTER REED ARMY INSTITUTE OF RESEARCH ADDRESSES THE SHORTAGE OF AMERICAN SCIENTISTS AND ENGINEERS



*Students learn skills in cell culture to prepare for more advanced laboratory experiences.*

Even research-consuming federal scientists can come to the realization that young U.S. citizens seem little interested in science, technology, engineering and mathematics (STEM), that the scientific community is not representative of a diverse population, and that there will likely be few young U.S. citizen-scientists to someday take their places.

Pride in our nation and its accomplishments encourages us to come up with a sound solution. The USA faces an enormous shortage of scientists and engineers in the future due to a lack of effective introduction of science and mathematics to all students during important formative periods in their educations. It's clear that large student populations no longer have mentors to guide their young students to careers in STEM fields. A vocation for a STEM

career does not come from one museum exhibit, from a tour of a federal research laboratory, or from participation in a career fair. Rather, it comes from carefully designed and continuing hands-on, inquiry-based science modules and authentic research/laboratory experiences that build in content and experience. Beginning over 15 years ago and with several existing tools and lots of energy and ideas for new interventions, scientists at the Walter Reed Army Institute of Research (WRAIR) created the following paid student research internships, which are capable of developing the talent extant in all young people.

- Gains in the Education of Mathematics and Science (GEMS)
- Science and Engineering Apprentice Program (SEAP)
- College Qualified Leaders (CQL)

Designed at WRAIR under grants from the National Institutes of Health National Center for Research Resources (principal investigators Drs. Marti Jett and Debra Yourick), the GEMS program is now sustained by the U.S. Army Educational Outreach Program (USAEOP) and held in federal and university environments <www.usaeop.com>; GEMS is now offered elsewhere in the U.S. via USAEOP dissemination. Through careful evaluation, GEMS has been shown to effectively prepare diverse, less-advantaged, but enthusiastic middle/high school students for advanced STEM activities. The students are taught in a teaching laboratory by near-peer mentors (college students in the CQL program), who translate current research and scientific concepts into experiments suitable for GEMS students. Near-

peer mentors also act as much-needed and effective role models for the GEMS participants by encouraging them to take difficult science and math classes, and by enlightening them about college life and pathways to careers. The GEMS program builds student confidence and interest in increasingly more difficult and exciting summer experiences from one to four weeks in length over several years. The aim is that the most advanced GEMS program prepares students to participate in SEAP, an eight-week laboratory experience, or the CQL program, as much as years-long internships and teaching experiences that open up STEM career opportunities.



*Technology For Today*  
This annual publication highlights the technology transfer successes of federal laboratories.

*Order your free copy Today!*  
To order, call the FLC at  
856-667-7727

# LAB CLASSIFIEDS | AVAILABLE TECHNOLOGIES, FACILITIES, AND PARTNERS

## STORM WATER RUNOFF

The Naval Facilities Engineering Service Center has developed, tested and patented a storm water runoff treatment system that meets stringent military and government industrial site toxicity requirements.

The Navy system meets strict regulatory toxicity requirements in a cost-effective manner. The system is similar to a sand filter; however, instead of relying solely on sand, heavy metals (in particular, zinc and copper) are removed by a bed of special filter-absorption materials.

The Navy's storm water treatment system has consistently exceeded regulatory requirements, while the previous system met requirements only one-third of the time.

*More info:* Darin D. Oelkers, TeckLink, 406-994-7723, [darin@montana.edu](mailto:darin@montana.edu) or Kurt Buehler, Naval Facilities Engineering Service Center, 805-982-4897

## PYROTECHNICS

Pyrotechnics are used in a variety of applications, including fireworks and colored signal flares. The fireworks and signal flares currently available use perchlorate oxidizers to produce their desired colors, but residual perchlorates from pyrotechnic devices may leach into groundwater and cause widespread contamination, requiring remediation. The Naval Surface Warfare Center (NSWC), Crane Division has reformulated pyrotechnic compositions to remove perchlorate ingredients while maintaining good performance.

The perchlorate-free pyrotechnic composition eliminates objectionable perchlorate ingredients, avoiding costly cleanup.

*More info:* Kurt Rued, 406-994-7776, [krued@montana.edu](mailto:krued@montana.edu).

## PNNL'S BOTTLE SCREENING TECH

Pacific Northwest National Laboratory (PNNL) researchers have developed a new technology for detecting materials that can be used in transporting dangerous or illegal liquid and gels through checkpoints. PNNL's Container Screening Device (CSD) can be used across the full spectrum of screening stations by airport security screening specialists, customs and border patrols, law enforcement officers, and more. The technology uses sound waves to measure specific acoustic properties, allowing the operator to detect, classify, and discriminate benign liquids from substances such as liquid explosives, and hazardous and flammable liquids at security checkpoints.

In a three-month study, PNNL researchers successfully tested 181 liquid samples using a multi-property measurement method.

*More info:* Dave Greenslade, 509-375-6555, [David.Greenslade@pnl.gov](mailto:David.Greenslade@pnl.gov).

## NIST LASER POWER

The U.S. military can now calibrate high-power laser systems, such as those intended to defuse unexploded mines, more quickly and easily thanks to a novel nanotube-coated power measurement device developed at the National Institute of Standards and Technology (NIST).

A key innovation is the use of a sprayed-on coating of carbon nanotubes—tiny cylinders made of carbon atoms—which conduct heat hundreds of times better than conventional detector coating materials.

*More info:* Laura Ost, [laura.ost@nist.gov](mailto:laura.ost@nist.gov), 303-497-4880

## SEISMOMETER

Scientists at the U.S. Geological Survey (USGS) have developed a three-component borehole seismometer with leveling capability for use during earthquake site response studies.

The low velocity and high attenuation of weathered near-surface rocks strongly influence the amplitude and phase characteristics of seismic waves. Therefore, it is important for earthquake-source and seismic-shear-wave-polarization studies to place seismometers at depths below weathered rocks. Borehole seismometers can be used as elements of a seismic network for determining earthquake locations and magnitudes.

*More info:* Hsi-Ping Liu, 650-329-5643, [liu@usgs.gov](mailto:liu@usgs.gov)

## NIH CANCER TREATMENT

National Institute of Allergy and Infectious Diseases inventors David Dorward, Vinod Nair, and Elizabeth Fischer have developed an advanced process for microwave-assisted freeze substitution of biological and biomedical samples (MWFS). Freeze substitution fixation (FS) of hydrated samples frozen in vitreous ice provides exceptional preservation of structure for light and electron microscopy, and enables immunological detection of thermo-labile antigens that otherwise are damaged/destroyed by processing at ambient or elevated temperatures.

The invention utilizes controlled microwave (MW) irradiation to accelerate the FS process, and comprises systems, devices and methods for microwave-assisted processing of samples under cryo-conditions.

*Licensing Contact:* R.C. Tang, JD, LLM; 301-435-5031; [tangrc@mail.nih.gov](mailto:tangrc@mail.nih.gov)

## MRI INNOVATION

A further enhancement to diffusion MRI technologies is being offered by researchers at NIH. The invention proposes and claims an MRI method that is based on the measurement and acquisition of multiple pulsed field gradient (m-PFG) rather than the previously used single-pulsed field gradient (s-PFG) MRI sequences.

In particular, a double PFG (d-PFG) sequence offers higher sensitivity and greater robustness as it is more sensitive to the effect of "restriction", i.e., to water trapped within the axon's intracellular space.

*More info:* Dr. Uri Reichman, 301-435-4616, [UR7a@nih.gov](mailto:UR7a@nih.gov)

## SUBSURFACE MODELING

A software tool developed at Pacific Northwest National Laboratory (PNNL) over the past 16 years provides multidimensional modeling of subsurface flow and reactive transport phenomena for a growing list of applications of importance to the nation. STOMP—short for subsurface transport over multiple phases—was originally designed to support environmental remediation of subsurfaces contaminated with hazardous materials; it is now expanding into the energy field. Scientists and engineers from various disciplines have used STOMP in their subsurface analyses, exploiting its ability to save time and reduce costs by efficiently providing critical information. For example, the use of STOMP provided more effective recovery strategies for petroleum contaminants at the Brooklawn and Scenic sites near Baton Rouge, Louisiana.

*More info:* <http://availabletechnologies.pnl.gov/>

*NREL, Ford, from page 5*

corresponding human comfort levels, allowing researchers to surmise how cool a car will need to be for passengers to reach a base level of comfort.

#### ***NREL Looks at How to Take a Load Off***

NREL's Vehicle Ancillary Load Reduction team has previously evaluated technologies that reduce the amount of fuel used for automobile air-conditioning. NREL looks to improve vehicle efficiency and fuel economy by controlling the climate in a vehicle while keeping passengers comfortable.

The theory behind thermoelectric heating and cooling dates back to the 1800s, but only recently has it been eyed as a solution for cooling cars.

With no moving parts except the air blower, thermoelectric heating or cooling is achieved by providing an electric current to a thermoelectric unit. Heat can be generated or removed from the passenger compartment depending on the direction of the current. The conditioned air is directed where needed. Researchers believe this type of system has the potential to augment the traditional air-conditioning unit and reduce vehicle fuel use.

One critical benefit of reducing thermal loads is that occupants experience lower temperatures when entering a heated vehicle and therefore feel more comfortable. NREL's research has shown that certain technologies, such as solar-

reflective glass and parked-car ventilation, can significantly reduce thermal loads and fuel use. Cooling occupants through ventilated, cooled, or low-mass seats also shows the potential for energy savings.

This is why Rugh says that "all of these pieces — from our past research in load reduction, to the VCCL and ADAM — make NREL a strong partner in this CRADA, and we are excited to be helping move this research forward and hopefully someday change the way we cool our cars."

#### ***What Will Be Explored***

The FORD-NREL CRADA won't kick into high gear until this summer, but according to Rugh, some of the areas the research teams will be looking at are:

- analyzing and reducing overall thermal loads with respect to vehicle cooling
- looking at how the number of thermal electric devices in a car can be reduced to help reduce costs
- how to cool the people in the car rather than the car itself, possibly through strategic vent placement.

The research agreement is set up so that work is done in phases and key milestone will have to be met before the project can continue to the next level, which means ADAM may have a little waiting to do.

"At first we'll be working with Visteon and Ford to determine the best thermal comfort tools each partner has, and then we'll select the best ones for the project," Rugh said. "We won't get to use ADAM to test those ideas until the later phases of the project."






## Innovation at Work

Plan now to attend the leading event for those in the international scientific community who are building the future through discovery and innovation. Attend for the training, networking, and promotion of your research.

- ▶ NanoScience+Engineering
- ▶ Solar Energy+Applications
- ▶ Photonic Devices+Applications
- ▶ Optical Engineering+Applications

Connect with others in the field by attending SPIE Optics + Photonics 2009.

2-6 August 2009 | Exhibition: 4-6 August 2009  
San Diego Convention Center  
San Diego, California, USA

[spie.org/op](http://spie.org/op)



Left image: The USC Nanoscale. Courtesy of National Science Foundation.

PRRST STD  
U.S. POSTAGE  
**PAID**  
PERMIT #117  
SOUTHEASTERN PA  
19399

July  
2009

Published by the Federal Laboratory Consortium for Technology Transfer  
The Only Government-wide Forum for Technology Transfer

# FLC NEWSLINK