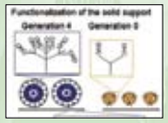
T2 INSIDE

30-Second Screening, page 2



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NREL's Solar Electricity, page 6

T2 EVENTS

21st Industry Growth Forum
Denver, Colo.
October 28-30, 2008

•

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

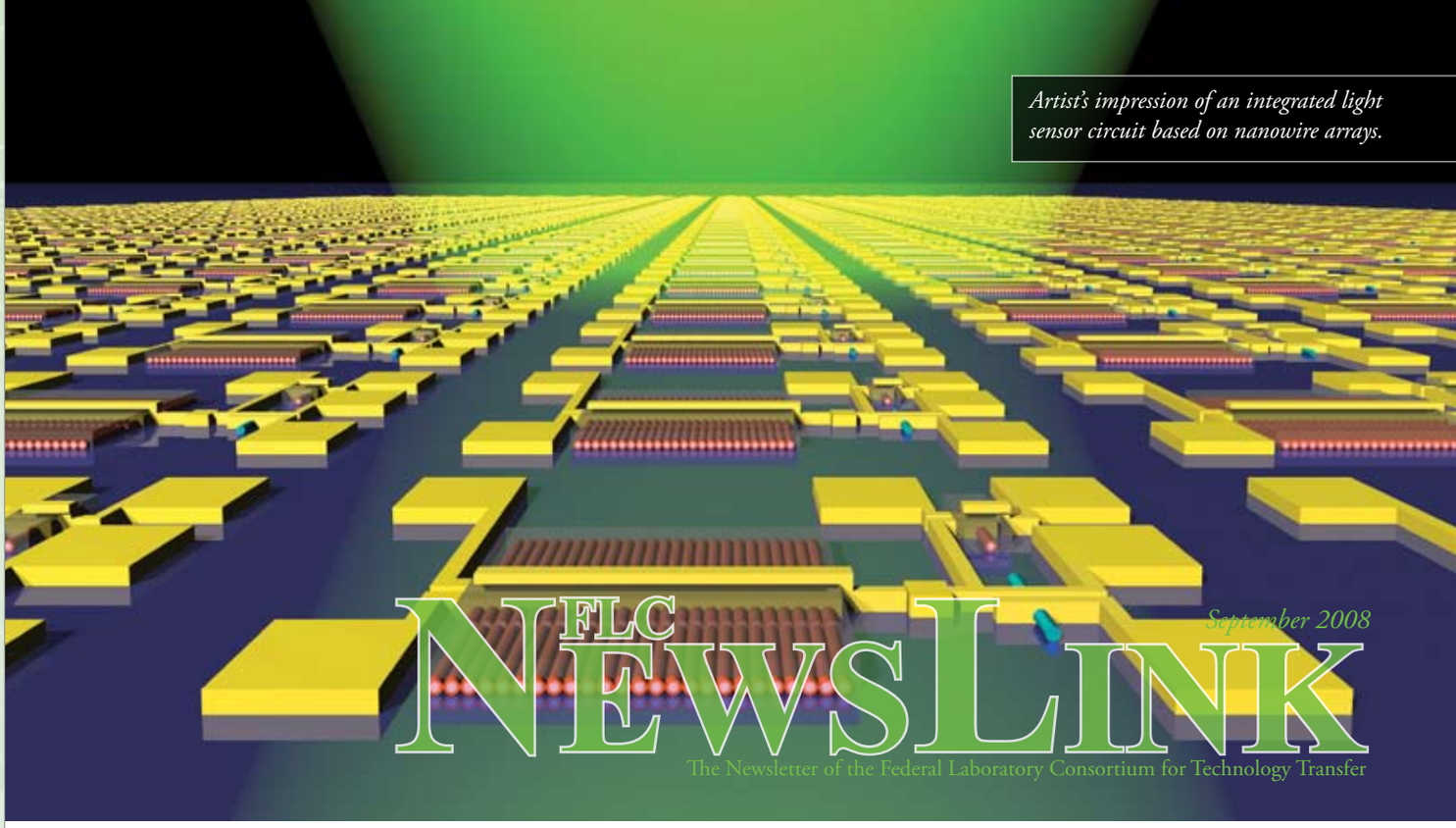
•

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

T2 FACT

In 1853, Levi Strauss, a 24-year-old German immigrant, left New York for San Francisco with a small supply of dry goods. A prospector wanted to know what Mr. Strauss was selling. When Strauss told him he had rough canvas to use for tents and wagon covers, the prospector said, "You should have brought pants!" Strauss had the canvas made into waist overalls. Miners liked the pants, but complained that they tended to chafe. Levi Strauss substituted a twilled cotton cloth from France called "serge de Nimes." The fabric later became known as denim, and the pants were nicknamed blue jeans.

- Mary Bellis, About.com



Artist's impression of an integrated light sensor circuit based on nanowire arrays.

FLC NEWSLINK

September 2008

The Newsletter of the Federal Laboratory Consortium for Technology Transfer

A First in Integrated Nanowire Sensor Circuitry

by Paul Press, LANL Public Affairs

Scientists at the U.S. Department of Energy's Lawrence Berkeley National Laboratory and the University of California (UC) at Berkeley have created the world's first all-integrated sensor circuit based on nanowire arrays, combining light sensors and electronics made of different crystalline materials.

Their method can be used to reproduce numerous such devices with high uniformity.

Nanostructures made with specific chemical, electronic, and other properties have a number of advantages over the same materials in bulk. For example, a nanowire is an ideal shape for a light detector; being virtually one-dimensional, practically "all surface," a nanowire is not only highly sensitive to light energy, but its electronic response is greatly enhanced as well.

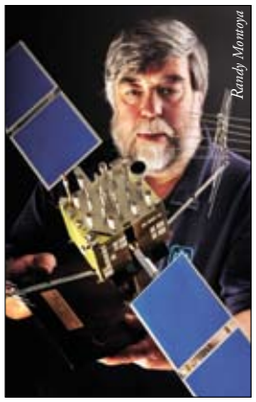
To be practical, however, the photosensors must be integrated with electronics on the same chip.

And the materials that make an ideal photosensor are necessarily different from those that make a good transistor.

"Our integration of arrays of nanowires that perform separate functions and are made of heterogeneous substances—and doing this in a way that can be reproduced on a large scale in a controlled way—is a first," said Ali Javey, who led the research team.

Javey is a staff scientist in Berkeley Lab's Materials Sciences Division (MSD) and an assistant professor in the Electrical Engineering and Computer Sciences Department at UC Berkeley.

See Nano First, page 4



Sandia engineer Steve Yearout displays a 1/15 scale model of a NAVSTAR Block IIR GPS satellite.

Sandia Sends Sensors into Space to Detect Nuclear Blasts Globally

by Neal Singer, Sandia National Laboratories

Imagine you're in charge of a collection of sensors, flying information on one of 31 U.S. Air Force satellites in medium Earth orbit. The satellite itself is part of the Air Force's Global Positioning System, which lets truckers, hunters, and lost city drivers know exactly where they are. But from your point of view, the satellites are perfect platforms for a collection of sensors to detect and triangulate airborne or space-based nuclear explosions

See Sandia Space Sensors, page 5

Lab in the Spotlight: TARDEC

The Tank Automotive Research, Development and Engineering Center (TARDEC), part of the U.S. Army Research, Development and Engineering Command (RDECOM), headquartered at the Detroit Arsenal, Warren, Mich., is the nation's laboratory for advanced military automotive technology. TARDEC develops and integrates technology solutions to improve the effectiveness of the current Army force and realize the superior capability of the future force. With more than 50 component laboratories, TARDEC is home to one of the best collections of advanced vehicle and vehicle support systems research and testing laboratories in the world.

See TARDEC, page 6

Fed Labs Flash | *News From the Around the Consortium*

Keep Your Shoes, Step Inside; Your Scan Will Be Done in 30 Seconds

by Andrea Turner

Across the United States, passengers are entering a space age-looking machine that can detect objects hidden on their bodies.

The system, known as ProVision™, was developed at Pacific Northwest National Laboratory (PNNL) and is now in 10 airports; by 2009, the Transportation Security Administration (TSA) will install a total of 120 more systems in 21 airports.

"Using the millimeter wave technology in airports is one of the first significant changes we've made to checkpoint technology since the 1970s," said Ellen Howe, TSA's assistant administrator for strategic communications and public affairs. "The technology is being more broadly deployed in the airport environment because of its ability to detect materials that cannot be found by the walk-thru metal detector."

PNNL's millimeter wave technology was just a gleam in researcher Doug McMakin's eye in the 1980s.

By the early 1990s, he and a team developed a prototype that was tested at Seattle-Tacoma International Airport and demonstrated for companies in the U.S., Japan, Canada, and Israel.

It wasn't until 2002, however, that the technology actually moved toward the marketplace.

Battelle, which operates PNNL for the Department of Energy, licensed the patented technology to SafeView, Inc., a startup company formed in 2002 to commercialize the scanning technology into noninvasive security "portals."

In 2006, L-3 Communications acquired SafeView, Inc., and started selling the ProVision systems to TSA for use in airport screening.

By the end of 2008, 21 U.S. airports will have ProVision systems, and TSA will purchase and install 80 more in 2009.

"You can see the ear-to-ear grin on my scanned image," said Doug McMakin, one of the technology developers. "It's very gratifying to see your work in the marketplace, particularly when it's being used in public places and for important purposes like airport security."

The millimeter wave technology uses non-harmful, ultrahigh-frequency radio waves to penetrate clothing; the reflection off the body allows system operators to see hidden objects—even nonmetallic ones, which is just one of the advantages of the system.

Other advantages are its scanning speed (about 30 seconds) and the fact that it doesn't require person-to-person contact.

"I'd certainly prefer to be scanned rather than patted down," said McMakin.

NSA, DHS CAE-Rs

The National Security Agency (NSA) and the Department of Homeland Security (DHS) have designated the following universities as National Centers of Academic Excellence in Information Assurance Research (CAE-R) for the years 2008-2013:

- Auburn University
- Boston University
- Dartmouth College
- George Mason University
- Indiana University
- Johns Hopkins University
- Mississippi State University
- Missouri Univ. of Science & Technology
- North Carolina State University
- Northeastern University
- Oklahoma State University
- Polytechnic University
- Stevens Institute of Technology
- The George Washington University
- Pennsylvania State University
- University of Texas at Dallas
- University of California at Davis
- University of California, Irvine
- University of Illinois at Urbana-Champaign
- University of Maryland, Baltimore County
- University of North Carolina, Charlotte
- University of Pittsburgh
- University of Washington

Ohio Astronauts Celebrate NASA's 50th Anniversary

An all-star gathering of legendary American astronauts appeared in Cleveland August 29, 2008, to celebrate NASA's 50th anniversary. John Glenn, the first American to orbit Earth; Neil Armstrong, the first person to walk on the Moon; Jim Lovell, veteran of two Apollo missions; and Kathryn Sullivan, the first woman to walk in space, joined 15 other astronauts from Ohio.

The Ohio aerospace community hosted the event to celebrate 50 years of NASA innovation, inspiration, and discovery, the achievements of NASA's Glenn Research Center, and to salute Ohio's astronauts. Glenn, a former Ohio senator, was the honorary chairman of the event; veteran NBC News space correspondent Jay Barbaree, the only journalist to cover every manned space launch in the United States, was the keynote speaker.

Barbaree moderated "A Conversation with the Astronauts," during which the 19 astronauts in attendance reminisced about their spaceflight experiences. When asked about the courage it takes to be an astronaut, Lovell referred to the Apollo 13 mission that almost ended in disaster. "Sometimes when confronted with a problem that has no immediate solution, you must either summon the courage to continue or you're lost."

An all-star gathering of legendary American astronauts appeared in Cleveland, Ohio, Aug. 29, 2008, to celebrate NASA's 50th anniversary.

Dr. Woodrow Whitlow, director of NASA Glenn, was delighted to be among Ohio's most accomplished citizens. "I feel extremely lucky, as a boy from the suburbs of Detroit, to be able to sit at a table with the commander of Apollo 13, the first American to orbit Earth and the first man to set foot on the Moon."

FLC NewsLink

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Tech Watch | *Laboratory Techs Ready for Transfer*

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.

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. Additionally, the inventors discovered that this regulation requires interaction with thrombospondin-1's cell receptor CD47. Murine studies revealed that in the presence of NO, genetically altered mice, lacking either thrombospondin-1 or CD47, showed dramatically improved blood flow and tissue oxygenation. 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.

Applications

- Precise regulation of blood flow to tissues and organs.
- Increasing tissue survival under conditions of trauma and surgery.
- Treatment of elderly subjects using agents that affect thrombospondin-1 and CD47 and thereby affect tissue perfusion.
- Methods for treatment of ischemia/reperfusion injury as associated with transplant surgery.

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

Simulation Generator

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, then allowed to practice solo.

The process for creating such interactive instruction has been very expensive and time-consuming. To reduce time and cost, Idaho National Laboratory has created a tool called SimGen.

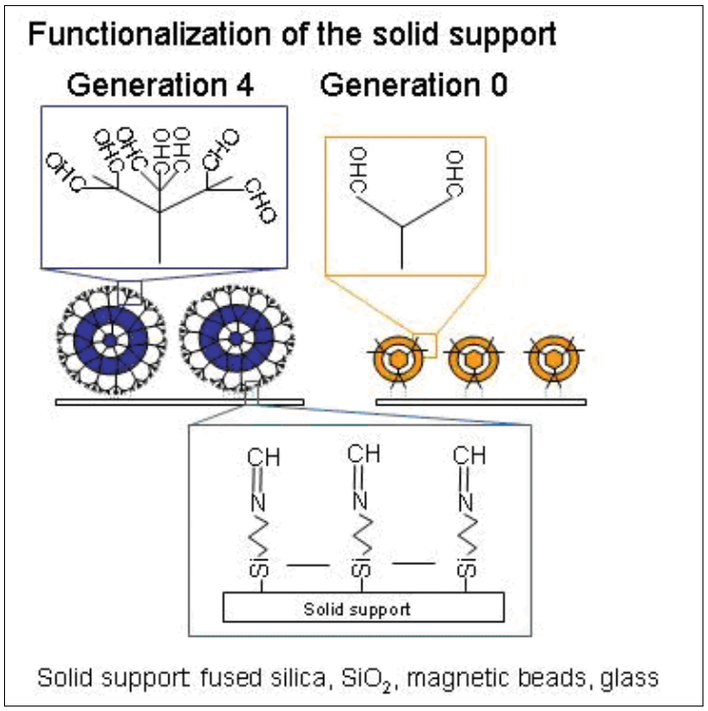
Simulation training created using SimGen is currently being coupled with standard web-based overview tutorials to provide training for a large-scale software implementation.

More info: Charity Follett, 208- 526-9353

Magnetic Bead-Based Solid Phase for Extraction of 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 the 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. Use of variable branched dendrimeric linker systems enables the performance to be tailored for specific targets. 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.



Nano First, from page 1

He and his colleagues reported their work in the August 1 edition of *Proceedings of the National Academy of Sciences* (PNAS).

Printed arrays

To grow a crystalline material on another crystalline material is difficult if the crystal lattices of the two materials are highly mismatched. Lattice matching is a particular challenge when more than one kind of material must be assembled on the same substrate. While many nanowire devices involving circuitry have been created over the years, these have required carefully selected substrates and specialized assembl—devices that are virtually one of a kind.

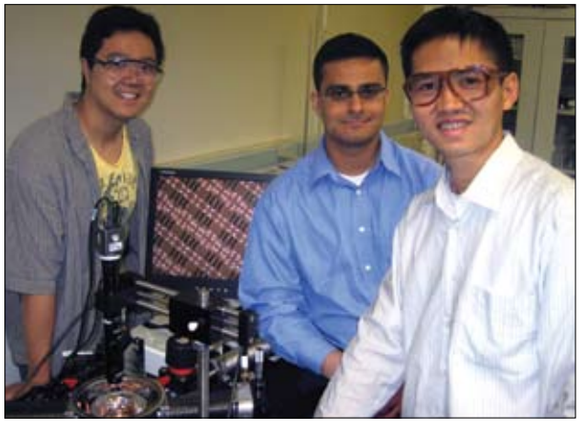
"Our main objective is a route toward integrated nanowire arrays that we can produce on any substrate—even paper!—and to reproduce them uniformly on a large scale," Javey said. "To do that, over the past two years our group has developed methods of printing nanowire arrays. After first growing the nanowires on a donor substrate, we transfer them to any desired substrate, including paper or plastic."

The Javey group has devised two printing methods, contact and roller. The roller method involves growing nanowires on the surface of a cylinder and rolling it across the application substrate, like painting with a paint roller.

Contact printing involves growing nanowires on a flat substrate, inverting it, and pressing it onto the desired substrate. Then the nanowires are detached by sliding the growth substrate away, leaving them attached to the application substrate.

Due to the lack of strong surface chemical interactions between nanowires, the process is self-limited to the transfer of only one layer of nanowires. The printed nanowires are highly aligned in the direction of the sliding. "This has an added advantage," Javey said. "Nanowires grow sticking out in random directions; they look like a bad hair day." But directionally sliding the array off the growth substrate, Javey said, "is like combing the hair to make it stand up straight."

This is a particular advantage because nanowire electronics need to be aligned for uniform performance. In the case of nanowire photosensors, alignment is essential for consistent response both to the intensity (brightness) of light and to its polarization, since the one-dimensional wires respond differently to polarization depending on their orientation. Because of their random orientations, the polarization response of "bad hair" nanowire arrays varies widely.



From left, Johnny Ho, Ali Javey, and Zhiyong Fan worked on the all-nanowire integrated sensor circuit. Not pictured are Zachery Jacobson and Haleh Razavi.

For their integrated nanowire photosensor circuitry, the Javey group used cadmium selenide nanowires as visible-light sensors. For the electronics, nanowires with a germanium core and a silicon shell were the basis of field-effect transistors that would amplify the current produced by the photosensors in response to light by five orders of magnitude.

Integrating the circuit

"To fabricate the integrated circuitry, we had to position the two kinds of materials at precise locations on the receiver substrate," Javey said. "The pattern for the device was on a photoresist layer coated on the substrate. First we printed the cadmium selenide nanowires onto the substrate, then removed the photoresist with acetone, leaving the cadmium selenide nanowires exactly where we wanted them. We repeated the process for the germanium/silicon nanowires."

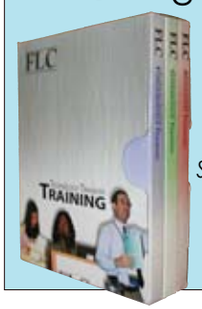
The photosensors and the electronics were now positioned on the substrate as such elements might be mapped onto a much larger integrated circuit. (In the test case, a standard silicon/silicon-oxide substrate was used.) The circuit was completed by depositing metal electrodes to connect the elements; the resulting matrix of all nano-wire circuits, which acted as pixels, was used for imaging.

Results of the Javey group's integrated nanowire circuit showed successful photoresponse in 80 percent of the circuits, with fairly small variations among them. Where circuits did fail, the causes were due to defects in fabrication of the circuit connections (10 percent), failure in photosensor printing (5 percent), or defective nanowires (5 percent). The relatively high yield of complex operational circuits proved the potential of the technology, with improvements readily achievable by optimizing nanowire synthesis and fabrication of the devices.

"In the future, we can foresee using a variety of different optical sensors to create nanoscale devices sensitive to multiple colors in high-resolution," said Javey. "And that's just the beginning. We contemplate printing nanowire sensor circuitry—photosensors, chemical sensors, biosensors—not on silicon, but on paper or plastic tape. This could be used, easily and with instant results, where spills have occurred, or to test air quality, or to test for disease organisms—almost any use for a sensor that you can imagine."

This research was supported by the Microsystems Technology Office of the Defense Advanced Research Projects Agency; Intel Corporation; and the Microelectronics Advanced Research Corporation—Materials, Structures, and Devices Center (MARCO MSD). Fabrication was performed at the Berkeley Microfabrication Laboratory. Nanowire synthesis was supported by a laboratory research and development grant from Berkeley Lab.

Technology Transfer Training DVD Set



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FY 2008 Supplemental Increases R&D/Competitiveness Funding

by Gary Jones
FLC Washington, DC Representative

Greetings from D.C. Better late than never, as they say. Nearly seven months after passage of last year's omnibus appropriation bill, which did not include funding for many of the "competitiveness" programs included in various authorizing legislation (e.g., the America COMPETES Act), the President signed a supplemental appropriation bill earlier this summer that included substantial R&D-related increases for several agencies for the current and next fiscal year.

While the primary focus of the funding is clearly to support the war efforts in Iraq and Afghanistan, the $162 billion supplemental bill also includes approximately $338 million in research funding for science programs at four agencies (National Institutes of Health, Department of Energy, National Science Foundation and National Aeronautics and Space Administration) for this fiscal year, as well as an additional $2.4 billion in research and development funding for the Department of Defense for the current and next fiscal years.

The supplemental allocations for the four agencies are detailed below.

The National Institutes of Health will receive $150 million "to be distributed on a pro-rata basis across the NIH institutes and centers." The funding amounts are to be based on the existing 2008 allocation of funds across the institutes and centers.

The Department of Energy Office of Science will receive $62.5 million, which is to be used first to "eliminate all furloughs and reductions in force which are a direct result of budgetary constraints." The bill language highlights that while this funding is "intended to maintain technical expertise and capability at the Office of Science, and may be used for National Laboratory Research and Development, including research related to new neutrino initiatives," funding all Office of Science personnel requirements must come first.

The Department has announced how it will allocate the funding: $13.5 million for basic energy science, $15.5 million in the fusion energy area, $32.0 million in high energy physics (where the brunt of the funding cuts—reflected in staff reductions—were felt following the initial omnibus appropriation), and $1.5 million to nuclear physics.

The National Science Foundation will receive $62.5 million, composed of $22.5 million for research and related activities and $40 million for education and human resource activities (both allocations will fund programs authorized under America COMPETES legislation).

Finally, the National Aeronautics and Space Administration will also receive $62.5 million to help boost steadily diminishing science research accounts.

While the supplemental funding for research and development is certainly welcomed, and will hopefully not only avert the layoffs resulting from the initial appropriations but start to pay for many of the authorized competitiveness programs, it still falls far short of the funding envisioned for these programs. It's a start, and hopefully these and similar programs will fare better in the FY 2009 appropriations currently under development.

You can access H.R. 2642 on the Thomas website and a preliminary breakout for the R&D portion of the bill on the AAAS website. Also, see DOE's announcement regarding its supplemental allocation.

Gary can be reached at gkjones@federallabs.org.

Sandia Space Sensors, from page 1

anywhere they may occur.

In the past, of course, detection has been no problem—there haven't been any above-ground explosions for decades. On the other hand, there could be one anytime. And the country that did it might deny doing it if its leaders didn't believe the U.S. could track it.

So sensors have to be ready to detect a real explosion, and do so through a forest of potential false alarms. There are lightning bolts that occur more than once per second, energetic particles from the Van Allen radiation belt that collide with electronics on the satellite, a welter of "noise" from cell phone communications, and meteors.

Sandia—a National Nuclear Security Administration laboratory—has a long history of developing components of the nuclear detonation detection system in cooperation with the U.S. Air Force.

"What was tricky in the early sensor placements," said Sandia project chief engineer Steve Yearout, "is that we did not have a good idea what our observations of the environment would look like from the standpoint of space. Looking at Earth with sensors was new and not well understood—the background noise, the clutter."

Yearout speaks from experience. No matter which GPS satellite the sensors fly on, he has been there to turn them on and test their responses in the sky. He's overseen an average of two payload launches a year for the past 25 years, packaged in boxes that resemble several small suitcases.

Sandia provides optical and electromagnetic pulse (EMP) sensors, radio frequency equipment, and the main processors that coordinate all commands, as well as return sensor output back to ground. Los Alamos National Laboratory provides X-ray and particle detectors.

"We also have a state-of-health telemetry system that allows us to see how our system is functioning," said Yearout. Perfectly synchronized atomic clocks on all satellites mean that telemetry, geometry, and computer programs working together can accurately define the position of any point of interest, whether a lightning bolt or a nuclear explosion.

Difficult as it is to test equipment without the environment in which it will be used, the Sandia group's sensor packages have performed exceptionally well over the years.

This success includes surviving one faulty rocket that exploded on takeoff in the 1980s. A number of the sensors survived and were still operable. "We build pretty good stuff," said Yearout. The next launch is scheduled for October.

Funding and oversight for the development, construction, and on-orbit support of the sensors is provided by the Office of Nonproliferation Research and Development in the National Nuclear Security Administration.

The sensor components are delivered by Sandia to an Air Force contractor, either Boeing or Lockheed Martin, to integrate onto the GPS satellite package. The Air Force launches GPS satellites from Cape Canaveral, Fla., and then, once in orbit, the sensor components are switched on remotely by Yearout and his teammates from Sandia, LANL, and the U.S. Air Force.

NREL and Optony Collaborate on Developing Cost-Competitive Approach for Solar Electricity

by Theresa von Kuegelgen, Senior Communicator, National Renewable Energy Laboratory

If you combine thin-film solar cells with an optical system design, you'll have a revolutionary concentrating photovoltaic (CPV) system.

That is what the National Renewable Energy Laboratory (NREL) and Optony, Inc. are working on together. It's a brand new approach.

Instead of using silicon or gallium arsenide solar cells, the system will use thin-film solar cells to be developed during the collaboration, based on technologies originally developed at NREL that hold the world efficiency record for thin-film photovoltaic solar cells.

NREL senior scientists (l. to r.) Miguel Contreras and Scott Ward will unite their expertise to develop a concentrating photovoltaic system with Optony.

"We're just embarking on this project with Optony, and this is our first attempt at merging a concentrator system with our next-generation converter technology," said Scott Ward, a senior NREL scientist specializing in concentrating solar power. "But we have reason to believe that it will lead to low-cost electricity."

CPV systems create electricity using lenses or mirrors to concentrate sunlight on high-efficiency solar cells. The energy conversion efficiency of a solar cell is the percentage of sunlight converted by the cell into electricity.

Even though they're more efficient than thin-film cells, the silicon solar cells currently used for these systems are more expensive than those used for flat-plate PV systems.

The multi-junction gallium arsenide-based solar cells now being considered for CPV systems are the most efficient at 40 percent. However, they require lenses or mirrors that focus the light around 500 to 1,000 times its strength, which has some disadvantages.

"If you've ever taken a magnifying glass to ants, it's a lethal thing," Ward said. "You can imagine what a hostile environment it is for a cell to operate under 500 to 1,000 suns concentration, and it's expensive to create an optical system that will provide that kind of concentration ratio."

Because there's a lot of heat involved, you need a means to dissipate the heat away from the cell.

This is difficult with silicon wafer cell technology, which is limited to the thermal properties of the cell. Thin-film cells, however, can be deposited into a variety of thermally conductive substrates. And they're cheaper to manufacture than silicon cells.

"In this respect, thin-film cells are superior in design to the silicon solar cells," said NREL senior scientist Miguel Contreras, who developed the thin-film cells with the world efficiency record. "The cheaper thin-film cells and low-cost optics should lead to a less expensive product or a lower dollar per watt of electricity."

Dong Wang, vice president of Optony, is working onsite at NREL as part of a joint team with Contreras and Ward. "The system will not only be cheaper to manufacture, but also more reliable," Wang said.

For this joint project with Optony, Contreras and Ward are taking advantage of NREL's many years of research in thin-film PV and concentrating solar power, bringing these two technologies together.

For example, Ward said the characterization techniques developed for concentrator cells will be applicable to this project. Contreras added that NREL's efforts in developing efficient thin-film cells will make a considerable contribution.

"The reason we're working with NREL researchers is because we consider them to be the world's experts in these solar technologies," said P.R. Yu, president and CEO of Optony.

Because of this new approach's great market potential, the joint project between NREL and Optony has received $250,000 from the Department of Energy's Technology Commercialization and Development Fund (TCDF).

The TCDF program has provided the NREL Technology Transfer Office with a total of $4 million to expand such collaborative efforts between NREL researchers and companies.

"With the additional funds provided by the TCDF, we can proceed with this research in an accelerated fashion," Contreras said. Yu agrees that this financial support should help Optony speed up the commercialization process of its product

The Cooperative Research and Development Agreement established between NREL and Optony includes three phases. During the first and second phases, they'll design CPV devices that are compatible with Optony's optical system.

The third phase will involve uniting the cells and Optony's optical system into an interconnected array for studying and evaluating the new technology under real-world conditions at NREL's Outdoor Testing Facility.

When Optony and NREL complete this project, they hope they'll have a CPV product that will be directly transferable to a manufacturing environment.

TARDEC, from page 1

TARDEC provides full-service life-cycle engineering support to the TACOM Life Cycle Management Command, the Program Executive Office for Ground Combat Systems, the Program Executive Office for Combat Support and Combat Service Support, and the Program Manager for Future Combat Systems Brigade Combat Team, and supports more than 2800 Army systems and many joint warfighter development programs.

At the recommendation of a committee led by Chrysler Corporation's president K.T. Keller, TARDEC was originally formed as the Tank-Automotive Components Laboratory in 1946. From the beginning, the Components Laboratory spawned many successful collaborative working relationships. As part of the current TARDEC organization, the National Automotive Center (NAC) works with private industry to leverage commercial automotive technologies for military use. With more than 60 percent of U.S. automotive engineers living and working in Michigan, TARDEC resides in the heart of a concentrated source of automotive intellectual property.

With four main focus areas, TARDEC's technical staff leads research in ground vehicle survivability, mobility, intelligent systems, and maneuver support and sustainment.

The Ground Vehicle Power and Mobility (GVPM) area is the Army's center for research, development, test and engineering of ground vehicle technologies. As the Army's ground mobility expert, the GVPM area is a key component of ground mobility in the theater of combat for the current force as well as for Future Combat Systems (FCS).

The Survivability area identifies, develops, and integrates technologies that preserve manned combat platforms from a wide range of threats. This allows TARDEC to produce ground vehicle platforms with affordable, manufacturable armor protection against objective threats at reduced weights. This focus area also seeks technology to anticipate and identify possible threats to soldiers and ground vehicles.

See TARDEC, page 8

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

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.

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/

Cardio CRADA

Ischemic heart disease is the cause of human cardiac morbidity and mortality, affecting over 14 million people in the U.S. alone. An NIH invention shows that Cripto-1 is overexpressed in infarcted myocardial tissue, and not expressed or weakly expressed in non-infarct-related heart disease tissues and normal tissues. The technology could represent a new biomarker for the diagnosis of myocardial infarction, as well as a surrogate biomarker to monitor the healing process, including regenerative stem cell activity of the infarcted myocardial tissue.

More info: John D. Hewes, Ph.D., 301-435-3121, hewesj@mail.nih.gov

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

Oak Ridge's Cryoblasting

Oak Ridge National Laboratory has developed a cryoblasting process using a centrifugal accelerator for accelerating frozen pellets of argon or carbon dioxide toward a target area.

The system utilizes an accelerator throw wheel designed to induce, during operation, the creation of a low-friction gas bearing within internal passages of the wheel, which would otherwise retard acceleration of the pellets as they move through the passages.

A system and method for producing large quantities of frozen pellets from a liquid material, such as liquid argon or carbon dioxide, for use in a cryoblasting process utilizes a chamber into which the liquid material is introduced in the form of a jet that disintegrates into droplets.

Applications include paint stripping, cleaning of radioactive surface contamination, and solvent reduction in cleaning/stripping processes.

More info: Mark Reeves, 865-576-2577, reevesme@ornl.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.

Electroactive Polymer Braids

An electroactive polymer (EAP) is a plastic-like material that changes shape when voltage is applied to it. It can serve as an actuator or sensor and has myriad other applications such as conductors, batteries and transducers. It can handle large amounts of deformation, have many properties similar to biological tissues, and have great potential in the field of robotics.

The Space and Naval Warfare Systems Center-San Diego (SSC San Diego) has woven together single strands of EAPs. These braids are made up of EAP tiles connected by actuators. By controlling the actuators, the EAP braid can perform a wide range of motions, including contracting, elongating, expanding outward or inward, twisting, bending and curving. Braided EAPs also enable scalability for large and small devices alike and can be used in unconventional settings such as at depth in the ocean.

More info: Stephen Lieberman, 619-553-2778, or stephen.lieberman@navy.mil

SSC San Diego Enters Soil Tech License

by Regina Coeby, L-3 Services, Inc.

SSC San Diego's Technology Transfer Office executed a patent license agreement with Soil and Topography Information (STI) Limited Liability Company.

STI is a Wisconsin-based company that develops and deploys tools and techniques for digital, three-dimensional mapping of soil properties and topography.

STI instruments on an all-terrain vehicle utilizing SSC San Diego technology for three-dimensional mapping of soil properties.

The Center's licensed technology consists of an optical sensor probe coupled with software that utilizes real-time measurements of soil type and moisture content to improve quantification of soil conditions and soil nutrient data.

It will improve STI's Soil Information System (SIS) product, which uses proximal soil sensors; geographic positioning; and information systems, statistics, and computer technologies to produce detailed maps of soil nutrients and conditions.

Information on soil type and condition has been used for centuries to manage and understand crop growth. Since the first plow was put in the ground, growers have used soil information to guide their decisions. Farm managers are often responsible for thousands of acres and need detailed soil information to make proper decisions.

A growing concern around the world is pollution due to overfertilization. By incorporating the Center's licensed technology, SIS data will enable farmers to more efficiently apply the optimal quantity of fertilizer, leading to resource savings and decreased pollution.

Using the Center's technology for soil information is especially useful in managing high-value crops, such as wine grapes, where quality is highly dependent on variations in soil type and conditions.

SIS also has a variety of other real-world applications for the Center's technology, including snow pack assessment for safety or recreational purposes, and evaluating soil conditions in military battlefield environment during military operations.

The product is expected to be commercially available within 36 months. Due to the Navy's generous royalty sharing policy, the Center's inventors will receive the first $2,000 in royalty payments each year and 40 percent of the remainder.

More Info: Dr. Stephen Lieberman, T2@spawar.navy.mil

TARDEC, from page 6

Intelligent Ground Systems is the solution to operational requirements that utilize intelligent, automated ground systems capable of engaging threats while interacting with the operator.

Through autonomous perception and navigation, intelligent tactical behavior, command and control, Intelligent Ground Systems seeks to enhance the Army's capability to diagnose possible battlefield threats.

Condition Based Maintenance (CBM), a new methodology of maintaining the Army's ground vehicle fleet, is based on analysis of operating and maintenance data collected from each platform and aggregated across a fleet of platforms and/or components.

The information is used to improve the capability to diagnose and isolate faults and predict future failures; provide more cost-effective overhaul of platforms and components; focus product improvements on root causes of cost and readiness drivers; and improve platform readiness and availability.

The ability to diagnose and repair on-system problems and failures increases the Army's ability to transport assets and personnel to areas where it is engaged in combat and peacekeeping missions. CBM develops technologies, processes and capabilities to address this need.

Recently, two TARDEC-led projects —the High Mobility Multipurpose Wheeled Vehicle (HMMMV) Egress Assistance Trainer (HEAT) and the Improvised Explosive Device Mine Roller Self Protective Adaptive Roller Kit (SPARK)—were honored as two of the top ten Army Greatest Inventions (AGIs) for their lifesaving features.

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