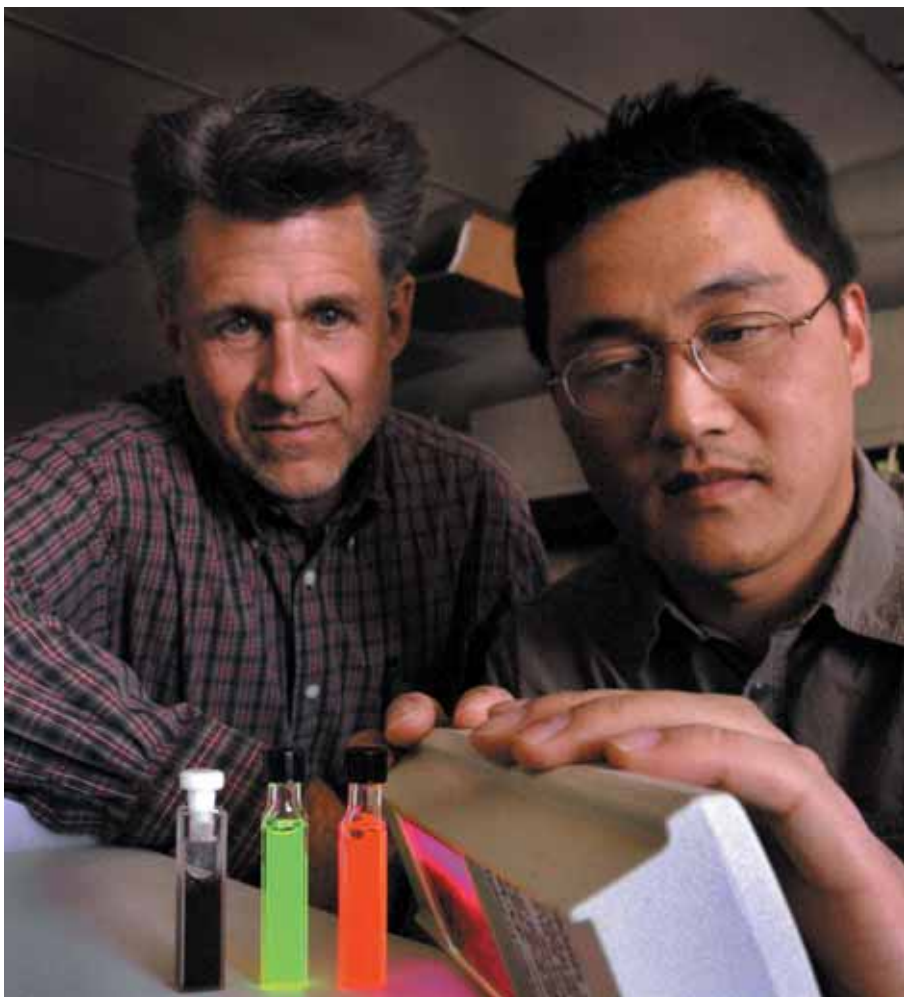
The gold standard: Self-assembly process forms durable nanocrystal arrays, independent nanocrystals

Possible uses include biological labeling, laser light, catalysts, better lighting, memory storage



NOW, SIT UP — Jeff Brinker, left, and Hongyou Fan observe satisfactory fluorescence by their well-trained nanocrystals in water solution. The dark vial holds gold nanocrystals; the orange and green are semiconductor nanocrystals.
(Photo by Randy Montoya)

By Neal Singer

A wish list for nanotechnologists might consist of a simple, inexpensive means — actually, any means at all — of self-assembling nanocrystals into robust orderly arrangements, like soup cans on a shelf or bricks in a wall, each separated from the next by an insulating layer of silicon dioxide.

The silica casing could be linked to compatible semiconductor devices. The trapped nanocrystals might function as a lasing medium, their frequency dependent on their size, or as a very fine catalyst with unusually large surface area, or perhaps a memory device tunable by particle size and composition.

Tracking hostile cells

Or perhaps the technologist might want to stop nanocrystals from clumping. Agglomeration prevents them from being used as light-emitting tagging mechanisms to locate cancer cells in the body and from being used in light-emitting devices needed for solid state lighting.

In the April 23 *Science*, Sandia and University of New Mexico researchers report a simple, commercially feasible method for doing both these things.

"The paper overcomes barriers to using nanocrystals routinely," says Jeff Brinker, Sandia Fellow and UNM chemical engineering professor, who with Hongyou Fan (1846) led the self-assembling effort. "The question in nanotechnology isn't 'where's the beef,' it's 'where're the connectors'? How does one make connections from the macroscale to the nanoscale? This question lies at the heart of nanotechnology."

It is, Brinker says, "the *raison d'etre* for CINT." (CINT is the Sandia/Los Alamos joint Center for Integrated Nanotechologies, now under construction.)

Bridging huge gaps in scale

The self-assembly approach developed by the Sandia/UNM team allows nanocrystal arrays to be integrated into devices using standard microelectronic processing techniques, bridging huge gaps in scale.

IBM staff researcher Chuck Black at T. J. Watson Research Center in Yorktown Heights, N.Y., praises the research. "One thing that's nice is that these materials are hard materials. Often they come with an organic surfac-

(Continued on page 4)

JCEL opens

The Joint Computational Engineering Lab (JCEL), a $30.8 million building funded by the Advanced Simulation and Computing Program, comes on line. Read about it in Will Keener's stories on **pages 6-8**.

Sandia LabNews

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Sandia National Laboratories

Sandia polymer electrolyte membrane brings goal of a high temperature PEM fuel cell closer

New Polymer Electrolyte Membrane has higher temp capability than state-of-art fuel cell membrane

By Chris Burroughs

A new type of polymer electrolyte membrane (PEM) is being developed by Sandia researchers to help bring the goal of a micro fuel cell closer to realization using diverse fuels like glucose, methanol, and hydrogen. This Sandia Polymer Electrolyte Alternative (SPEA) could help fulfill the need for new, uninterrupted autonomous power sources for sensors, communications, microelectronics, healthcare applications, and transportation.

The membrane research is one part of a three-year internal Laboratory Directed Research and Development (LDRD) Bio-Micro Fuel Cell Grand Challenge led by Chris Apblett, principal investigator, and Kent Schubert, project manager (*Lab News*, Aug. 9, 2002).

Recently the membrane research team headed by Chris Cornelius (6245) demonstrated that the new SPEA could operate as high as 140 degrees C and produce a peak power of 1.1 watts per square centimeter at 2 amps per square centimeter at 80 degrees C. Under identical operating conditions, the SPEA material can deliver higher power outputs with methanol and hydrogen than Nafion. Nafion is recognized as the state-of-art PEM material for fuel cells.

Because the SPEA material can operate at elevated temperatures it enables several key benefits that Nafion cannot provide. These advances include smaller fuel cell stacks because of better heat rejection, enhanced water management, and significant resistance to carbon monoxide poisoning. These performance properties suggest that the SPEA material may be a potential alternative to Nafion.

Chris notes that a higher temperature PEM material is one of the goals of the DOE's Hydrogen, Fuel Cells, and Infrastructure Technologies Program

(Continued on page 5)

Sandia tests conventional weapon created to penetrate hardened, buried targets

TACMS-P successful in first flight test in range, accuracy, penetration

By Michael Padilla

Sandia engineers have successfully tested a new conventional weapon (non-nuclear) that provides US forces a way to penetrate hard, buried targets such as weapons storage bunkers and command/control facilities.

MARK PILCHER takes a look at a TACMS-P after test (left) and a mass mockup (right) used for system testing.
(Photo by Randy Montoya)

Tactical Missile System-Penetrator (TACMS-P), an accelerated three-year project, integrates an Army TACMS booster developed by Lockheed Martin with a Navy Strategic

(Continued on page 4)

What's what

It's time to go sailing and that means it's time to fix up your sailboat, if you're a procrastinator like me and didn't do any "fixin' up" over the winter. I ordered a solar panel to trickle charge the batteries on my boat. Using one is not rocket science; you lay it out somewhere flat and connect the terminals to the battery terminals and the sun recharges your batteries.

Good thing it's so simple. The instructions are printed in Spanish, Italian, French, German, and Dutch — no English.

* * *

Sandians get kudos for the outstanding work they do while they're at Sandia. But two years after retiring from Sandia, Jack Jones has made a top-10 list elsewhere. He's now the National Institutes of Health information architect, and recently was honored by Government Computing News — via a panel of government and contract folks — as one of the 10 most influential IT managers in government.

You can read about it at GCN's website.

http://gcn.com/23_8/mgmt_edition/25540-1.html

* * *

Looking at a photo in the *Albuquerque Journal* recently of Betty Sabo directing the placement of seven life-size statues she created near the University of New Mexico's Popejoy Hall and Student Union Building, I recalled that she is a one-time Sandian. That made me think of Gordon Snidow and Wilson Hurley, whose paintings hang amid some of the most prestigious collections in the country, and who also are former Sandians.

And thinking of those two made me wonder about other former Sandia folks who left the lab and made professional careers in the world of arts — painters, sculptors, writers, actors, singers, musicians, etc. If you know of any, let me know and I'll pass their accomplishments along in a future scribbling.

* * *

Suzy Wagner (2995) wishes she spoke Japanese.

On a recent trip to Tokyo, she noticed a huge sign in English at a train station that read: "KEEP OFF The person concerned only."

She and probably a lot of others also wish the sign painter spoke English.

* * *

We hope you always find the *Lab News* a good read, but a couple of stories in this issue are particularly noteworthy.

Michael Padilla writes about the Tactical Missile System-Penetrator, which recently passed its first flight test with actual flying colors in range, accuracy, and target penetration. The Labs was chosen for the project because of its "proven expertise" in the fields required to adapt an existing delivery system to the Sandia warhead. It starts on page 1.

Also be sure to read Will Keener's story about the Joint Computational Engineering Lab (JCEL), which was dedicated Wednesday with DOE Secretary Spencer Abraham in attendance. he $30.8 million building, funded by NNSA's Advanced Simulation and Computing Program, is home for 175 people in 61,200 square feet of space. Among its innovations are secure "need to know" office clusters and state-of-the-art collaborative meeting and visualization rooms. You'll find it on pages 6-8.

— Howard Kercheval (844-7842, MS 0165, hckerch@sandia.gov)

Sandia LabNews

Sandia National Laboratories

http://www.sandia.gov/LabNews

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LOCKHEED MARTIN

Fang named ASME Fellow

Sandia engineer H. Eliot Fang has been elected a Fellow of the American Society of Mechanical Engineers (ASME) for his "seminal contributions in understanding the microstructure and properties during thermomechanical fatigue of engineering materials."

Eliot, Manager of the Materials and Process Modeling and Computation Department, received notification of the award April 6. The Fellow grade of membership recognizes "exceptional engineering achievements and contributions to the engineering profession."

ELIOT FANG

Eliot's citation notes that he has published more than 50 papers in the area of his speciality and is "a well-recognized expert in solder joint fatigue and failure analysis." In his department manager position, he has guided more than 60 scientists, postdocs, and university faculty members "through various programs focused on developing the relevant physics required to model and simulate critical phenomena associated with materials aging and degradation."

Eliot received his PhD in mechanical engineering from the UC Santa Barbara in 1989. He joined Sandia in January 1990. He became a principal member of technical staff in 1997 and manager of Dept. 1834 in 2000. He is a member of the Materials Research Society and the Association of Chinese-American Engineers and Scientists of New Mexico.

Mike Cieslak, Director of Materials and Process Sciences Center 1800, says Eliot has recently been named Sandia's Theory and Simulation Thrust Leader for the new Center for Integrated Nanotechnologies (CINT), where he will coordinate research efforts aimed at realizing the potential of materials engineered at the nanoscale.

SSTP gets $750,000 grant for high-tech networking, switching equipment

Sandia Science & Technology (SS&TP) Park received a $750,000 grant from the Economic Development Administration (EDA) at an SS&TP ceremony April 15.

David Sampson, assistant secretary of Commerce, presented the check to the Science and Technology Park Development Corporation (STPDC). Sen. Pete Domenici, R-N.M., served as keynote speaker. Participants in the ceremony included Executive Director of STPDC Jackie Kerby Moore, City of Albuquerque Economic Development Director Mike Albers, New Mexico Secretary of Economic Development Rick Homans, House Minority Leader Ted Hobbs (R-Bernalillo), and

CHECK THIS OUT — Sen. Pete Domenici (second from right) and Assistant Secretary of Commerce David Sampson (third from right) present a $750,000 development grant to Sandia Science and Technology Park. Joining in the presentation are, from left, N.M. State Sen. Ted Hobbs, SSTP Executive Director Jackie Kerby Moore, N.M. Secretary of Economic Development Rick Homans, Sampson, Domenici, and Science and Technology Park Development Corp. Chairman Sherman

President/CEO of Technology Ventures Corporation (TVC) Sherman McCorkle.

The funds will be used to purchase networking and switching equipment for the fiber optic network recently installed in the park. This so-called Point-of-Presence (POP) will benefit Sandia in several ways, says Jackie.

Sandia offices located in SS&TP, including the International Programs Building and the new Innovation Center housing Sandia's Controller and Pension Plan Center, will have access to a direct high-speed fiber link to the Sandia communications switch. This link will allow the extension of Sandia communications services to employees at the park without the need to purchase slower, lower bandwidth connections from other providers. In addition, the fiber and the POP facility enable more economical high-speed connections to other locations such as Los Alamos, says Jackie.

"The biggest benefit of this equipment is that it will allow tenants and Sandia to communicate rapidly and efficiently with each other as well as the whole world," Jackie says. "This fiber optic network that will be lit up with this new equipment is absolutely cutting-edge technology, and it will be the best fiber network in the state."

The network will allow extremely large files to be transferred electronically between parties at the speed of light, she says.

The funding was made available to the STPDC, a nonprofit organization founded by TVC to manage and develop the park.

"We are very appreciative of this grant from EDA," says Jackie. "This grant will benefit the whole Albuquerque and Central New Mexico region, as this cutting-edge telecommunications network will help attract additional high-tech companies, which need this technology, to the park. These new companies will create high-paying jobs, which will benefit all of us."

— Michael Padilla

Methane imager undergoes field trials in Japan

By Nancy Garcia

The photo of a Japanese "tea party" on a bulletin board in the Combustion Research Facility is deceptive — the austere interior is really part of a natural gas leak detection training facility where a team recently demonstrated a methane gas imager.

Japan's natural gas companies routinely conduct natural gas leak surveys inside buildings all the way up to appliances (like gas cookers).

"The main advantage of this imager to existing methods is fast detection of the leak point," says Masayuki Tamura of the Technology Research Institute of the Tokyo Gas Co., Ltd., the technical manager of the JGA/METI Project Against Natural Gas Leaks. "It was really easy to find the leak point fast."

"[With this imager] it was really easy to find the leak point fast."

This work was done by a team consisting of Ray Bambha, Tom Reichardt, Tom Kulp, Ricky Sommers (all 8368), Sal Birtolda (8350), and Gary Hubbard (8362) under management by Kiran Kothari of the Gas Technology Institute (GTI). Both Toms and Ray spent two weeks in Japan for the demonstrations with Kiran Kothari of the GTI. The GTI developed the initial project plan and helped arrange for project management and financing of the four-year project from the Japan Gas Association (JGA), which in turn had been funded by the Japan's Ministry of Economy, Trade, and Industry.

Task: develop a handheld imager

The group was tasked with developing a handheld methane imager "The tests conducted in Japan were viewed as a big success," Tom Kulp says. "Both GTI and JGA were very happy with the outcome."

The audience included members of the committees that oversee the pipeline leak detection programs from universities, natural gas companies, and the JGA. Tests included quantitative ones that measured flux in leaks from piping (the imager is designed to measure methane at a distance of five meters and concentration of 10 ppm – meter).

VIEW OF THE GAS IMAGE on the portable gas imager monitor when operating in differential imaging mode. The person in background is measuring the plume with a handheld sensor.

For the second week, the group demonstrated the video-imaging device in the training facility, which includes interior settings like the tea room.

The hand-held imager uses a laser to illuminate the leak and a video camera to capture the image. Similar to a portable imager the group created to view leaks in refineries (*Lab News*, Feb. 23, 2001), it creates a video image of leaks as a dark cloud against a background. The leaks absorb the laser light, while the background reflects it back.

Making the images even easier to discern, there is a new feature on the natural gas imager. It subtracts out detail from the background in the final image. This differential imaging is based on rapidly switching the laser light between two colors, one of which is absorbed by the gas and one that is not.

A much simpler design

Also, the laser is a much simpler design. Those features may be promising for next-generation refinery imagers.

"The tests conducted in Japan were viewed as a big success."

Now the project is nearly completed, the device will eventually be provided to the sponsors in Japan who may develop it further if components, such as lasers and infrared detectors, go down in cost.

SANDIA RESEARCHERS Ray Bambha (left) and Tom Reichardt (second from left) demonstrate the JGA gas imager to Japanese gas industry personnel at the Osaka Gas test facility.

New Mexico employee death

Michael Hafich of RF Microsystems Technologies Dept. 1742 died April 13.

He was 50 years old.

MICHAEL HAFICH

Michael was an SMTS microelectronics/semiconductor engineer who had been at Sandia since September 1998.

Survivors include his wife, Mary Jo Maravetz, and daughters, Willa Hafich and Katya Hafich.

Sandia CaliforniaNews

Recent Patents

Thomas Kulp (8368), Thomas Reichardt (8368), Randal Schmitt (1118), and Ray Bambha (8368): Pulsed Laser Linescanner for a Backscatter Absorption Gas Imaging System.

David Haaland and David Melgaard (both 1812): Augmented Classical Least Squares Multivariate Spectral Analysis.

Ronald Manginell (1764), Gregory Frye-Mason, Edwin Heller (1763), and Douglas Adkins (1764): Method to Fabricate Silicon Chromatographic Column Comprising Fluid Ports.

Tim Shepodd (8762): Self-Regulating Formulations for Safe Hydrogen Gettering.

Paul Dentinger (8762) and Kelby Simison: Photoimageable Composition.

Anthony Farino (1746): Reconditioning of Semiconductor Substrates to Remove Photoresist During Semiconductor Device Fabrication.

Dahv Kliner (8368): Method of Bundling Rods so as to Form an Optical Fiber Preform.

William Sweatt (1743): Condenser for Photolithography System.

Alex Robinson and Lawrence Anderson (both 1764): Sub- to Super-Ambient Temperature Programmable Microfabricated Gas Chromatographic Column.

Kurt Berger (8231): EUV Mirror-Based Absolute Incident Flux Detector.

Neal Fornaciari (8231) and Michael Kanouff (8752): Discharge Source with Gas Curtain for Protecting Optics from Particles.

Thomas Bennett (8762): Sensor Assembly.

Scott Reed, Ronald Stone (both 14154), Tina Nenoff (6245), Daniel Trudell (1764), and Steven Thoma (14153): Gas Impermeable End Seals for Separation Membranes.

Nanocrystals

(Continued from page 1)

tant layer that makes it difficult to process materials, like a kind of grease. This material is embedded in oxide. It sounds like a neat thing and a new approach." The Sandia/UNM method scrubs away the surfactants.

Biolabeling, biosensing

"Also, quantum dots [another term for nanocrystals] can be important for biolabeling and biosensing," says Hongyou, who is the paper's lead author and who initiated the effort to use the nanocrystals for those purposes. "The beauty of our approach is that it makes these quantum dots both water-soluble and biocompatible, two essential qualities if we want to use them for in vivo imaging. The functional organic groups on the quantum dots can link with a variety of peptides, proteins, DNA, antibodies, etc. so that the dots can bind to and help locate targets like cancer cells, a critical issue in biomedicine."

Sandia has applied for a patent on this approach, which should aid attempts at several major universities to identify individual cancer cells before they increase in number.

Researchers have found that in the nanoscopic realm, changing merely the size of a material changes the frequency it emits when "pumped" by outside energy; so, quantum dots of particular sizes and material will emit at predictable frequencies, which makes them useful adjuncts when bound to molecules created to bind to particular cancer molecules.

How it works

The process uses a simple surfactant (similar to dishwashing soap) to surround the nanocrystals — in this case, made of gold — to make them water-soluble. Further processing involving silica causes the gold nanocrystals to arrange themselves within a silica matrix in a lattice — a kind of artificial solid with properties that can be adjusted through control of nanocrystal composition, diameter, properties of the surfactant, or stabilizing ligands used in formation of the water soluble nanocrystals.

The robust 3-D solids, which are stable indefinitely, demonstrate the incorporation of nanocrystalline arrays into device architectures.

HONGYOU FAN, lead author of the new study, takes private time to observe the new nanomaterials.

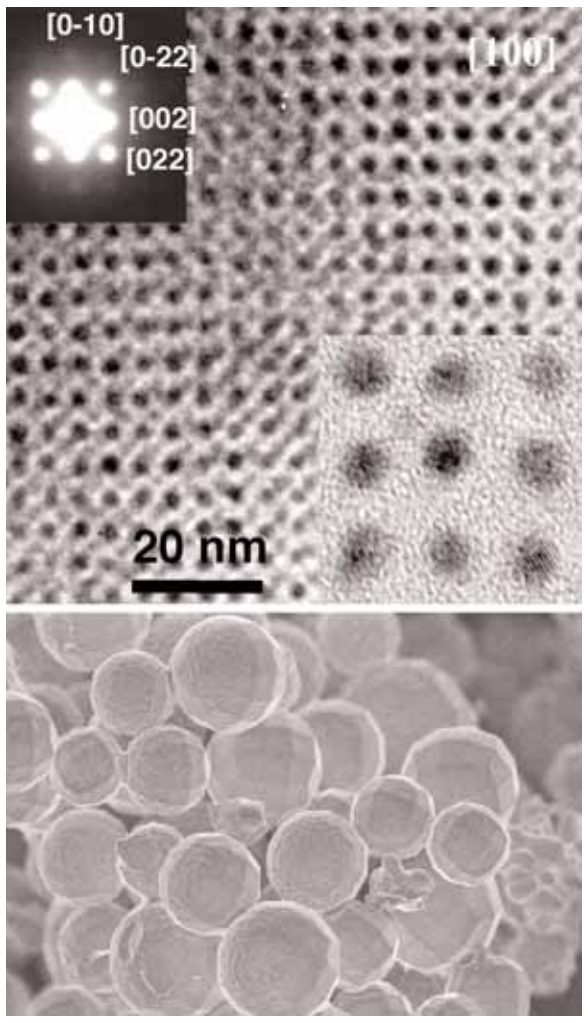
Relief for physicists

A further use allows physicists to go beyond modeling to determine how current scales with voltage in nanodevices. "Before," says Jeff, "there was no way to make precisely ordered 3-D nanocrystalline solids, integrate them in devices, and characterize their behavior. There was no theoretical model. How does the current decide which way to hop between crystals?"

The new material can be used as an artificial solid to test theories. "It should be a dream for physicists; they don't just have to model anymore," says Jeff.

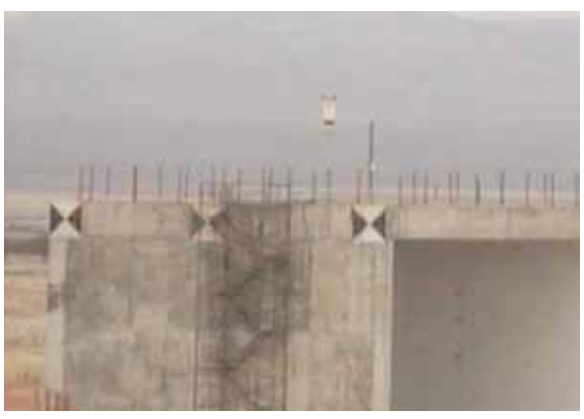
A kind of choreographed transmission possibility exists with the so-called "coulomb blockade," he says: No current is passed at low voltages because each crystal is separated by a thin (several nanometer thick) layer of silica dioxide, creating an insulator between the stored charges. Each nanocrystal charges separately. "This could be configured into a flash memory," he says, "with a huge number of charges stored in an array of nodes."

Researchers at UNM's Center for High Technology Materials performed experiments to establish the current/voltage scaling characteristics of the gold/silica arrays as a function of temperature. Sandia researcher Tim Boyle (1846) made and provided nanocrystal semiconductor (cadmium selinide) quantum dots.



VIEWS OF THE NANOREALM — Top image: Ordered gold nanocrystal packed inside silica. Electron diffraction pattern (left corner image) and high-resolution image (right corner) confirmed the nanostructure and gold nanocrystals. Bottom image: Self-assembled, well-shaped gold nanocrystal/silica arrays.

TACMS-P missile launch from Launch Complex 33 at White Sands Missile Range.



TACMS-P warhead about to strike the target in the northern end of White Sands.

SUCCESSFUL impact into the DTRA target.

Weapon

(Continued from page 1)

Systems Program (SSP) maneuvering reentry vehicle that was designed, developed, and tested by Sandia.

Sandia was chosen to build the integrated Earth Penetrating Warhead (EPW) based on the Labs' proven expertise in high-speed flight system design, precision navigation, guidance, control capabilities, and penetrator technology, says David Keese (15404), Deputy Director of Aerospace Systems Development Center 15400.

"This represents a great accomplishment for the Labs and the nation," says David. "It demonstrates the feasibility of the first high-speed, precision-guided EPW delivered from a deployed tactical missile system."

Test success

Sandia and Lockheed Martin conducted the flight test of TACMS-P on March 11 at White Sands Missile Range.

The test was conducted under a joint Army-Navy Advanced Concept Technology Demonstration funded by the Office of the Secretary of Defense (OSD).

TACMS-P performed as expected, demonstrating integration of the Sandia warhead with the modified Army TACMS missile as well as meeting specific range, accuracy, and penetration objectives.

The TACMS-P was fired from a Multiple Launch Rocket System (MLRS) M270A1 launcher at Launch Complex 33, and flew to a pre-determined altitude and speed to separate the EPW from the booster.

After separation, the booster locked its fins and continued on a ballistic path while the EPW used its movable fins to guide it to a fixed, hard target using a navigation, guidance, and control system developed at Sandia.

The inert penetrator used for this flight test was recovered from the target structure to assess overall weapon performance.

Research and development

Eric Schindwolf (15425), project department manager, says the project encompassed a body of innovative research and development that led up to the successful test.

"This was symbolic for the Labs," he says. "Various integrated system design activities enabled the success of the test. This is the type of program that energizes the imaginations of the participants and

(Continued on next page)

What a successful high-temp membrane means...

A successful high temperature membrane, like the one Chris Cornelius has developed, will have several positive impacts on fuel cells.

It will provide an enhanced carbon monoxide tolerance that will significantly reduce catalyst poisoning. The result is a simpler fuel cell system because ultrapure hydrogen is not necessary.

It will result in faster reaction kinetics, meaning that a smaller fuel cell stack can be used to generate a defined power requirement.

And it means a reduced heat exchanger size. This means the fuel cell system can be smaller and lighter due to improved water management capability (vapor phase instead of the liquid phase).

The standard fuel cell membrane, Nafion, becomes dehydrated at elevated temperatures, resulting in a loss in proton conductivity and fuel cell function. Increasing the operating temperature of the fuel cell is recognized as a means of improving catalyst efficiency, minimizing carbon monoxide catalyst poisoning, and potentially enabling other types of catalysts to be used.

CY FUJIMOTO, left, and Chris Cornelius (both 6245) hold a test micro fuel cell with the Sandia membrane. Next to Cy is a micro fuel test station. (Photo by Randy Montoya)

Micro fuel cell

(Continued from page 1)

(http://www.eere.energy.gov/hydrogenandfuelcells). One milestone is to develop by 2005 polymer electrolyte membranes for automotive applications that operate at 120 degrees C for 2,000 hours with low membrane interfacial resistance.

Of the new SPEA material that Chris and Cy Fujimoto (6245) developed, Chris says, "Our arrival at this point in our research is the result of stubborn determination and a good dose of serendipity. Validation of this material as a Nafion alternative would be a significant achievement, an accomplishment we strongly desire."

A polymer electrolyte membrane is a critical component of a working fuel cell. Its function is to conduct protons efficiently and possess low fuel crossover properties. It must also be robust enough to be assembled into a fuel cell stack and have long life.

In developing the SPEA material, the team looked at the success and limitations of other PEM alternatives in order to develop a set of characteristics for their model material.

"At the beginning of this project we were considering several polymer families for a PEM alternative, including a family of polyphenylenes developed by David Wheeler (1764) and Greg Jamison (1846) that Doug Loy [now at Los Alamos National Laboratory] suggested." Chris says. "When the physical properties of one of the polyphenylenes being considered as a polymer electrolyte was improved and integrated into a working fuel cell, we happily discovered that it works extremely well compared to Nafion."

Chris says that the SPEA material he and Cy are developing "may be an enabling material that could have an impact on the fuel cell community at large and help Sandia become recognized as a fuel cell research organization.

"We have already completed initial material validation studies of our SPEA with the help of our battery group (2521) and Los Alamos National Laboratory."

"The next steps," Chris says, "are to reduce the internal resistance in the fuel cell membrane electrode assembly, optimize catalyst and ionomer composition, improve the properties of the SPEA material, conduct life cycle testing in a fuel cell environment, and assess the potential value for large-scale commercialization of the polymer electrolyte. Understanding the material's capabilities and limitations are necessary steps in order to potentially improve the physical properties of SPEA material.

"We see this SPEA material as having the potential of being integrated into fuel cells ranging from microwatts to kilowatts. Such a broad power range means that this Sandia Polymer Electrolyte Alternative could be used in a fuel cell to power everything from sensors, cell phones, laptops, and automobiles," Chris says.

Bio-Micro Fuel Cell technical team members

Principal investigator: Chris Apblett (1763); *Microsystems Integration*: Jim Novak (1738), David Peterson (1738), Jason Padgorski (1738), Steve Eisenbies (8731); *Electrochemistry*: David Ingersoll (2521), Ganesan Nagasubramanian (2521), Mike Kelly (1822), Plamen Atanassov (UNM), Tim Boyle (1846), Doug Wall (1832), Greg Roberts (2521), Richard Muller (9235), Eric Coker (1846), James Miller (1846), Scott Bunge (1846), Carol Korzeniewski (Texas Tech Univ.); *Biomaterials*: Blake Simmons (8762), Susan Brozik (1744), Swapnil Chhabra (8141), Pat Dolan (1744), Suzanne Ma (8141), Monica Manginell (1744), Elizabeth Patrick (1744), Sarany Singer (1744), Joanne Volponi (8141); *Architecture*: Stan Kravit (1763), Jeb Flemming (1744), Carrie Schmidt (1763), Alex Santos (1744), Ed Matteo (1763); *Membranes*: Chris Cornelius (6245), Cy Fujimoto (6245), Frank Delnick (2522), Mike Hickner (6245), Chad Staiger (6245), Jocelyn McNeely (6245), Dvora Perahia (Clemson); *Market Intelligence*: Ed Southwell (Perspectives), Barbara Schay (Perspectives).

Weapon

(Continued from preceding page)

moves them to do great things. It was quite evident in the result."

The memorandum of understanding between the DOE and the Department of Defense provided valuable research and development for three key areas of the project, says David. These included the penetrator case design, fuze technology development, and high explosive fill. All of these penetrator elements must withstand the very harsh, high-deceleration environments encountered during target impact, he says. During penetration the fuze must function and begin a critical chain of events that ultimately results in the detonation of the warhead.

After the first test, the Sandia team is already preparing for subsequent missions.

Additional flight tests are planned for summer and late fall, and several additional residual weapons will be delivered to the government.

The ultimate goal is to have TACMS-P ready for industry to produce the system for military use, says David.

John Hill, Naval Surface Warfare Center, says the Navy is extremely happy with the successful flight. "Our primary objective was accuracy, and we met that beyond our expectations," he says.

Thomas Floyd, Army Precision Fires Rocket and Missile Systems, says the next flight test will look at other aspects of the project. "We will continue the path forward in assuring the best product," he says.

The ATACMS family of munitions includes the ATACMS Block I, Block IA, and the Block IA Unitary. The ATACMS Block IA Unitary was successfully used for the first time during Operation Iraqi Freedom. In February, Lockheed Martin received a contract to produce ATACMS Block IA Unitary missiles for the Army.

Team effort

"The team consists of a variety of personnel from centers throughout the Labs," says Bill Guyton, Director of Aerospace Systems Development Center 15400. "This includes scientists, engineers, researchers, and administration."

The following organizations participated in the project: 1800, 2300, 2500, 2600, 2900, 3100, 9100, 12300, 14100, and 15400.

HIGH-TECH CONFERENCING will be made easy in the Joint Computational Engineering Lab's (JCEL) new first-floor conference room. Jim Dawson, construction project manager, is shown checking out the room. (Photos by Randy Montoya)

Joint Computational Engineering Lab (JCEL) up and running

By Will Keener

Area 1 project brings together weapons, analysis, and computer engineering capabilities in a single building.

Sandia's new Joint Computational Engineering Lab — JCEL for short — was scheduled for an official dedication with Secretary of Energy Spencer Abraham Wednesday (April 28). But employees didn't wait for him to cut the ribbon. Much of the building is up and running.

Funded to the tune of $30.8 million by Advanced Simulation and Computing (ASC) — a program within NNSA — JCEL is home to 175 people in 61,200 square feet of space. It offers innovative secure office clusters, two major computer systems, and state-of-the-art collaborative meeting and visualization rooms.

In short, the newest addition to Area 1 is a long ways from the light labs and offices of Sandia's past. It meets higher standards for safety, security, and environmental friendliness. And it provides people-friendly spaces designed to attract high-quality new employees to the Labs.

TANGLES of computer cable remain in unclassified computer room at JCEL. With 256 processors, the computer is being used to develop protocols useful when Sandia's Red Storm supercomputer comes online later this year.

"The building design provides opportunities to marry many different processes at Sandia that will need to be used to revolutionize engineering design," says Tom Bickel, Director of Engineering Sciences Center 9100. "Design-through-analysis is being prototyped within JCEL." This design initiative was fundamental to determining who would work in JCEL, says Tom. Key building occupants are Engineering Sciences Center 9100; Computation, Computers, Information, and Mathematics Center 9200; and Stockpile Resource Center 2900.

"This building marks a milepost along the way to achieving the ASC vision for predictive simulation," says Mike Vahle, Director for the Advanced Product Realization Program (9900). "It enables computer scientists, engineers and designers to interact on a daily basis to apply modeling and simulation to weapons systems."

Staff members began moving into JCEL — numerically Bldg. 899 — in March, as Hensel Phelps completed construction.

JCEL is a "sister facility" to the Distributed Information Systems Laboratory (DISL), under construction at Sandia's California site. With DISL (expected to be online this year) and JCEL, Sandia takes a giant step toward enhanced design and weapon manufacturing, making use of visualization and collaborative technologies that will provide high-security links throughout the DOE weapons complex.

High-tech facade

JCEL is metal, concrete, and turquoise-tinted glass. Its design, by Benham Companies architects and engineers, combines three towers of offices, with an elliptical front space, housing the computers, visualization rooms, and other common facilities. Glassed-in stairwells flank the east and west ends of the building.

Metal panels and canopied walkways give the building a high-tech façade. Passive solar panel sun shades along a south-facing window wall incorporate an energy conservation system that will provide power directly to the building. It has more than good looks, designers point out. JCEL is the first Sandia building to be rated under a national program to evaluate the sustainability and environmental friendliness of a structure. (See "Green" on next page.)

Adherence to Sandia's Architectural Surety standards and to IBC 2000, a newly adopted international building code, also defines JCEL. The surety standards address possible terrorist attacks, including blasts and security system compromises. The building code features increased requirements for seismic events, wind loading, and blast damage mitigation. Cast-in-place concrete walls of the three towers provide structural strength to prevent the kind of collapse seen in the bombing of the Murrah Federal Building in Oklahoma City.

Main floor features in JCEL include an advanced conference room with large screens for image projection, automatic window shades and other amenities. The floor also houses two large computer spaces, one for "Renegade," a classified system, and another for "Rogue," its unclassified counterpart. There is also an impressive visualization room with a 24-projector rear screen projection system focusing on an 18-foot by 10-foot glass screen. The visualization room, one of two in the facility, includes conference desk plug-ins for power, phone, and Internet. This allows conferees to project images from laptops onto the large screen during discussions.

See also:

- *Green: More than a color for JCEL . . . . . page 7*
- *ER project paves way to JCEL . . . . . page 8*
- *Sandia Computing District thrives in Area 1 . . . . . page 8*

Common themes in the building include: wall-sized white boards and automatic shades for conference rooms; conversation niches with tables and chairs incorporated along hallways and in otherwise unused spaces; color coding in floors to help employees and visitors orient themselves; raised flooring for ventilation, power, and high-flexibility in room layouts; natural light in hallways and offices; and unique office clusters.

Need-to-know suites

Many of JCEL's new tenants have occupied windowless offices in buildings noted largely for their long corridors, says Dave Corbett, Director of Facilities Management and Operations Center 10800. "JCEL's architectural features were designed with light in mind." Northside towers incorporate windows into the offices, and the towers are joined by glass curtained hallways and stairwells, he notes.

The "need-to-know" office clusters open onto the hallway through a single entrance for security. Individual offices include fiber optic drop boxes with both classified and unclassified connections, part of a 60-mile maze of fiber optic cable in the building.

The cable maze provides the communications link for the building's world-class 10 gigabit network, says JCEL Program manager John Zepper (9324).

"Engineering sciences and computing sciences have been working together for many years toward the vision of transforming engineering, at Sandia and more broadly, through predictive computational simulations," says Bill Camp (9200). "That's a huge challenge — one that requires much more than just technical breakthroughs. We also have to

(Continued on page 8)

FIRE SAFETY LIGHTS and metallic window shades at the Joint Computational Engineering Lab follow the building's high-tech style. (Photo by Randy Montoya)

Green: More than a color for JCEL

The tall windows at JCEL give the building a distinctive turquoise cast, but to Jack Mizner (3124) and others on his Pollution Prevention (P2) team, the building is very green. That's "green" meaning environmentally and people-friendly.

Soon after the selection of Benham Companies as building architect, Sandia's P2 and Energy Management staff hosted a one-day workshop on fitting sustainable design into the JCEL project. Next the team used the programming stage — integrating user, security, and engineering requirements — to emphasize sustainable design, says Jack, who coordinated the P2 effort. That process involved maintenance, custodial, mail services, transportation, and other support groups to ensure a fully functioning building, adds Jim Dawson (10824), construction project manager.

"The users were very receptive to making this facility a technological showplace, not just from the computer technology aspects, but from the energy and environmental viewpoint," says Jim.

The building process included use of the US Green Building Council rating system to score the building on sustainability issues, from design through occupation of the space. A final report is expected soon, with building teams hoping to achieve a "Silver" rating, the third highest.

Prior to bidding, contractors were made aware of recycling requirements for construction wastes and other sustainable design activities that would be a part of the job. "The initial response was 'this is going to cost us money,'" says Jack. But through the process contractors came to appreciate the integrated waste management approach.

"In the end, 82 percent of all waste, including wood and wallboard, was recycled. Hensel Phelps (the construction contractor) is a believer now. They learned to put recycle materials in baskets and dump them into chutes for storage. It gave them a cleaner, safer site."

Doug Vetter, also on Sandia's P2 staff (3124), struck a deal with American Gypsum wallboard plant in Bernalillo that resulted in the company taking 54 tons of recycled wallboard from the project. The New Mexico Recycling Coalition is now looking at the concept for other sites in the state, while Sandia's P2 staff hopes to use it for MESA and other buildings now moving toward construction.

Other recycling amounts: wood, 40 tons; steel and mixed metals, 58 tons; asphalt, 32 tons; clean concrete, 600 tons

"Sandia learned recycling could be done on a construction project, as well as on a D&D (demolition and decommissioning) project," says Jack. "Jim Dawson and Program Manager John Zepper (9324) became big advocates for us. "One of the charges connected with the building was creating an environment where you can attract the best and brightest researchers. Sustainable design fits with that charge, and John Zepper was enthusiastic about it."

One of the most visible green features of the building is the landscaping, designed by Charlene Collins-Mathis of Benham. A dry riverbed of large rocks and smaller cobbles winds around the building to form a retaining moat for storm runoff. Curving walkways, light-colored pavers (to reduce heat island effects), sheltered patios, and sitting areas are part of the design. Pine trees and drought-tolerant plants and grasses satisfy security and water-use requirements.

Perhaps one of the least visible features is an under-floor, erector-set-like grid that supplies air through registers in the floor in a low-pressure, low-velocity system that saves energy. The system has ceiling air returns, as in a traditional design, and includes controls for every work space and space for nonsecure cabling systems.

Compared to normal ducted overhead systems, this type of air plenum can be operated at a higher temperature for cooling than conventional systems, realizing considerable energy savings, says Jim Dawson. The system is more flexible, offering individual office thermostats rather than zone-type systems, and making it easier to move interior office walls in the future without the necessity for rebuilding the air duct system. The floor registers can be relocated fairly easily to accommodate the new wall locations as needs change in the future, Jim says.

Here are some other green features in the new building:

• Overhead glass in walkway canopies and on rooftop arrays is prewired for photovoltaic panels. These will provide part of the building's electrical power demands.

• Overhangs on windows balance the desire for natural light with heating and cooling requirements.

• Inside controls will improve energy use by 30 percent over current standards.

• Material with recycled content accounts for approximately 50 percent of the structure, including fly ash from Four Corners coal-fired power plants mixed into concrete,

• Reuse of a "brownfield," site formerly contaminated with PCBs. (See "ER Project" on next page.)

• Use of local suppliers, such as Rio Grande Concrete and American Gypsum, to reduce transportation energy and costs.

• Marmoleum floor tile, a durable recycled product that will require wet mopping instead of waxing, recycled carpeting, and jute-based wall coverings along with environmentally friendly paints, adhesives, and sealants.

Labs site architect Roy Hertweck (10853), energy efficiency coordinator Ralph Wrons (10827), John Scott (10862), and John Rathbun (10861), as well as Benham lead architect Jack Morgan and Hensel Phelps' Larry Wright, all strongly supported the effort.

JCEL open for business

(Continued from page 6)

learn to integrate the activities of our organizations more consistently and deeply than in the past."

Several years ago the organizations established the Strategic Computing Office on the west aisle in Bldg. 880 to improve interactions. "JCEL has allowed us to take that integration to a new level," says Bill, who will share an office suite with Tom Bickel.

It's important to note the Stockpile Resource Center role as well, says Rob Leland, Manager of Computer and Software Systems Group 9220. "These three organizations share primary responsibility at the New Mexico site for the Design Through Analysis program." JCEL is integrally linked to the Microsystems and Engineering Sciences Application (MESA) efforts. "In JCEL, we are prototyping some of the themes and relationships that will prove critical in MESA," Rob says.

Right people, right time

Jim Dawson, who managed the 17-month construction for Corporate Projects Dept. 10824, encountered more than a few challenges in designing and constructing the unique building. "The thing that strikes me as impressive about this project was the cooperation between the design and engineering teams and the construction contractors," says Jim. "The right people came together at the right time to make the right decisions."

The contract was awarded in July 2002, but early work encountered delays due to a variety of problems, including the location of underground utilities, tie in to existing water lines, and even the weather. Despite 30 "pot holes" to help accurately locate underground utilities, workers found some surprises when building began.

JCEL is structurally unique compared to other Sandia office-light labs, due in part to the 121 piers, ranging in diameter from 18 to 36 inches and reaching 35 feet into the ground. A lattice of concrete beams connects the piers at various angles and elevations throughout the first floor. "The main building structure is cast-in-place concrete and structural steel framing," says Jim. With the complexity of angles in the structure, nearly every concrete-to-steel connection in the part of the building south of the towers had to be separately detailed by the steel supplier, Jim says.

High winds in spring 2003 cost a cumulative three weeks of lost construction time, says Jim, more time than most standard contracts anticipate for bad weather. With crane and steel operations under way, it was unfortunate timing. General contractor Hensel Phelps worked hard to return to schedule, starting some work earlier than planned and working other tasks in parallel with additional crews.

For example, the Sandia team worked closely with the construction contractor to achieve early completion of the two large computer rooms and the first-floor visualization lab. This expedited installation of equipment, which began last November, two months prior to building completion. Construction of the stair towers at the east and west ends of the building, with concrete, steel, and a "curtain wall" of aluminum-framed windows, proved slower than predicted, but an early start helped compensate. Problems with fabrication of the exterior metal panels and a missing section of structural detail on the south side of the roofline sent team members scrambling as well.

Efforts of the contractor to accommodate the plans for equipping and occupying the building mean that the overall project is on schedule and should be completed later this year, says Jim.

ER Project paves way to JCEL

Before it was JCEL, it was Sandia New Mexico's reclamation yard.

The salvage yard, then south of Area 1, was host to weekly auctions from the early 1950s through the 1980s, with desks, cabinets, pallets, electrical components, and a variety of miscellaneous paraphernalia offered to the highest bidder. But in 1987, with the onset of the DOE's environmental restoration activities, the site was identified as a bad actor. Early tests revealed harmful PCBs, volatile organics, metals, and an ill-defined, viscous "black ooze" on the site.

"We had considered cleaning the PCB-contaminated soils to a 25-parts-per-million (ppm) level and using it for a parking lot. But that was before it became prime real estate."

As Sandia's Environmental Restoration (ER) Project geared up, the site was further sampled and studied, and a plan was put into place to eventually clean it up. "It was the largest of the contaminated sites in Area 1," says Brenda Langkopf, task leader for the site remediation. "We had considered cleaning the PCB-contaminated soils to a 25-parts-per-million (ppm) level and using it for a parking lot. But that was before it became prime real estate."

"When JCEL expressed an interest in the site, the time frame changed and became more of an obstacle," says Mike Skelly, assistant task leader for the cleanup. Skelly said a major reframing of cleanup rules for PCBs was also under way at EPA, adding complexity to the planning and approval process.

By the summer of 2000, the team, including Mike Sanders, Stacy Griffith, Anh Lai, and members of the ER field office (Robin Ryan, David Grandi, Rod Nagel, Bill Bixby, Bill Gibson, and Randey Colgrove) were busy at the site. Riyaz Natha, of the ER Project's Chemical Laboratory, helped organize the sampling.

The site was divided into one-meter squares. A 6-inch layer of soil from each square was removed and put into trucks for authorized disposal. The squares were then sampled. The plan called for 341 samples to ensure the PCB content was less than 1 ppm. Where sample results showed more contamination, staff members lifted more soil into trucks and resampled. In some parts of the site, up to 3.5 feet of soil were excavated, Brenda says.

"We came in on schedule and under budget. We had to finish in time for road grading (for M and 14th streets) to be done the same year. Some of the grading was in the place where we had to remove the most soil to get to the 1 ppm level." After confirmatory sampling, clean dirt was trucked in to level the site.

"The ER team worked very hard in the field and with the EPA and New Mexico Environment Department regulators to ensure that everything was done on or ahead of schedule," says Fran Nimick, ER Project Manager (6101). "Sandia invested leveraging funding so that the work could occur two years earlier than scheduled. Once things got going, the inter-organizational teaming was excellent." — *Will Keener*

Sandia 'Computing District' thrives in Area 1

Welcome to the "computing district." JCEL's location, south of Bldg. 880 and near three relatively new buildings, is the most recent example of how Sandia planners are grouping by district.

"This is a concept that goes back to the Greeks," says Sandia's Site Architect Roy Hertweck of Planning and Project Development Dept. 10853. "It's a loose planning concept we've been using at Sandia for at least the past 10 years. We try to fit buildings with similar hazards, infrastructure needs, security requirements, and work adjacencies where programs can work together."

The district includes: the Supercomputing Annex (SCA), the Integrated Network Security and Reliability Center (INSRC), a new Central Utilities Building (CUB), JCEL, and Bldg. 880, home of Sandia's resident supercomputer, "ASCI-Red Tera-Flops."

SCA will house the new generation "Red Storm" supercomputer, says George Connor, Manager of Computer Operations Dept. 9335. With 10,000 computer processors configured in end-to-end cabinets, the coming Red Storm will operate at speeds of 40 trillion operations per second and higher.

Red Storm needed a very large "free span" building (without internal columns) to allow users to configure the computer in unrestricted space. Project Manager Bill Hendrick (10824) worked with users on electrical, cooling, and free-span requirements for the new building, instead of trying to install the machine in Bldg. 880. MV Industries worked with Sandia to design and build the new building for just under $5 million.

The increasing load and complexity of Sandia's three computing networks led to INSRC, built to integrate Sandia computer and network specialists, the Corporate Computer Help Desk, network security, computer technicians, and computer security specialists. "INSRC puts all the right people in the right place with the right tools," says Jim Smith, project manager (10824.) Summit Construction completed the facility for Sandia.

(See also *Lab News*, April 2, 2004, page 6 story on Cyber Enterprise Management's new home.)

CUB supports SCA and INSRC with very large transformers and two 1,000-ton chillers. The facility will provide backup for Bldg. 850 CUB, so it can be taken off-line for maintenance. CUB won't start until Red Storm comes on-line and can be expanded for additional loads, says project manager William Tierney (10824).

THE NEW JCEL building is home to 175 researchers and support staff.

Jim Tegnelia named chairman of Army Science Board

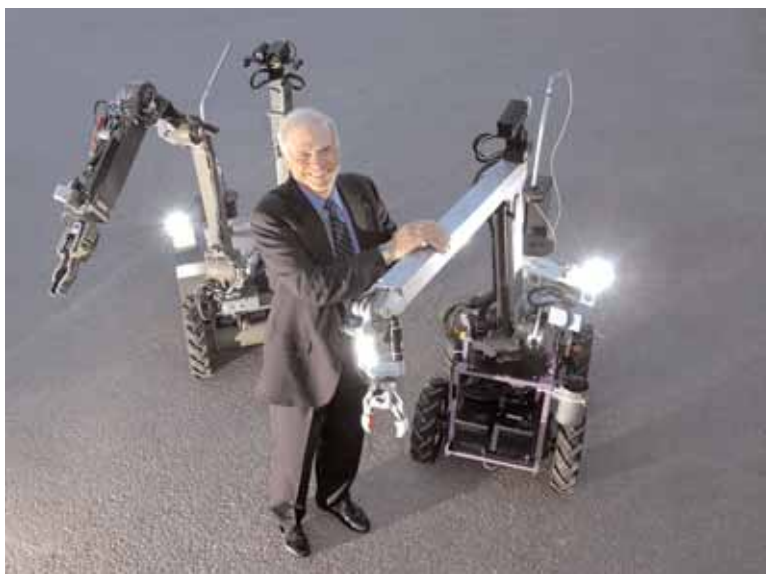
Jim Tegnelia, VP for Department of Defense Programs (15000), has been appointed chairman of the Army Science Board (ASB) for approximately two years, effective April 1.

The board provides the Army with independent and unbiased advice on science and technology issues that are strategic in nature and important to large segments of the Army.

"This appointment has two direct benefits for Sandia," says Jim. "The first is that the board serves in the national interest, and second is that it gives Sandia an opportunity to be more responsive to the military."

Three Sandians are currently members of the ASB: Executive VP Joan Woodard, VP of Business Management and CFO Frank Figueroa, and Director of Manufacturing Science and Technology Gil Herrera.

The ASB is the Department of the Army senior scientific advisory body. Chartered in 1977 to replace the Army Scientific Advisory Panel, the ASB advises and makes recommendations to the secretary of the Army, the chief of staff of the Army, the assistant secretary of the Army (Acquisition, Logistics, and Technology), the Army staff, and major Army commanders on scientific and technological matters of concern to the Army.



DIV. 15000 VP Jim Tegnelia is chairman of the Army Science Board. (Photo by Randy Montoya)

The board is composed of individuals from the private sector, academia, and non-DoD government agencies. Members are selected according to their pre-eminence in their respective fields and appointed by the secretary of the Army.

Jim will participate in at least four meetings throughout the year, plus a two-week summer study at a selected Army installation. The meetings enable members to review ASB activities and become better educated on Army issues.

Because the work of the division and SMU must continue without interruption during Jim's absences, and in recognition of the additional time Jim will have to devote to ASB activities, he has asked Jerry McDowell to move from director, Aerospace Systems Development Center, to director, DoD Systems Analysis and Concepts Center. In this role, Jerry will act for Jim in his absence with regard to division activities and will become the chief operating officer for Military Technologies & Applications Strategic Management Unit operations.

—Michael Padilla

'Your Thoughts, Please'

. . . What does the past indicate about the future?

"Explosive handlers work 17 years without incident." "Health care costs under scrutiny." "Test Capabilities Revitalization project to modernize Sandia weapon test complex."

When did these headlines appear in the *Lab News*? Recently or some years ago? Well, actually both.

Although there's a Labs-wide initiative right now to increase the complex's dedication to safety on the job, that headline about safe work by explosives handlers appeared in 1964. (See "YTP, too: Sandians offer thoughts about improving today's safety" below right.)

The one about health care costs came from page 1 of a 1984 issue (although there have been some similar ones even this year).

The latest Your Thoughts, Please *challenges you to "describe what sorts of heads [headlines] you hope to see or expect to see in the* Lab News *come spring of 2014."*

The Test Capabilities Revitalization project head appeared earlier this spring.

The question now posed by the employee comment program "Your Thoughts, Please" offers some of these heads, asks Sandians to read them, and then asks them to "describe what sorts of heads you hope to see or expect to see in the *Lab News* come spring of 2014."

Some other *Lab News* heads from the past: "Satellite payloads still laboring after 6 months" – 1964; "Lab proposes new way to drill oil wells" "Congressman Lujan optimistic about Labs future" – 1974; "Math model depicts hydrogen embrittlement dynamics" – 1984; "Less-than-lethal weapons: an extra step between talking and shooting" "E-mail latest Sandia information superhighway vehicle" – 1994; "Combustion Research Facility team and partners measure car's particulate emissions driving on road" – 2004.

"Your Thoughts, Please" appears on the internal Web homepage's Newscenter (http://www-irn.sandia.gov/newscenter/news-frames.html). From there simply go to the program's hyperlink near the top left of the page to offer your thoughts about desired or likely *Lab News* headlines for 10 years from now.

Responses will be accepted through the end of May.

Frank Figueroa, Lenny Martinez, Sid Gutierrez named to Hispanic Engineer *top-50 list*

FRANK FIGUEROA

LENNY MARTINEZ

SID GUTIERREZ

Sandians Frank Figueroa (10000), Lenny Martinez (14000), and Sid Gutierrez (12630) have been selected as part of the "50 Most Important Hispanics in Technology and Business" list for 2004 by *Hispanic Engineer & Information Technology* magazine.

Frank has been VP and chief financial officer for Sandia since 1997. He is responsible for the Integrated Enabling Services Strategic Management Unit as well as finance, business services, facilities and construction, procurement, logistics, pension and savings fund management, and prime contract administration.

Lenny is VP of Manufacturing Systems, Science & Technology at Sandia. He joined Sandia in 1995 as director of Production Integration, a center created to support of the manufacturing operation to produce neutron generators.

Sid is the director of the Monitoring Systems and Technology Center and the Systems Assessment and Research Center at Sandia. Prior to joining Sandia in 1994 he served as an Air Force fighter pilot/test pilot and NASA astronaut/shuttle commander. He serves on a number of boards and commissions including the Board of Regents of New Mexico Institute of Mining and Technology, the New Mexico Space Commission, and the National Advisory Board for the National Hispanic Cultural Center.

Honorees are chosen for this annual list for their outstanding work in technology and their leadership. This list includes many of the nation's highest-achieving Hispanic executives, managers, and researchers in industry, government, and academia.

For the first time, the 50 most important exemplars will gather this year for a colloquium and awards dinner where increasing minority entrepreneurship, executive development, and educational readiness for the "Digital Economy" will be discussed. The event is set for Friday, Sept. 17, in Nashville, Tenn., as part of the Emerald Honors Conference, a career development and employee recognition event for minorities in the areas of research science and technology.

The honorees will be featured in the June/July issue of *Hispanic Engineer & Information Technology* magazine.

YTP, too: Sandians offer thoughts about improving today's safety

Also ready for perusal now through the "Your Thoughts, Please" Web page are the various comments you and your colleagues offered to this question: "With recent talk around the Labs — including some in *Lab News* and *Daily News* — about improving safety, what is the one thing — maybe the one stupid thing — going on right now that if done better or differently would improve safety throughout the Labs so that every member of the workforce truly could expect to go home injury-free every day?"

Some of those comments:

• "Be aware that we are our own worst enemy, and in times of stress (work deadlines, personal problems, scheduling conflicts) we sometimes ignore those things that should be most obvious to us."

• "Three words immediately come to mind: slips, trips, falls."

• "While some areas of the lab have nice paved sidewalks, my area (trailers east of 823 inside Tech Area 1) is terrible. This former parking lot is full of potholes, cracks, cement humps where things used to be, and low areas that turn into ponds or mud pits in bad weather."

• "More people than we would like to admit are climbing on things that shouldn't be climbed on (desks, chairs) in the course of 'safe' office work. Every office work site should have a step stool readily available. . . ."

Thunderbird Café and SALUD invite Sandians to eat healthy, their way

By Iris Aboytes

Low-carb, low-fat, low-calorie — with so many dietary suggestions on the market today, how does one decide what to eat? To help consumers wade through the diet jungle, Sandia's Thunderbird Café has teamed with ¡SALUD! Health Promotion on a new initiative called "Your Health Your Way."

According to Thunderbird Café manager Steve Carleton, new menu options such as a fresh fruit breakfast and low-carb tortillas will be added in an effort to provide a variety of choices. The café will also begin to advertise the nutritional information of many of the meals.

"Each individual has their own unique dietary needs," says ¡SALUD! nutritionist Eileen Gonzales. "Having access to nutrition information can help customers make informed decisions about what they are choosing to consume."

According to Sodexho Site Director John Davis (who runs the Coronado Club and the Thunderbird Café), with this new initiative the café will feature daily meals that include certain fundamental characteristics. They will all have great taste and be power-packed with essential nutrients.

There are 37 featured items to choose from each day. Breakfast is served from 6 to 9 a.m. Lunch is served from 11 a.m. to 1:30 p.m. Cold sandwiches and snacks are available anytime the café is open, 6 a.m. to 3 p.m.

The café serves about 22,000 meals a month. That includes about 2,800 breakfasts. In the spring and summer, the café hopes to initiate a roving barbecue four days a week. Look for an announcement in the *Sandia Daily News*.

"The café is also available to Sandians who need a place to hold impromptu meetings away from the office or to temporarily escape and have a cup of coffee," says Steve. "No reservation is needed, just come."

For more information on the services available at Thunderbird Café, call Steve at 844-7373. For a complete weekly menu, check out the *Daily News*.

MIKE GARCIA prepares sandwiches at the Thunderbird Café. (Photo by Randy Montoya)

Labs honored with six Crystal Communicator Awards for 2004

Sandia communicators and their publications and products have won 17 Communicator Awards in the 2004 print media competition. Six of the awards, announced April 5, were the highest possible in the competition, the Crystal Award of Excellence.

The Communicator Awards are an international awards competition that recognizes outstanding work in the communications field. Entries are judged by industry professionals. The judges look for companies and individuals "whose talent exceeds a high standard of excellence and whose work serves as a benchmark for the industry." This year there were 3,743 entries.

Here are the six Sandia winners of Crystal Awards of Excellence ("among the best in their field") and their categories:

- 2003-2004 Sandia Annual Report (annual report/government)
- 2003-2004 Sandia Annual Report (writing/annual report)
- R&D/Community Calendar (photography/calendar)
- *Sandia Lab News*, Sept. 5, 2003 (newsletter/government)
- *Sandia Technology*, Vol. 5, No. 3 (magazine/government)
- Tan Thai profile, Iris Aboytes, *Lab News*, April 4, 2003 (writing/feature article)

In addition, the Labs received seven Awards of Distinction ("exceed industry standards"): The 2003-2004 Annual Report (design/annual report); "Electricity Girl" photograph, Randy Montoya (photography/people/portrait); "Galileo's 14-Year Odyssey of Discovery Ends," Ken Frazier (writing/news article); "Morning Media Report," Janet Carpenter (web site/overall site); *Sandia Technology*, Vol. 5, No. 2, Will Keener, editor (magazine/government); *Sandia Technology*: Biotechnology, Chris Burroughs and Neal Singer (writing/magazine); *Sandia Technology*: Biotechnology (design/magazine interior).

The Labs also received four Honorable Mention awards.

Manager promotion

New Mexico

Matthew Brown, from PMTS, Analog Electronics Engineering Dept. 5735, to Manager, Space Processor Engineering Dept. 5713.

MATTHEW BROWN

Matthew first came to Sandia in February 1989 as a member of the Nuclear Weapons Test Equipment Design Department, where he worked on a variety of tasks, including a modernized data acquisition system. In May 1997, he transferred to the Satellite group's Testers and Experimental Ground Stations Department, where he designed testers to support verification and testing of optical sensors.

In July 2000, Matthew left Sandia to join IBM Corp. in Research Triangle Park, N.C., where he developed microcode for IBM's PowerNP Network Processor Chip. He returned to Sandia in October 2002 and joined Monitoring Systems and Technology Center's Space Sensor Engineering Department, where he worked on an enhanced optical sensor.

Matthew was a member of the EnRad Satellite Payload Team that won a NOVA award in 2003 and a member of the BDYE Sensor Development Team that won a Division 5000 Employee Recognition Award in 2004.

Before joining the Labs, Matthew worked for Hughes Aircraft Corp.

He has a BS in electrical engineering from the University of New Mexico and an MS in electrical engineering from Purdue University.

Plumb 'worn-out' Bldg. 805's demolition starts with 'wall-breaking' ceremony

HAMMER TIME — VIPs, from left, Mike McFadden (SSO), Dave Corbett (10800), Senior VP 9000 Tom Hunter, and VP 10000 Frank Figueroa gathered Monday to participate in Bldg 805's wall-breaking ceremony. The building is being demolished. Bldg. 805, originally referred to as Bldg. 861, Phase I, opened in 1960. In 1963 a small accelerator cell addition was built and in 1966 additional chemical storage was created. In 1969 a trolley hoist was added in Room 121. Most of the work done in the building over the years consisted of basic research into materials. In a 1998 interview about the new Processing & Environmental Technology Laboratory that would house Materials & Process Sciences Center 1800, until then located in Bldg. 805, then-Facilities Director Neil Hartwigsen described Bldg. 805 as "totally worn out."

TOP OF THE WORLD — Rich Diver (6218) and his daughter Kylie have great view of dad's work on top of the Solar Thermal Test Receiver. Kylie, along with 885 other girls, got a chance to visit Sandia work sites for the annual Take Our Daughters to Work Day on April 22. (Photo by Laura Montoya, age 12)

A daughter's look at Daughters to Work Day

I saw uranium atoms split and turn water molecules blue as they slowed down from the speed of light! I did this at Sandia's 2004 11th annual Take Your Daughters to Work Day. A real nuclear scientist told a group of girls how a nuclear reaction works and how it looks when the reactor fires only 30 feet away under a pool of water. It was amazing.

I blasted a fossil into a brass plate. At remote explosive site 9930, eight girls laid leaves and seashells on 3x3" pieces of brass. When we had finished decorating our plates they were taken outside and had 4 grams (about 4 pennies worth) of sheet explosives attached. After we sounded the alarm and everyone was safe, we pushed the trigger button and bang, the shock wave hit the control room. The imprint of delicate leaves was forced into rigid brass; they turned out to be a wonderful and beautiful keepsake.

Take Your Daughters to Work Day is a fun day dedicated to getting women interested in science. More than 850 young women between the ages of 9 and 15 got to enjoy learning about some cool robots, seeing a nylon parachute cord stretched beyond its breaking point, and seeing hundreds of reflective heliostats at the solar tower.

Daughters to Work Day was very encouraging. It made me want to work hard and to do my best in school. I learned that women and men study many different parts of science. To be a scientist you have to want to learn new things to enjoy your career. You must be able to work with others and get really good grades. My dad is Randy Montoya, the photographer at the *Lab News*. He tells me that at work, "I don't photograph B students." I ran into a couple of friends from school and soccer. They were also with their dads and, just like everyone else, they seemed to be having a great time.

I think everyone enjoyed the experience, the girls, the parents, and the people who helped us. My sister Amanda and I had a lot of fun too. We got to do my dad's job and take photographs for a day. — *Laura Montoya, age 12*

GOOD VIBRATIONS — Blythe Frew and her dad Danny (15412) set up a sample for a shock test in a Hopkinson Bar Lab. (Photo by Amanda Montoya, age 10)

COOL ROBOTS — The Robotic Vehicle Range was a big hit with guests who braved the windy day. (Photo by Amanda Montoya, age 10)