

W76-1 Life Extension Program milestone a Labs-wide accomplishment

Program to update W76 warhead is biggest weapon project in 20 years

By Bill Murphy

In late September, when Labs Director Tom Hunter signed the W76-1 Final Weapon Development Report, it represented Sandia's certification of the US Navy's strategic warhead. Los Alamos National Laboratory (LANL) Director Michael Anastasio also signed the report along with a yield certification letter, denoting LANL certification of the W76-1.

The lab directors' signatures marked the culmination of a process that began in 1998 with a joint NNSA and US Navy feasibility and cost study. The certification represents a key accomplishment in NNSA's Life Extension Program, or LEP, which is designed to extend the life of warheads in the nation's nuclear stockpile.

With the lab directors' signatures, and with accep-

tance of the W76-1 by primary customers NNSA and the US Navy, the updated warhead will be deployed over the next several years, replacing first-generation W76 weapons.

It's hard to overstate the significance of the W76-1 milestone, as Tom made clear in his recent all-hands meeting.

"For the first time since 1989," Tom noted, "we certified a weapon system for the stockpile," which allows it to go into full-scale production.

"This is a first in many years for the laboratory," Tom said, "and it is also a very important commendation on the work of hundreds of people who worked across the laboratory to make this possible and one for which the laboratory has received a lot of recognition."

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Sandia earns ISO 9001 certification

Sandia has received ISO 9001 certification by the British Standards Institute (BSI-Americas). On Nov. 18, the Labs received its ISO 9001:2008 Certificate of Registration following a comprehensive ISO audit conducted by BSI-Americas. In late October, BSI auditors visited Sandia to assess the system of policies, processes, procedures, tools, and roles and responsibilities used to manage the Labs.

Sandia's ISO 9001 scope of registration includes policy areas (Facilities, Human Resources, Information Management, Corporate Governance, Supply Chain Management, Integrated Safeguards and Security) and mission activities (nuclear weapons program management, design, fabrication, and production of unique equipment, weapon components, neutron generators, and ASICs — application-specific integrated circuits).

Labs Director Tom Hunter has made achieving ISO 9001 registration a key objective for Sandia. His interest dates back to his days as Nuclear Weapons VP. Tom's commitment to the process stems from the compelling body of evidence indicating that achieving ISO 9001 registration would be an important milestone, an objective recognition that Sandia is a well-managed, agile, responsive, and high-performance national laboratory.

"This significant accomplishment for our Sandia team," Tom says, "reflects our continued commitment to operational excellence and provides a framework for the future of the Laboratory."

According to Enterprise Transformation Div. 9000 VP Joe Polito "Receiving ISO 9001 registration assures Sandia and its customers that ILMS (the Integrated Laboratory Management System) meets an internationally accepted quality management standard that is widely considered to be a commercial best practice, that ILMS

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Dangerous bacteria may evolve from a single cell, not many, Sandia/UNM researchers find

A 'quorum of one' is enough to start an infection — or stop it



JEFF BRINKER sits next to a cell-suspension wheel that contains bacteria suspended in media.

(Photo by Randy Montoya)

By Neal Singer

Most scientists believe that staph infections causing inflammation or worse are produced by a large community of bacterial cells signaling each other to emit toxins and biodegradatory enzymes. The signaling process is called "quorum sensing" because many bacteria — a quorum — are thought to be present to start the process.

Contrary to this opinion, in the Nov. 22 *Nature Chemical Biology* journal, a research group led by Jeff Brinker (1004) has determined that the very first stage of staph infection — a bacteria's switch from a harmless to a virulent form — can occur in a single cell independent from the behavior of other cells around it.

"The good news is that by inhibiting the single cell's signaling molecules with a small protein, we were able to suppress any genetic reprogramming into the bacterium's more virulent form," says Jeff. "Our work clearly showed the strategy worked."

While staph are often harmless bacteria that commonly live in and on the body, the Brinker group's nonantibiotic approach may make it easier to treat staphylococci strains that have mutated to become drug resistant like the methicillin-resistant *Staphylococcus aureus* MRSA, control of which is a formidable problem in modern hospitals.

In the course of their experiments, the Brinker team

(Continued on page 5)

That's that

Last time in this space, I wrote about some of my favorite sports clichés. I hardly scratched the surface of that rich vein. There's another aspect of this general subject area that's fun to consider: the hackneyed questions sportswriters and commentators sometimes ask athletes. My favorite is a question I heard an announcer ask a surprise gold medal winner at the last Olympics: Did you ever in your wildest dreams think you'd be standing here? Getting with the spirit of the question, the athlete played along and said nope. Never dreamed it could happen. But I don't believe it. Not for a second. Of course he dreamed it! Heck, in my wildest dreams I've stood there on the winner's podium accepting a gold medal in modern pentathlon while the *Star Spangled Banner* plays. And I bet you have, too. (Okay, maybe not for pentathlon.) In my wildest dreams I've been the first man on Mars, written the universally acknowledged great American novel, and sailed my own home-built sloop around the world. C'mon. Why do you think the kid spent 14 hours a day for the past 10 years practicing the hammer throw? To come in second?

* * *

Here's a random factoid, heard on the radio news: Turns out babies cry with an accent. French babies sound French; Chinese babies sound Chinese. Guess it's obvious, but I'd never really thought about it before. And speaking of accents, I'm an interesting case. My father was a cartographer with the US Geological Survey. Because of his job, we moved around a lot, north in the summers and south in the winters. Whenever we were in the north, kids thought I sounded Southern. Down south, kids said I sounded like a Yankee. And that's the term they used: Yankee. Guess my accent fell somewhere in between. And here's a sidebar to the story: Up north, as kids we played World War II. Down south, we played Civil War, which even almost 100 years after the fact still loomed huge in Southern consciousness. The Southern kids were glad to have us new kids on the block. My brother and sister and I were always the Yankees, a role the local kids were loathe to play. I didn't mind. The Yankees won.

* * *

I promised in my last column that I'd pass along any favorite annoying phrases people sent my way. And I did get a few responses. Here are a couple:

Retiree Pat Hoffman is just driven nuts by the phrase "no problem." "Seems like it's mostly young people in service jobs who use that phrase all the time," Pat writes. "If they fill your coffee mug, etc., and you tell them thanks, they reply 'no problem' rather than say 'you're welcome' or any other sort of reply. I just don't get it."

Rosa (she asks that I use only her first name) writes that the term "utilize" bugs her. "Why not simply say 'use'?" she writes. (My journalism school prof would agree with Rosa on that one.) To be a stickler, there are certain situations where utilize is the correct word, but Rosa's right — people utilize the word way too much. And Rosa's got something else on her mind, "The phrase 'that would be great' after every request or action item to do something is annoying — didn't anyone learn from watching *The Office*?"

Jane Zingelman (9710) took a stab at identifying the five most annoying phrases in my column as determined by a recent Marist poll. I'd mixed in the phrases cited by the poll with a whole bunch of other phrases that I figured would be guaranteed to annoy. Jane actually came pretty close, picking up on three out of the five phrases that really bug people. For the record, here are the five "winners" the Marist pollsters identified: Whatever. You know. Anyway. It is what it is. And . . . at the end of the day.

By the way, in her email to me, Jane thanked me for giving her the chance to weigh in. To which I happily say, "No problem."

See you next time.

— Bill Murphy (505-845-0845, MS0165, wtmurph@sandia.gov)

Mike Knoll promoted to director of Electronic Systems Center 5300

Mike Knoll has been promoted from senior manager of Flight and Space Subsystems Dept. 5330 to director of Electronic Systems Center 5300.



MIKE KNOLL

Prior to working at Sandia, Mike, as a captain in the US Air Force, led a microelectronics group developing nuclear radiation-hardened microelectronics. Mike joined Sandia's Custom Integrated Circuit Design department in 1980. He then became manager of the Custom Integrated Circuit Design and Products Department in 1987. In 1998, Mike became group manager of the Microsystems Design and Products group.

Mike's work has been in design, development, and delivery of space and aeronautical electronics systems, nuclear radiation-hardened microelectronics, and other electronic components.

Mike received a BS in electrical engineering from the US Air Force Academy in Colorado, and an MS in electrical engineering from the University of California, Berkeley.

TVC call for posters, business plans



Technology Ventures Corp. invites staff members employed at DOE research laboratories including Sandia to apply to present posters of technologies with potential for commercialization at the 17th annual Equity Capital Symposium, to be held May 19-20 in Albuquerque. Selected applicants will meet venture capitalists, corporate investors, angels, business owners, and entrepreneurs focused on commercializing promising technologies. Each selected applicant will receive a complimentary symposium registration and will be featured in TVC's magazine, which is distributed to more than 15,000 readers worldwide. Applications are due Feb. 12.

Visit www.techventures.org for instructions.

If you have questions, contact Suzanne Roberts at suzanne.s.roberts@lmco.com or at 505-843-4091.

Accepting business plans now

TVC is also accepting business plans and executive summaries for US technology companies interested in presenting at the 2010 Technology Ventures Equity Capital Symposium.

For 17 years the symposium has served as a vehicle to connect growing or expanding technology companies with investment opportunities. Of the entrepreneurs who have worked with TVC, about one in three have received funding.

Preference will be given to those opportunities that are based on technology developed by or with a DOE laboratory.

The submission deadline for nonproprietary business plans is Jan. 8, but interested companies should contact TVC or a TVC project manager now for assistance with their business plan development.

TVC has helped form more than 100 new businesses, created more than 12,000 jobs, and has facilitated more than \$1 billion in funding for its client companies.

TVC was established in 1993 by Lockheed Martin as a nonprofit corporation with a mission to help facilitate movement of technologies developed at DOE labs into the private sector.

Thunderbirds club meets Dec. 8

The Coronado Thunderbirds, Sandia's retiree club, will hold its monthly meeting Dec. 8, 1 p.m., at the Mountain View Club on Kirtland Air Force Base. The meeting will include a presentation on making Christmas decorations. Many of the demonstration projects will be given as door prizes. A holiday sing-along will follow the meeting, with Eddie Reyes playing guitar. For more information about the meeting or about the Thunderbirds, go to <http://coronado-tbirds.tripod.com>.

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Make a career resolution: Take a serious look at mentoring

Keeping one of Sandia's top commodities — knowledge — flowing

What are you going to do that is really good for you and your career next year? After all, 2010 and resolution time are fast approaching.

Joan Luciano, manager of Leadership Learning and Talent Management Dept. 3502, offers a suggestion — look at what you can do to proactively manage and take responsibility for your career.

Joan provides a specific resolution recommendation — consider becoming a mentor to other Sandians, or identify a mentor for yourself.

And, as you consider the mentoring question, there just may be a little something in your brain saying, “Hey, I could mentor? I do have a lot to offer. But I also know there are some things about the Labs, some of our emerging initiatives, for example, I should learn more about. Maybe I could get a mentor as well” (see “Employee career lifecycle” below).

Sandia has a long and proud history when it comes to mentoring and lots of people with familiar names around the Labs have taken advantage of the opportunity. VP and Principal Scientist Gerry Yonas had a mentor. Science and Technology and Research Foundations Div. 1000 VP Steve Rottler also had a mentor/mentee relationship. So did Executive VPs Joan Woodard and Al Romig early on in their Sandia careers.

Joan Luciano is quick to point out that she and others who work in the area of leadership development and talent management aren't trying to correct any mentoring deficit at Sandia.

“Sandia certainly has some very impressive mentoring activities, which are owned by and will continue to be owned by the line,” she says. “We are here to facilitate and provide resources to help increase an organization's mentoring efforts and to ensure that the mentoring partnership is as productive as possible for the mentor, mentee, and ultimately the Labs. Too often, mentoring relationships lack structure or just fizzle out. So, there's a way to approach mentoring with some clearly defined objectives.”

In today's complex work climate, it is important that mentoring not only be viewed as a way to acclimate to Sandia or transfer knowledge, but should also be strategic, benefiting the individual and the organization.

For example, Todd Hunter, senior business manager for Div. 6000, says the mentoring program in his division must be very focused on the next three to five years. “Skills must match our emerging programs and we need new leaders,” he says. This impacts what sorts of mentors are needed and hopefully can more precisely pinpoint staff of various stripes who see the long-term value for themselves and the Labs as a whole of being a mentor or a mentee, he says.

Joan and others on her team are eager to visit with any Sandia group that would like to get reacquainted with mentoring. If you would like more information on mentoring contact Joan at 505-844-9172 or Linda Logan-Condon (3523) at 505-284-2921.

Joan stresses — and with notable passion — that mentoring should never go away. “It is a key part of

ensuring our legacy and the transfer of knowledge while moving forward.”

She continues: “A lot of people with great knowledge often find themselves at a stage in their careers where they want to transition, perhaps from one job to another, one employer to another, or even retirement. We are interested in helping Sandians recognize that becoming a mentor can be a viable transition choice and a great way to reengage in a career. Sharing knowledge can be very energizing.”

Joan says that in years past, many people hired into a company and into a particular discipline with the expectation of remaining there for their entire professional career. There may still be some folks with that predisposition.

“However,” she says, “statistics show that increasing numbers of workers move around a lot more than in the past. They move from job to job without changing companies. They hire into a job with an expectation of staying put for only a few years.”

This dynamic, Joan emphasizes, really points to a special modern-day importance for mentoring.

Joan is working to update and develop a robust website that offers useful information about mentoring, leadership development, and Full Spectrum Leadership. Find it at <http://leadership.sandia.gov>. There's even a link to a detailed document — Mentoring Guide: Your Tools, Your Way — that offers things like checklists to help Sandians decide whether they're ready to mentor or to be a mentee.

Employee career lifecycle: Why it's possible to be mentor and mentee simultaneously

Typically some responsibilities of a manager — no matter the level — are to oversee and support team members by setting expectations, assisting with matching mentors and mentees, and providing ongoing career development opportunities.

Concurrently an important responsibility of managing one's own career for maximum and satisfying results — independent of the individual's spot on an organization chart — is to understand the concept of an employee career lifecycle and where you fit into it.

The chart at right illustrates the evolving nature of folks in different phases of their career lifecycle.

| New employee | Early career employee | Mid-career employee | Late career employee |
|---|---|---|---|
| Role: Buddy | Role: Mentee | Role: Mentor and Mentee | Role: Mentor |
| Focus: Getting started — Understanding how to get work done, expectations, teaming, culture, systems, processes, etc. | Focus: Development — Building competency and confidence in the areas of knowledge and skills. | Focus: Subject matter expert or leadership development — Developing others by leading the way, coaching, teaching, and mentoring. | Focus: Leaving a legacy and developing the next generation — Transferring history, knowledge, and skills to others. |

Deputy Energy Secretary Daniel Poneman announces funding for clean energy work

Sandia will receive \$4.2 million in stimulus money for battery work

By Stephanie Hobby

During a Nov. 18 visit to be briefed on Sandia's capabilities and programs, Deputy Secretary of Energy Daniel Poneman announced that the Labs will receive \$4.2 million as part of a \$104.7 million American Recovery and Reinvestment Act package. The funds are intended to advance research and development activities in clean energy and efficient technologies across seven DOE national laboratories. The announcement came during a news conference attended by members of the local media.

The funding announced by Poneman is concentrated on three priorities: advancing carbon fiber manufacturing and processing technologies to help reduce the weight of vehicles; developing integrated building systems to reduce US carbon emissions; and expanding facilities for fabricating and testing advanced battery prototypes for fuel-efficient vehicles.

Sandia's \$4.2 million portion of the funds will help finance modifications and enhancements to the Labs' Battery Abuse Testing Laboratory, with the goal of developing low-cost batteries that meet real-world performance requirements.

Poneman applauded Sandia's past and present achievements, while emphasizing the Labs' role in protecting the country.

“As we look to the future and the challenges this nation will continue to face in terms of national security, in terms of energy security, in terms of climate, we can continue to rely on the insights, on the innovation, on the technology, on the dedication, and on the patriotism of the people at Sandia and at our other national laboratories,” Poneman said.

DURING A NOV. 18 news conference, DOE Deputy Secretary Daniel Poneman announces (in photo at immediate right) that Sandia will receive \$4.2 million in stimulus money to do research on battery technologies. In photo at far right, top, Poneman inspects a device developed at Sandia's Microelectronics Development Laboratory as Center 1700 Director Gil Herrera looks on. At bottom right, Labs Director Tom Hunter discusses Sandia work with the deputy secretary.

(Photos by Randy Montoya)



W76-1 LEP

(Continued from page 1)

Huge for Sandia

As weapon system integrator for the W76-1, Sandia is the design agency for the nonnuclear components of the weapon. Design efforts include systems engineering, requirements management, arming, fuzing and firing system (AF&F), instrumented and high-fidelity Joint Test Assemblies (JTAs), system components, system qualification, handling gear, trainers, and production support.

"This was huge for Sandia," says Mark Rosenthal (2130), senior manager for Navy Strategic Weapon Systems, who has been involved in the W76-1 LEP effort since its inception. "We changed out the whole arming, fuzing, and firing [AF&F] system. This wasn't a department accomplishment or a division accomplishment. This was a lab accomplishment."

In fact, as Mark notes, the accomplishment reaches well beyond Sandia, reflecting the close cooperation among the labs, with Lockheed Martin Space Systems Company, and with a host of DoD partners and suppliers within the nuclear weapons complex. In addition, says Mark, "Sandia was fortunate to have engaged knowledgeable NNSA and Navy customers that set clear expectations and provided the necessary guidance to successfully execute the LEP."

The W76-1 effort, Mark notes, called for effectively reinventing the weapon's AF&F system, which not only controls the detonation of the warhead, but incorporates features that ensure it can only be fired under very strictly defined conditions. The AF&F system includes critical components that ensure the safety of the weapon as well as providing the detonation function at the correct fuzing height.

Sandia brings more than 40 years of experience providing the Navy and NNSA with integrated AF&F designs, says Mark, adding that the W76-1 incorporates everything the Labs has learned about AF&F systems during that time. (The arming and fuzing subsystem of the AF&F is a Navy responsibility and the firing subsystem along with its nuclear safety critical components is an NNSA responsibility. The integrated design provides packaging and performance enhancements.)

Though the W76-1 is emphatically not a new weapon system, the scope of the LEP effort was very demanding. The original W76 design, as a product of the 1970s, is built around technology of that era. The LEP program brings W76 technology into the 21st century.

Exceeding Navy requirements

"We haven't done a project of this size in 20 years," Mark says. And while the scope was wide-reaching, the efficiencies attained in the project set a new standard. "We designed and qualified the arming and fuzing subsystem for 30 percent of the cost of what we did for the W88," Mark says, exceeding a 50 percent requirement and almost meeting the 25 percent goal set by the Navy at the inception of the project.

No new W76 warheads have been manufactured since the late 1980s, which, with the passage of time, has loomed as a growing concern for the Navy. With no new weapon designs on the horizon, Navy leadership deter-



ON SEPT. 24 Sandia President and Labs Director Tom Hunter signed the W76-1 Final Weapon Development Report providing Sandia's certification of the W76-1 warhead. Pictured with Tom (seated in the center) at the signing ceremony are, from left, Steven Barnhart (2132), Kathleen Diegert (0413), Robert Paulsen (2011), and Mark Rosenthal (2130).

mined that it needed to extend the useful life of its W76 weapons to coincide with the life-cycle of the delivery system, the Trident II (D5) missile and the *Ohio*-class ballistic missile submarines.

The W76-1 LEP delivers on that need. The updated weapon, while incorporating modern safety enhancements, extends the service life of the weapon from 20 to 60 years.

In replacing 1970s technology, Mark notes that several of the Labs' unique capabilities were brought to bear.

"MESA played a big part in this," he says. "It played a significant role in delivering rad-hardened ASICs." (Mark is referring to the role Sandia's Microelectronics Development Laboratory and Microsystems and Engineering Sciences Applications played in delivering radiation-hardened application-specific integrated circuits to the LEP effort.)

Strategic reentry systems like the W76-1 must survive hostile radiation environments. Sandia provides unique radiation effects expertise for developing rad-hardened technology and qualifying performance in severe radiation environments. The W76-1 capitalized on these capabilities to design the AF&F and used advanced computational tools and experimental facilities like the Annular Core Research Reactor to assess the performance in hostile radiation environments.

Physical simulation and computational simulation

The W76-1 drew on the rapid evolution over the past decade or so of NNSA's computing capabilities.

"A significant amount of the qualification was accomplished with modeling and simulation," says Mark. "The system was also certified by Los Alamos [National Laboratory] in the absence of underground

nuclear tests." For sake of comparison, Mark points out that five underground weapon effects tests simulating hostile radiation environments were conducted on the W88 weapon system in the 1980s.

Qualification also relied heavily on unique Sandia test facilities for simulating the environments that the W76-1 will encounter during its deployment, mission, or in an abnormal or accident environment. A number of these facilities, like the Light Initiated High Explosive and the Blast Tube, had to be reconstituted, since they were last used on the W88 program. It is noteworthy that the W76-1 was the last weapon to qualify with the Sandia Pulsed Reactor III before its decommissioning and the first system to use

the new Thermal Test Complex. Extensive planning and coordination ensured that tests provided necessary data for validating computer codes. Compared to previous weapon systems, physical simulation combined with computational simulation significantly increased the W76-1 technical basis for performance qualification.

Assert, challenge, conclude

In the certification process for the W76-1, Sandia applied a critical approach Labs Director Tom Hunter has come to favor in the annual stockpile surveillance process — "assert, challenge, and conclude."

In this process, project engineers assert that a particular requirement has been met; a Weapon Assessment Team from the Surety Assessment Center, with no vested stake in the design, examines the assertion. If and where the team finds insufficient evidence, it challenges the assertion. The process wraps up with a conclusion that either endorses the original assertion or directs that the issues raised in the challenge are properly addressed.

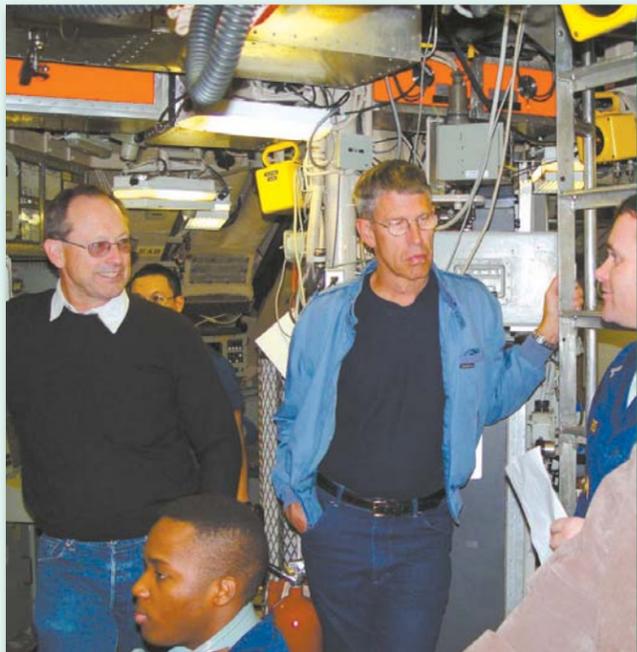
Even with certification, the W76-1 LEP is far from over: The challenge now moves to the production arena.

"I tell everyone production is hard, because you want the first unit to look exactly like the last unit," Mark says. "That's not a trivial challenge with systems of this complexity, and for most of these components, we haven't done production in a while."

Mark says the lessons learned in the W76-1 LEP will serve Sandia well as it continues its role as stewards of the nation's strategic nuclear deterrent.

"We've laid the foundation for the B61 Life Extension Program project," Mark says, "and that could be a more complex program even than the W76 effort was."

Aboard the USS Wyoming



In 2002, a number of Sandians involved in the W76-1 LEP had an opportunity to visit the USS *Wyoming*, an *Ohio*-class ballistic missile submarine. The Sandians were briefed on a variety of the submarine's systems and came away with a better understanding of how the Navy integrates the W76 into its at-sea operations. In the photo at left, Tom Hunter, then the Labs' VP for nuclear weapons, and Don Dietz, now retired, are briefed by *Wyoming* crew members. In photo above, Sandians get a tour and briefing of the *Wyoming*'s torpedo room. From left are Dennis Helmich (2138), Jose Montoya (2132), and Mark Rosenthal (2130). Brad Boswell (1521) is standing behind Jose.

(US Navy photos courtesy of Mark Rosenthal)

Sandia announces completion of mixed waste landfill cover construction

By Stephanie Holinka

The Environmental Restoration Project at Sandia completed construction of an alternative evapotranspirative cover at the Mixed Waste Landfill (MWL) in September. The 2.6-acre site is located in Tech Area 3 in the west-central part of Kirtland Air Force Base.

The protective cover consists of four engineered layers, including three layers of compacted soil and a biointrusion rock barrier that will keep burrowing animals out of the former disposal areas. Together, these four layers and the native plants will control water infiltration, thus isolating the wastes from the accessible environment. Because the cover is constructed without rigid layers, it can accommodate differential subsidence, or settling, without undue impairment of its performance.

The MWL was established in 1959 as a disposal area for low-level radioactive waste generated by Sandia's research facilities. Low-level radioactive waste and minor amounts of hazardous waste were disposed in the MWL from 1959 through 1988. Approximately 100,000 cubic feet of waste containing about 6,300 curies of activity (in 1989) were disposed of in the



MIKE MITCHELL, (6765, left) and Don Schofield (4133) inspect the evapotranspirative cover of the Mixed Waste Landfill. (Photo by Randy Montoya)

landfill. Over time, the radioactive materials in the landfill decay and become less hazardous.

The MWL has been monitored since 1969 and actively studied since 1991. An extensive investigation effort provided the technical foundation for the determination that the landfill is not expected to contaminate groundwater and does not represent an unacceptable risk to human health and the environment. After the extensive investigation, public meetings, and a public hearing, the New Mexico Environment Department (NMED) secretary issued the final order in 2005 selecting an evapotranspirative cover with a biointrusion rock barrier as the selected remedy. After a review of competitive bids, Sandia awarded the construction contract to a local small business. Cover construction was completed on schedule, near budget, and without any safety incidents.

The NMED regulates the corrective action to the MWL as well as the implementation of institutional controls and long-term monitoring and maintenance. Sandia and DOE continue to provide quarterly progress reports to the NMED. In addition, the final order requires compilation of a report that reevaluates the feasibility of excavation and analyzes the continued effectiveness of the selected remedy every five years. Construction of the MWL alternative cover will be documented in the Corrective Measures Implementation Report that will be submitted to the NMED for approval.

According to NNSA Sandia Site Office Federal



DON SCHOFIELD (4133, left) and Mike Mitchell (6765) check on the establishment of the new vegetation on the Mixed Waste Landfill cover. Construction on the cover was completed in September. (Photo by Randy Montoya)

Project Director Joe Estrada, "If it had not been for the personal perseverance of the project team, this mission would have withered. Now that the remedy is in place the team is looking forward to sharing lessons learned from the project."

The implementation of the selected remedy at the MWL is a critical step forward for the site. More than a decade of work and many personnel contributed to the success of the project. Although the cover is now constructed, monitoring work continues at the MWL.

"The groundwater, soil gas, and the cover will be monitored long-term to ensure performance and the protection of human health and the environment," says ER project task leader Mike Mitchell (6765).

Bacteria

(Continued from page 1)

achieved several interesting firsts.

First, they isolated *Staphylococcus aureus* bacteria in individual nanoscale compartments self-assembled by silica and lipids. Isolation of an individual bacterium previously had been achieved only computationally, leaving open questions of how a physically and chemically isolated bacterium would actually behave.

Second, the team demonstrated that it was the release of signaling peptides from a single cell — not a group — that acted as a trigger to reprogram that same cell so that it released toxins.

The finding challenges a generally accepted but unproven biological hypothesis that it takes a number of cells, called a quorum, to produce enough peptides to stimulate bacterial transformations. So settled is this belief that the process is referred to in technical literature as "quorum sensing."

But the term may prove a misnomer, the result of observations made in cell cultures rather than in the body, says Jeff. Because signaling molecules diffuse away in liquid, a culture of cells would naturally require many bacteria corralled together to produce enough signaling bacteria to begin reprogramming. The situation is otherwise in nature, where even a single cell may be sufficiently isolated that its own manufactured peptides would remain in its vicinity.

"Also, it's hard to believe that one cell's evolution could be based on what a whole bunch of cells do," says Jeff. "When we instead consider that an individual cell will do what's best for it, we can more clearly understand the benefits of that cell's behavior."

For example, by reprogramming itself to produce toxins or enzymes, a bacterium can break out of its confinement to access external nutrients and survive longer, the Brinker group showed.

This aspect of the research has drawn favorable comment from researchers in the field.

In an email, University of Illinois professor of microbiology and immunology Mike Federle wrote to Jeff, "I am

often asked when and where during the infection process quorum sensing starts. I often suggest that shortly after colonization, small numbers of cells may signal to initiate virulence factor expression, but this hypothesis is not always received well since many assume large groups need to be involved.

"Thank you for providing evidence this is not just a theoretical possibility."

Also at the University of Illinois, Professor Linda Kenney emailed, "... that the term quorum sensing is actually not an accurate description of [bacterial] behavior... [is] likely to have significant impact on the field as well as enhance our understanding of how biofilms [the relevant bacterial lifestyle in most infections] form."

Third, and equally startling, the Brinker group demonstrated that merely by introducing an inexpensive, very low-density lipoprotein (VLDL) to bind to the messenger peptide, they could stop the single cell from reprogramming itself.

One aspect of experimental rigor was the team's ability to organize living cells into a nanostructured matrix. "We've already done this with yeast," says Jeff. "We just extended the process to bacteria."

By compartmentalizing the bacteria individually, the Brinker group had set the stage to determine whether a single bacterium could reprogram itself without a quorum present.

A key question was whether a cell could distinguish between peptides emitted by itself from those sent by other cells. If the specific signaling peptides were chemically the same, what would it matter which bacterium emitted it?

It turned out, says Jeff, "Peptides could bond to surface receptors on their own [generating] cell. So a single cell's peptide molecules could activate its own genes into an expression that makes staphs virulent."

One indication that the experiment had isolated the actual cause of the transformation was that when the number of peptides produced by a cell ultimately came to exceed the number of VLDL molecules in solution the stalled quorum-sensing procedure started up again.

The researchers also demonstrated that if more signaling molecules were added to the mix, the cell's transformation occurred more rapidly.

A green fluorescent protein inserted in the cell's DNA showed, in its operation, that proteins were being manufactured by the cell itself when the transformation was permitted to occur.

Among the problems remaining for researchers is to find a mechanism to locate bacteria in the body starting to reprogram and deliver the antidote in time.

The problem could be solved, suggests Jeff, by the insertion of VLDL-bearing nanospheres (another Brinker-group creation) into the bloodstream, linked to a 'searcher' molecule designed to find and link to suspect peptides or cells that produce them.

"Inhibiting this species-specific signaling molecule from turning on the virulence wouldn't inhibit other bacteria," Jeff says.

Targeting is important because the human gut contains many useful bacteria. These are often decimated by conventional antibiotics but would be spared by the Brinker group's method.

Extending implications of the work to bacterial pathogenicity in general, Jeff says, "Our results imply that shortly after bacteria colonize the gut, respiratory tract, or other enclosed spaces, small groups of cells or even individual cells initiate an expression of virulence through use of these signaling molecules. So therapies aimed at inhibiting this behavior are promising strategies for eradication of infection at its outset."

Jeff, a Sandia Fellow and distinguished professor of chemical engineering and molecular genetics and microbiology at UNM, performed this work with Eric Carnes and DeAnna Lopez at the UNM Department of Chemical and Nuclear Engineering (DeAnna is now a Sandia technologist), Graham Timmins at the UNM College of Pharmacy, Niles Donegan and Ambrose Cheung at Dartmouth Medical School, and Hattie Gresham at the New Mexico Veterans Administration Health Care System.

The Sandia work is supported by the DOE Basic Energy Science/Division of Materials Science and Engineering and Sandia's Laboratory Directed Research and Development (LDRD) program. Other project work is supported by the Air Force Office of Scientific Research, the National Science Foundation, the Defense Threat Reduction Agency, and the National Institutes of Health.

Streamlining international travel

Consolidation of International Business Operations aims to simplify tasks, reduce risks in several ways

By Rod Geer

Things changed in a significant way a few weeks back in connection with the Labs' operations related to foreign travel and laptop computers taken on such travel, international protocol, and export control. But very few of us really noticed.

And that's just the way the team populating the newly consolidated International Business Operations & Export Control Group (4030) wanted it to be.

The group, which went into business at the start of FY10, comprises several organizations that previously had been scattered in various slots on the Labs' organization chart.

"The cast of in-house experts Sandians must deal with in connection with these activities and the procedures required for all aspects of international business conducted by the Labs are, by and large, unchanged. Transparency, that was a goal," explains Marcie Jordan, manager of International Business Operations (4031). "The major functions related to international business operations have been placed in one organization, in a very appropriate group to foster mission success."

Coordination required

Mike Hazen, VP for Infrastructure Operations (4000), adds, "It is a great pleasure for me personally to serve with such a talented group of professionals all focused on the success of Sandia's worldwide missions."

Internal processes for international travel, export control and international protocol often seem complex, but there also are coordination requirements with Lockheed Martin, DOE, DoD, and the State and Commerce departments. The need to comply with various legalities (safety, security, and personnel tracking) whether you are a Sandian traveling abroad or a Sandian hosting a foreign visitor to the Labs, can seem like navigating a minefield.

Be informed about LOFT requirements

Important reminder: In order to take a laptop on foreign travel (LOFT), employees must borrow a machine from a pool of specifically configured and managed laptops for that sort of activity (see <http://info.sandia.gov/css/loft/>). The managed-pool procedure ensures that export control, information protection, cyber security, and counterintelligence requirements and concerns are addressed.

Yet, these activities are vital to success of the overall Labs' mission. Just one example: International protocol officers often are the first to interact with foreign governments on Sandia's behalf.

The original suggestion for this consolidation came more than a year ago from Jim Chapek, a now-retired senior manager of the International Physical Protection Group. His staff took lots of trips to foreign countries, including a healthy collection of nations on DOE's sensitive country list. Jim, in effect, was dealing on a daily basis with processes that he considered opportunities for improvement.

So, he pushed for change. And his speaking points for consolidation of these functions and activities, which are increasing in number at Sandia, were clear:

- Global engagement is a growing and diverse laboratory initiative that, by its very nature, exposes employees and the corporation to increased risk.
- The growth of international business and work for others creates special risks such as identification and marking of export control information.
- International business has spread across the corporation.
- The Labs is playing an increasingly important role in solid nonpartisan support for nonproliferation, security, and energy at a global level.

The need for such a consolidation was confirmed by a lean six sigma assessment that took place in early 2009.

"In some ways the world is getting smaller," Marcie offers, "but it isn't getting any safer. It's quite possible for a Sandian to be in a United Kingdom subway when something bad happens."

Training for critical events

The Labs is quietly evaluating procedures and conducting exercises to train for such a critical event if it



TRAVELING THE WORLD — In FY09, 959 Sandians took 2,054 foreign trips, which included stops in 107 different countries, or about half of all the countries in the world. Examples of International Protocol Office events: biological laboratory and chemical safety officers training, consequence management, border security, and nonproliferation workshops.

Be smart about intellectual property matters

The US departments of State and Commerce impose restrictions or prohibitions on the licensing, sale, and transfer of information technology (including encryption software), and commodities to non-US entities (including countries, companies, and individuals).

Non-compliance with these requirements is an extremely serious matter because it could damage Sandia's reputation and/or result in significant civil/criminal sanctions against the Labs and an employee. Foreign travelers must know the relevant rules before they travel to a foreign country.

were to occur. For example, recently a very realistic "table top" emergency management exercise offered a scenario that involved two Sandia members of management finding themselves in a hostage/kidnapping situation in a Middle Eastern country.

Sally Uebelacker, senior manager overseeing 4030, points out that the consolidation of these sensitive and serious activities into her new group was completed "without adding bureaucracy or complexity."

"For instance," she says, "we've identified opportunities to set up mechanisms that reduce steps an individual or an organization must complete to plan, carry out, and close out a foreign trip."

That's tremendously important in many realms. Foreign trips are becoming increasingly complex, which increases safety and security challenges in many ways.

An example: Not too many years ago employee trips to and from a sensitive country like Russia were common. But that was just an out-and-back sort of event. "Now," Marcie says, "we're having more Sandians take a foreign business trip first to Russia, but then continuing on to Kazakhstan, and finally over to Malaysia before returning to the US."

If you're likely to travel internationally on business and feel a bit shaky on the details contact the International Business Operations Help Line at 505-845-1300 or its website at <http://ibs.sandia.gov>.

With the consolidation of all these related activities, which impact a significant number of individual Sandians and discrete organizations, complete, Sally emphasizes that "we want to make sure the Labs understands our operations are a mission enabler. We also want to let organizations involved in any of these activities to let us know how we can improve our service — planning, for example — even further."

"So," Sally adds, "let us know the international business programs and activities you're planning or even contemplating."

ISO 9001

(Continued from page 1)

is being used to manage the Laboratories, and that ILMS is effective. Prior to receiving ISO 9001 registration, companies must demonstrate that their quality management system results in continual improvement. We designed ILMS so that we can self-identify and fix our own problems."

In the future the intention is to expand Sandia's scope of registration to include additional mission and support activities. This should be easier, says Chuck Meyers, senior manager of Enterprise Systems Dept. 9001, now that Sandia has a comprehensive set of policies, processes, procedures, tools, and roles and responsibilities that meet the ISO 9001 requirements. Organizations will be able to leverage ILMS procedures rather than having to create their own, Chuck says, adding such that organizations need only ensure they use ILMS to do their work and document and follow their own product realization procedures.

"Achieving the internationally recognized standard [ISO 9001] allows us to focus on continuous improvement in mission results by building on a solid base," Joe says. "Furthermore, it improves the alignment of corporate objectives throughout Sandia and standardizes policies, processes, procedures, tools, and roles and responsibilities throughout the Laboratories."

Although there were some growing pains associated with adopting ISO 9001, Chuck says, Sandia expects the benefits of the effort to be more time to focus on mission-specific work. In addition, he says, the increased customer and stakeholder confidence that come as a result of ISO 9001 certification should result in more systems-level oversight as Sandia's customers come to have more trust in the Labs' internal management systems.

Achieving ISO 9001 registration, Chuck adds, also provides Sandia the critical foundation needed to more effectively use commercial standards for mission and operations work as part of DOE Secretary Steven Chu's Reform Initiative.

NNSA Administrator Tom D'Agostino, in a memo from last April, asked Sandia to identify "ways to dramatically rethink, and fundamentally redesign, what many on both sides see as a compliance and enforcement-driven contractual relationship instead of a constructive partnership for mission accomplishment." Sandia and the NNSA Sandia Site Office have formed a Joint Reform Team tasked with changing the DOE/Sandia contract relationship. ISO 9001 registration is a key element in transitioning to industry standards.

Achieving ISO 9001 was a Labs-wide accomplishment, notes Div. 9000 VP Joe Polito. "It took a lot of hard work and commitment on the part of many people at the Laboratories who were willing to change the way we do things for the betterment of Sandia and ultimately our customers," Joe says.

Marianne Walck hears the music in her head

By Iris Aboytes

In the movie *August Rush*, a young orphan boy hears music in everything — the wind, the light, the air.

Marianne Walck hears the music in her head. “You have to,” she says. Marianne plays the violin in the Albuquerque Philharmonic Orchestra. Marianne is director of Nuclear Energy & Global Security Technologies Center 6700.

“My mother Marie studied piano performance in college,” she says. “By age seven, even though she was a piano teacher herself, my mother wisely sent us to a different teacher. Her primary work was as a church musician. She was also choir and handbell director.

“Mom did a lot of accompanying for school instrumental soloists at various competitions. She made sure that music was a part of our lives continually throughout our childhoods. My sister Marcia and I still play piano duets when we get together during the holidays. My sister Marlene died in 2002 from ovarian cancer. She was a wonderful clarinetist, pianist, and singer.

“When I was in third grade, I began with the prerequisite song flute and then went to the violin in fourth grade.”

By the time Marianne was in seventh grade, she was taking private lessons and was part of a youth orchestra. She did not enjoy the practicing but she enjoyed the music.

When Marianne went on to college, she knew she wanted to be a good scientist, but she also loved her music. She attended Hope College in Michigan. She joined the orchestra and was a participant five days a week, even though she did not major in music. She eventually restarted violin lessons and performed a recital in her senior year.

“Music to me is a stress reliever,” says Marianne. “When I went to grad school at Caltech in California, I played in the Caltech/Occidental College orchestra and

joined a chamber music program. Music is my life saver. As big a load as I carried, I always made time for the music I love.

“It feels wonderful to be part of a group creating one sound. The overall effect is very uplifting and comes with a great deal of satisfaction. I am very busy, but it is a real upper.”

When Marianne moved to New Mexico more than 25 years ago, she wasn’t sure how to find a group to play in. “I happened to see an article in the newspaper that mentioned the philharmonic, known at that time as philharmonia,” she says. “I called and started to attend rehearsals.”

Marianne is one of 30 violinists in the orchestra. The violin is the most common stringed instrument. Besides the violin, cello, and bass, the orchestra also has a variety of wind and percussion instruments.

Marianne says that unlike Marcia, who received two degrees in music, she still does not like to practice. “I practice as much as it takes to learn the parts,” says Marianne.

If she has had a hard day when she goes to orchestra, she is always calmer when she returns. “Playing is fun,” she



MARIANNE WALCK



MARIANNE WALCK, in chair near lower left (nearest the conductor), performs at a recent concert with the Albuquerque Philharmonic Orchestra.

says. “With the city of Albuquerque growing, the pool of musicians has gotten larger, which is terrific. We now have a second community orchestra.”

For Marianne, music is a family affair. Her son Andrew plays piano and French horn and her son Nathan plays piano and trombone.

Marianne says that when she was growing up one of the things she liked best about playing the violin was playing duets with her grandpa Carl. He was a chemist for many years, but always kept up with his violin.

“He had a great sense of humor,” says Marianne. “One of the odd things about the family is that grandpa was about 5 feet 6 inches while my mom was taller. My sisters and I were even taller, about 5 feet 11 inches. We towered over him. My first violin was a gift from him.”



MARIANNE practices violin in 1976. Her mother is at the piano and her grandfather looks on.

The Albuquerque Philharmonic Orchestra will perform two free holiday concerts in December. One is scheduled for Dec. 13, 2 p.m., in Keller Hall at the University of New Mexico. The Dec. 14 concert will be at 7:30 p.m. at St. Andrew Presbyterian Church, 5301 Ponderosa NE.

Eugene McPeek honored by Marine Corps colleagues

By Anita Romero

Emergency Operations Dept. 4136 Manager Eugene McPeek was the guest of honor at the 234th Delta Company Fourth Reconnaissance Battalion Marine Corps Birthday Ball in Albuquerque Nov. 14. (This year

Thanksgiving turkey drive



GOBBLE! GOBBLE! Two hundred and thirty-one turkeys were donated by Sandians during the recent Thanksgiving turkey drive. Sponsored by the Office Professionals Quality Council Community Outreach Team and Community Involvement (3652), the drive is meant to help feed the more than 240,000 New Mexicans who sought emergency help last year.

marks the Marines’ 234th birthday.)

Eugene, who retired from the Corps in 2007 as a sergeant major, was honored by his Marine colleagues for his decades of exemplary service to the Corps and to the nation. The plaque presented to Eugene at the Birthday Ball read:

Presented to Sgt. Major Eugene McPeek Guest of Honor Delta Company, Fourth Recon Battalion, USMC Birthday Ball 2009. Your service to Delta Company has paved the way for generations to come. Through professional pride, integrity, and teamwork, you have been the example for all Marines to emulate. Your service and sacrifice will never be forgotten. Now we must strive to maintain the tremendous reputation of those who went before us. From the Marines of Delta Company. Semper Fidelis.

Eugene, an Albuquerque native, joined the Marine Corps Reserve in 1977 and served in the Corps’ active-duty forces from 1980 to 1983. In 1983 he rejoined Delta Company Fourth Reconnaissance Battalion, where he remained until his promotion to sergeant major in 1998.

Eugene served in Operation Enduring Freedom as the Command Sergeant Major for Combined Joint Task Force Consequence Management, Camp Doha, Kuwait, and served as first sergeant of a reconnaissance company in Operations Desert Shield and Desert Storm in 1990-91.

Prior to his 2007 retirement from the Corps, Eugene spent four years as the Individual Mobiliza-



EUGENE McPEEK

tion Augmentee (backfill for active duty force sergeant major) senior enlisted military advisor to the Three Star General, US Marine Corps Forces Pacific, the largest field command in the United States Marine Corps.

After being honored by his colleagues, Eugene said, “The Marines of Delta Company left a lasting impression on me and helped mold me into the person I am today.” The tradition continues with Eugene’s son, Luke McPeek, a Delta Company Reconnaissance Marine Corporal who served in Operation Iraqi Freedom in 2007.

Eugene’s personal decorations include the Legion of Merit, Defense Meritorious Service Medal, Meritorious Service Medal, Navy and Marine Corps Commendation Medal, Navy and Marine Corps Achievement Medal, and the Combat Action Ribbon.

Eugene also retired after 20 years of distinguished service from the Albuquerque Fire Department at the rank of deputy fire chief. He assumed his current position as manager of the Emergency Operations Department in 2006.



MEMBERS of the Delta Company Fourth Reconnaissance Battalion in Albuquerque share a cake in celebration of the Marine Corps’ 234th birthday. The battalion honored Eugene McPeek (4136) for his many years of dedicated service. Eugene, standing at attention second from right, retired from the Corps in 2007. (Photo by Dan Harman)