

Staffing, budgets, and opportunities: Tom Hunter talks with employees about Sandia's prospects

By Bill Murphy

What a 10 months it has been! And what a future awaits the Labs — a future that will demand focus, commitment to mission and operational excellence, and a willingness to step to the plate to meet great new challenges.

Those were the themes Labs President and Director Tom Hunter addressed during a standing-room-only all-hands meeting last week at the Steve Schiff Auditorium in Albuquerque, with video linkups to Sandia locations at Carlsbad, N.M., the Nevada Test Site, Yucca Mountain, Pantex, and Washington, D.C. (Tom is scheduled to do a similar presentation in California in late March.)

It was Tom's first such all-hands session with employees since he took office last April 29.

In discussing one future-related issue that came up during the meeting's Q&A session, Tom emphasized that Sandia has no plans to conduct any kind of reduction in force or offer any kind of retirement incentive program to reduce staff size.

To the contrary, he said: "We see the opposite . . . We see a need for people." That need, he said, is driven by the demanding work that lies ahead in transforming the weapons stockpile and in new program work for a variety of other government customers. Sandia's non-nuclear weapons work, he said, will probably account for 50 percent of the Labs' funding — and workforce requirements — in the years ahead.

Tom noted that the senior management team has strived for and is committed to maintaining the workforce for the foreseeable future at something very near its current level. One way the management team is achieving stability is through the concept of workforce mobility — employees move to where the work is. For example, he said, about a hundred employees are shifting out of nuclear weapons work to other areas.

"The Laboratory Leadership Team is dedicated to stability," he said. To that end, he anticipates a hiring program over the next few years that keeps pace roughly with attrition — hiring perhaps 400 new employees per year.

In reviewing the Labs' activities during the 10 months since he became director, Tom said, "It's tough to talk about [accomplishments], because there have been so many."

As a way to remind attendees of just how busy the Labs has been, he noted that in recent months the Labs has hosted a presidential visit and gone through a major reorganization process. He reviewed progress made in key areas:

• **The Life Extension Programs** for two weapons systems, W76 and W80, are doing very well, are on schedule, and are engaging people from across the Labs.



TOM HUNTER

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Edgier LDRD in works, says VP Rick Stulen

Revamped program to provide more creative, high-risk projects

By Neal Singer

Responding to feedback that Sandia's Laboratory Directed Research And Development (LDRD) program has become too risk-averse and near-term in the research it sponsors, too political in its selection process, and too complex in its structure and processes, Sandia VP and CTO Rick Stulen announced to managers and employees last week that an LDRD team was effecting a series of changes to revitalize one of Sandia's most important programs.

He was accompanied by senior LDRD manager Wendy Cieslak (1010) and LDRD manager Hank Westrich (1011).

"LDRD's not broken," Rick told the *Lab News*, "but we're going to alter the type of research that's going to be selected and funded so we can achieve a different R&D balance."

The aim, he says, is to bring the program — generally considered to produce the "seed corn" of the Labs' science and technology base — back to where it was approximately 10 years ago, when the research selected was "based on the best ideas and more forward-looking, more risky."

"We have high-risk [research now]," he says, "but if you look at the portfolio as a whole, we've been drifting away."

In balance, he says, "the program may have moved too far toward near-term deliverables, like corporate America's labs. We don't want to fall into that trap. We have a different role."

LDRD proposal writers should ignore internal politics and "get really creative," he says, because brilliance of ideas, not politics, will drive proposal selection.

"Sandia is a mission-driven engineering labora-

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Labs-developed coatings can immobilize, clean up radiation-contaminated surfaces

Paint-like sprays can be peeled off after hardening



SANDIA RESEARCHER JOE JONES stands behind coatings developed at Sandia to be used by federal emergency response teams to prevent the spread of radiological contamination. (Photo by Randy Montoya)

By John German

Lab researchers have developed two spray-on/peel-off coatings that could be used by federal emergency response teams to prevent the further spread of radiological contamination and, later, cleanse radionuclides from contaminated surfaces following a dirty bomb attack or other radiation incident.

The first, a containment coating, is impervious to weather once it dries and can be used by the earliest federal responders to ensure radionuclides stay in place until evidence is gathered and cleanup begins, says project manager Joe Jones of Radiological Consequence Management & Response Dept. 6874.

The second, a hydrogel for decontamination of porous surfaces, can help restore radiation-contaminated construction materials — such as concrete, brick, marble, and granite — to usable condition, says principal investigator and inventor Bob Moore of Advanced Nuclear Concepts Dept. 6872. The decontamination hydrogel was developed jointly with Mark Tucker (6245). Chemical getters in the liquid hydrogel solution quickly grab onto radionuclides in the pores of the materials and hold the contaminants in their molecular structures until the hydrogel dries.

Once dried, both coatings can be peeled off the surface and disposed of as radiological waste. Chemically both coatings contain advanced

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This & That

Editor's Note: Former Lab News Editor Larry Perrine wrote his "This & That" column in this space from March 1989 through 2001 before turning it over to Howard Kercheval. Larry and his wife Renae are retiring from the Labs in early April, but will be gone after today compliments of taking accumulated vacation this month. With a little trepidation, we gave Larry a last opportunity to "columnize," as he called it.

Parting thoughts – When Editor Ken Frazier invited me to write this "swan-song column" before retiring, my first reaction was, "Nah – been there, done that." But then I thought it a good opportunity to offload a few things on my mind.

I don't pretend to speak for everyone – never have – but I'll bet Tom Hunter's next paycheck that many Sandians and retirees share some similar feelings and thoughts. Here they are, pretty much in random (or if you prefer, rambling) order:

1. All things considered, Sandia is by far the best place I've worked, and this is my sixth career stop. I'm grateful to be retiring now at a relatively young age (OK, that's relative to a mature redwood tree) and healthy for a "60-something," but I sure wish I had landed here 15 years earlier in my mid-twenties instead of in my late thirties.

2. Above everything else, what has made working at Sandia satisfying and downright stimulating most days is the opportunity I had to work with a lot of really smart, well-spoken, dedicated, patriotic, inspiring, caring, giving, and hard-working people. Most Sandians are truly "class acts."

3. I leave grateful for the benefits Sandia has provided me and my family over the years and those that continue in retirement, including the pension, 401k plan, medical and dental plans, and life insurance. No, some benefits aren't quite as good as they once were – like free medical insurance for entire families – but they are still far better than most Americans have. I don't buy the theory that our management or benefits pros have "conspired" to reduce benefits. In fact, I think they have done well to keep them as good as possible under escalating costs, but I also hope they will continue fighting to keep them from deteriorating. You can't attract and keep exceptional people with mediocre benefits.

4. I regret that our laboratory now suffers from too many time-sapping bureaucratic requirements. Some requirements are reasonable and serve us well, but others are burdensome, distracting, and downright annoying. Remaining good stewards of taxpayer dollars gets harder and harder as bureaucratic requirements grow. This laboratory – full of smart and creative people – should continue to be about exceptional service, not just about exceptional compliance. We need to work seriously with our sponsors, partners, and parent company – but mainly among ourselves – to reduce bureaucracy and improve technical productivity. Otherwise, Sandia could one day price itself right out of the high-tech R&D business. What a shame that would be.

* * *

Permanent vacation, here we come. – It's time to climb down from the soapbox and leave the grounds. In the coming years, Renae and I plan to wear out lots of tires, shoes, golf clubs, fishing gear, and maybe several travel trailers instead of wearing out our rocker recliners. And between playtimes, we also hope to do a few things to help some less-fortunate folks. Goodbye and good luck. Maybe we'll see you on down the road sometime. – Larry Perrine

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Four Sandians injured in vehicle accident on Kodiak Island, Alaska

Thoughts of many Sandians were going this week toward four Labs colleagues injured as a result of a vehicle accident on Kodiak Island, Alaska. They were part of a team of Sandians in Alaska that had successfully conducted a flight test operation earlier in the day (Thursday, Feb. 23) at the Kodiak Launch Complex.

Those injured were: David Stokebrand (5416), Diana Helgeson (5419), Paul Southward (5425), and Joshua Lucas (5425).

All four received medical care. David and Diana were still hospitalized this week in Anchorage. Family members and a Sandia department manager were with them. Paul and Joshua had returned home to Albuquerque.

The four had been in Kodiak for the first of a series of tests to be conducted this calendar year for the Missile Defense Agency. More information on the project is available at: <http://www.mda.mil/mdalink/pdf/05news0015.pdf>.

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Security Salutes: Team to recognize employees' good security practices

The Safeguards and Security Education and Awareness team (4232) is introducing the new Sandia Security Salutes Program. This program



will allow S&S to recognize individuals and groups for excellence in good security practices.

Sandia is dedicated to improving workplace performance through recognition of good security practices, and the Sandia Security Salutes Program provides a way for all employees to recognize fellow colleagues. Some examples of good security practices may be reminding someone to keep her personally owned cell phone in her vehicle, or reminding someone who is wearing his badge off-site that he should not.

All members of the workforce are eligible for recognition. This includes all full-time and part-time employees, contractors, and consultants. A Sandia Security Salutes recipient will be sent a letter of recognition, via e-mail, and the employee's name will be placed in the *Lab News*.

For information, visit the Security Salutes Program website at: <http://www-irm.sandia.gov/security/resource/salutes/index.htm>.

Cook leaves Sandia to direct UK's AWE

Don Cook (4002) has left Sandia to become Managing Director of the Atomic Weapons Establishment (AWE) in Aldermaston, England.

The lab historically has worked with the US weapons labs, including Sandia, in areas dealing with nuclear threats.

AWE is under direction of the British Ministry of Defence.

The assignment was effective March 1.



DON COOK

Mike Tachias promoted to lieutenant colonel

Mike Tachias (4211) (*Lab News*, Oct. 28, 2005) was promoted to lieutenant colonel in a ceremony Feb. 3 at Redstone Arsenal, Ala.

This was a family affair, as his brother Brian, who is career Army, was also promoted to lieutenant colonel. Brig. Gen. William Phillips presided at the presentation to both.

"My father, Roy, a sergeant in the US Army, set the example," says Mike. "Brian and I are just following in his footsteps. My father was career Army and served over 20 years. He was a decorated Korean veteran who served three tours in Vietnam."

Mike will begin serving his third term in May when he returns to Afghanistan for another year.

"I will be operating as embedded trainer with the Afghan Army, and the Joint Special Operation's Command," says Mike. "We are living in trying times, and our nation is facing incredible challenges with the war on terrorism. I am looking forward to seeing my team and working again with the Afghan military. This is a great honor."

"My wife and children would like for it to be over," says Mike, "but they understand I have to do this, especially for them. I want them to have the same freedoms I am privileged to enjoy."

Take Note

Retiring and not seen in *Lab News* pictures: Alan Dickinson (10861), 39 years; Claire Evans (3334), 30 years; Marilyn Warrant (5631), 23 years.



LT. COL. Mike Tachias (left) and his brother, Lt. Col. Brian Tachias.

California site employees hear 'mostly good news' in Valentine's Day Town Hall meetings

Mim John's talk to employees comes near eve of site's 50th anniversary

By Nancy Garcia

California Laboratory VP Mim John chose Valentine's Day to update employees about recent accomplishments and challenges that she termed "mostly good news" in two back-to-back Town Hall meetings.

Beginning with a slideshow of staff members and activities from the past year, she segued to photos of New Mexico-based members of Dept. 8330, who are researching cellular and biomolecular processes under the leadership of Grant Heffelfinger.

Mim's talk was up-to-the minute, with her only other visual aid besides the projected photos at the outset being a copy of the morning's *Valley Times* that showed



MIM JOHN

LeRoy Whinnery (8762) on the front page, with a reformulation of his TuffFoam invention designed to meet a recent need in the surfboard industry. She went on to mention that his other patented material, TEPIC, received an R&D 100 award last year from *R&D Magazine*.

She moved on to mention other awards, including 25 patents received last year.

Leading two LDRD Grand Challenges

In other technical accomplishments, she said the site has been leading two Laboratory Directed Research and Development Grand Challenges. The first, underway about a year, is the Fiber Laser Grand Challenge that has attracted interest from a large number of interested customers in defense and other areas. It builds upon work by Dahv Kliner (8368) and is being guided by an external advisory board. The second is the recently begun Microscale Immune Studies Laboratory (MISL) Grand Challenge that includes Sandians from California and New Mexico as well as academic collaborators. The effort to understand host-pathogen response "obviously has a tremendous potential impact in the health care community," Mim said.

In the weapons area, she said a series of flight tests have been "just one huge success after another, a testament to just how good our instrumentation folks are." Meanwhile, congressional approval of the Reliable Replacement Warhead — a new design that duplicates existing capabilities — will be the first competition for a weapon design in at least 15 years, since underground testing was halted.

A tremendous step forward

"It's been a tremendous step forward to remember what it was like to actually design a weapon," Mim said, adding that surety will be an emphasis. Not creating new capabilities is indicative of the fact, she continued, that "the nation isn't completely settled yet on the role our nuclear weapons will play in our national security posture."

In terms of another agency-level customer, the Department of Homeland Security (DHS), she said that in the fall the Sandia Board of Directors' mission committee concluded that even though DHS is a challenging customer that may take years to become a coherent department, we need to continue our work in that area because "it's too important to the country."

The weapons budget has "been on a glide path down" the last couple of years, she added. "It will be down another 6-7 percent this year, and next year's not going to be any better." The Labs are aiming to diversify to the point that nuclear weapons will account for less than 50 percent of the budget within two to three years, if not sooner, but the California site especially needs to emphasize that shift since it has had about 60 percent of its budget from this area.

All the same, it is important to continue hiring, she added, so we have the capability to fulfill new work that comes to us. "We're going to ramp up again, much like we did five years ago."

Congress mandated a report issued in July by the Secretary of Energy's advisory board, the Overskei report, which examined the role of the nuclear weapons complex of the future. Mim said that after the chair, David Overskei, toured the California site, he concluded that we are too important a piece of the picture to consider consolidation. And in the fall, the National Security Advisory Panel also toured and reached the same conclusion, which she said reinforced for Labs

leadership the idea of strategically positioning the California site for the future.

About consolidation notions, Mim said that the site has always been the most vulnerable, but the idea opens the question of what happens to weapons work in the Livermore Valley, "and once you open that question, they start to back off again."

One opportunity for program growth is a partnership with Lawrence Berkeley and Lawrence Livermore national labs to bid for DOE's proposed GTL (formerly called Genomes to Life) facility, the Protein Factory, the first in a series of major building investments intended to move research forward in understanding how proteins, which form much of the physical basis of life, fold to carry out processes encoded within genetic sequences.

Including academic and industrial partners,

Sandia California News

the bid due April 11 appears to be getting strong support from the California Council on Science and Technology, she said, but has major competition from a joint Argonne and Los Alamos national laboratories team, as well as potential competition from bids led by industry.

DOE intends to invest \$200 million to build the facility and provide \$40 million annually in operating costs for seven years. The location of a potential California-based facility would be decided by examining best options, Mim said. Sandia's unique contributions include expertise in systems engineering, manufacturing know-how, and process development. "There are a whole host of things we bring to bear on this — we're going for the gold and we hope we win."

In early March the California site will celebrate 50 years of official operations. Mim anticipates an appearance, or, at the very least, a videotaped presentation from former director Jack Howard, whom she called responsible for acquisition of practically all the land at the site and the decision to erect some of its early buildings.

Mim closed the talk by congratulating everyone on the outstanding safety record the division has achieved over the past year.

Sandia's Z machine exceeds two billion degrees Kelvin

By Neal Singer

Ions produced by Sandia's Z machine have exceeded 2 billion degrees Kelvin, 10 times hotter than any fusion experiment on Earth and hotter than the interiors of stars.

The reaction, if it could be harnessed, presents the possibility of eventually building smaller, hotter nuclear fusion plants to produce the same amount of energy as larger, cooler plants.

A description of the achievement and its theoretical explanation — which appeared in the Feb. 24 *Physical Review Letters* — also could serve to describe how astrophysical entities like solar flares maintain extreme temperatures.

The temperatures, first recorded approximately 18 months ago, puzzled Sandia researchers because they were roughly four times stronger than the estimated kinetic energy of the machine's implosion phase, where a magnetic field smashes ions together to release heat in the form of X-rays.

According to the conventional view of Z-pinches, the emitted heat should be less — not more — than the kinetic energy from which it came.

"Dave LePell [1646] measured the temperature," says team leader Chris Deeney (1640), "which prompted the question: how can it be

that high for so long?"

"Long," in this case, was 10 nanoseconds.

Because the team was concerned about possible errors in measurement, they did not report the readings at first but instead — coordinating with computer models created by John Apruzese at the Naval Research Laboratory — did additional experiments.

Measurements were possible even at these extreme temperatures because emerging X-rays create spectral lines on a spectrometer. The width of the line establishes its temperature.

"Depending on how hot they are," Chris says, "the rays move with a given velocity that produces a [Doppler] red or blue shift that widens the spectral line." But, he says, "Other phenomena could cause the line to broaden: for example, plasma opacity that would cause emitted X-rays to be reabsorbed, depressing the center."

When no error was found, Chris and Dave, along with Christine Coverdale (1344) and Brent Jones (1646), who helped plan and lead the shots, turned to Sandia consultant Malcolm Haines, well-known for his work in Z-pinches as a physics professor at the Imperial College in London.

Haines theorized that the rapid conversion of magnetic energy to a very high ion plasma temperature was achieved by magnetohydrodynamic instabilities at stagnation, when the ions and

electrons could travel no further. At this point, all the kinetic energy should have been used up and the plasma collapsed. But some unknown energy was still pushing back against the magnetic field.

The surprising explanation theorizes that Z's magnetic energies create microturbulences that increase the kinetic energies of ions caught in the field's grip. The extra jolt of kinetic energy then produces increased heat, as ions and their accompanying electrons release energy even after they should have been exhausted.

High temperatures previously had been assumed to be produced entirely by the kinetic flight and intersection of ions and electrons, unaided by accompanying microturbulent fields.

In these experiments, the work was done by magnetically imploding ions from stainless steel wires 55 to 80 mm in diameter.

The Z machine's magnetic field is created by an electrical current of 20 million amperes. The current burns out the wires like a short circuit in an automobile burns out a fuse.

The temperatures are produced in unadorned, flat-roofed Bldg. 983 — about the size and shape of an aging high-school gymnasium — in Sandia Technical Area 4.

This work has already prompted other studies at Sandia and the University of Nevada, Reno.



Photos by Randy Montoya

Tom Hunter talk

(Continued from page 1)

- **Supercomputing:** "It's hard not to brag about computing at Sandia," he said, noting that in recent months, two key computers, Red Storm and Thunderbird, have come on line and are delivering on their promise.

- **MESA,** he noted, is 77.6 percent complete; it's on schedule and under budget. "We plan to actually do some dedications during this [calendar] year," he said, noting that some of the folks in the Steve Schiff Auditorium could very well be working in some of the MESA facilities by the end of the year. Tom also discussed the status of two other high-profile construction projects: CINT, the Center for Integrated Nanotechnologies (a collaboration with LANL), and NISAC, the National Infrastructure Surety Analysis Center, a project being done for the Department of Homeland Security.

- **Yucca Mountain:** Tom noted that DOE has named Sandia the science integrator for the Yucca Mountain project, a hugely important task for DOE and the nation, as the project begins the licensing process to win approval to store high-level nuclear wastes. Sandia has played a similar role at WIPP.

- **The Sandia Pulsed Reactor (SPR):** Tom singled out the SPR team for special mention, noting that the team, involving groups from across the Labs, "worked so hard" to get the facility operational after several idle years. "It's a great achievement," he said, noting that its capabilities are vital for radiation environment weapon testing requirements for the W76.

- **Safety and security:** Good news, or, as Tom put it, "encouraging signs" on the security front: the number of security incidents is down, and the Labs leadership team is working to see that the trend continues. Likewise, Labs management is committed to fostering a safety culture as part of a larger emphasis on operational excellence.

After reviewing current accomplishments and ongoing successes at Sandia, Tom offered a quick overview of the world situation, particularly in the context of how Sandia can contribute to addressing vital national and global concerns.

Among issues he cited: crime in the streets, persistent energy problems, natural disaster response, terrorism threats, a looming possibility of WMDs deployed against the nation, and federal spending that is far outpacing revenue.

"What do these things mean to Sandia?" he asked rhetorically. It means, he said, "the nation needs us in all these areas."

He outlined areas where Sandia is impacted by national issues:

- **Science and engineering:** Tom cited the work of New Mexico senators Pete Domenici and Jeff Bingaman to draw attention to a potential decline in science and engineering capability in the US. Sandia, he said, plans to be a leader in encouraging a more robust science and engineering environment in the US. "It's a huge and important issue," he said.

- **Industry trends** in outsourcing, pension issues, and health care costs: "We're not immune from these trends; we're in the middle of them," he said, adding that it is vital that Sandia's future planning address these issues.

The rising costs of benefits is a huge looming factor; medical costs and pension costs are rising inexorably. Where Sandia currently spends about 20-something percent of its payroll on benefits, Tom said, it is not at all improbable that within 10 years those benefits (in the current form) could cost in the realm of 40-something percent of payroll. He foresees a probable need to reinstitute contributions to Sandia's pension plan by perhaps 2010.

Also in the area of industry trends, Tom noted that industry has turned to outsourcing of jobs for a wide variety of functions, including professional services such as legal and engineering work. (Outsourcing is a reference to subcontracting jobs and services to overseas shops where labor costs are substantially cheaper than they are in the US.)

Later, in response to a question, Tom indicated that even at Sandia, outsourcing of certain functions at some point in the future has not been ruled out.

Specifically, Tom said, "We're going to have to become more efficient; we're going to have to figure out ways to get more work done for a lot

less effort, and that means we'll have to look at creative ways to use the right workforce for the right applications. We haven't made any decisions about things like outsourcing. We're studying all [our options] to try to figure out if there's a way we can get our work done more efficiently, and so we're not ruling out any options in terms of how we'll get that done. The key ingredient is how we have the right workforce for the future and the right balance."

- **Budgets** are stable and are likely to remain so, although the percentage of budget that funds nuclear weapons work may decline and the percentage from other programmatic work (for other DOE customers, for DoD, DHS, NASA, and other agencies and partners) will likely increase. "We're growing that [work-for-others] area week by week," Tom said. The Labs will soon be at a point, Tom said, where half our budget will be in areas other than nuclear weapons, a trend that is likely to continue. The investment in infrastructure and the Labs' involvement with a variety of partners in and out of the weapons complex mean that it can offer its customers more and better service. "We deliver more than you expect" because of our integrated capabilities, Tom said.

Tom described what he sees as Sandia's "path forward," one that includes "a historic opportunity" to be deeply engaged in the transformation of the weapons complex and stockpile, one that seeks and cultivates "maximum engagement" in national security technology R&D, and one that is built on a foundation of operational excellence.

"This is like no other time in Sandia's history," Tom said. Certainly, the Cold War was a dangerous era in which the Labs made huge contributions, he said. But that era was characterized by a kind of clarity that does not prevail in the current world situation.

In the murkier waters of the 21st century, he said, the security challenges will be more complex and will demand more complex approaches and solutions. The Labs, he said, is ready for that challenge.

"The nation probably needs us now more than ever."

Coatings

(Continued from page 1)

water-soluble polymers with an oxidative cross-linking additive such as sodium borate. The cross-linker allows the polymers to remain as a liquid — individual molecules suspended in a water-solvent solution — until activated by, for example, the oxygen in open air.

Once activated, the polymers begin to chemically join into strands (for the containment coating) or balls (for the hydrogel). A network of these polymer chains or balls form as the water and solvents evaporate from the structure, leaving a

hardened, water-insoluble plastic than can be peeled off a surface.

Both coatings go on like paint and dry like the latex of a party balloon. Drying times for both coatings can be tailored to need, from less than an hour to more than a day.

Sandia developed the containment coating as part of a Department of Homeland Security program to secure a scene following a radiation incident. Sandia initially developed the hydrogel as part of a DARPA call for proposals in 2004.

Although DARPA has chosen not to move forward with the hydrogel, the Sandia researchers say both technologies are ripe for commercialization.

"Basically the first responder community has said they want more tools in their tool boxes to

deal with a broader range of threats, including a dirty bomb incident," says Bob.

"We needed something that dries fast and is easily removable and meets the needs of the earliest federal responders," says Joe. "In laboratory tests, both coatings have been effective for their intended purposes."

Ideally, adds Bob, the two technologies could be combined into a single containment-decon coating product.

The Sandia team has sought to minimize costs by using inexpensive, off-the-shelf chemicals as constituents.

Patent applications are being prepared for both coatings.

'Growing Up Together': Community leaders hear Tom Hunter's first State of the Labs presentation

Event features special recognition of Albuquerque's Tricentennial celebration, linked history of city, Labs

By Larry Perrine

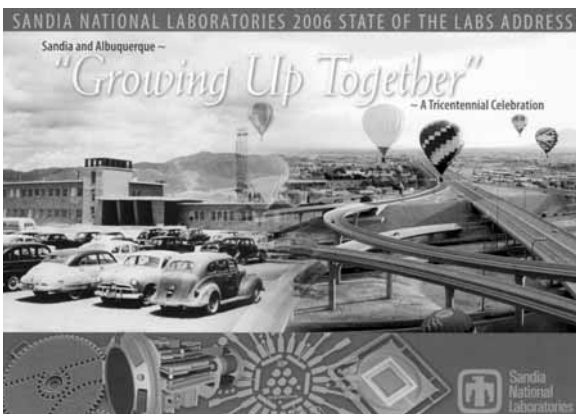
Several hundred community, business, and political leaders heard Labs Director and President Tom Hunter emphasize Sandia's growing relationship with, and reliance on, the Albuquerque community during his State of the Labs address the evening of Feb. 23 at the National Hispanic Cultural Center. The invited audience in the center's new Disney Auditorium consisted primarily of city/area leaders, dignitaries, and guests from around the state.

This year's presentation centered around a "Growing Up Together" theme, recognizing Sandia's role in Albuquerque's history and growth. Although the Labs has been in operation only for about one-fifth of Albuquerque's 300-year history, Sandia has significantly impacted the city. Most of Albuquerque's growth and high-tech development has come since the Labs started in 1945.

This was Tom's first State of the Labs address since becoming Sandia's leader last April. The tradition of Sandia leaders giving a progress and activity report to community leaders began in 1994 and has continued annually.

Reinforcing the Growing Up Together theme, Tom began with a short personally narrated video showing decade-by-decade highlights of both Albuquerque and Sandia since the Labs began operating. "We have grown up together and become partners in the truest sense," he noted.

Tom's live presentation focused first on Sandia's recent and current DOE/NNSA nuclear weapons programs; work for NASA, the military, and the Department of Homeland Security; and



ALBUQUERQUE MAYOR MARTIN CHAVEZ, left, talks with Labs Director Tom Hunter at the community State of the Labs presentation. (Photo by Bill Doty)

modeling and simulation programs for government customers and with industry partners.

Tom then talked about the Labs' future technical programs and how Sandia is addressing difficult technical challenges in the face of US economic uncertainties and competing priorities. He pointed to growing Sandia roles in ensuring adequate, affordable energy sources and safe and affordable water supplies, saying that worldwide water issues could become as big as energy issues. Tom also emphasized the importance of Sandia's nonproliferation mission, stressing that weapons of mass destruction in the wrong hands could cause world chaos.

New facilities, new capabilities

Several major new and upgraded facilities that Sandia is building will give the laboratory truly world-class technical capabilities for the future, Tom said. They include the Microsystems Engineering and Sciences Applications (MESA) complex, the soon-to-open Center for Integrated Nanotechnologies (CINT), the Z Machine refurbishment, and the Labs' high-performance supercomputing systems — specifically Red Storm and Thunderbird. He pointed out that with the completion of Red Storm this year, the

Labs' supercomputing capacity would be about 220 teraflops, up from only 0.2 teraflops 10 years earlier.

Tom emphasized Sandia's increasingly strong ties with university, supplier, construction, and industrial partners, many in New Mexico. He said Sandia purchased about \$367 million in goods and services from New Mexico businesses alone last fiscal year. Of these purchases, nearly 69 percent (\$253 million) were from small business vendors. Tom also pointed out that Sandia's Small Business Assistance program provided technical assistance to 283 small businesses.

Recognizing Sandia's growing partnerships with New Mexico's state universities, Sandia's leader announced during the presentation that the Labs' parent company, Lockheed Martin, is providing special \$50,000 grants each to UNM, NMSU, and NM Tech to enhance R&D capabilities, encourage talented students to major in engineering and science, and to support further collaborations with Sandia.

Sandia's eight-year-old Science and Technology Park, now home to 21 companies employing about 1,260 people, got a special mention, along with a Sandia spin-off company, Advent Solar, that is building a manufacturing facility in the Mesa del Sol area to employ about 1,000 people by 2010.

Sandians' support for their communities was also stressed, including the fact that Sandians pledged \$2.9 million to the United Way of Central New Mexico last year and raised about \$19,000 in the separate Shoes for Kids program. Tom also pointed out that Lockheed Martin donated more than \$2 million last year to community educational initiatives and programs.

Several times during the evening, Tom emphasized the importance to Sandia and the nation of continued investments in people, science and engineering programs, ideas, and leadership.

He concluded by asking city and state leaders to join with Sandia and other groups in helping New Mexico continue to grow into a major national technology hub and center of excellence.

Employees with access to Sandia's internal web (Techweb) can access the full streaming video presentation at <http://as54snlnt.srn.sandia.gov/mediasite/viewer/?peid=66603c64-c418-451b-ae3b-a7d4304e4481>.

LDRD

(Continued from page 1)

tory built on a rigorous scientific foundation, and LDRD must continue to renew that use-inspired foundation," says Wendy.

Sandia's LDRD program, in existence for more than a decade, takes a percentage of the laboratory's budget as determined by Congress to fund novel, high-risk, but potentially high payoff projects in national security. The idea behind creation of the program was to perpetuate the environment that led to rapid innovations demonstrated by scientists and engineers at remote locations (like New Mexico) during and immediately after World War II. To achieve this, Congress mandated that on-site laboratory management allocate a percentage of research funds on the basis of intensive internal reviews, rather than halting potentially breakthrough research until approval was secured from distant institutions in Washington.

The closely watched program has survived on its many successes.

But to combat what Rick terms "an evolution toward complexity" — "the bad kind," Wendy clarifies — the LDRD management team has sharply reduced the number of program investment areas seeking to improve efficiency and quality of proposals.

"The old investment areas were legitimate, but with the large number of them, funding was becoming insufficient, with only a few new propos-

als being funded each year in some areas," says Rick. "The number of areas had steadily increased over the decade and lacked a strategic and integrated approach across the portfolio."

"The changes mean that staff will be able to do work in depth while managers concentrate on program goals," says Wendy.

The three major program areas remain the same, but the number of their subdivisions has been reduced "to facilitate more integration within these areas," says Hank.

The areas and their subdivisions now are:

- Mission technologies (nuclear weapons, energy resources and nonproliferation, defense systems and assessments, and homeland security and defense)
- Science, technology, and engineering foundations (nanoscience to microsystems, enable predictive simulation, extreme environments, new directions)
- Corporate initiatives (strategic partnerships, seniors council, advanced concepts)

Funding targets will be decided for these areas based on three simple categories termed "Discover," "Create," and "Prove."

Not just buzzwords, says Hank, "These categories link dollar targets to new discoveries, creative solutions, and demonstrations of new technologies and processes."

"Take bio pathogens," says Rick. "The 'discovery' phase would look at fundamental biological processes, like intracellular signaling that occurs when a pathogen binds to a cell. The 'create' part means creation of a platform, as in, 'I think we

could create a device that could measure the signaling pathway using existing knowledge and technology approaches.' The 'prove' section would be, 'I think I could construct a bio microchip made up of devices that have previously been created in the lab.' Prove is practical."

In LDRD's more formal terminology, Discover means the attempt to achieve new understanding or knowledge. Create would apply or combine new or existing knowledge for novel solutions or revolutionary advances. And Prove would demonstrate a prospective innovation or concept in a real-world environment.

A consideration that should be noted by researchers is that Discover, Create, and Prove receive different fund weighting in the three major investment categories. Mission Technologies assigns the largest dollar portions to the "Create" and "Prove" categories. In ST&E Foundations, the largest amount is in Discover and Create. Corporate Initiatives equally balances funding between the three categories.

Also introduced, says Hank, is a Senior Steering Committee, composed of senior managers across the laboratory and the Sandia Fellows, to provide strategic oversight, not only within each major area, but for the entire LDRD portfolio.

"LDRD is a relatively small, precious resource that we are working very hard to use to best advantage," he says. "We anticipate these changes will get us there."

"The bottom line is to use LDRD — our sole source of discretionary R&D funding — to create the future of the Labs," says Wendy.

Red Storm is ranked the world's most efficient supercomputer in two of six categories

Internal communication between chips rated tops for complex problems

By Neal Singer

A new series of measurements — the next step in evolution of criteria to more accurately determine the efficiency of supercomputers — has rated Sandia's Red Storm computer — already judged sixth fastest in the world on the old but more commonly accepted Linpack test — the best in the world in two of six new categories, and very high in two other important categories.

The two first-place benchmarks measure the efficiency of keeping track of individual data (called random access memory), and of communicating data between processors. This is the equivalent of how well a good basketball team works its offense, rapidly passing the ball many times to score against a tough opponent.

NNSA Administrator Linton Brooks got an advance peek at the results and touted them publicly during his recent Sandia visit (*Lab News*, Feb. 17). Sandia president Tom Hunter proudly noted them in his talks to Sandians and the community last week (see pages 1 and 5).

To understand why success in the new categories is more definitive than the more easily understandable measurement of mere speed (and is not just shopping for a hard-to-understand test that gives the most favorable result for the home team), it's probably worth a moment to examine how technical ratings were established in the first place.

In the mid-19th century, researchers had all they could do to figure out the speed with which electricity traversed a simple wire.

Much more complicated in the late 20th and early 21st centuries were measurements made of currents flowing along the intricate circuitry of a computer chip.

Basic task of supercomputer

Still more difficult was to arrive at a meaningful number describing the information flowing electrically between many chips intended to work together like an orchestra — each instrument coming in at exactly the right time to solve small portions of large problems, and then pass along that information to the next set of chips waiting to continue the symphony.

This is the basic task of a modern supercomputer.

The only way to know whether all the pieces are playing together would be to check the output of each chip, and there are thousands and thousands of chips in computers processing information in parallel circuits. Such tests would be expensive and time-consuming.

Thus, in the early 1990s, supercomputer manufacturers distinguished the capabilities of their products by announcing Theoretical Peak numbers, says Sudip Dosangh (1420). This figure represented how fast a computer with many chips in parallel circuits could run if all processors worked perfectly and in unison. The number was best considered a hopeful estimate.

Next came the Linpack benchmark, which provided a real but relatively simple series of algorithms for a supercomputer to solve. Since 1993, that part of the world interested in supercomputers has watched for the new Linpack numbers, published every six months, to determine the 500 fastest computers in the world, and which entrant is the fastest of them all. For several years, this was the Sandia ASCI Red supercomputer.

More recently, the limitations of this approach have encouraged the Linpack founders, in conjunction with supercomputer manufacturers, to develop



RED STORM — Cray contractor Jason Repik checks out a Red Storm panel. Red Storm has been judged to be the world's most efficient supercomputer in two of six categories.

(Photo by Randy Montoya)

still more realistic tests. These indicate how well supercomputers handle essential functions like the passing between processors of large amounts of data necessary to solve real-world problems.

It is in this revised series of tests, called the High Performance Computing Challenge (HPCC) test suite, that Sandia's Red Storm supercomputer — funded by NNSA's Advanced Simulation & Computing (ASC) program — has done extremely well.

Rob Leland, director of Computing and Network Services Center 4300, offers this example of a complicated problem: "Suppose your computer is modeling a car crash," he told the *Lab News*. "You're doing calculations about when the windshield is going to break. And then the hood goes through it. This is a very discontinuous event: Out of the blue, something else enters the picture dramatically."

"You have to remesh every point [of your visualization]," agrees John Zepper (4320).

Fundamental problem solved

Continues Rob, "This is the fundamental problem that Sandia solved in Red Storm: how to monitor what's coming at you, in every stage of your calculations. You need very good communications infrastructure, because the information is concise, very intense. You need a lot of bandwidth and low latency [to be able to transmit a lot of information with minimum delays], and because the incoming information is very unpredictable, you have to be good [read, 'aware'] in every direction."

Rob gives particular credit to Steve Plimpton (1412) and Courtenay Vaughan (1422) for their contributions to solving these problems.

David Womble, acting director of Computation, Computers, and Math Dept. 1400, uses another metaphor. "The question," he says, "is how much traffic can you move how fast through crowded city streets." Red Storm, he says, does so well because it has "a balance that doesn't exist in other machines between communication bandwidth [the ability of a processor to get data it needs from anywhere in the machine quickly] and floating point computation [how fast each processor can do the additions, multiplications, and other operations it needs to do in solving problems]."

More technically, Red Storm posted 1.8 TB/sec (1.8 trillion bytes per second) on one HPCC test: an interconnect bandwidth challenge called PTRANS, for parallel matrix transpose. This test, requiring repeated "reads," "stores," and communications among processors, is a measure of the total communication capacity of the internal interconnect. Sandia's achievement in this category represents 40

times more communications power per teraflop (trillion floating point operations per second) than the PTRANS result posted by IBM's Blue Gene system that has more than 10 times as many processors. Red Storm is the first computer to surpass the 1 terabyte-per-second (1 TB/sec) performance mark measuring communications among processors — a measure that indicates the capacity of the network to communicate when dealing with the most complex situations.

Random access benchmark

The "random access" benchmark checks performance in moving individual data rather than large arrays of data. Moving individual data quickly and well means that the computer can handle chaotic situations efficiently.

The computer has already modeled how much explosive power it would take to destroy an asteroid targeting Earth, how a raging fire would affect critical

machinery, and elements of Earth's atmosphere, in addition to the basic stockpile calculations the machine is designed to address.

It would be effective in visualizing complex defense-related events like an aircraft crashing with nuclear weapons on it, says Jim Tomkins (1420).

Red Storm also did very well in categories it did not win, says Courtenay, finishing second in the world behind Blue Gene in fft ("Fast Fourier Transform," a method of transforming data into frequencies or logarithmic forms easier to work with); and third behind Purple and Blue Gene in the "streams" category (total memory bandwidth measurement). Higher memory bandwidth helps prevent processors from being starved for data.

The two remaining tests involve the effectiveness of individual chips, rather than overall computer design.

In a normalization of benchmarks, which involves dividing them by the Linpack speed, Jim found that Red Storm had the best ratio. That is, Red Storm — of all the supercomputers — was best balanced to do real work.

An unusual feature of Red Storm's architecture, says Jim, is that the computer can do both classified and unclassified work with the physical throwing of a secure switch, similar to the way a railroad switch can divert a train from one track to another. "That's important at Sandia because we have a whole community here that does science. We can allocate part or even the whole machine to a science problem, and then move to DOE interests and do secure work." The secure transfer does not require any movement of discs. There are no hard drives in any Red Storm cabinet.

"We get the value of a big machine that can do classified and unclassified," says John. The capability of the machine to put its entire computing weight behind science jobs enabled one Sandia researcher to get an entire year's worth of calculations done in a month, he says.

Red Storm's architecture was designed by Jim and Bill Camp. The pair's work has helped Sandia partner Cray Computers Inc. already sell 15 copies of the supercomputer in various sizes to US government agencies and universities, Canadians, and overseas customers in England, Switzerland, and Japan.

Cray holds Sandia licenses to reproduce Red Storm architecture and some system software, says Jim. "The operating system was written here, but the IO [input-output] is Cray's."

Sandia is paid by Cray at a per-node amount for those Cray installs elsewhere.

Sandia and partners work together to build prototype electromagnetic mortar launcher for future armies

Electromagnetic control promises greater range, speed, and accuracy

By John German

Sandia and a team of government and university labs are building a prototype mortar launcher that could alter the way armies have launched projectiles at their enemies for a thousand years.

As part of a two-year electromagnetic mortar project for the Defense Advanced Research Projects Agency (DARPA), the research team is building a prototype electromagnetic (EM) gun and demonstrating electromagnetic launch of mortar-class munitions. Full-scale field testing is scheduled for this fall at Sandia.

Partners in the project include the Institute of Advanced Technology at the University of Texas;



GARY FRANK and Matthew Aubuchon (both 5445) inspect a Sandia-developed capacitor bank that will become part of the full-scale coil gun system scheduled to be field tested at Sandia this summer.

the Munitions Development Division of the US Army Armaments Research, Development, and Engineering Center; and capacitor film manufacturing company TPL, Inc.

The DARPA-funded project focuses on low-cost, high-fire-rate munitions. A complementary joint Sandia project with Lockheed Martin is demonstrating EM-launched missile systems (*Lab News*, Jan. 21, 2005).

In conventional mortar-firing operations, crews determine mortar range by the amount of propellant (the number of individually packaged propellant charges behind the round), barrel attitude, and external factors such as terrain features and wind direction.

The science is essentially unchanged since 11th-century Chinese combatants used the first crude gunpowder-propelled projectiles to decimate enemy lines. Later in Europe, 15th-century armies perfected the use of cannonballs to pulverize castle walls.

“Although today’s mortar crews become very good over time, launching mortars is by today’s standards an inexact science, and it is constrained by the incremental degree of control offered by propellant rings,” says Bob Turman, Senior Manager for Directed Energy Systems Org. 5440.

In an electromagnetic launcher, coils stacked along the gun’s barrel are subjected to precisely timed current pulses, one after the other, creating a magnetic wave that moves quickly up the barrel and pushes the mortar and armature along with it.

No propellant is necessary, eliminating not only a safety hazard for soldiers and a logistics headache for the military, but also a major source of imprecision in conventional mortar guns. A very slight variation in propellant quality, temperature, or quantity can result in a mortar missing its target.

“There is only so much fidelity you can get with propellant rings,” says project manager Ron Kaye (5445).

Dial a range

The barrel-end velocity of an EM-launched projectile, on the other hand, when timed by computer, can be very precisely controlled, he says. The intensity with which individual coils are fired in succession can also be adjusted on the fly to make slight adjustments, literally while the mortar is traversing the barrel.

“This will allow the warfighter to essentially dial a range,” says Ron. “It will allow for a new degree of control.”

Because no propellant loading is necessary, launch cycle times can be reduced from the 10 rounds-per-minute maximum of a skilled mortar crew to, Bob estimates, 16 to 24 rounds per minute — determined by the time required to reload the mortar and recharge the energy-storage capacitors. Eliminating the propellant also opens the door to



DEREK LAMPPA (5445) examines a coil that is part of a small-scale coil gun test bed. The test bed, in the foreground, includes four 50 mm coils used to test and refine electromagnetic acceleration of an aluminum projectile to as fast as 400 meters per second. (Photos by Randy Montoya)

EM guns produce almost no muzzle flash and a fraction of the muzzle report associated with traditional artillery. In essence, the mortar departs the barrel with a swoosh rather than a bang.

fully automated, robotically reloaded EM mortar guns that might achieve even faster fire rates.

EM guns produce almost no muzzle flash and a fraction of the muzzle report associated with traditional artillery. In essence, the mortar departs the barrel with a swoosh rather than a bang. In today’s world of space- and aircraft-based reconnaissance sensing, reducing the optical and acoustic signal will make it more difficult for the enemy to pinpoint the source of artillery fire, says Ron.

Bricks and mortars

Sandia’s DARPA project focuses on land-based army munitions, and the Sandia team has built a nonfunctional replica of a turret containing an EM gun that could sit atop a Future Combat System vehicle or Bradley fighting vehicle.

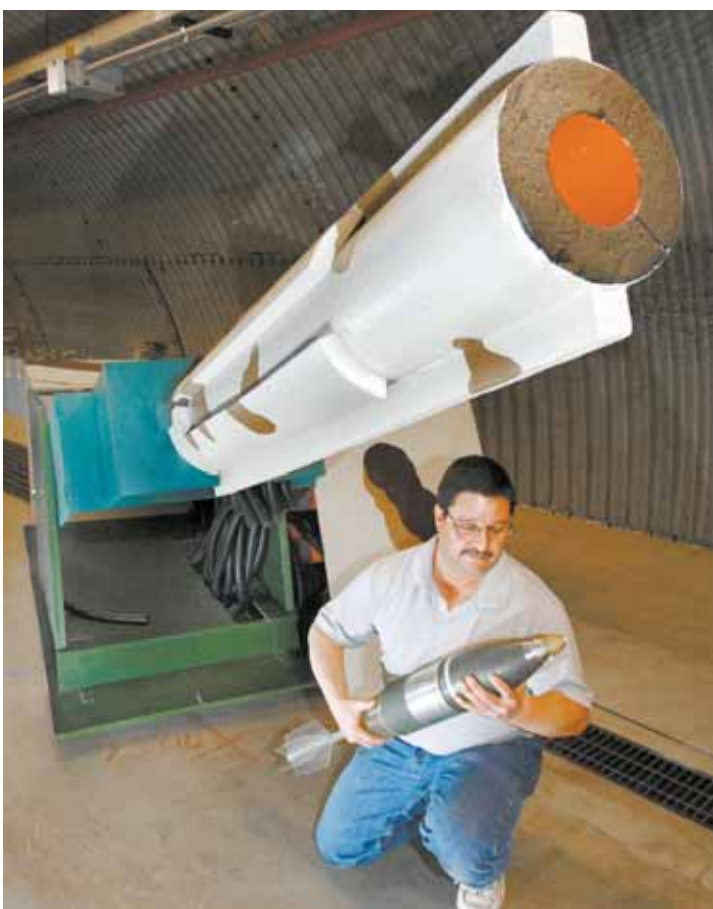
A full-scale, 50-coil EM gun prototype has been designed and is being built in Area 4. Projectile interaction with the EM gun barrel components have been modeled on Sandia computers and validated using data from a four-coil mock-up gun. Laboratory tests on the full-scale prototype are scheduled for this fall.

For vehicle applications, a portable electrical power generation and capacitance-based storage system would be necessary, which Bob believes need be only as large and weighty as the turrets on current military platforms.

DARPA is considering EM mortar launchers as a potential component of the US military’s Future Combat System. If hybrid electric vehicles are adopted, the EM launcher could, essentially, share an on-board power plant with its host vehicle, says Ron.

The Sandia-led project falls in the category of applied development and goes well beyond the research projects conducted at Sandia in the early ‘90s that resulted in demonstration of an EM-launched projectile across Coyote Canyon, says Bob.

“DARPA has provided the specifications and the parameters and asked us to build them a mortar demonstration using existing 120 mm mortar ammunition,” he says. “We’re getting close to a working, full-scale gun.”



GERARD TORRES (5445) holds a modified mortar round under the barrel of a cardboard-and-Styrofoam EM gun mock-up that demonstrates the feasibility of mounting a coil gun’s components atop a military vehicle.

PEARLS of wisdom add quality to Sandia software

By Bill Murphy

If you showed up at a Sandia software shop a few years ago and told the programmers you were there to help them with quality issues, you weren't likely to be embraced in warm hugs. After all, if you're a programmer, proud of your team's work and its productivity, you'd likely have said, "Quality? Of course we do quality work. Our code works, doesn't it? And we deliver when we say we'll deliver. What more is there?"

That's the not-uncommon situation Ray Trechter and his PEARLS software quality team faced when PEARLS was launched some five years ago. That reaction, while probably not completely a thing of the past, is far less frequent today. Ray is manager of Software Systems Dept. 6225; PEARLS is one of his group's products.

Think about processes

Despite programmers' early concerns to the contrary, PEARLS never was about helping coders make sure their software works. Programmers themselves are the best judge of that: They know the customer, they know the requirement, they know the deadline. And they know how to code. If they weren't the best of the best, they wouldn't be at Sandia — that's a given. Rather, says Ray, the PEARLS team was created to help programmers — and programming teams — think about processes.

Better processes — industry best practices — are known to bolster productivity and help programmers demonstrate and document their coding methodology. Using industry standards means that a programmer at (for example) Lawrence Livermore or Los Alamos (Sandia's partners in so many high-consequence endeavors) can work with Sandia-written code and understand the framework within which it was produced and the assumptions underlying its structure. PEARLS, Ray says, helps teams make sure their code measures up to best-practices standards and is accessible to others trained in the same way of thinking and working.

It's not as if Sandia had any alternative to embracing best-practices. It's a DOE/NNSA requirement to have such processes in place; there is a Sandia corporate policy requirement that addresses the issue specifically.

Says PEARLS team member (and long-time coder herself) Molly Minana: "We don't go in telling coders how to write code; they already know how to do that. We try to direct teams toward adopting standard conventions and a consistent way of writing code." (Molly, who says of her PEARLS work, "We really love this stuff," lives and breathes software quality. She even heads up a software quality interest group — SQUIG — at Sandia. See the sidebar about the group at upper right.)

Ray notes that programmers are "understandably reluctant to embrace or accept a system that would compromise their creativity."

The PEARLS team doesn't do that. On the contrary, the team arguably helps free up programmers to be their most creative, much the way the sonnet form (arguably) helped Shakespeare find new dimensions in his own creativity.

"We relieve the coding team from having to develop their own standards," Ray says. And that can be a big relief, indeed.

Consider the experience of Rob Turner, a coder with the Code Management System team (and a long-time partner of the PEARLS folks). Rob says PEARLS-introduced processes, "have made a world of difference for us." Since PEARLS began working with the CMS team and offering its insights and recommendations (by the way, PEARLS deals in recommendations, not mandates), Rob says, "We've been able to work faster with fewer initial bugs and more confidence."

Harvey Ogden, the PEARLS team leader, says, "Generally, programmers ultimately find that the quality processes PEARLS introduces them to improve their life."

PEARLS input is vital

Harvey notes, too, that the PEARLS input is vital in helping teams demonstrate they are meeting DOE/NNSA process requirements. "We show teams how to maintain a body of documentation that is traceable clear back to its original requirements — a body of artifacts that support the quality claim."

Ray acknowledges that meeting DOE/NNSA and Sandia requirements is important and, yes, PEARLS can help teams do that. In Ray's mind, though, there are other factors at play.

"Requirements' is one way to look at it, sure. But there's more, really. There's 'How do I get better? How does the process get better? How does the product get better?' That's something everyone at Sandia can take to heart."

Ray notes that in the current Labs environment, with its emphasis on operational excellence, "more will be demanded of all Sandians and their processes in terms of accountability. And that includes, most definitely, the area of software development." Indeed, he says, "Software quality is just a natural for operational excellence." Ray cites Sandia Executive VP John Stichman's perspective that the purpose of operational excellence is not an end in itself

Software Quality Interest Group

SQUIG is Sandia's Software Quality Interest Group whose membership represents a broad spectrum of Sandia organizations, including 0232, 2620, 4510, 5530, 6220, and 12340.

Formed in May 2005 as a grassroots body interested in actively promoting the development of quality software, SQUIG has drafted a charter. The SQUIG charter defines several goals supporting the notion of learning, influencing, and practicing software quality. The charter also includes the desire to encourage and implement good, sound software quality policies and practices across Sandia.

A specific goal is to drive and shape several high-impact software quality milestones each fiscal year. SQUIG meets monthly to identify current opportunities to support and endorse software quality, determine methods for collaborating, and share information on timely topics. If your organization is interested in being represented on the SQUIG, e-mail Molly Minana at maellis@sandia.gov or phone at 844-8258.

and it is not simply a way to make sure the product is excellent. Rather, John says, the point or operational excellence is to ensure repeatability of results and the continued excellence of Sandia's mission work.

A quick aside about the name: PEARLS is one of those ubiquitous Sandia acronyms that makes more sense as an acronym than when you spell out the words it stands for: Productionizing Environments and Releasing Lifecycle Systems.

Ray admits with a grin that the words are a mouthful: "I always thought that the name was a bit contrived in order to come up with a good acronym." So, don't think about "Productionizing Environments . . ." and all that. Just think about that team that brings pearls of wisdom to your operation.

More about PEARLS

PEARLS competencies

- Software Quality Engineering
- Software Systems Assessments
- Verification and Validation
- Project Management
- Software Development
- Technical Knowledge Management
- Software Architecture
- Continuous Software Process Improvement
- SEA Guided Emergence (GEM) Framework
- Agile Methodologies
- Requirements Management and Software
- Configuration Management Tools

Colombian dignitaries visit solar tower



A DELEGATION from Colombia visited the DOE-owned, Sandia-operated National Solar Thermal Test Facility last week, learning about solar energy and other alternative energy sources they may adopt in their country. Here Pablo Garcia (6002), deputy to VP Les Shephard, talks about how the six Stirling Energy Systems solar dish collection systems operate. Visiting from Colombia were representatives of the country's president and of major mining and engineering schools, private companies, and different levels of national government. (Photo by Randy Montoya)

New initiative focuses on small business purchases

Goal this year is to have 47 percent or more of Sandia purchases be from small businesses

Consider purchasing from a small business. That's the message being sent Labs-wide to all Sandians as a reminder about Sandia's commitment to the small business community.

As part of this commitment, a new initiative is underway by the Supply Chain Management Center (10200) and Supply Chain Resource & Development Dept. 10222 to increase purchases from small businesses.

"It makes good business sense to seek out innovative small businesses that can provide timely, quality, responsive, and cost-effective products and services," says Deputy Laboratories Director John Stichman.

Last year, Sandia placed 46.5 percent of its contract dollars with small businesses, corporate-wide. In New Mexico alone, \$432,180,947 was committed to small businesses. Small businesses provide Sandia with technical products and services, commercial off-the-shelf items, construction services, and manufacturing and production services.

FY2006 goal

Sandia's goal for FY 2006 is to improve on last year's record, says Toni Leon Kovarik (10222).

It is estimated that Sandia will spend more than \$470 million in small business contracts and purchases for the year.

The Labs-wide goal is to have all Sandians consider a small business for their next purchase.

"This demonstrates Sandia's ability to meet the mission — and work with small businesses," says Toni.

Sandia will provide a comprehensive end-of-

year report that identifies the efforts taken to develop new opportunities.

Think Small website

Toni says a new website has been created to help Sandians find a small business that sells what they are looking for.

"It's a one-stop page," she says. "The website has been set up to make things easy to find a small business."

The site features the Open Market Items Program that helps p-card holders purchase most commercial off-the-shelf items not available through Just in Time (JIT) contracts. The site provides a link to Supply Central Ltd., which lists most commercial items. It provides access to thousands of vendors and products through one point of contact.

The website defines and provides small business categories including Small Business, Small Disadvantaged Business Certified, Small Woman Owned, 8(a), Veteran Owned Small Business, Service-Disabled Veteran Owned Small Business, and HUBZone - Historically Underutilized



THINK BIG — Michael Cirricione, of Team Specialty Products (TSP), works on targets for the Z machine. TSP develops, fabricates, and tests mechanical and electronic products (*Lab News*, July 8, 2005). TSP is designated a Sandia Strategic Supplier.

(Photo by Randy Montoya)

Business Zone.

The Think Small Business website can be found at: <http://cfo.sandia.gov/thinkSmall.htm>, or type "thinksmall" in the search box.

— Michael Padilla

Three Sandia projects receive FLC National Technology Transfer Awards

By Erin Gardner

Three Sandia teams have been named winners of the 2006 Federal Laboratories Consortium (FLC) National Technology Transfer Annual Awards. The Award for Excellence in Technology Transfer is presented annually by the FLC to recognize laboratory employees who have accomplished outstanding work in transferring a technology developed by a federal laboratory to the commercial marketplace.

Sandia's three award recipients are the Robust, Wide-Range Hydrogen Sensor; SMART: Sensor for Measurement and Analysis of Radiation Transients; and SUMMiT V™ Fabrication Process and SAMPLES™ Program.

Awardees will be honored at an awards ceremony May 3 at the FLC national meeting in Minneapolis.

Technology transfer experts from industry, state and local government, academia, and the federal laboratory system evaluated the nominations.

Here is information on each Sandia winner.

Robust, Wide-Range Hydrogen Sensor

Sandia's Robust, Wide-Range Hydrogen Sensor offers both low-range and high-range hydrogen measurement capability on the same chip. This nearly eliminates false readings and makes it an ideal candidate for a variety of governmental and commercial applications.

H2scan Corporation of Valencia, Calif., has licensed Sandia's sensor technology through a formal cooperative research and development agreement (CRADA). The company has developed a small *in situ* sensor with the capability

of detecting hydrogen concentrations between 10 parts per million and 100 percent.

In the emerging hydrogen economy, this new technology provides customers with an inexpensive hydrogen sensor that essentially eliminates false readings by detecting the presence of hydrogen, with or without oxygen, against most background gas.

The primary contact for the project is Paul Smith (10104).

SMART: Sensor for Measurement and Analysis of Radiation Transients

As a new tool in the fight against terrorism the SMART system uses detectors and software to distinguish between normally occurring radioactive materials and those that are potential signatures of terrorist activities.

SMART uses Sandia proprietary software to help operators easily and accurately identify the isotopes associated with radiological emissions. A video imager captures an image of the person or vehicle carrying the radioactive material when the detector is set off.

Sandia licensed its FitToDB, PASSBY, and GADRAS-LT software to Thermo Electron Corporation.

The company is incorporating the software technology into existing hardware platforms and plans to deliver third-generation systems to the market in mid-2006.

Under a CRADA, Sandia and Thermo Electron are collaborating to refine the Sandia-developed software for large-scale commercial deployments in Thermo Electron's Advanced Spectroscopic Portal system.

The SMART system will be a key component in protecting military assets and the

homeland against dirty bombs and other nuclear devices.

The primary contact for the project is Dean Mitchell (5935).

SUMMiT V™ Fabrication Process and SAMPLES™ Program

The Sandia Ultralplanar, Multilevel MEMS Technology (SUMMiT™) fabrication process is a microelectromechanical systems (MEMS) batch fabrication process that uses conventional integrated circuit processing tools to achieve high-volume, low-cost MEMS production.

The SUMMiT V™ technology is unique in that it is the only MEMS technology that offers four levels of structural polycrystalline silicon (poly) and electrical poly level isolated from the silicon substrate and that is fabricated using traditional integrated circuit processing techniques.

Micromachined polysilicon has excellent mechanical properties with astounding design flexibility, developers say.

To facilitate MEMS education and access to Sandia's SUMMiT™ process technology, Sandia launched the Sandia Agile MEMS Prototyping Layout Tools, Education and Services (SAMPLES™) in 2001. The program enables customers to develop their own innovative MEMS-based products by leveraging advanced design, fabrication, and characterization technologies originally developed for national laboratory applications. This approach reduces cost and risk, opening the door to a larger market, facilitating prototypes and a better understanding of MEMS in general.

The primary contact is Harold Stewart (1749).

Mileposts

New Mexico photos by Michelle Fleming



Wilfred Mitchell
30 10854



Stephen Sanderson
30 6451



Richard Chapman
25 5526



Rita Coslow
25 24541



Mark Smith
25 2450



Annie Webb
25 5431



Lisa Barham
20 3551



Shannon Letourneau
20 10263



David Marks
20 5932



Joan Tallant
20 11



Ron Pate
20 6115



David Garcia
15 4211



Doug Brown
30 4312



Andy Jones
30 5353



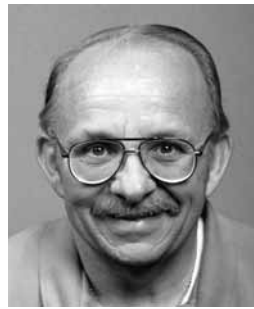
Douglas Trump
30 2992



Bruce Bainbridge
25 2952



Quenton McKinnis
25 8231



Dwight Newell
25 4211

Manager promotions New Mexico

Melecita Archuleta, from DMTS, IH Compliance Service and RP Labs Dept. 10321, to Manager, Weapons Engineering and Product Realization.

Melecita worked first at Sandia as a summer intern from 1977 to 1980. She has extensive experience in ES&H and toxicology and was the lab division manager for toxicology at SED Medical Laboratories in Albuquerque. Prior to that she was group leader for the forensic chemistry laboratory of the Office of the Chief Medical Examiner for the State of Oklahoma.



MELECITA ARCHULETA

Melecita rejoined Sandia as an MTS in 1992 in the ES&H department as an occupational toxicologist and later as deputy emergency manager for the emergency management department.

In her last assignment before going to Division 2000, Melecita served as the team lead for the Industrial Hygiene Analytical Chemistry Laboratory. She has a lengthy list of publications in refereed journals and is an adjunct professor at the University of New Mexico College of Pharmacy.

Melecita will be responsible for helping to achieve operational excellence in Division 2000.

She has a BS and an MS in inorganic chemistry from the University of Oklahoma and a PhD in toxicology from UNM.

Charlie Pechewlys, from Manager, Legal Infrastructure Support Dept. 11100, to Director of that same department.

Charlie joined Sandia in 2000 and worked in the Corporate Contracts and Policy Management Department. He has since concentrated on procurement, prime contract, property, and general corporate governance.



CHARLIE PECHEWLYS

Charlie has a BS in mechanical engineering and a master's in management from Rensselaer Polytechnic Institute and a master of Laws in

Recent Retirees



Tom Ferguson
25 4620



Renae Perrine
25 6030



Larry Perrine
22 3651



Jackie Blackburn
16 10730



Mary Wendt
15 3655

Government Procurement and a juris doctor from George Washington University.

Bob Turman, from Manager, Directed Energy Beam Applications and Initiatives Dept. 5445, to Senior Manager, Directed Energy Systems Dept. 5440.

Bob joined Sandia in 1980 and has since worked in pulsed power and defense applications in the Pulsed Power Sciences Center. He currently works in the Integrated Military Systems Development Center.

Bob has a PhD in physics from the University of Texas, Austin.



BOB TURMAN

JOIN US FOR THE MERCADO!

WEDNESDAY, MARCH 22nd
11am - 1pm

At the BIG TENT
(next to Thunderbird Cafeteria)

To Answer your Questions &
To Listen to your Suggestions on
Operational Issues (Safety, Security,
Finance, others)

(Look for the IES folks
with the bright clipboards!)

FREE
Giveaways!



FREE!
IES Cream
Bary!

Bobby Baca to receive Employee of the Year award from **CAREERS & the disABLED** magazine

By Iris Aboytes

Bobby Baca (2712) will receive *CAREERS & the disABLED* magazine's Employee of the Year award at its 14th Annual Conference the week of March 22 in New York. Bobby will be recognized for his professional and advocacy efforts on behalf of people with disabilities in the workplace.

"When Bobby was born," says Rita, his mother, "I thought God was punishing me. What he was doing was giving me one of my greatest gifts. The doctor told me, 'Do not feel sorry for him,' and I didn't. Not having a left hand, one of Bobby's earliest challenges came when he had to learn to tie his shoes in kindergarten. He stayed in his room until he learned to tie them his way.

Bobby is a neutron generator test engineer



BOBBY BACA

working with the team that functionally tests neutron generators during production builds. "I became an engineer because I enjoy analyzing a problem and then researching and developing an optimal solution," says Bobby. "The real fun of being an engineer is implementing the solution after your analysis and seeing that the solution really works."

'I do not see him as disabled'

Bobby received his undergraduate and graduate degrees in engineering from New Mexico State University. He is a recent graduate of Sandia's Weapon Intern program. Before coming to Sandia, Bobby was a computer science instructor at NMSU. He is a member of the Maintenance and Reliability Professionals (SMRP) board of directors and Sandia's Corporate Diversity Team (CDT).

"Nominating Bobby did not initially cross my mind," says Rochelle Lari (3553), Diversity Program leader, "because I do not see him as disabled."

"In my 15 years at Sandia, I have been able to function just like everybody else and have rarely been treated as a disabled employee" says Bobby. "I believe disabled employees bring a problem-solving perspective to the work environment because each of us has had to learn to accomplish everything in our own way. Employees with limi-

tations deserve to be treated just like any other employee and be included in project activities. Our limitations have become our strengths as we have had to become extremely good problem-solvers just to be able to function on a day-to-day basis."

Not having a left hand has not kept Bobby from doing anything a two-handed person can do. As an individual who lives life to the fullest, Bobby does not back away from challenges. He wanted to play golf and has achieved considerable success (*Lab News*, Nov. 26, 2004).

Recently Bobby had the opportunity to give a USGA (US Golf Association) golf clinic to single, double, and triple amputees in Austin, Texas. Bobby was their inspiration and their role model, enabling them to change their own perceptions about their abilities. "This was one of the most rewarding things I have done," says Bobby. "Teaching someone to accomplish something (like golf) despite their limitations was awesome. To have a student look at you and say, 'I can do this' made it all worthwhile."

"We never looked at Bobby like he had a handicap," says Rita. "He was just Bobby. I am amazed and proud of all his accomplishments. His father and I will be there to see Bobby receive his award. I wait patiently to see what he will accomplish next. I am sure there is much more to come."

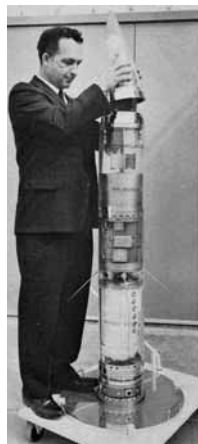
"I believe disabled employees bring a problem-solving perspective to the work environment . . ."



This monthly column highlights Sandia Lab News items from 50, 40, 30, 20, and 10 years ago, but each column does not necessarily include items from each decade.

50 years ago . . . "Livermore Branch to Become Sandia's Largest Satellite" was the big page-one story on March 23, 1956. The story said Sandia's "new assignment, providing ordnance engineering support on a greatly expanded scale for the University of California Radiation Laboratory [now Lawrence Livermore National Laboratory] . . . will result in the westward migration of some Sandians in the months to come and the hiring of a number of new employees from the Bay area." The article went on to extol the Livermore area's attractions and virtues, reading like a Chamber of Commerce brochure: "The absence of fog, abundance of sunshine, and an altitude of 476 feet produce a dry, even climate with warm days and cool nights the year around. This temperate climate is so healthful that numerous hospitals and sanitariums have been located in the area." The "Livermore Branch" is today known as Sandia/California, which has various 50th-anniversary activities planned March 7-9. Learn more on its internal web page: <http://www.ca.sandia.gov/anniversary>.

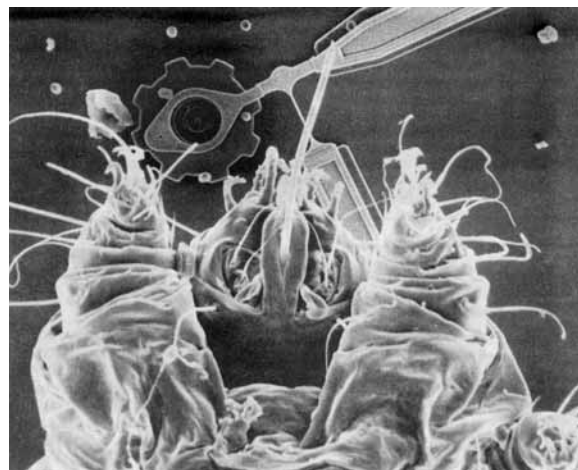
40 years ago . . . The reliable Sandia-developed Nitehawk 9 rocket system was featured in the March 11, 1966, issue. The slender two-stage sounding rocket, which carried a variety of instruments, had already been fired successfully 48 times since the first flight in 1963, with payloads up to 60 pounds. The flights were conducted to obtain information on the aurora borealis, winds, radiation, and solar activity at heights up to 200 miles. Launch sites included the Tonopah Test Range and the Kauai Test Facility.



W. C. WOMAC with a typical Nitehawk 9 payload section.

30 years ago . . . A new \$1.1 million Sandia oil shale demonstration project that was just gearing up was the page-one feature in the March 5, 1976, issue. With the goal of demonstrating a "true *in situ* oil shale technology," the project near Rock Springs, Wyo., was drilling into a 40-foot-thick shale lying about 150 feet below the surface. The intent was to "rubble-ize" the shale with explosives and then take core samples to determine how successful the technique was in fracturing the formation for the ultimate recovery of the trapped oil and gas. Other Energy Research and Development Administration (predecessor agency to DOE) researchers had already demonstrated the feasibility of in-place burning of oil shale to produce oil and gas. Although some shale experiments from that era were technically successful, the technology was too costly to be competitive. Maybe someday!

10 years ago . . . Sandia's new ability to produce "intelligent" micromachines was featured in the March 15, 1996, *Lab News*. For the previous few years, Sandia had gained worldwide recognition for developing a succession of increasingly powerful micromachines. The article said the new intelligent, or smart, micromachines could do such things as signal for more power, communi-

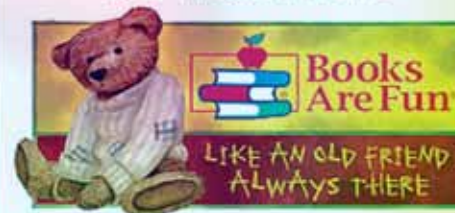


A DUST MITE no bigger to the human eye than a tiny dot crawls over one of Sandia's micromachines. The machine turns gears, each smaller in diameter than a human hair.

cate their operating speeds, and perform actions on an automated basis. Then — Sandia Department Manager Paul McWhorter, who later left Sandia to form the firm MEMX, said the development would be a big enabler for a variety of new products that are small, smart, and cheap. (MEMX is a start-up firm for commercializing microtechnology and nanotechnology capabilities.) —Larry Perrine



Spring Book Fair
To Benefit Sandia's
ECP/United Way
See What's New!



March 15, 16
The Bistro
International Programs Bldg.
9:30 am-4 pm

March 21, 22, 23
Thunderbird Cafe
10 am- 2 pm

March 29 & 30
Bldg. 811, Large Conf. Room
9am-4pm