

MIGHTY. FAST. COMPUTERS.

Red Storm upgrade boosts Sandia supercomputer to #2 in world *Labs' big iron is #1 in scalability, researchers say*

By Neal Singer

A \$15 million upgrade to Sandia's Red Storm computer has increased its peak speed from 41.5 to 124.4 teraflops in a computing terrain in which a single teraflop was a big deal only six years ago.

The machine, built by Cray Inc., is now rated second fastest in the world,



with a Linpack speed of 101.4 teraflops. The widely recognized Linpack test measures a supercomputer's speed as applied to a computing problem.

In peak speed, Red Storm remains well behind BlueGene/L at Lawrence Livermore National Laboratory, but, "in terms of scalability, Red Storm is the best in the world," says Bill Camp (1400), director of Sandia's Computation, Computers, Information, and Math Center.

Scalability refers to a supercomputer's computational efficiency as the number of processors on a job is increased. "You want to use more processors to get large jobs done more quickly," says Bill, "but if the computer doesn't scale well you can lose much of that speedup." Red Storm loses very little effi-

(Continued on page 4)

Sandia's Thunderbird Linux cluster ranks #6 in Top500 supercomputing list

By Sophia Corwell (4324) and Neal Singer

Sandia's 8,960-processor Thunderbird Linux cluster, developed in collaboration with Dell Inc. and Cisco, maintained its sixth position in the Top500 Supercomputers list by achieving an improved overall performance of 53 teraflops, an increase of more than 18 percent over last year's performance testing.

The Top500 ranking of supercomputers is based on the Linpack benchmark, a yardstick of performance to test processor speed, scalability, and accuracy.

"This achievement represents a long-term investment to meet our mission to transform engineering and provide greater processing capacity," says Computing Systems Senior Manager John Zepper (4320).

Sandia researchers use Thunderbird to perform a broad range of weapons simulations, including atomistic scale-to-device modeling of radiation effects on semiconductor electronics, assessing weapon-response safety in extreme thermal and impact environments, and quantifying uncertainties in weapon performance.

(Continued on page 4)



Sandia Lab News
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Sandia's Employee Caring Program (ECP) tops \$3 million, a new high

By Iris Aboytes

It happened. Sandians and Sandia retirees pledged a record-breaking \$3,175,000 to the United Way of Central New Mexico. Sandia's participation rate is 73 percent, an increase of 1.1 percent over last year. New-hire participation level is now at 58 percent, up from 54 percent last year and 27 percent in 2004.

How did it happen? An army of about 100 Sandians went on tours, attended training, and communicated to their fellow Sandians how much the community needs their help. Their coworkers responded.

"Sandians realize that it is only when we work together that we can make the biggest difference, and Sandia is about making a difference," says Amy Haas (5556) campaign co-coordinator.

"Sandia's tradition of giving has represented 20 percent of United Way's annual drive for the last 25 years," says Jack Holmes, president and CEO of United Way of Central New Mexico. "Congratulations to all Sandians for a terrific example of caring for our community. Your completed campaign is truly an amazing showing. Your participation level will certainly be one of the highest, if not the highest, for large organizations locally, and we believe nationally as well. Your campaign sets a new standard for our community."

So what can \$3 million accomplish?

"Since 2001, in addition to designated agencies, the number of Community Fund agencies funded by United Way has gone from 45 to 89. Those increased numbers would have been basically impossible without the consistent Sandia

(Continued on page 5)



Rad response team deployed to NM state fairgrounds
DOE deployed a Radiological Assistance Program team from Sandia to assist in the recovery of two containers discovered at the Expo New Mexico fairgrounds last Saturday. The containers held cobalt and cesium sources. Story on **page 5**.

New approach for sensors



OUTSTANDING IN THEIR FIELD — Sandia researchers Jonathan Van Houten and Jeremy Giron (both 2623) hold a Labs-designed sophisticated sensor that interacts with smaller off-the-shelf sensors like those seen in the foreground. Read about this new and improved sensor detection system in Chris Burroughs' story on **page 6**. (Photo by Randy Montoya)

Also inside . . .

- California plating facility project shows how decommissioning is done Page 3
- Sandia researchers win two Lockheed Martin NOVA awards Page 4
- A better way to see how a drug attaches to a cell Page 5
- International team studies radiation dispersal device plumes Page 7
- Students learn about 'wicked science' in annual Science Night Page 12

What's what

I have a coffee maker in my office and some colleagues and I share the coffee-buying responsibility so we can have real coffee. Because of the coffee maker, my office has become an occasional gathering spot – mostly in the morning when we all show up about the same time for a first cup or a refill.

Since I'm about to retire, a member of the coffee klatch asked one morning recently where the coffee maker would go when I go. As such chit-chat goes, one member in good standing suggested leaving it there. Another said, yeah, and we could get a cardboard cutout of Howard and put it in his chair, and it would be like he's still here. I was wearing a noticeably orange sweater during this conversation (I wear sweaters a lot), and someone said, yeah, and we could even make up different color sweaters and put a different one on the "poster Howard" every day.

We all had a laugh and everybody poured another cup of coffee and went back to their offices. And as I turned back to my own work, I thought, so, that's what happens when you retire: You're fixed in the minds of your friends and colleagues as a giant paper doll with different colored sweaters, and your memorial is a used coffee pot.

* * * * *

There's all kinds of thievery, ranging from the kid who snags a piece of bubblegum to the business executive who loots a company treasury. There are lovable rogues like Cary Grant as a reformed cat burglar in the movie *To Catch a Thief* and Paul Newman and Robert Redford in *The Sting* and *Butch Cassidy and the Sundance Kid*. George Clooney and his pals in the *Ocean's* pictures. (For that matter, how about Frank Sinatra and the Rat Pack and *their* *Ocean* picture – they only managed to do one.) The *Italian Job* crew. George Scott as the *Flim-Flam Man*. The lovable rogue is truly a Hollywood staple.

Then there are thieves like whoever broke into the Bureau of Indian Affairs' Southern Pueblo Agencies fire management compound sometime over the Veterans Day weekend. A note from US Forest Service spokeswoman Karen Takai asked law enforcement agencies to watch highways and parking lots for the plunder – vehicles, a 4x4 vehicle, a couple of trailers, a generator, some folding tables, and. . .

- 200 plastic Smokey Bear hats
- 200 red plastic fire fighter hats
- 500 plastic Smokey Bear water bottles and
- 700 plastic Smokey Bear flying discs

Stealing toys? I bet Butch Cassidy and the Sundance Kid would have a choice way of dealing with thieves low enough to steal toys.

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



STEALING FROM SMOKEY — How low can you get?

Labs' Truman Fellowship applications due by Dec. 5

The application deadline for the 2007 President Harry S. Truman Fellowship in National Security Science and Engineering is Dec. 5. Begun in 2004, the program offers the best nationally recognized new PhD scientists and engineers an opportunity to conduct independent research of



President Harry S. Truman Fellowship
in National Security Science and Engineering

their choosing within a national security context through a prestigious postdoctoral research fellowship.

Six fellows have come to Sandia through the program so far. One, Greg Nielson, is completing his fellowship but has also been hired by the Advanced MEMS Department (1749-2), where he's been working for nearly three years.

For details on the program and to read about the experiences of current and previous fellows, visit the Truman Fellowship website at www.sandia.gov/employment/special-prog/truman.

Special materials transport gets boost

Sandia, partners deliver major system upgrade to NNSA's Office of Secure Transportation

A major upgrade to the system that tracks and manages the movement of special nuclear material and other high-consequence national security cargo around the nation is now operational. It ensures that NNSA's secure transportation group has the tools it needs to continue to operate effectively, safely, securely, and efficiently for years to come.

Sandia's Critical Information Systems Dept. 6453, which designs and delivers new capabilities and upgrades of existing systems to NNSA's Office of Secure Transportation, has teamed with several key partners to deliver the much-anticipated upgrade to the Transportation Command and Control System (TCCS) system. The TCCS 4.0 upgrade represents the culmination of a four-year effort. Working with the Dept. 6453 team were Communications Systems Dept. 6452 and partners from Parallax, Inc., Honeywell FM&T, and other OST contractors.

TCCS 4.0 provides 24/7 support for tracking and response, continuous monitoring of vehicles in real-time, and consequence management. It also supports subsequent data analysis, such as reporting transport activity to the nation's governors. Real-time vehicle tracking is conducted at the primary control center in Albuquerque's DOE compound.



Retiree deaths

Charles E. Anderson (age 88)	Oct. 1
Clarence W. Karfs (78)	Oct. 4
Victor D. Schaeffer (90)	Oct. 4
Bernard A. Clouse (96)	Oct. 5
Robert H. Baxter (84)	Oct. 8
Edward D. Sims (84)	Oct. 10
Lorene B. Adams (76)	Oct. 10
J. A. Allensworth (83)	Oct. 11
Debra S. Shaw (55)	Oct. 12
E. Ruth Barth (81)	Oct. 15
Eugene W. Zucuskie (79)	Oct. 15
Gilbert S. Wallace (84)	Oct. 15
Gerald J. Rohwein (72)	Oct. 17
Juan Martinez Mata (83)	Oct. 21
James E. McCreight (76)	Oct. 21
Homer Ator (83)	Oct. 25
William L. Clement (75)	Oct. 25
Alton L. Simpson (78)	Oct. 28
Robert W. Higgins (85)	Oct. 29
Carl F. Lundbom (86)	Oct. 29
Paul Aaron Silva (81)	Oct. 30

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For the record

The caption accompanying the photo of a sled track test on pages 6-7 in the Nov. 10 issue was incorrect. The test in the photograph has been authoritatively described as a reverse ballistic impact test conducted in 1986 for the W87 program. In another caption in the same issue, President John F. Kennedy's visit to Sandia occurred in 1962, not, as stated in the caption, 1963.

Sandia Thunderbirds to hear Southwest Edition's renditions

Sandia Thunderbirds (and all interested persons) will be entertained at their December meeting with the sounds of Southwest Edition of Sweet Adelines. The free-of-charge meeting is Monday, Dec. 11, 2 p.m. at the Mountain View Club on Kirtland Air Force Base.



Southwest Edition — Judy, Andrea, Sue, and Marilyn — have been entertaining audiences in Albuquerque for years. They have sung for governors, veterans, sweethearts, weddings, new babies, seniors, and many others. They plan a selection of Christmas music for the Thunderbird performance.

The Sandia Thunderbirds is Sandia's retiree club. Call Rod Boenig at 836-6977 for information on how to attend.

It's how decommissioning is done: Plating facility closure removes site's largest source of chemical waste

By Nancy Garcia

When Jim Mitchell, team leader of the Electronic Prototype Lab Dept. 8236-1, was asked to close the printed circuit board plating facility — the largest hazardous waste generator at the California site — he turned to Environmental Management and Industrial Hygiene for help.

The result was getting rid of drums of chemicals, large quantities of materials, and reclaiming several thousand dollars of metal used in electrical contacts.

"Waste Management was getting ready for a chemical inventory reduction," says Jim. "It kind of fit right in with what they were planning."

Pollution Prevention point-of-contact Laurie Farren (8516) took the lead. She advertised items to give away — throughout the site first, then around the complex. About \$25,000 in supplies will go to Lawrence Livermore National Laboratory (LLNL), avoiding disposal of 8,000 pounds of personal protection equipment, lab coats, nuts and bolts, and a variety of hardware. LLNL workers have collected eight pallets of plating supplies and will also take a hot press and oven.

"They were glad to get it," Laurie says.

Not only does reuse minimize waste disposal, it also helps to maximize the use of government money, points out Janet Harris, Laurie's pollution prevention (P2) colleague in Environmental Management Dept. 8516.

Declining use prompted the decision to close the plating operation as a cost-saving measure.



TODD BARNETT watches a printed circuit board make its way through the automated plating facility line. The line has been closed and its parts are being offered to any takers around the NNSA complex. In the background is Rigo Ledezma. (Photos by Bud Pelletier)

it probably would have cost in the neighborhood of \$75,000."

The facility had amassed a large storehouse of chemicals, some left over from old chemical processes. These were mainly cleared from three

a new user is found. The plating line had replaced an outdated system and is less than two years old, with a value of about \$200,000, Jim estimates.

The upstairs location has made moving bulky or heavy equipment challenging. A several-ton Avalon Hot Air Leveler is still awaiting a new user. Andy Martinez of Property Management and Reapplication Dept. 10267 is investigating reselling the large equipment, and Charlie Henn, who handles pollution prevention for the DOE Sandia Site Office, has emailed photos and descriptions of available equipment around the DOE complex.

About four containers of plating chemicals were refined, yielding almost seven ounces of palladium, an expensive precious metal used in electrical contacts. Worth from \$600-\$700 an ounce on any given day, it was sent to the DOE's "precious metal bank" at Oak Ridge National Laboratory for reuse.

This process has been underway for a few months, including a productive summertime chemical inventory reduction led by Susie Orth (8516). In addition to Jim, this project involves the Waste Management pickup team of Pam Irish and Michael Clark (both 8516); help from Steve Leach and coworkers in Facilities Modification Team 8514-1; and assistance from others, including Rigo Ledezma (8236-1), Todd Barnett (formerly 8236-1, now 8368), Mike Firreno (8236-1), Doug Garceau (8516), and Jerry Inman (formerly 8236-1, now 8324). "They were really helpful," says Janet.

Not an isolated case

From site-wide spring-cleaning efforts to re-commissioning of the former Tritium Research Laboratory, similar successful team efforts have taken place over the years. Perhaps one of the more notable from recent years is an award-winning cleanup from a busy R&D program that kept up to 100 people occupied for a half-dozen years, the Extreme Ultraviolet Lithography (EUVL) program.

A team with members from P2, Maintenance, and Property Management worked together to decommission the EUVL area in the Bldg. 942 high bay, saving about \$3 million through reapplying equipment.

"We had a big 'Kmart blue-light special'," recalls Laurie. The team worked over a five-week window in which Steve Costa (8523-3) assembled a binder of photos of the equipment to document where the money had gone. The nine-member team received an award from DOE for averting disposal of some 3,900 cubic yards of material and releasing millions of dollars of free equipment to benefit other programs and sites.

Sandia California News

The facility had been used for many years to develop prototypes and build high-quality printed circuit boards. With the loss of capability, Jim's team is helping customers find outside vendors.

Teamwork appreciated

Environmental Management helped reduce the large chemical inventory and kept the process affordable, while Waste Management supplied help with paperwork and picked up drained plating bath liquid.

"We worked together to dispose of the chemical inventory," Jim explains. "Without their help

storage sheds behind Bldg. 910 where the chemical inventory system was helpful in identifying what had been stored. Areas being cleared out are the ground-floor storage sheds, third-floor work space, and a storeroom on the second floor.

Just emptying a supply-filled file cabinet took several people to remove each drawer, Janet says. "It's quite a process — these aren't just chairs we're going to pick up and carry out the door; there's a lot of equipment in the plating facility."

Decommissioning will continue as money becomes available. The 30-foot-long automated plating line, which bears some acid residue, will cost from \$40,000 to \$45,000 to dispose of unless



RIGO LEDEZMA conducts an in-process inspection of a printed circuit board fabricated at the Electronic Prototype Lab's plating facility, which has been decommissioned. Before its closing, the plating line was the biggest hazardous waste generator at the California site.

Red Storm

(Continued from page 1)

ciency on large numbers of processors.

"The Cray XT3 supercomputers now dominating the highest end of computing worldwide are based upon Sandia's Red Storm," says Bill, who together with Sandia colleague Jim Tomkins (1420) led the design of the machine. "Scientists love it because they can do bigger science more quickly on it than any other computer in existence, except for molecular dynamics studies on BlueGene. Otherwise, it's the best thing since night baseball."

"The machine's also a computational workhorse. It gets the job done," says Sandia researcher Steve Attaway (1534), winner of several national computing awards. He runs large engineering simulations on the machine.

Red Storm, designed under NNSA's Simulation & Computing program, became the basis for the Cray XT3™ massively parallel processor supercomputer that has been installed at supercomputing centers around the world.

Purchasers of this design include Oak Ridge

National Laboratory, which will create an even bigger supercomputer than Red Storm based on the same design, as well as Lawrence Berkeley Lab, Pittsburgh Supercomputing Center (which is the largest National Science Foundation site); the US Army; the United Kingdom's Atomic Weapons Establishment program; the national computing centers in Finland, Switzerland, and the UK; and other US and allied government sites.

Thrifty in its use of power

Red Storm is Sandia's largest high-performance computer, but is thrifty in its use of power. It uses 2.2 megawatts, compared, for example, to IBM Purple, another highly capable NNSA platform — which requires 4.5 megawatts of power. This means that comparatively less of Red Storm's energy is converted to useless heat.

Red Storm also takes up a relatively small area — about 3,500 square feet.

Its Linpack test demonstrated high reliability, repeatedly running for nine hours on more than 26,000 processor cores without a failure.

The machine was created in less than three years from concept to customer shipment. It was relatively inexpensive to develop and build — \$77.5 million including engineering and design

costs — and is used for large scientific and technical problems.

Sandia developed the architectural specifications of the machine and did much of the software development. "The hardware at Cray was built to meet our specifications," says Jim Tomkins.

The upgrade included the addition of a fifth row of cabinets and upgrading the entire system with dual-core AMD Opteron™ processors, resulting in a supercomputer with more than 26,000 processor cores. Dual-core technology fits two processor cores on a single die, doubling processing capacity with minimal impact on power consumption and temperature levels.

Why is Red Storm so efficient? In part, says Sandia researcher Robert Balance (4328), because its operating system is based on minimalist software — termed a lightweight kernel — which carries just enough functionality to load the job, put it on the network, and stop it. Any other software is job-specific; thus, each computer node (at which two chips are located) in effect lugs no useless software on its back.

The original technology was pioneered by Sandia on its ASCI Red machine, built by Intel Corporation, which became the world's first terascale supercomputer.

Thunderbird

(Continued from page 1)

The level of detail being modeled in these assessments was not practical without the new level of scalable capacity that Thunderbird provides.

With its 4,480 commodity compute servers linked with an Infiniband message-passing interconnect, Thunderbird is the largest cluster of its type in the world.

The improvements in Thunderbird's performance were propelled by its switch to OpenFabric Enterprise Distribution (OFED) and OpenMPI — together, a Linux-based open-source software stack qualified by the OpenFabrics Alliance to operate with multi-vendor Infiniband hardware and imple-

ment open-source Message Passing Interface (MPI) protocol.

The achievement was a joint venture involving Sandia and Cisco. Cisco, an active developer in the OFED and OpenMPI projects, had its engineers on site at Sandia to assist with monitoring, diagnosing, and fine-tuning Thunderbird's performance.

The new software-stack environment allows for more memory per node to be available for parallel jobs at runtime, as well as an increase in reliability and scalability of users' jobs. Sandia's extensive use of the new software ironed out bugs and tweaked performance — improvements that benefit the entire high-performance-computing community.

Infiniband is widely regarded as one of the most attractive commodity interconnect technologies because of its high bandwidth, low latency, and low cost. This is the first time Infiniband, OpenMPI, and OFED have been used in such a massive configuration as Thunderbird.

Sandia receives two Lockheed Martin NOVA awards

By Michael Padilla

Craig Taatjes (8353) and the Red Storm Supercomputing Design and Development Team led by team representative Bill Camp (1400) were recently awarded Lockheed Martin's NOVA Awards.

The NOVA Awards honor individuals who have made outstanding contributions to Lockheed Martin's mission and business objectives in the four categories of exceptional service, leadership, teamwork, and technical excellence.

Craig received a Technical Excellence Award for original contributions that have advanced the understanding of combustion chemistry, including the discovery of a new class of combustion intermediates called enols — an extremely rare event in the 150-year history of flame chemistry research.

"My work is aimed at providing fundamental chemistry knowledge that forms the basis for understanding the chemical processes that take place in combustion," Craig says. "Combustion is a complicated system of interacting chemistry and fluid mechanics.

Part of his work attempts to isolate important steps in ignition chemistry, using laser-initiated reaction of carefully controlled mixtures of reactants. Another part measures the chemical composition in real flames of pure simple fuels. This part of his research led to the discovery that enols, unstable isomeric forms (molecules made of the same atoms but connected differently) of well-known combustion intermediates, are found in flames of a range of fuels. These isomers had previously been ignored in models of combustion chemistry because they were thought too unstable to play a role. His research shows that they are present in concentrations similar to other important intermediates and that their chemical fate is distinct from that of their more well-known isomeric partners. Because enols are minor components, their importance will likely be in areas where the details of the chemistry matter most, like pollutant formation, he says.

"What pleases me most about the award is that fundamental chemistry is being honored at such a

high level in what is essentially an engineering and physics organization," he says.

The Teamwork Award recognizes the Red Storm Supercomputing Design and Development Team for its contributions in creating the most successful high-end computer in more than a decade. Red Storm was created because no commercial product was available to meet the customer's needs. It is now used to solve critical NNSA challenges.

Red Storm was a partnership between Cray and Sandia in which the Labs contributed hardware and software architectural design expertise and a significant part of the systems software development. Cray contributed hardware and software engineering and leading-edge high-tech manufacturing expertise.

"Red Storm sets new high-water marks among high-end supercomputer designs for scalability of applications performance, cost effectiveness, and manufacturability," Bill says.

Sandia's Red Storm design has been affirmed by Cray's success with XT3, the commercial version of Red Storm. In the past two years that Red Storm/XT3 has been commercially available, Cray has won every high-end procurement that it has bid on, says Bill. Centers around the world have purchased the design.



NOVA AWARD WINNERS Craig Taatjes (second from right) and Jim Tomkins (third from left, representing the Red Storm team) were honored by Sandia senior management when their award nominations were announced earlier this year at the Employee Recognition Night celebration. With Craig and Jim are, from left, Executive VP John Stichman, Labs Director Tom Hunter, then-California VP Mim John, and Senior VP Al Romig.

"Cray is a forward-looking small company," Bill says. "Its success with XT3 is in no small part due to the respect for Sandia's architectural expertise in the international community. For example, Dr. Horst Simon, associate lab director at Lawrence Berkeley National Lab, said in a published interview, 'With Red Storm, Sandia has done the high-performance computing community a great service.'"

The Red Storm team includes Robert Balance (4328), Linda Bonnefoy-Lev (4014), Ronald Brightwell (1423), Douglas Doerfler (1422), John Neagle (4336), John Noe (4328), Kevin Pedretti (1423), Mahesh Rajan (4328), Leonard Stans (4336), Judy Sturtevant (4328), James Tomkins (1420), Keith Underwood (1423), John Van Dyke (1423), Courtney Vaughn (1422), Lee Ward (1422), David White (4340), and John Zepper (4320).

Sandia researchers discover way to see how a drug attaches to a cell

Research to appear in upcoming issue of German chemical journal

By Chris Burroughs

Sandia researchers John Shelnett and Yujiang Song (both 1112) have discovered a better way to see where a drug attaches to a cell. They do it through a new process that produces novel hollow platinum nanostructures.

The research will appear as a paper in an upcoming issue of the German chemical journal *Angewandte Chemie Int. Ed.* In advance of publication, it is featured as a short "hot paper" on the journal's website.

In their paper, John and Yujiang describe a new way of producing porous, nanoscopic, hollow platinum spheres by using liposomes as blueprints. (Liposomes are microscopic, fluid-filled pouches that are used to deliver certain vaccines, enzymes, or drugs to the body.)

In earlier work, John's group grew large continuous nanosheets of platinum on liposome templates, forming foam-like platinum nanostructures. This method provided no way to control shape and size.

The new method reported in the paper uses a different technique to produce porous platinum nanocages with diameters up to 200 nm. Instead of large sheets, they consist of many small flat-branched platinum structures — called dendrites — that join together in a network or cage in the shape of the spherical liposome.

The liposome that John and his team used as a blueprint consists of a double layer of lipid (detergent) molecules. The liposomes are placed

in a solution containing a platinum salt.

When these liposomes are irradiated with light, photocatalysts located in the narrow space between the two layers of the lipid transfer electrons to the platinum ions.

The uncharged platinum atoms gather into tiny metal clumps. Once they reach a certain size, they also become active and catalyze the dendrite growth by adding more platinum atoms from the platinum salt.

Little by little, small, flat, platinum dendrites form within the double lipid layer.

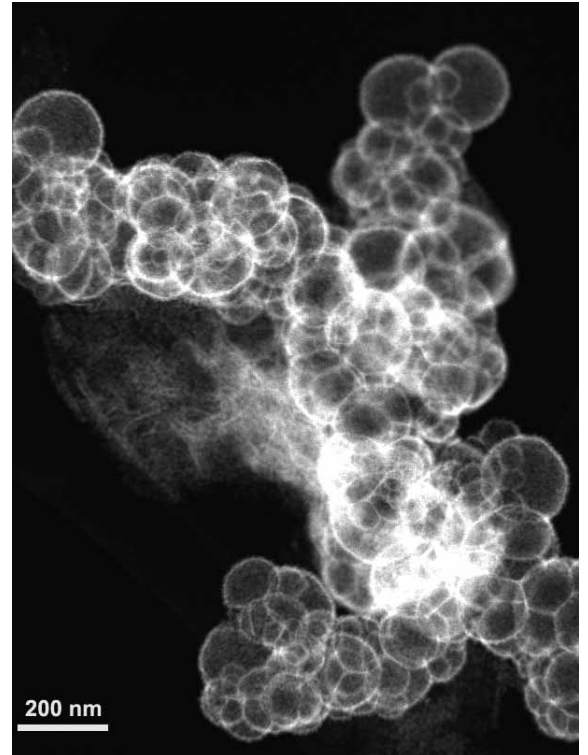
"The important thing is to make sure that the number of photocatalyst molecules — and thus the number of platinum clumps — within the liposome double layer is very high," John says. "The resulting dendrites are then close enough to join and take the shape of the liposome."

When the liposomes are broken up, the platinum spheres remain intact.

The thickness of the platinum shell around the sphere can be controlled by reducing or increasing the amount of the platinum salt placed into the solution.

John sees many potential applications for this process, including "nanotagging" biological structures such as drug molecules.

"This would involve labeling the drug by attaching a porphyrin molecule and, after allowing the drug to bind to a cell, using light to grow a nanometer-sized particle," John says. "The nanoparticles can then be imaged with electron microscopy to reveal the location of the drug



ELECTRON MICROSCOPE image of hollow platinum nanocages.

receptor molecules on the cell. This type of nanotagging technique might be used in non-biological applications as well — such as finding flaws in semiconductor surfaces."

\$3 million

(Continued from page 1)

growth," says Jack. "The increased giving means we can fund more services, agencies, and programs."

Sandia retirees (Sandia's "secret weapon" according to 10000 VP Frank Figueroa) contributed/pledged \$231,528. Lockheed Martin contributes \$50,000 annually that goes into United Way's Corporate Cornerstones program for administrative costs. That means 100 percent of Sandia contributions go to people and programs that need them the most.

"Most Sandia employees see just three weeks of our yearly campaign," says Pam Catanach (3652) campaign co-coordinator. "In essence the campaign begins when the previous year's celebration ends. We look at lessons learned and ways to improve the campaign. This is my second year, and I am totally in awe of our coworkers' generosity. Sandia not only hires the brightest, but the ones with the biggest hearts."

United Way's community-wide campaign results, which will include pledges received from all workplace campaigns, will be announced at the United Way campaign celebration scheduled for February. It is there that Sandia will take its place as it sets a new standard in its long tradition of giving.

Sandia holiday giving opportunities

(Note: About this time every year the Lab News starts getting questions about holiday giving opportunities. Over the years, we've published information in our December edition about opportunities we hear about. Again this year, we've canvassed Sandians to find out how their groups are helping the community during the holiday season. Here's a list of some of the giving opportunities we've found. The list isn't exhaustive by any means; there are scores of opportunities out there in the community, and perhaps within Sandia, as well.)



Division 5000 Holiday Giving Tree

Point of Contact — Nichole Humphrey, 284-8128
Select tags identifying needs from decorated tree in Bldg. 810.

Agencies selected include Cornucopia, The Barrett Foundation, and Cuidando Los Ninos.

Shoes for Kids — 50th anniversary

Point of Contact — Patty Zamora, 844-2146
Furnish shoes for needy school children identified by APS teachers.

Make contributions to:
Sandia Laboratory Federal Credit Union
Account Number 223180 Shoes For Kids Fund
To make a transfer call 293-0500 or 1-800-94-SLFCU

Roadrunner Food Bank

Point of Contact — Kelly Collins, 844-8723
The Sandia Science & Technology Park Holiday Food Drive
Dec. 4-15.
All food and money collected will go to the Roadrunner Food Bank

Albuquerque Character Counts — Cool Yule Toy Drive, Nov. 20 – Dec. 7

Point of Contact — Patty Zamora, 844-2146
Toys for needy children identified by
APS counselors — ages 6-12.
Unwrapped, approximately \$20 in value;
goal is 500 toys.
(Sponsored by Sandia, Sandia Laboratory Federal Credit Union, Cardinal Health, and Bank of Albuquerque)

Our HearTs Warm Kids Feet, Center 3500 Socks for Kids

Point of Contact — Sylvia Hands, 845-8951
Supports Shoes for Kids by donating socks for needy children ages 5-10.
Hang your socks on the Wall of Socks in Bldg. 800S/ Room 1080.



DOE sends Radiological Assistance Program team to Expo New Mexico

By Michael Padilla

DOE deployed a Radiological Assistance Program (RAP) team from Sandia to assist in the recovery of two containers discovered at the Expo New Mexico fairgrounds last Saturday.

The containers, containing cobalt and cesium sources, were discovered under a vehicle at the fairgrounds, prompting state police to evacuate hundreds of people from weekend events on the 256-acre fairgrounds.

The items were recovered by the RAP team and temporarily stored in a safe and secure location at Sandia. After the items had been verified and examined, Sandia turned them over to the New Mexico Environment Department's Radiation Control Bureau. An investigation by state

authorities is ongoing as to the origin of the material.

The team on Saturday was lead by Dave Rast, NNSA Sandia Site Office Waste Management Program manager, and included Sandians Richard Stump, Al Horvath, and Hans Oldewage (all 12345).

Dave says the team, which is part of Region 4 (out of nine regions), was deployed nine times last year. The team includes members from Los Alamos National Laboratory, Waste Isolation Pilot Plant, and Pantex. He says the region is one of the largest in the country, covering New Mexico, Arizona, Kansas, Oklahoma, and Texas.

RAP responds to any type of radiological incident from lost sources to nuclear power plant incidents, from terrorist use of radioactive

materials to a nuclear weapons incident. RAP provides radiological assistance to federal agencies, state, tribal and local governments, and to private businesses or individuals for incidents involving radiological materials.

RAP is always fully mobilized within two hours of activation and can arrive on-scene within six hours of activation.

"The response at the New Mexico State Fairgrounds demonstrated the importance of the Radiological Assistance Program and its volunteers," says Kathleen Burianek NNSA Region 4 Radiological Assistance Program manager. "The first responders in this case understood when and how to call for RAP assistance and even recognized the team when they arrived. This sets a strong framework for a successful response."

Researchers develop better sensor detection system

System combines basic off-the-shelf sensors with sophisticated Sandia-developed sensor

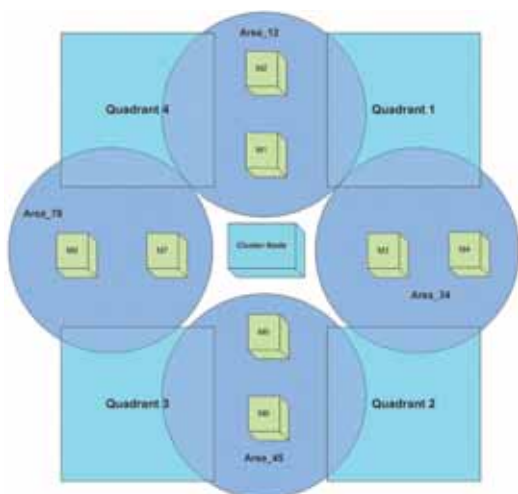
By Chris Burroughs

By integrating readily available generic sensors with a more sophisticated sensor, Sandia researchers have developed a detection system that promises to make it easier to catch perpetrators trying to infiltrate prohibited areas.

Researchers from Embedded Sensor System Dept. 2623 and Exploratory Real Time Systems Dept. 5432 spent the last four months of FY06 figuring out how small, low-cost, low-power, commercially available sensors can supplement their in-house customized sensors developed between 2002 and 2005. During that time, numerous projects — Target Acquisition, Location, Observation, and Neutralization (TALON), Hard and Deeply Buried Target Grand Challenge (HDBT), Sensor Dart, and Virtual Perimeter System (VPS) — contributed to the advancement of unattended ground sensor (UGS) technology.

As a result, Sandia has solidified a sensor system complete with onboard GPS, compass, local and long-haul radios, digital signal processor, and video capabilities. However, it is significantly larger than the off-the-shelf sensors and is not currently available for mass production.

“We wanted inexpensive sensors to act as a first line of defense identifying potential targets and then through a series of radio signals wake up the UGS package. The Sandia-developed UGS package could then use advanced pattern-recognition techniques to classify four-



THE LARGE SOPHISTICATED SENSOR would be placed in the middle of four quadrants surrounded by the smaller off-the-self sensors.

legged animals, two-legged humans, or civilian and military vehicles,” says Hung Nguyen (5432), project investigator. “The significance of this is that by combining commercial sensors with our UGS, we can cover more ground for less.”

The integration of the more powerful sensor and the smaller ones will increase detection range, lower false alarms, and increase the area of coverage per dollar spent in complex terrains.

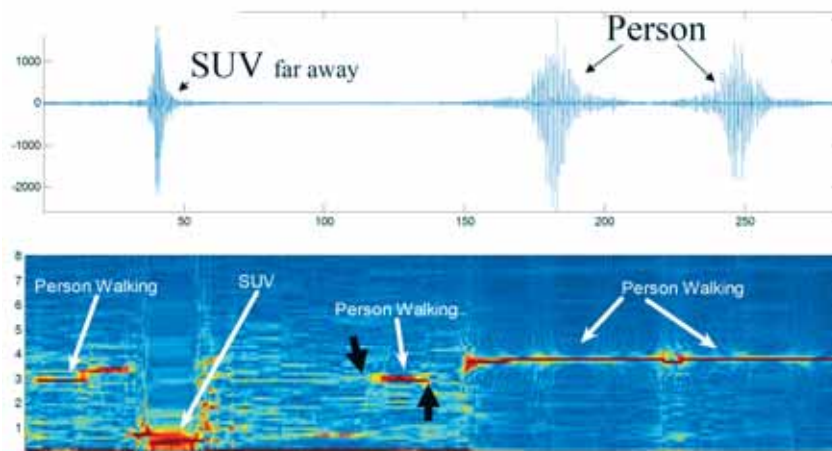
The \$75,000 in funding for the off-the-shelf sensor work

came through Sandia’s internal Laboratory Directed Research and Development (LDRD) program. It was “late start” money awarded near the end of the fiscal year to help solve a specific problem.

The commercial sensors, provided by Crossbow Technology, Inc. were modified with Sandia algorithms and some minor hardware changes. They can be powered by either a battery or solar panel, depending on customer needs. The sensor uses a geophone equipped with a four-inch pointed

spike planted in the ground to detect movement by measuring seismic waves. To complete the situational awareness package Isaac Toledo (5432) describes how the system is both “an elegant and seamless network configuration capable of self-configuring and self-healing.” Any events detected are reported back to the UGS via this network.

“Our customized unattended ground sensors work extremely well for monitoring various situ-



THIS GRAPHIC illustrates data analysis from a Sandia in-house customized sensor, showing advanced pattern recognition identifying an SUV compared to a person. The large sophisticated sensor — complete with onboard GPS, compass, local and long-haul radios, digital signal processor, and video capabilities — is supplemented by small, low-cost, low-power, commercially available sensors.

ations but for wide areas can be very costly,” says Mark Ladd, Dept. 2623 manager. “Using the commercial sensors in combination with a handful of our UGS devices is a viable alternate solution.”

Researcher Jonathan Van Houten (2623) says one potential application of the sensor system would be to strategically place off-the-shelf sensors at out-of-sight locations around a secure facility. The Sandia UGS would be placed nearby and video-linked to a security station monitored by guards.

“You could put them in arroyos or other places guards can’t immediately see,” Jeremy Giron (2623) says. “If an intruder shows up, the commercial sensors can send a signal to the Sandia UGS, which in turn performs more analysis and notifies the guard via Google Earth.”

Now that the initial integration of commercial sensors with custom UGS has been demonstrated, Mark is quick to point out that the next logical step is to seek out customers interested in both advancing and deploying this architecture. These sensors will also become part of the intrusion detection work done by 6429.

“We are eager to propel this system to the next level and meet a need that we know is out there,” Mark says. “Eventually the technology would be transferred to a manufacturer.”

Team members

Project manager: Regan Stinnett (6429); project investigator: Hung Nguyen (5432); team members: Jonathan Van Houten, Jeremy Giron, Lonnie Diehl (2623); D. Isaac Toledo, William O’ Rourke (5432); Mark Ladd (manager, 2623); K. Terry Stalker (manager, 5432)

MIND Institute offers new fields to conquer

By Neal Singer

An increasing tempo of interactions between Sandia management, Sandia’s Advanced Concepts Group, and the Albuquerque-based MIND Institute promises yet another new engineering direction opening to Sandia researchers: the human brain.

The most recent discussion took place in a “New Directions Symposium” held Nov. 10 at the Institute’s modernistic quarters in Pete and Nancy Domenici Hall at the University of New Mexico.

The Institute, for seven years funded at \$10 million a year by money appropriated by Congress to investigate neurological disorders, has recently moved to make a contribution in national security areas.

“We’re going after funding from DARPA and other agencies to develop means to accelerate learning in the warfighter, intelligence analysts, and soldiers,” says Rex Jung, a MIND Institute psychologist and neurologist who is now also a part-time employee at Sandia’s Advanced Concepts Group. “We have some ideas about the critical interplay between stress and cognition, for example. You need some stress but not too much. We understand the psychology and neurology, to



THE MIND Institute in Albuquerque, N.M. (Photo courtesy of MIND Institute)

some extent. But how do we exactly figure out the specifics of neuronal firing?”

Enter Sandia. “They need us for widgets, computational power, neurosystem engineering,” says Sandia Senior VP Al Romig, who was the first Sandian to serve on the Board of Trustees of the Institute. “We need them for data acquisition from subjects. They have capabilities in neurology that we don’t have. We can model. We can do this

from an end-to-end systems point of view. We can do this together.” Al envisions ongoing projects with the National Institutes of Health, DARPA, DOE, and other agencies.

At a recent meeting at the Institute, Sandia VP Gerry Yonas is supposed to be eating lunch, but jammed into a booth with three researchers, sparks seem to be flying out of the top of his head as he discusses how to determine the damage to the brain caused by shock waves.

“From a mechanical damage point of view, the brain is like a tire,” he says at one point. “We can model a tire,” referring to the Sandia computational effort that successfully modeled the effect of road stress on the complex materials stress and strain of Goodyear’s tires. “So we can model the multidimensional response of the brain as the pressure pulse propagates and rattles around in the cranium.”

Neurosystem engineering consists of three parts: creating a system theory of the brain including its mechanical, electrical, chemical, and biological functioning; complex modeling that pulls all these phenomenon together into a computer simulation that includes physical inputs,

(Continued on next page)

Explosive testing yields plume modeling data

Researchers from Canada, UK join Sandia to study effects of radiation dispersal devices

By Stephanie Holinka

At the end of a long, dusty gravel road, behind yellow barricades that warn wanderers away from active testing sites, a group of scientists from Sandia, two Canadian institutions, and experts from the UK are conducting experiments to better understand what happens on the ground and in the air when explosives detonate on specific surfaces.

After the second five-pound charge of the day detonates, the group receives the all-clear to investigate the blast site.

"Bit of a shelf in that crater," remarks John Marriage from the Atomic Weapons Establishment in the UK. Fred Harper (6417), senior scientist in High Consequence Assessment and Technology, feigns skepticism. "That's half a shelf, at best," he teases.

Testing allows scientists to better predict the consequences of explosive and nonexplosive radioactive dispersal devices (RDDs). The purpose of this series of tests performed at the 9920 test site was to learn more about the interactions between explosive fireballs and different ground surfaces and to better characterize the buoyant behavior of the resulting plumes. This information will be combined with the results of the explosive aerosolization work that has been performed at the 9920 test site to understand the impact of RDDs detonated in urban environments.

Much of Fred's work has been in indoor experiments. Working with the Canadian teams and the



THIS IS A BLAST — Members of a Canadian research team join William Wente (6417, right) for the trip to the remote site where explosives tests will be conducted. (Photo by Randy Montoya)

UK experts allowed him to bring his work outdoors to study different aspects of dispersal.

Other Sandians involved in the testing include Will Wente, Paul Johnson, Mark Naro, Weldon Teague, Roger Goode, Chris Parchert, Lindsay Dvorak (all 6417), Byron Demosthenous (1535), and Gary Zender (1822).

"The soot and dust swept into the fireball can combine to change the nature of the aerosol originally produced by the dispersal device," Fred says. "This can significantly change the impact on the population. The indoor experiments are done on a smaller scale in a clean environment, and tell you what is produced after the interaction between the material and the shock wave on the microsecond time scale.

"The outdoor experiments tell you what happens to the material when it is exposed to soot and dust in the fireball on the mil-

lisecond time scale and how high the material initially rises on the second time scale."

During this round of testing, 50 one-, five-, and 10-pound charges were detonated on asphalt, concrete, grass, play sand, loose dirt, and packed dirt so scientists could study the characteristics of the resulting debris clouds and the resulting surface damage.

After each explosion, the Canadian team tracked the resulting plume with a light detection and ranging (lidar) system that provides a four-dimensional model of the plume's progress.

The lidar system is similar to Doppler weather forecasting systems. It generates a four-dimensional map that includes plume information about density, distance, and dispersion over time.

Each test tracks the movements of debris plumes for up to seven minutes. This allows researchers to better understand how variables like wind, explosive charge size, and the impacted surface affect the quality of materials released into the air and the rate at which they travel.

After the plume disperses, the UK team characterizes the resulting impact crater on a variety of surfaces including hard-packed dirt, sand, concrete, grass, and steel plates.

Gilles Roy from Defence R&D, Valcartier, says the lidar "sees more particles for a longer period of time than other systems." The Canadians drove the lidar system with the delicate instrumentation on



A SHOCK WAVE ripples above the blast during a test to study plume characteristics and surface effects of blasts. (Photo by Byron Demosthenous)

top all the way from Quebec, Canada, for the tests.

This is the Canadian team's seventh trip to Sandia. Roy's colleague Patrick Brousseau says that since Fred's group had already done considerable research in the field, it seemed logical to share information to advance knowledge in the field without duplicating effort. The research programs and facilities in Canada were modeled after the program at Sandia.

Brousseau says work such as Fred's helped them get into the field of detecting and analyzing radiological threats. He also says that after 9/11, the Canadian government decided it was something they should study further for their own national security.

Project team members from the Royal Military College of Canada and Environment Canada are using the measurements of the plume evolution to validate atmospheric dispersal models. Information coming out of these joint experiments is used by the health ministry in Canada to model biological effects of radiological dispersals.

John Marriage says work such as this provides emergency preparedness personnel and first-responders invaluable data to identify potentially dangerous source items.

Lorne Erhardt from Defence Research and Development Canada says this research contributes to the ongoing work to prepare those involved in emergency activities to assess the possibility and consequence of potentially harmful agents, both radiological and biological.



FRED HARPER (6417) and researchers from the UK examine blast crater in sand. (Photo by Randy Montoya)

MIND Institute

(Continued from preceding page)

functional operations, and cognitive interactions — "as challenging as anything we've ever attempted at Sandia," says Gerry — and then experiments performed with an emphasis on high-resolution imaging of the kind done at MIND Institute.

On the subject of creating system models, says Gerry, "We really can't rely on anyone else. We'll have to create them. Without them, advances like we're proposing will be impossible.

"We're good at the modeling tools and knowledge of material properties," he says. "We just don't have subject matter expertise on brains."

Back at the luncheon, several researchers tell Gerry that understanding the physiology of the brain includes more than mechanical damage, but they agree the interaction may be modelable.

"And we don't have detailed ways to go from our [medical] map to realistically model controlled stress and dynamical models," says Bruce Rosen, a radiology professor from Harvard Medical School.

"A finite-element [computational] code is easy, but doing it well and efficiently isn't."

"The payoff is in real results that you wouldn't otherwise get," says Gerry. "Let's put out a proposal to model the damage caused by a pressure pulse and then model a helmet that would prevent damage from that pulse to soldiers' brains. This would be a beginning effort using our complementary skills, and we would mostly likely succeed."

Studying nano-info-bio

More complex areas of research are apparent, says Sandia researcher Annie Sobel, a medical doctor, a major general in the US Air Force Reserve, and a member of the MIND Institute Board of Trustees.

"Biosystems present models from which we can learn how other systems can be made more effective," she says, mentioning the way the immune system mobilizes to attack threats. "Studying nano-info-bio — the way living systems interact — requires a variety of tools." Universities joining with the MIND Institute for research will also need Sandia's computational and experimental expertise.

"This could help us understand strokes," says Rosen, "with a detailed modeling of the vascular

bed and how pressure waves propagate through."

The belief in the growing national security importance of studying the brain is not a new thought to Gerry, who gave the introductory talk at a Cognitive Systems Workshop on June 27 in Santa Fe.

"All people have one thing in common," he told the researchers there. "Brains. We're up to our ears in brains."

He mentioned, as subjects of possible study, brain trauma, attention, sleep, stress, peer pressure, decision making, learning trust, religious feeling, managing fatigue and depression, and pain management.

On the positive side, he mentioned enhancement of pain and drug tolerance, instant learning, and improved memory and cognition.

"These areas of research will be the most important of the 21st century," he told the *Lab News* at the time. "But I can't think of anything further from what goes on at Sandia at this time."

"That's why we need a few innovators like Gerry and me to help push the Labs in a new direction," says Al Romig.

The Advanced Concepts Group is pioneering the neurosystem engineering approach that Gerry believes is necessary to deal with the national security implications of brain research.

Tech Area 1 to be Supersized

By John Zavadil (10871)

If you've been to the Thunderbird Café lately, then you've noticed a new fence installed on the north side of H Avenue. That fence now stretches east to 17th Street, past buildings 878, 887, and 885, and on to the west end of Motown. It's part of a plan to incorporate these and other buildings into Tech Area 1 to increase the space available for growing mission programs.

According to Mike Quinlan, senior manager of Facilities Design and Construction Projects Dept. 10820, this is the largest tech area expansion he's seen in his 25 years at Sandia. The total area added (including buildings) will be approximately 580,000 square feet, or about 13 acres. The expansion will take place over several months in a series of phased steps:

Step 1: Build the new fence, except the new turnstiles and vehicle gates.

Step 2: Move most of the current occupants of the buildings inside the new fence to the Innovation Parkway Office Center (IPOC) being constructed in the Sandia Science and Technology Park.

Step 3: Install the turnstiles and vehicle gates.

Step 4: Activate the new tech area perimeter fence.

Step 5: Modify the buildings as needed to support classified operations.

Step 6: Move the new occupants into the buildings.

The new fence was funded with FY06 dollars and is already in place, but the turnstiles and vehicle gates won't be constructed until early next year. The perimeter probably won't be activated until late 2007, depending on how soon IPOC is ready for occupancy.

Fence innovations

William Tierney, the project manager in charge of the new fence installation, tried a couple of new techniques on this project. The project saved about \$15,000 by reusing the decorative fence removed from the north side of Bldg. 870 when Bldg. 899 was brought into the tech area, and another \$30,000 by using chain link fence left over from previous fencing projects.

"This was also the first time Sandia used vacuum excavation (high pressure water jet and enormous vacuum) to dig the fence post holes," William says. "It's the safest way to dig because it doesn't disturb any buried utilities. It was a good



thing, too — the crew found a couple of lines that they might have cut through if they'd used standard methods to install fence posts. The bottom line is that we saved money and worked safely."

Pros and cons

The new fence configuration offers some significant advantages, says William. Several hundred thousand square feet of office space will be made available for new mission programs. In addition, pedestrians and vehicles will have a much easier time getting around Tech Area 1 — H Avenue will be open all the way from Bldg. 802 to Bldg. 885, and 14th Street will be open from Bldg. 899 to Bldg. 887. This means that for the first time, emergency vehicles and Protective Force officers will be able to use roads that loop all the way around the tech area inside the fence. This will greatly improve emergency response to all of Tech Area 1 and make it easier to monitor the fence perimeter. Three new gates will be added, and the existing gates and fencing around Bldg. 878 and 887 will no longer be necessary and can be removed.

On the negative side, some riders of the #98 Wyoming and #2 Eubank buses should note that their bus stops will be moved several hundred

yards to the east. Sandia planners have already worked with representatives from ABQ Ride to site these new bus stops; see the map above for more information.

What's next?

The fence is in place and H Avenue has been closed from the Thunderbird Café to 14th Street to all but emergency and construction traffic. This will allow construction of a cul-de-sac on 12th Street just north of H Avenue. Once the cul-de-sac is constructed, H Avenue will be reopened, but it will no longer intersect with 12th Street, and traffic southbound on 12th Street by the cafeteria will have to use the cul-de-sac to turn around. The sidewalk on the north side of H Avenue will be widened between 12th and 14th Streets to accommodate additional pedestrian traffic, and other new sidewalks will be installed on H Avenue west of Building 878 to improve pedestrian circulation in the area. After this work is done, not much else will change until IPOC is up and running later in 2007. For now, keep using existing bus stops and tech area gates.

As soon as more exact dates are available, updates will be issued in the *Sandia Daily News* and the *Lab News*.

Albuquerque to host the Intel International Science Fair

Sandians are playing a major role in the events

By Erin Gardner

Albuquerque will soon play host to more than 1,500 students representing all 50 US states and 47 countries, territories, and regions during the Intel International Science and Engineering Fair (ISEF), May 13-17, and Sandia will not stand back and watch from the sidelines.

Several Sandians will be directly involved with organizational aspects of the science fair and judging of the projects. The fair will be held at Tingley Coliseum and the Albuquerque Convention Center.

"This is one of the most exciting ways for the tech staff at the Labs to really make a difference," says Rick Stulen (VP 1000). "Getting Lab members into the community is invigorating to the students — it's important for us to be out there as visible role models."

17 categories to be judged

Judges will evaluate student projects in one of 17 categories and are required to have a bachelor's or master's degree and six years of work experience or a PhD in their field.

"What has gotten me and the Lab interested in the Science Fair is our desire to contribute to the nation through education, engineering dis-

covery, and innovation," says Rick. Sandians serve as role models to grade school, junior high, and high school students, according to Rick.

A good way to keep students interested is to let them know there are available jobs in science and math. Some students don't realize this, says Rick.

Science fair pipeline

"The science fair represents the pipeline of students that will be going from the high school level to college," he says. "We want to keep them enthused about continuing their education in math and science."

Sandia will also be sponsoring the Government Awards Ceremony, which will be held on Friday, May 18.

The ISEF was established, in part, as an opportunity for students across the country to improve their performance in mathematics and science in order to succeed in today's world. It is also a way to help ensure that the US will stay competitive in an integrated global economy.

Science fairs provide the venue for students to learn to analyze information, make accurate observations, develop questions, and test hypotheses. To sum it up, students become familiar with a scientific approach to solving problems, Rick says.

Want to help?

If you are interested in helping with the Intel International Science and Engineering Fair 2007 (ISEF), you have a few options:

As a Grand Award Judge you will be evaluating student projects for the Overall Category, and first-, second-, third-, and fourth-place awards in one of the 17 categories. The judging positions are open to anyone with a bachelor's or master's degree and six years of work experience in their field, or a PhD.

Judges will be required to commit a day and a half to the judging process: Tuesday, May 15, in the afternoon and evening and all day on Wednesday, May 16. Go to the website (URL below) for more information.

You also have the option of being a volunteer or an interpreter. After you sign up, you will receive an email confirmation and periodic email updates as the fair approaches.

As a volunteer you can choose from various duties requiring time commitments ranging from a few hours to an entire week. For more details, see the 2007 ISEF website: (<http://www.intelisef2007.org>).

If you have questions or would like more information about getting involved, contact ISEF at: volunteers@intelisef2007.org, or Jeanette Miller at 505-867-2007 or jeanette@intelisef2007.org.

Mike Hazen focuses on mission success and people first

Director of Safeguards and Security Center 4200 says group has had many successes over the past two years

By Chris Burroughs

Mike Hazen learned early in his Air Force career that to succeed in the military you have to surround yourself with the best people. Give them authority, responsibility, and support, and they'll ensure mission success.

He brings that same attitude to his position as director of Safeguards and Security Center 4200, a job he's held since June 2004.

"I have focused on mission success and people first," the retired Air Force colonel says. "It is critical that we have the right people doing the right things so we can sustain the operations expected of us."

Mike says he's done some reorganization and brought in an influx of talented people from both inside and outside the Labs. This talent pool, coupled with the strong foundation of superior performers already in place, has made the center stronger and better, he says.



PRO FORCE maintains its edge with a rigorous and realistic training regimen. (Photo by Cal Smith)

Mike is not hesitant to say that he took over a center that had been under considerable fire and criticism but had undergone very positive changes under the leadership of interim center director Dennis Miyoshi.

Center 4200 handles every aspect of Sandia's safeguards and security programs, including the protective force, physical security systems, classified information protection, personnel security, technical security, safeguards and security training, material control and accountability, foreign interactions, assurance, and classification.

One of the most significant initial challenges, Mike says, was to provide security support for upcoming key mission tests at Coyote Test Facility, Sandia Pulsed Reactor (SPR), and Tonopah Test Range (TTR).

Mike says the security system installed at the SPR site used a mix of professional people and the latest in technology. Key to this support was the fact that security had to accomplish this while demonstrating compliance with the 2003 Design Basis Threat (DBT). "It was accomplished well under budget and ahead of schedule," he says. Additionally, TTR was the first site within the DOE complex to achieve compliance with the 2003 DBT.

A significant change that has occurred in Center 4200 since Hazen's arrival is the integration of security at the New Mexico, California, and Tonopah sites.

"Previously they were three separate security entities," Mike says. "Now management of the Sandia/New Mexico site and the other sites are joined, and function as one Sandia. They just happen to be geographically separate." The change was a key objective of Chief Security Offi-



MIKE HAZEN in his office. As Center 4200 director, Mike is overseeing several key initiatives. (Photo by Bill Doty)

cer Ron Detry to have a single Safeguards and Security program for the Labs. Additional benefits are process efficiencies, reduction in duplication of effort, and savings, both in costs and resources.

The organization is currently working on several major initiatives. The one most familiar to Sandians is the alarm replacement project known as "SSRP." This project is improving the existing alarm system, much of which is more than 20 years old. Additionally, old vaults will be retrofitted and new vaults will employ the new alarm system.

Another of particular importance is Safeguards and Security's role in supporting the Special Nuclear Material de-inventory project. Security was instrumental in developing the technical package to request termination of safeguards on specific Sandia/New Mexico assets. This was the first package of its kind receiving approval by NNSA for this specific material. The organization has many such initiatives underway.

Mike says that as Center 4200 director, he's had a "great" two years despite the many challenges his organization has faced.

"The rewarding part is working with people who care passionately about what they do — people who want to make this place a little better than they found it. Every day is a great day to serve with people who believe so passionately in 'exceptional service in the national interest,'" Mike says.

Mike Hazen worked way through ranks in Air Force

Prior to starting his career at Sandia in June 2004, Mike Hazen worked his way through Air Force ranks, beginning as a guard at an Air Force gate.

Before assuming his current leadership role, Mike was a colonel serving in the US Air Force. His career spanned more than 31 years and culminated with his assignment as the director of security forces, Air Force Space

Command.

In this position he was responsible for the stewardship of both the Nuclear and Space Security Roadmaps, which guaranteed the protection of global vital national assets. He was the principal advocate for force protection and antiterrorism and provided guidance to ensure deterrence and overwhelming defeat if necessary of those who would do the US harm.

Manager promotions

New Mexico

Dan Rader, from DMTS, Thermal, Fluid & Aero Experimental Sciences Dept. 1512, to manager, Microscale Science and Technology, Dept. 1513.

Dan has been with Sandia since 1985 when he joined Dept. 1512. Most of his years at Sandia have been spent in Albuquerque and mostly in Center 1500. He transferred to Sandia/California from 1997-1999 where he worked in the Computational Reactive Processes Dept. 8345.

He was promoted to manager one day shy of his 21st lab anniversary, on Sept. 22.

During most of his time at Sandia, his research has focused on aerosol science, which concerns the study of micron-sized particles or droplets suspended in air or other gases. More recently (1997-2006) Dan has worked on numerical methods for predicting gas and particle transport in the noncontinuum (low gas



DAN RADER

pressure) limit.

Dan is a co-inventor on 14 patents, most related to contamination control. He is a co-author on about 60 journal/proceedings publications.

He has a BS in engineering from Caltech and a PhD in mechanical engineering from the University of Minnesota.

Moo Lee, from PMTS, Geomechanics Dept. 6117, to manager, Performance Assessment & Decision Analysis Dept. 6711.

Moo joined Sandia in 1995. He has been involved in fields such as: Yucca Mountain site characterization, space shuttle *Columbia* accident investigation, and neutron generator material testing.

He is currently working on the compliance recertification application of the Waste Isolation Pilot Plant.

He has a BS in mineral and petroleum engineering from Seoul National University and an MS and PhD in mining engineering from the University of Wisconsin-Madison.



MOO LEE

Take Note

De Profundis, the men's *a cappella* chorus (which claims two Sandia members) will perform a holiday concert Dec. 2, 7:30 p.m. at Immanuel Presbyterian Church. Featured music will include Gregorian chant, Christmas carols, music of Hanukkah, and Islamic chant. 266-4240.

Singles group meets



SANDIA SINGLES are alive and well. Here they are on a recent trip to Durango. For information about joining or upcoming events, go to the group's website at <http://sandiasingles.sandia.gov> or contact Nancy Campanozzi at nrcampa@sandia.gov, Charlie Field at csfield@sandia.gov, or Jeneane Taylor at sjtaylor@sandia.gov.

Mileposts

Photos by Michelle Fleming



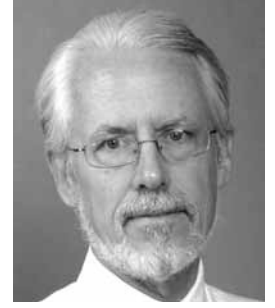
Robert Barton
30 10223



Lalit Chhabildas
30 1647



Gerald Knorovsky
30 1813



John Olsen
30 6721



Barry Schoeneman
30 6722



David Like
25 2625



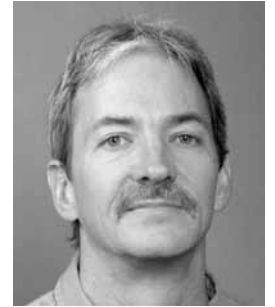
Raymond Prior
25 6452



Glen Argabright
20 10861



Donna Filip
20 6032



Timothy Meeks
20 2994



Clayton Pryor
20 4524



Jessica Shaffer-Gant
20 4536



Etta Tsosie
20 5341



Nikki Chavez
15 5053



Sandra Culler
15 12001



Samantha Flores
15 4233



Marlene Keller
15 1056



Leigh Ann Kelly
15 5920



Linda Ristvet
15 5059



Lucille Roybal
15 10861



Jackie Silva
15 3654



Recent Retirees



Dick Shead
47 5937



George Novotny
39 2001



Elefio Montoya
38 2992



Douglas Greenway
34 1711



Dan Doughty
27 2520



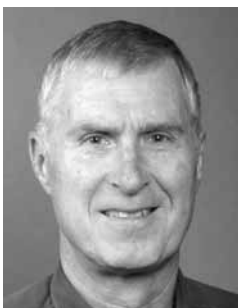
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Leon Chapman
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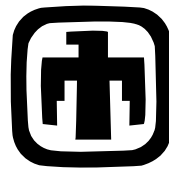
Theodore Wrobel
25 1343



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Carol Skaggs
17 6034



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Sandians teach 'wicked science' to high school students

By Neal Singer

Under ceilings so high, furnishings so varied, and a student-to-teacher ratio so low that most public school teachers would be in heaven, the Sandia Student Science Symposium educated 20 local high school students to the intricacies of "wicked science," as the principal speaker put it, in a three-hour session at the New Mexico Museum of Natural History and Science earlier this month.

That speaker — Sandia VP Gerry Yonas (7000) — not only spoke on the value of studying real-world problems that yield contradictory rather than simple solutions, but circulated around to three discussion groups during the evening.

Discussions were led in each group by two adults (mostly Sandians). The interested young people, there voluntarily, sat in circles to encourage more participation. The circles were within view of each other but widely spaced, under 50-foot-high ceilings, on tiled floors, surrounded by terraced geological layers, with a huge prehistoric flying

reptile hovering above. The setting resembled a spacious, upscale home with plenty of room for ideas. It was as distant as could be from more customary classroom regimentation.

Led by Curtis Johnson and Rex Jung (among others) of Sandia's Advanced Concepts Group (7000), the students discussed what might be the effect of electronic communication that involved



VP GERRY YONAS listens to a presenter during a group discussion at the annual Sandia Student Science Symposium.

all five senses, and what that might make possible: traveling to strange places without leaving one's home, conducting electronic meetings between people from different countries on common ground like a beach, as well as possibilities of medicine and research carried on with

five senses but at a distance from the patient or laboratory.

Another group discussed alternative means of rising into outer space using space elevators, projectiles, and other drive forces.

Each suggestion was discussed by each group for its positive and negative aspects.

The one unexpected feature of the evening was its low student turnout, says Sam Bono of Community Relations (3652), who had hoped for participation of about 100 students. As host, he cannily had advertised free pizza as an attendance inducement. But whether it was the earlier darkness accompanying the end of daylight-saving time, the long drive to Old Town, or the date itself — "Perhaps we should have thought about it being election night," says Sam — the turnout was less than optimum.

Still, Sam says, "Those kids who came got a lot more than they may have bargained for."

Tom Laub (1341) agrees. He asked his son after the meeting what it had been like.

William, a senior at El Dorado High School, said the evening was "weird."

Wise to teenage ways, Tom asked, "Good weird, or bad weird?"

"Good weird," William said. "We got deeper into what we were discussing [total communication] than I've ever been."

Gerry later commented, "In other meetings, I could tell there were kids the science teachers forced to show up. These kids really wanted to be there. As one of them said, 'Making these [technical] things real will depend on the desire of the individuals.' She questioned if our educational system is creating the desire. Some of those kids here tonight might just be the ones that eventually make all the difference."

This month in the past

Note: The wording used in *This Month in the Past* is taken directly from Lab News articles as originally published. Janet Carpenter compiles this information.



ELECTRONIC "MASTER MIND" — An IBM Electronic Data Processing Machine, such as the one pictured above in this composite photo, was in use by Sandia about May 1958.

late matter. Sandia's interest in clean rooms was an outgrowth of the Laboratories' responsibility in nuclear ordnance engineering and the need for a method to control contamination in the assembly of weapon components, especially miniaturized parts. . . . **Vela Satellites Still Setting New**

Records — One of the most successful space programs ever undertaken by the United States started with an Atlas-Agena space booster lifting two experimental Vela nuclear detection satellites into a 60,000 nautical mile, near-circular orbit. That was on Oct. 16, 1963. Today, the two spacecraft with Sandia-designed logic systems and Los Alamos Scientific Laboratory sensors are the oldest continuously

operating US spacecraft still providing useful data. Originally an offspring of the 1958-1960 Geneva nuclear test ban negotiations between the USSR, United Kingdom, and the US, the Vela satellites have grown in sophistication, size, and scope so that they can now participate in nuclear detection missions from the surface of the earth to deep space.

30 years ago . . . New Image-Storing Ceramic Developed — A new method of storing black and white images in PLZT ceramics [that] eliminates the need for photoconductive films has been developed at Sandia. Devices using the



SANDIA researchers developed a method for storing high-density images in a special ceramic material.

new technique have several potential uses, including generation of high-density images — documents, photographs, etc. — from signals transmitted by telephone or radio. PLZT, developed at Sandia in 1970, is a transparent lead lanthanum zirconate titanate ceramic [that] has optical properties that can be controlled by applying voltages to thin plates of the material.

20 years ago . . . ECP '86 Wrap-Up. Goal Topped by \$83,576, Average Pledge Up \$12 — By pledging a total of \$1,163,576, Sandians topped this year's goal of \$1,080,000 for the Employee Contribution Plan (now called the Employee Caring Program) campaign by 7.7 percent.

10 years ago . . . Sandia unveils new web-based electronic time cards — Employees with access to the internal web can access the

50 years ago . . .

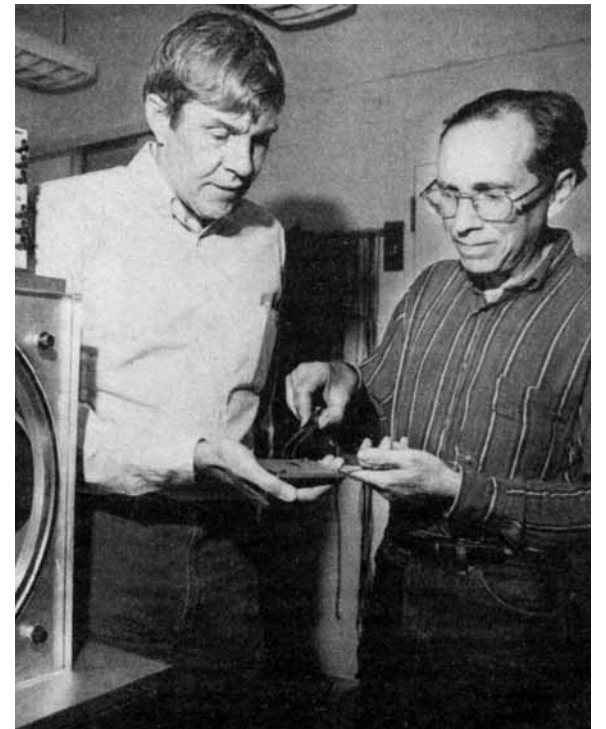
Electronic Brain Coming to Sandia Corporation — Early in this stepped up technological age industry issued a call for mechanical wizards. Such accelerated mathematical performance was demanded that man alone could not perform the calculations needed. As a result of a special committee's recommendations an IBM "705" Electronic Data Processing Machine has been ordered. If the abilities of the EDPM make it appear that all of the man calculating and figuring work around the corporation will be taken over, don't believe it. Only high volume jobs are practical for the EDPM. The average job [that] involves computing can be done more economically under present procedures. It's the problem [that] takes a multitude of factors into consideration that the EDPM takes in stride. "Programming" a problem for the EDPM may take several man-years. Already work is underway assembling facts and figures that will go into "questions" for the machine 18 months hence.

40 years ago . . .

Patent Issued for Whitfield Clean Bench — A second patent covering special features of laminar flow clean areas has been issued to the Atomic Energy Commission in the name of Willis J. Whitfield. The latest patent is for a laminar flow airhood apparatus [that] uses a continuously moving mass of clean air (that has passed through fine or submicron filters) to keep a work area substantially free of airborne particu-



WILLIS WHITFIELD holds a page from the patent for the laminar flow airhood apparatus.



MARS BOUND — Mike Butler, left, and Rick Buss examine a sample holder used in preparing thin film coatings similar to organic coatings used in the Mars Oxidant Experiment, or MOX. The fiber-optic chemical sensor system used in the MOX experiment was the US contribution to the Russian Mars '96 mission.

application. Their managers must have access to approve the employee's time card using the EDM or cc: Mail Review and Approval time card application. Employees must use the US version of Netscape Navigator 3.0, which allows access to secure servers and supports the Javascript embedded in the time card application; and have an Internal Restricted Network Kerberos password, which will be supplied automatically from Password Control. . . . **US and Russian Mars missions tap into Sandia, Lockheed Martin technologies and know-how.** Fiber optic sensor is a key science instrument on Russia's Mars '96 mission — With three major missions scheduled to launch in November and December, the Red Planet will be the target of an unprecedented scientific broadside. . . . As the earthly armada hurtles toward Mars, it will be taking Sandia and Lockheed Martin technology and know-how along. Sandians played a key role in designing and prototyping Pathfinder's airbag landing scheme and helped design a key science instrument on the Russian Mars '96 craft.