Sandia microshutters flying aboard tiny NASA satellites

MEMS-louvered skin regulates satellite temps

By John German

Arrays of tiny shutters made at Sandia are serving much the same purpose as home window blinds — helping regulate interior temperatures — aboard one of three small experimental satellites launched into space March 22 as part of NASA's ST5 mission.

The mission's purpose is to demonstrate innovative technologies for a new generation of autonomous microsatellites. (See "NASA's ST5 mission" on page 4.)

Satellite designers pay special attention to electronics temperatures. If circuit boards get too hot, they can fail. If batteries get too cold, they can degrade faster or perform intermittently.

Temperatures inside satellites can fluctuate to both extremes, heating up when in sunlight or cooling way down when in Earth's shadow, for example. The heat generated by the electronics themselves can be trapped inside the satellite.

Larger satellites have sophisticated, and heftier, thermal control systems. Smaller ones, like the 25 kg (55 lbs) ST5 experimental microsatellites, each roughly the size of a wedding cake, require smaller, lighter-weight, and, ideally, lower-tech approaches.

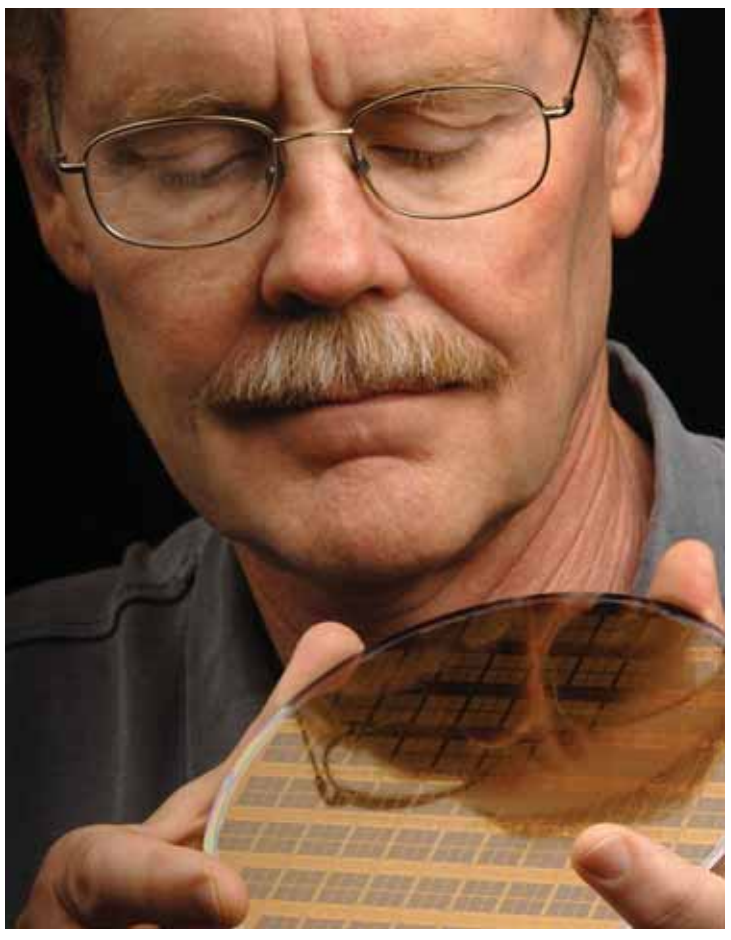
Fortuitous meeting

In 2001 researchers from Johns Hopkins University's Applied Physics Lab were attending a MEMS (microelectromechanical systems) short course at Sandia when the need for innovative microsatellite thermal control methods came up. The visitors were part of a Johns Hopkins team supporting the then-planned ST5 mission.

A collaboration was launched, and Sandia project lead Jim Allen (1769) and a team of Sandia MEMS designers worked with the Johns Hopkins researchers to design, using Sandia's SUMMiT V™ technology, a MEMS device featuring a moving grillwork of shutters with slats that are 6 microns wide and 1,800 microns long. A human hair is about 100 microns thick.

The arrays of small shutters, moved back and forth by electrostatic actuators, expose either

(Continued on page 4)



SANDIA RESEARCHER JIM ALLEN looks at a MEMS device that features a moving grillwork of shutters with slats 6 microns wide and 1,800 microns long. (Photo by Randy Montoya)

Sandia LabNews

Vol. 58, No. 15 July 21, 2006

Managed by Lockheed Martin for the National Nuclear Security Administration

Sandia National Laboratories

Wild at Sandia

Furred and feathered friends share Sandia space with human newcomers. Read about our animal neighbors — and how Sandia wildlife biologists watch out for them all year long — in Stephanie Holinka's story beginning on **page 6.**

Wind Energy Technology Department uses Sandia-developed device to determine how well wind turbines operate

By Chris Burroughs

In West Texas, New Mexico, and other places around the world, wind turbines are used to generate electricity. But how can engineers determine their efficiency and health?

Sandia's Wind Energy Technology Dept. 6214 has developed a device, the Accurate Time Linked data Acquisition System (ATLAS II), which answers that question and can provide all of the information necessary to the understand how well a machine is performing.

Housed in an environmentally protected aluminum box, ATLAS II is capable of sampling a large number of signals at once to characterize the inflow, the operational state, and the structural response of a wind turbine.

The ATLAS II has several key attributes that make it particularly attractive for wind turbine deployment. It is small and highly reliable, can operate continuously, uses off-the-shelf components, and has lightning protection on all channels.

ATLAS II PROJECT LEAD Jose Zayas stands next to advanced blades that will be tested at Bushland, Texas. (Photo by Randy Montoya)

"The system provides us with sufficient data to help us understand how our turbine blade designs perform in real-world conditions, allowing us to improve on the original design and our design codes," says Jose Zayas (6214), the project lead who has been working on ATLAS II since its inception in 1999.

Last year the ATLAS II team completed a project with GE Energy and the National Renewable Energy Laboratory (NREL) to monitor the performance of a GE wind turbine in a Great Plains site

(Continued on page 5)

Sandia wins two R&D 100 awards

By Julie Hall

Sandia researchers and their collaborators have won two R&D 100 awards, which are presented annually by *R&D Magazine* in recognition of the 100 most technologically significant products introduced into the marketplace over the past year.

Sandia winners include:

• **Compute Process Allocator**, a computer algorithm technology that increases processing efficiency on massively parallel supercomputers. Developed in conjunction with colleagues at the State University of New York and the University of Illinois, the CPA's principal developer is Vitus Leung (1415), along with Kevin Pedretti (1423) and Cynthia Phillips (1415). It was

(Continued on page 2)

New institute bridges nanoscience, computation

By Nancy Garcia

NECIS (the Nanoscience, Engineering, and Computation Institute at Sandia, pronounced "nexus") is a new institute that focuses on research activities that integrate nanoscale physical and biological sciences with computational science.

"NECIS recognizes and coordinates leading-edge, innovative experiments," says principal investigator Jean Lee (8759), "with new approaches in computational science and materials modeling to tackle fundamental challenges in nanosystems modeling and simulation."

(Continued on page 3)

Groundbreaking work reported in *Science* shows new capabilities in interface between nano and bio. *Story on* ***page 4.***

Sandia brings cleaner water to Jemez Pueblo in the form of hi-tech arsenic treatment. *Story on* ***page 9.***

What's what

First, an update on the recycling poster controversy: Apparently it no longer is one.

When the posters first appeared, messages from at least a few Sandians labeled them "offensive" because among the Coke and Pepsi cans — regular and diet — a couple of beer cans could be discerned. The folks mounting the recycling campaign responded by deciding to not use that particular poster, but they subsequently changed their minds and the posters are being used after all.

Interestingly, the "What's what" column in the last edition of *Lab News* pointing out the issue drew more responses than any other column since I have been writing it. And all of them expressed agreement with the position taken in the column — that being "offended" by something implies greater intensity of feeling than just "not liking" something and leads us quickly to intolerance.

Those responses seemed to reinforce a point in that last column that it's OK to not like something, but your opinion may not be the defining one and it may not be worth making a to-do over it.

* * *

An enduring mystery, always good for a fresh batch of speculation, is how Sandia came to lead the world in use of yellow tape. Some recent opinions (names omitted to protect the frivolous):

1. It started at the Nevada Test Site because carloads of gray tape were being used there and someone in Procurement discovered that the yellow stuff was cheaper. The yellow tape then started showing up in town, and it was rumored that someone in town had a convertible top covered completely in yellow tape.

2. It wasn't the color but the durability and strength of the material in the tape that kept — and keeps — it on the procurement list. Think of it like the McDonald's fries, purchased all these years from the farmer in Utah (I think it's Utah). If it's a good product, why change?

3. It was used to alert personnel who are picking up unclassified items, i.e., boxes, etc.

4. It's that the yellow tape is ugly and much less likely to "walk off." Also, you can write on it with a magic marker.

5. Yellow tape has been called out in Sandia weapons work for years; its use has been directed in some engineering drawings. Why? I don't know, other than for its visibility.

6. It's just tradition, as far as I know. It's been around here for at least 27 years.

All interesting, but I vote for #6.

(McDonald's fries??? . . . One farmer??? . . . Utah??????)

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

Sandia LabNews

Sandia National Laboratories

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Albuquerque, New Mexico 87185-0165
Livermore, California 94550-0969
Tonopah, Nevada • Nevada Test Site • Amarillo, Texas • Carlsbad, New Mexico • Washington, D.C.

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin company, for the US Department of Energy's National Nuclear Security Administration.

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Lab News fax 505/844-0645
Classified ads 505/844-4902

Published on alternate Fridays by Media Relations and Employee Communications Dept. 3651, MS 0165

LOCKHEED MARTIN

Sympathy

To **Mike McReaken** (2431), on the loss of his father Richard in Warrenton, Mo., May 23.

To **Dennis Martin** (1711), **Mary Martin** (1711), and **Michael Martin** (1742), on the loss of Hilda Martin in Kansas City, Mo., July 10.

Recent Patents

Frank Love (2953): Electrical Circuit Tester.

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R&D 100

(Continued from page 1)

licensed to Cray Inc. in 2005.

• **HTSS10V**, a solid-state, fluoride-based battery that is safer than traditional batteries in high-temperature applications such as oil, gas, and geothermal drilling. The principal developer is Alexander Potanin at the High Power Battery Systems Company in Nizhny Novgorod, Russia, working with General Atomics and, at Sandia, Randy Normann (6211), Gloria Chavez (6924), and Richard Smith (retired).

"I congratulate the researchers who have won these awards, which highlight the power and promise of DOE's investments in science and technology," Energy Secretary Samuel W. Bodman said. "Through the efforts of dedicated and innovative scientists and engineers at our national laboratories, DOE is helping to enhance our nation's energy, economic, and national security."

Compute Process Allocator (CPA)

The CPA's principal application is to maximize throughput on massively parallel supercomputers by managing how processors are assigned to particular computing jobs given a stream of computing tasks submitted to a job queue. The CPA assigns each job to a set of processors, which are exclusively dedicated to the job until completion. The CPA obtains maximum throughput by choosing processors for a job that are physically near each other, minimizing communication and bandwidth inefficiencies.

In experiments at Sandia, the optimized node allocation strategy employed by CPA increased throughput by 23 percent, in effect processing five jobs in the time it normally took to process four.

The R&D 100 awards recognize the 100 top technologies introduced into the market over the past year.

The CPA is scalable to tens of thousands of processors and is currently being used on supercomputers at Sandia (Red Storm), Oak Ridge National Laboratory, the US Army's Engineer Research and Development Center Major Shared Resource Center, Pittsburgh Supercomputing Center, and the Swiss Scientific Computing Center.

HTSS10V

Solid-state fluoride ion batteries have a high energy density while being inherently safe. The battery consists of nontoxic fluoride, and all three battery components of the HTSS10V — anode, cathode, and ionic conductor — are solid, making it the best and safest choice for high-temperature activities such as oil and gas drilling, currently its primary application. Traditional lithium batteries are at risk of exploding or leaking chemicals under high-temperature uses. Solid-state battery technology offers the largest temperature range — room temperature to 500° C — of any battery technology.

Other advantages of solid-state batteries are:

• The ability to be flown on commercial aircraft, while lithium sulfuryl chloride batteries can only be transported by ground and must be stored in explosive containers when on a drill rig.

• Longer shelf life and greater reliability in emergency situations, giving them advantages for battery backup or life support systems during a fire or other emergencies.

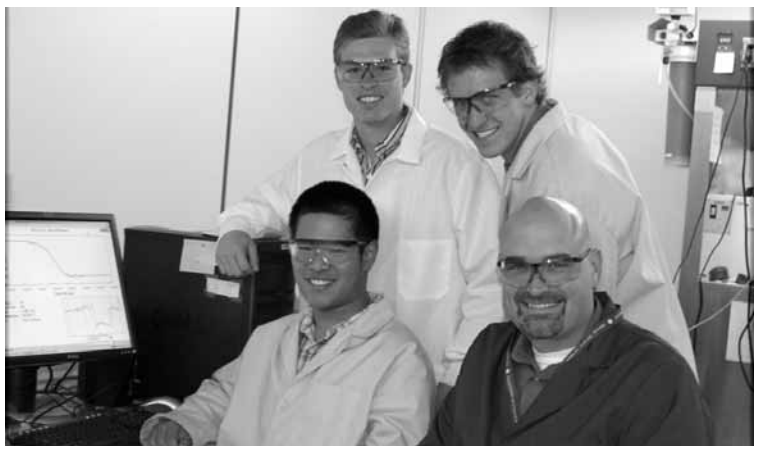
Researchers are currently working on a rechargeable version for laptop computers.

Limited production of the batteries began in 2005 at Russia's VNIIEF Institute. Under a joint program with Sandia and General Atomics, the batteries will be produced in Sarov, Russia, and in San Diego, Calif., for high-end oil and gas drilling uses.

New institute

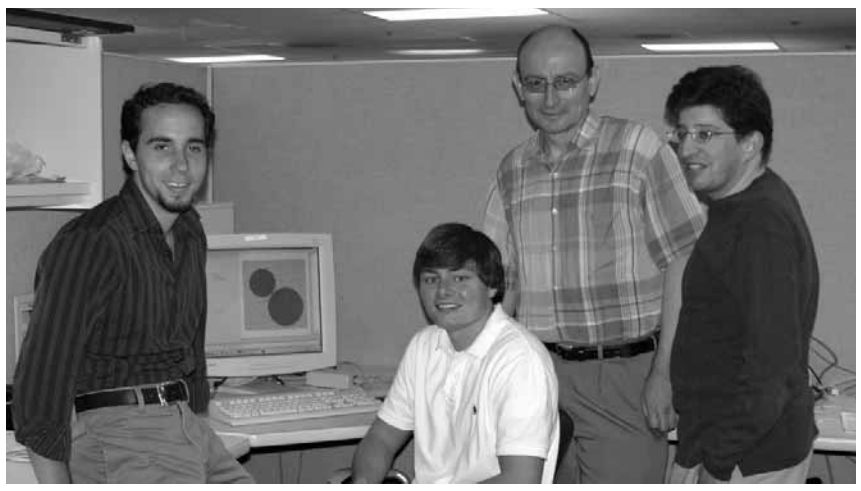
(Continued from page 1)

This produces efficient development and validation of "disruptive" nanotechnologies. (A disruptive technology, rather than being an incremental advance, overturns an existing, dominant one.) In collaboration with key university partners, NECIS research projects are designed to inspire and expedite breakthroughs in nanotechnology that support DOE strategic areas such as energy, science, and defense.



EXPERIMENT — NECIS interns in the laboratory are, clockwise from left, Vincent Liu (seated at computer), who received his BS in electrical engineering from the University of California, Berkeley, and will be going to MIT in the fall; Hunter Moore (standing on left), who received his BS in mechanical engineering at the Georgia Institute of Technology and will be entering graduate school there this fall; and Trent Lynch, standing at right, a senior in mechanical engineering at the University of Colorado, Boulder, who is studying mechanical engineering. Seated at right is their mentor in Nanoscale Science and Technology Dept. 8759, Blake Simmons. (Photo by Bud Pelletier)

Because many US universities do not offer programs that combine experiments with computation, and fewer American students are pursuing careers in science and engineering, NECIS aims to bridge these gaps by providing top US students research opportunities that bring together nanoscale experiments with advanced modeling, simulation, and computation.



COMPUTATION — Mechanics of Materials Dept. 8776 interns Nick Burgess (standing on left) and Joel Stinson (seated) pose with their mentors. Joel's mentor Esteban Marin is standing behind him; Nick's mentor Jonathan Zimmerman is to the right. Nick received a BS in mechanical engineering at Lehigh University and will be majoring in aerospace technology in graduate school at the Georgia Institute of Technology. Joel is in graduate school in mechanical engineering at Mississippi State University, where he also received his undergraduate degree in the same field. (Photo by Bud Pelletier)

NECIS serves as an incubator for nurturing new trends and trendsetters that will drive technical innovation in emerging fields such as nano-engineering and advanced computing to improve national security and enhance US technological competitiveness.

Along with Jean, NECIS is led by co-principal investigators Jonathan Zimmerman (8776) and Scott Collis (1414). In this inaugural year, NECIS has close to 50 interns participating in its summer program who are roughly equally distributed between Sandia's California and New Mexico sites.

NECIS is aiming to grow in future years to include more interns and more research activities, and to become part of Sandia's response to the American Competitiveness Initiative, announced in President Bush's 2006 State of the Union address. The initiative foresees increasing research spending in DOE's Office of Science and the National Science Foundation.

NECIS is the 11th educational institute at Sandia and is a crosscutting effort with three other Sandia institutes (the Sandia Institute for Nanoscale Engineering and Science, the Engineering Sciences Summer Institute, and the Computer Science Research Institute). All the institutes offer research opportunities for a range of applicants, primarily upper-division undergraduate students through PhD-level students.

For more information, see http://education.ca.sandia.gov/internships/institutes/at_a_glance

COMPUTER SCIENCE RESEARCH INSTITUTE (CSRI) — NECIS students discuss research in the new CSRI building in the Sandia Research and Technology Park. The students are, from left, Evan Vanderzee, Adam Oliner, John Fetting, and Michael Wolf. (Photo by Randy Montoya)

Sandia CaliforniaNews

California site activities foster native species

By Nancy Garcia

Wildlife biologist Joanne Mount-Sartor (8512) has a number of things on her mind this summer, including barn owls, restoration activities in the arroyo, and the anticipation that she will see more songbirds after the restoration is done.

She is looking forward to taking her first look at barn owl nestlings that are occupying a nesting box mounted on a building at the California site.

"Barn owls will nest wherever they can," she notes, saying the 410-acre site could probably support 10 nesting boxes that encourage these birds to take up residence. "It's a proactive way to help with the rodent population instead of poisoning," she says. "In the future, we're planning on putting perching posts for the larger birds, like the red-tailed hawk, in the fields" — another way to welcome wildlife that can help whittle down the population of such rodents as ground squirrels, which have been rampant this year after the heavy rains.

The restoration program includes replanting with native species to provide flood and erosion control and wildlife habitat. The project, approved by the US Fish and Wildlife Service, has been partially approved by the Army Corps of Engineers — full approval from the Corps is expected within the year. Work began this year with restoration at four sites by Facilities Planning and Construction Management Dept. 8512.

When the native willow and cottonwood trees being planted along the arroyo grow, they are expected to be home to native song birds. An upsurge in the songbird population, Joanne says, will indicate how well Sandia has done in sheltering native species. The overall arroyo plan calls for planting at 14 sites from East Avenue to the east side of the property, where some 30 acres along the arroyo have been placed in a wildlife reserve.

Joanne says the site includes habitat for the native California red-legged frog, which is a threatened species under the federal Endangered Species Act (threatened species are likely to become endangered in the foreseeable future).

JOANNE MOUNT-SARTER releases a great horned owl that had been abandoned by its parents and was cared for at Lindsay Wildlife Museum briefly before being returned to the site in 2004. (Photo by Bud Pelletier)

Arroyo restoration will likely improve red-legged frog habitat as well. To learn more about wildlife at the California site, visit www.ran.sandia.gov/div8000/wildlife.

Groundbreaking work, reported in *Science* and launched on space shuttle, shows new capabilities

Yeast and other individual cells prove effective in sensing, arranging, and protecting their environment

By Neal Singer

What better arrangement when building a new house than for the architect to consult with the tenants?

In a remarkable paper in the July 21 issue of *Science*, a team of researchers from Sandia and the University of New Mexico under the leadership of Sandia Fellow Jeff Brinker demonstrated that common yeast cells (as well as bacterial and some mammalian cells) customize the construction of nanocompartments built for them.

These nanocompartments — imagine a kind of tiny apartment house — form when single cells are added to a visually clear, aqueous solution of silica and phospholipids, and the slurry is then dried on a surface. (Phospholipids are molecules that make up cell membranes.)

Ordinarily, the drying of lipid-silica solutions produces an ordered porous nanostructure by a process known as molecular self-assembly (see *Lab News*, most recently April 30, 2004). This can be visualized as a kind of tract housing.

In the current experiments, however, the construction process is altered by the live yeast or bacteria.

During drying, the cells actively organize lipids into a sort of multilayered cell membrane that not only serves as an interface between the cell and the surrounding silica nanostructure, but acts as a template for the silica.

This improved architecture seamlessly retains water, needed by the cell to stay alive. Further, by eliminating stresses ordinarily caused by drying, the nanostructure forms without fine-line cracks. These improvements help maintain the functionality of the cell and the accessibility of its surface.

"Cheap, tiny, and very lightweight sensors of chemical or biological agents could be made from long-lived cells that require no upkeep, yet sense and then communicate effectively with each other and their external environment," says former UNM graduate student Helen Baca, lead author on the paper and advised by Brinker .

By comparison the more common practice of merely "trapping cells in gels" leads to stress, cracks, and rapid cell death upon drying.

CELL-DIRECTED ASSEMBLY — Helen Baca, selected the Material Research Society's Gold Medal graduate student in 2005 and UNM Outstanding Graduate Student for 2006, looks over the letters "CDA," standing for "cell-directed assembly," for the *Science* paper in which she was lead author for the Brinker group. The letters were prepared by UNM grad student Eric Carnes, who for the picture stained an estimated 10 to the 10th yeast cells with nucleic acid.

(Photo by Randy Montoya)

Already launched on the space shuttle

The incorporated cells of the Brinker group are self-sustaining — they do not need external buffers and even survive being placed in a vacuum.

To study their use as cell-based sensors for extreme environments, samples of the yeast- and bacteria-containing nanostructures were launched on the just-completed mission of the US space shuttle *Discovery*. It will remain on the space station as part of a US Air Force experiment to determine their longevity when exposed to the extreme stresses of the radiation and vacuum of outer space.

Of the NASA mission, Jeff says, "Ordinarily, under such extreme conditions, the cells would turn into raisins. But, because of the remarkable coherency of the cell-lipid-silica interface and the ability of the lipid-silica nanostructure to serve as a reservoir for water, no cracking or shrinkage is observed. The cells are maintained in the necessary fluidic environment."

The cell-architected nanostructure is, he says, "an amazing way to preserve a cell."

The cells already have emerged still viable after examination in electron microscopes and after X-ray exposure in Argonne's Advance Photon Source, where the accelerating voltage ranges from one to 20 keV, says Jeff.

Genetic modification done cheap

More interestingly, the entrapped cells easily absorb other nanocomponents inserted at the cellular interface. Because of this, the cell can internalize new DNA (introduced as a plasmid), providing an efficient form of genetic modification of cells without the usual procedures of heat shock or cumbersome puncturing procedures (electroporation) that could result in cell death. Thus, the yeast can be modified to glow fluorescent green when it contacts a harmful chemical or biotoxin.

Because such nanostructures are cheap, extremely light and small, and easy to make, they could conceivably be attached to insects and their emanations read remotely by beams from unmanned aircraft.

The method also makes it easier to prepare individual cells for laboratory investigation under microscopes. "Normally, to visually examine a cell, researchers use time-consuming fixation or solvent extraction techniques," says Jeff. "We can spin-coat

(Continued on next page)

Microshutters

(Continued from page 1)

the gilded and highly reflective grillwork surface or a dark silicon substrate to maximize or minimize heat transfer through the satellite's skin as needed.

The electrostatic actuators, themselves arrays of intermeshing, spring-loaded comb's teeth pulled together by electrostatic attraction, are a proven micromotion staple also developed at Sandia.

Louvered satellite skin

Two of the three ST5 satellites have on their top and bottom decks 4-inch-square arrays of micro-louvers. A single array includes some 2,600 individual electrostatically driven devices. Each device — grillwork and actuator together — is approximately the size of the cross on this letter "t."

Sandia's Microelectronics Development Laboratory (MDL) fabricated and delivered to Johns Hopkins in October 2002 twelve louver-laden wafers for the ST5 satellites. Johns Hopkins performed the packaging, integration, and space-qualification testing.

Each array weighs just grams and consumes nanowatts of power when changing states, from open to closed or vice versa, and no power (only voltage) to maintain a position.

In all, Sandia has 90 square centimeters of louver-skin flying aboard two of the three microsats, which have been in an elliptical polar orbit 200 to 3,000 miles above the earth since March 22. The three-month experimental mission ended June 22, but as of *Lab News* press time the satellites continued to operate.

"The MEMS variable-emittance louvers have performed successfully during their three month mission," says Ann Darrin, program manager at Johns Hopkins Applied Physics Lab. "This is the first time a fully space-qualified device of this type has ever been flown [in space], and the first to be flown on the outside of a satellite."

Ten new tools

As a result of ST5, spacecraft designers have 10 new tools to work with, says Ray Taylor of NASA's Science Mission Directorate, speaking of the 10 new technologies flown on the mission. "And tools that are not only smaller, lower power, and less expensive, but because of ST5 they will be proven in space," he says. "Therefore, they can be used with a high degree of confidence in future missions."

"I'm kind of in awe that these MEMS devices are in space," says Jim. "It's a pretty cool milestone for MEMS devices. I think it's great that Sandia could be a part of it."

Other Sandians involved in the project included Sita Mani (5719), Ed Wyckoff (2132), Frank Loudermilk (1738), Dave Sandison (1749), and Jay Jakubczak (1710). Sandia's Microelectronics Development Laboratory fabricated the delivered wafers.

NASA's ST5 mission

NASA's Space Technology 5 (ST5) mission consists of three microsatellites exploring the earth's magnetic fields. The ST5 microsatellites were launched successfully on March 22, 2006, aboard an Orbital Sciences Pegasus rocket from Vandenberg Air Force Base, Calif.

The mission's goal was to demonstrate the benefits of a group of small low-cost spacecraft taking measurements at the same time in different locations. ST5's objective was to demonstrate and flight qualify 10 innovative technologies and concepts for application to future space missions.

The ST5 project is a part of NASA's New Millennium Program, which was created to identify, develop, build, and test innovative technologies and concepts for use in future missions. Its missions are guided by future needs of NASA's Earth and Space Science program.

More info:
www.nasa.gov/mission_pages/st-5/main/index.html

Wind turbines

(Continued from page 1)

located about 30 miles south of Lamar, Colo., and will soon start a new monitoring work-for-others (WFO) project with Texas Tech University.

The GE Energy/NREL/Sandia collaboration involved testing a 1.5-megawatt, 80-meter tall turbine with a rotor diameter of 70.6 meters. GE Energy is the largest wind turbine manufacturer in the US and sells them to developers such as Florida Power & Light all over the world. Wind plant operators sell the electricity to utilities such as the Public Service Company of New Mexico.

The GE turbine was equipped with four ATLAS II units, collecting a total of 67 measurements, including 12 to characterize the inflow, eight to characterize the operational state of the turbine, and 24 to characterize the structural response.

The system collected data continuously for 24 hours a day, seven days a week. The four units were placed at various locations on the turbine, and a GPS time stamp was used to maintain synchronization between the units. (See a schematic of the field deployment at right.) All data streams from the different units were merged into a single data stream at the base of the turbine where the ATLAS II software compressed the data and stored them onto a local computer.

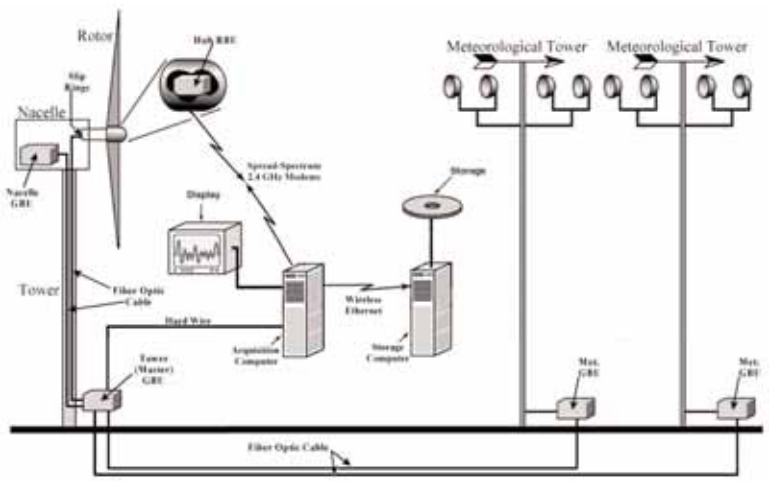
Data collection efforts began on Sept. 14, 2004, and ended Jan. 19, 2005. During that time, more than 17,000 data records were collected, for a total of 285 Gb of data.

Because the turbine was located at a remote site, the data were transmitted to NREL via a satellite link and later transmitted to Sandia. In places where there is access to the Internet, the data can be monitored in real time over the web.

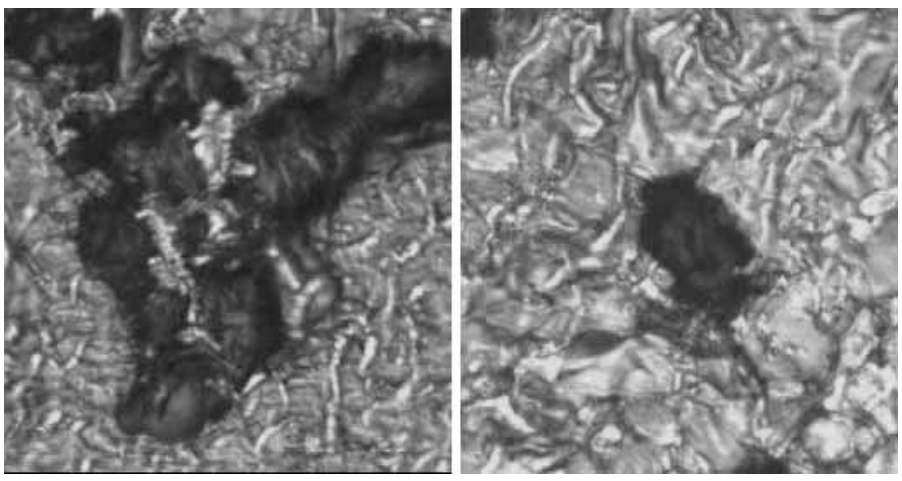
The Texas Tech project will start in August with an environmental monitoring box being placed on a 200-meter meteorological tower at a test site near the campus in Lubbock.

The university is expected to eventually erect a utility-size wind turbine. The ATLAS II will be used to collect data from the machine.

Sandia also is planning three experiments, using the ATLAS II to monitor the performance of three advanced blade designs on a test turbine it operates in conjunction with the US Department of Agriculture's research station in Bushland, Tex.



TYPICAL FIELD DEPLOYMENT of an ATLAS II-equipped wind turbine system. In tests, the ATLAS II units collect 67 measurements for further analysis.



TOPOGRAPHICAL confocal projections of cells which have integrated onto predefined lipid-silica films. (The fuzzy, darker parts of the images are cells that have redistributed the fluorescent lipid — which displays as green in color — from the plane of the thin film into three dimensions around the cells.)

Yeast

(Continued from preceding page)

a cell in seconds, pop the cell into an electron microscope, and it doesn't shrink when air is evacuated from the microscope chamber." The cell can be immediately imaged, says Jeff.

"Spin-coating" refers to deposition of the cell suspension slurry on a spinning substrate until dry.

From their comfortable "home," the empowered cells can also direct their own landscaping. They can organize metallic nanocrystals added at the cell surface. These may enhance the sensitivity of Raman spectroscopy for monitoring the onset of infection or the course of therapy. The cells also localize proteins at the cellular interface.

A model for persistent infections

Assistant Professor Graham Timmins of UNM's College of Pharmacy notes that the encapsulated cells' unusual longevity may serve as a model for persistent infections such as tuberculosis, which have a long latency period.

TB bacteria can remain dormant *in vivo* for 30-50 years and then re-activate to cause disease. Currently the state of the dormant bacterium is not understood. Timmins and Brinker are discussing further experiments to validate the model.

Finally, building the cells into a coating with a high enough density might elicit from them a defensive, multicellular signal of an unpleasant nature that discourages unwanted biofilm formation on the coated surface — important for avoiding infections that could be carried by implants and catheters.

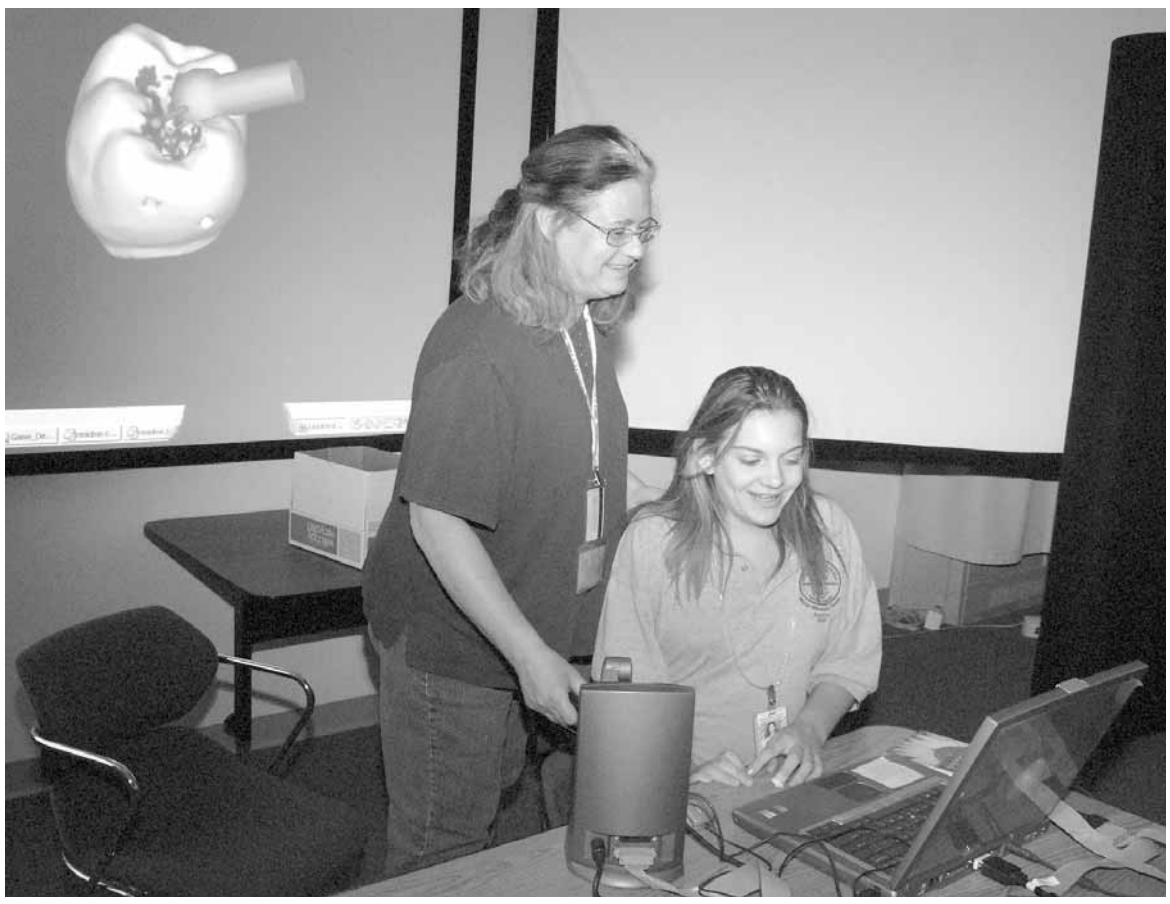
"This is not the end of the story, but the beginning," says Jeff. "No one else has created these symbiotic materials and observed these effects. It's a totally new area."

The cell's ability to sense and respond to its environment is what forms these unique nanostructures, says Jeff. During spin-drying, the cells react to the increasing concentrations of materials in the developing silica nanostructure by expelling water and developing a gradient in the local pH. This in turn influences lipid organization, the form of the silica nanostructure, the decrease in developed stress, and ultimately the living conditions of the ensconced cellular tenants.

The work was initially funded by Sandia's Laboratory Directed Research and Development (LDRD) office, then by DOE's Basic Energy Sciences group for its fundamental implications, and then (through UNM) by the Department of Defense (Air Force) for its practical possibilities.

Along with Helen Baca, the lead researcher, current graduate students Carlee Ashley and Eric Carnes have made significant contributions. Others contributing are Deanna Lopez, Jeb Flemming (1716), Darren Dunphy (1851), Seema Sigh, Zhu Chen, Nanguo Liu, Hongyou Fan (1851), Gabriel Lopez, Susan Brozik (1714), and Margaret Werner-Washburn. Flemming, Dunphy, Fan, and Brozik are Sandians; Liu is from LANL; other participants are from UNM. Brinker, in addition to his position at Sandia, is a professor of chemical engineering at UNM.

Girl Scouts tour Sandia imaging lab



LOOK AND FEEL — Arthurine Breckenridge, a former Sandia computer scientist now in the private sector, shows Girl Scout Gabrielle Swass a new tactile input device for computers. With the device, the user feels whatever object she is interacting with just as if she were holding it in her own hands. Arthurine and Gabrielle were at Sandia's Visualization Lab as part of a Girl Scout science camp program.

(Photo by Randy Montoya)

Wild at Sandia

Summer brings new life to Sandia, and sometimes visits from local animals

By Stephanie Holinka

Military bases often provide havens for wildlife. Bases such as Kirtland that are near metropolitan areas often are the largest tracts of sparsely inhabited land available. Few trespassers and limited development creates a *de facto* sanctuary for species looking for a quiet place to live and raise a family.

Sandia's wildlife biologists conduct species surveys of the reptiles, birds, mammals, and plants on the Labs' lands. They survey the local habitat, both the desert grassland terrain and the foothills and canyons of the Manzano Mountains. They also monitor camera stations that photograph wildlife at all hours of the day and night. The cameras are often located near on-site water guzzlers that constantly bubble out fresh water, attracting animal visitors of all kinds as summer progresses and water becomes more scarce.

The wildlife biologists sometimes conduct spotlighting surveys of nighttime animal activity. This summer, for example, they are planning to examine the base bat populations, which sometimes seek shelter in hidden caves and abandoned mines nearby, says wildlife biologist Stephanie Salinas (10331).

Lands at Kirtland serve as a permanent home for some bird species, such as burrowing owls whose unusual nests lay shallowly buried in sandy ground. Other migratory birds include the base in their stopover plans. Several small seasonal ponds around the Tijeras Arroyo Golf Course provide habitat for wetland birds.

The largest animals exist in remote areas of the Labs, only occasionally crossing paths with those who work in the buildings closer to the public lands that border the Air Force base. In the remote areas such as Madera Canyon and Lurance Canyon, cameras have photographed black bear, mule deer, cougar (mountain lion), and golden eagle, among others.

But a few wild base residents are visible before you even enter the gate. Prairie dogs inhabit the fenced areas visible from the Gibson gate. "Prairie dogs are a big deal here because they provide burrows for other animals, including burrowing owls, and are indicators of grassland health," says Stephanie. On the front door to Stephanie's office is an overblown picture of a well-fed and happy-looking prairie dog.

Small mammals like rabbits, bats, and mice live in even the most populated areas of the Labs. And where there are cute little animals around, the snakes are sure to follow.

Wildlife biologists at Sandia

Stephanie and other members of Sandia's environmental groups respond to calls about unexpected wildlife encounters with Lab employees. They remove animals from work spaces, some as small as rabbits or as large as a Cooper's hawk that flew into an outlying building when the garage door was up.

Biologists at Sandia share data with biologists at Kirtland, who conduct species and habitat research of their own. They coordinate surveys with Kirtland wildlife biologists and partner with other agencies like New Mexico Game and Fish on studies such as a current one examining the potential for black bear corridor use (Interstate-40) between the Manzano and Sandia mountains.

Currently Sandia wildlife biologists Steve Cox (10333) and Jennifer Payne, wildlife technologist Ann Marie Rader (10333), and summer intern Rachel Williams (10333) are participating in the Monitoring Avian Productivity and Survivorship (MAPS) program. The MAPS program uses a network of more than 500 public agencies, private organizations, and individual bird banders to monitor ecosystems across the country for the approximately 120 species of land birds in North America during the breeding season. Participants catch, band, and record critical data about birds in their areas, which are then fed into a nationwide database, giving biologists a large view of bird populations, their health, and migration.

The data collected also helps Sandia maintain compliance with wildlife laws including the Migratory Bird Treaty Act and the Endangered Species Act, as well as conduct site planning for natural resource conservation.

Keeping the wild animals wild

Because not all the wild animals at Sandia avoid the human-inhabited areas, Sandia's wildlife biologists conduct informational meetings and seminars with building and facilities managers to advise them on issues such as unexpected office visits from bats and snakes, and about unexpected migratory bird nests.

"Usually," Stephanie says, "when animals are found in office buildings, they are relocated to a more remote area and set free." But if birds build nests near business space at the Labs, she says, often those nests are left in place until the hatchlings leave the nest, and then the nest is removed by a trained wildlife biologist.

Stephanie points out that sometimes people at the Labs feed the cute furry animals near their offices, encouraging those animals to remain in people-populated areas. But an abundance of furry friends like these lead rattlesnakes and other predators into Sandia's populated areas, causing sometimes tense meetings between Lab employees and the locals. (See "Encourage wildlife to stay on the wild side" for tips on how to avoid encouraging animals to invade your work area.)

GIVING US THE EYE — A Northern Mockingbird stares intently prior to being released back into the wild. (Photo by Randy Montoya)

Encourage wildlife to stay on the wild side

Usually wild animals stay away from humans and try to avoid human contact. However, sometimes we unintentionally invite these animals into our work area. When wild animals can get to human food and refuse, they lose their fears and become comfortable around us, leading to conflict. Follow these tips to avoid encouraging animals to invade your work area.

• **Never feed wildlife,** including wild rabbits, who may attract rattlesnakes to work areas.

• **Never attempt to capture or touch wildlife.**

• **Don't feed birds or feral cats.**

• **Store your lunch and snacks inside** a building or vehicle inaccessible to animals.

• **Close unattended storage spaces,** equipment, room doors, and trash bins.

• **Put trash in appropriate cans** and bins.

To report unusual behavior of wildlife within the developed areas of the site, call Telecon at 844-4571 or Stephanie at 845-7711.

Photos by Randy Montoya

A BANDING OF BIRDS — (clockwise from top left), Steve Cox (10333) inspects a mist net, used to catch birds for the Monitoring Avian Productivity and Survivorship (MAPS) program.

The small band on this Northern Mockingbird will allow researchers to track the bird's migration, longevity, and overall health if he's caught again.

Steve Cox, using a special tool, gently places a band on a bird's leg.

Jennifer Payne (10333) blows the feathers aside on this Crissal Thrasher to assess the bird for muscle mass, amount of fat, molt, and parasites.

The bottom row of photos are of various wildlife at Sandia. The center four photos are from motion sensor cameras in the foothills of the Manzano mountains at Sandia/New Mexico. The two outer photos were take by Sandia employees Gary Bailey (left photo) and Randy Montoya (right photo).

Showcase features US-Russian nonproliferation partnerships

Sandia hosts signing of agreement between Stolar Research Corp., Russian partner

By Michael Padilla

Seven high-tech commercial technologies emerging from US-Russian partnerships sponsored by NNSA were showcased recently at Sandia's International Programs Building in Albuquerque.

The technologies ranged from high-temperature batteries for deep oil exploration to "smart bolts" used to secure and protect nuclear material.

The July 6 showcase was held in conjunction with the signing of a new agreement by Stolar Research Corp. of Raton, N.M., and its Russian partner NIIIS, the Institute for Measuring Systems Research in Nizhny Novgorod. The agreement covers the design and manufacturing of advanced radar equipment, which the US and Russian partners plan to market and sell.

SEN. PETE DOMENICI, R-N.M., receives a briefing from Randy Normann (6211) and Gloria Chavez (6924) about the HTSS10V high-temperature batteries for deep oil exploration. The HTSS10V was selected as an R&D 100 Award winner (see story on page 1). (Photo by Randy Montoya)

The deal is part of a nonproliferation goal of the NNSA's Global Initiatives for Proliferation Prevention (GIPP). GIPP sponsors three-way partnerships to help scientists, engineers, and technicians who worked on Soviet weapons of mass destruction to redirect their talent to peaceful, nonmilitary work. Each GIPP project features a private US industry partner, a former Soviet weapons institute (or its spin-off company), and a US national laboratory.

The event was sponsored by US Industry Coalition (USIC), an association of more than 160 American firms involved in IPP work.

Sandia Labs President and Director Tom Hunter, who offered opening remarks at the event, said the program has had the benefit of an enlightened congress and the leadership of Sen. Pete Domenici, whose wisdom, vision, and influence has supported this concept funded by DOE.

"Today, we have the clear evidence of success," Tom said. "USIC through the leadership of Vic Alessi and its board of directors has brought the concept to reality. Projects done, relationships built, and commercialization taking place — this is a proud legacy and a great result."

Domenici, who was instrumental in the creation of the program, said the program is vital because the US must engage the men and women who have the technical talents to design and build weapons of mass destruction.

"From its beginning, IPP has stood apart as the only program to fully engage US industry in our nonproliferation goals. It boils down to promoting peace through technology commercialization," he said.

Seven technologies showcased at signing

• **Drillstring Radar** (DSR) for Coal-Oil-Methane Gas Exploration (Stolar Research): Using electromagnetic waves to detect planar boundaries of rock formations, DSR allows operator to "see in advance" for clean, safe drilling of coal and/or methane gas. DSR is also useful for mapping abandoned mines.

• **Landmine Detector for Metal and Plastic Explosives** (Stolar Research): Handheld or robotic units detect antipersonnel mines. An estimated 100,000 landmines are deployed around the world.

• **Optical Fibers and Fiber Lasers** for global markets (VOLIUS, Inc.): Russian manufacturing facility producing advanced fiber lasers for the $2.2 billion industrial laser market.

• **Trace Chemical Detection** Using Diode Lasers (Canberra Aquila): Tunable diode lasers able to detect methamphetamine labs and explosive materials are designed to meet law enforcement and homeland security demands.

• **"Smart Bolts"** to Secure and Protect Nuclear Material (Canberra Aquila): Enhanced sealing and bolting system equipped with RF communications technology allows monitoring from remote locations.

• **"MORS"** Multi-Object Remote Surveillance (Canberra Aquila): Cutting-edge "smart video" system allows for automatic detection, identification, and tracking of objects of interest in a surveillance scenario.

• **High-Temperature Battery** for Deep Oil Exploration (Sandia): New Russian solid-state, high operating temperature battery for use under severe drilling conditions is designed to meet US oil industry demands.

Duel in the sun

Rodeo rounds up the quickest forklifts in the West

By Darrick Hurst

The midday sun stands high in the sky as the participants of the 2006 Forklift Rodeo prepare to face off in a showdown of speed, agility, and precision. The sweltering heat is unrelenting on the spectators that have gathered in the parking lot of the old Coronado Club, but the real heat is on the participants, because when the dust settles, only one will be left standing and declared the quickest lift in the West.

READY, SET, GO — Pete Nieto (10843) starts his run through the Serpentine course during the annual Forklift Rodeo.

For the sixth year in a row, the Forklift Rodeo pits operator against machine in an unforgiving labyrinth of obstacles. From the nerve-wracking "Bottleneck" event, to the brutal "Serpentine," the Rodeo promises to present a formidable challenge to even the most skilled forklift wranglers.

However, in the steady hands of a tried and tested professional, here on an aging piece of otherwise-forgotten asphalt, the forklift proves to be graceful and simplistic — just one driver, a machine, and the ever-present stopwatch as the judge.

Ride quickly and win. Hesitate, and lose.

When the showdown was over, the participants had proven not only their delicate and precise technique with the machine, but an ability to take whatever might come their way during a drive.

BACK AND FORTH — Paul Apodaca (10268) winds his way through the Serpentine course.

Photos by Randy Montoya

This year's most talented and versatile forklift operators west of the Mississippi:

1st place — (first-time winner) Paul Apodaca (10268), Special Material Handler

2nd place — (first-time top competitor) Eric Williamson (10263), Utility Truck Driver

3rd place — Dominic Kittredge (10263), Heavy Truck Driver

Special event winners over the first three days of competition were:

- Grand Canyon — Robert Romero
- Bottleneck — Maxine Baca
- Trailer/Low Boy, (tie) — Dominic Kittredge and Ray Cuoco
- Serpentine, (tie) — Dominic Kittredge and Eric Williamson
- Basketball — Dominic Kittredge
- Bowling — Cliff Ward
- Da Bomb — Dominic Kittredge
- High Stacking — Ernie Sauceda

Behind the scenes

ALMOST THERE — Ernest Sanchez (10322) gives direction to the forklift operator during the Bottleneck event.

The carefully planned and organized annual Rodeo showcases the skills and training of Sandia forklift operators. The event recognizes the vital role that forklift operators play in helping Sandia accomplish its many mission goals while drawing attention to the strict safety standards the Labs adhere to.

"I'm thrilled about the safety benefit this event provides to the Labs," says Liz Carson (10262). "Our ultimate goal is to make our folks aware that we have zero accidents and zero incidents on forklifts — we're real proud."

2006 team members: Liz Carson (10262) — Project Lead; Ernest Sanchez (10322) — Safety Engineering; Willie Johns (10322) — Safety Engineering; Lewis Marlman (10264) — Safety Coordinator; Kristin Flores (10262) — Manager; Louis Lucero (10262) — forklift operator; Paul Apodaca (10268) — forklift operator; Angel Alvarado — KAFB 377th Safety Wing; Ernest Salas (10265) — Fleet Services/forklift operator; John Ledet (10336) — Emergency Operations; Bill Wolf (10336) — Emergency Operations; Al Bendure (10312) — Manager, ES&H Assurance, Planning & Behavior Based Safety (BBS); Karen Armstrong (10312) — BBS; Mike Patton (10312) — BBS; Denise Lopez (10263) — Material Movement; Regina Jaramillo (2719) — Production; and Phil Rivera (10267) — Team supervisor, Reapplication Services.

Sandia brings cleaner water to Jemez Pueblo

New facility part of arsenic-removal technology partnership

By Stephanie Holinka

Sen. Pete Domenici, R-N.M., Jemez Pueblo Gov. James Roger Madalena, and Sandia VP for Energy Security and Defense Technologies Les Shephard were among those present to dedicate a new Jemez Pueblo Municipal Water Filtration System July 5.

Sandia demonstrated the coagulation filtration method of removing arsenic from drinking water as part of the dedication ceremony at Jemez Pueblo's new water treatment facility. Sandia engineer Bill Holub (6118) explained that coagulation filtration was chosen from about 20 other types of filtration systems based on the chemical makeup of Jemez' water.

This is the fourth arsenic-removal demonstration site in New Mexico that Sandia has established as part of a consortium made up of Sandia, the AWWA Research Foundation (AwwaRF), and WERC, a consortium for environmental education and technology development. The other arsenic-removal demonstration plants are located in Socorro, Anthony (Desert Sands), and Rio Rancho. A fifth is planned for a site in Oklahoma.

Project manager Richard Kottenstette (6118) says each of the four demonstration sites uses different arsenic-removal technologies. The coagulation-assisted filtration method being tested at Jemez Pueblo removes suspended and dissolved solids from the water. The method is currently being used in projects in El Paso and Paradise Hills (near Albuquerque). The pilot testing at Jemez Pueblo presents an opportunity to assess a small-scale test in a unique water quality environment, he says.

Domenici secured funding for the arsenic-removal test project through DOE as chairman of the Senate Energy and Water Development Appropriations Subcommittee.

This January, the arsenic standard for drinking water in the US was lowered from 50 to 10 parts per billion. These changes were intended to safeguard consumers from exposure to large quantities of arsenic.

During the dedication, Domenici said that many rural communities in New Mexico have arsenic levels that will now fail to meet the new water quality standards for arsenic.

Many smaller communities affected by the new standard have only a single source for fresh water and may be forced to install and maintain costly water treatment facilities. Part of the research underway includes evaluating costs associated with installation and maintenance of the various technologies.

NEW WATER FILTRATION SYSTEM — Sen. Pete Domenici, right, Jemez Pueblo Gov. James Roger Madalena, and others look at a new water filtraton system dedicated at the Jemez Pueblo earlier this month. This is the fourth arsenic-removal demonstration site Sandia has established as part of a consortium.

(Photo by Randy Montoya)

The senator expressed concern that the new arsenic level restrictions could represent "a serious hardship" to smaller communities in many areas across the American Southwest, including Texas, Idaho, New Mexico, and large parts of Utah.

Jemez Pueblo's water previously had slightly higher arsenic levels than allowed under a recently changed clean water law. Arsenic, manganese, and iron in Pueblo water has resulted in poor-tasting, rust-colored water that stained clothing and tasted unpleasant. These troubles bothered those in the community for years, Madalena said.

Worldwide, in areas that have been contaminated with arsenic through pollution and where naturally occurring levels of arsenic are high, arsenic contamination affects the water supply of millions of people.

Those sponsoring the project hope that the technologies being evaluated at the project's many sites can someday be refined and adapted for use in low-cost applications in areas all over the world.

What Sandia/New Mexico is doing to conserve water

July 26 speaker & info session to address conservation at work and home

Editor's Note: This article was written for the Lab News *by Katrina Wagner of Environmental Planning Dept. 10331.*

Monsoon season has arrived in New Mexico and portions of the state have received significant rainfall in recent weeks. Still, water use continues to be a major concern, both for state residents and employers.

Sandia uses 20 to 50 million gallons of water per month. The largest consumers are ultra-pure water systems that serve technical programs (such as deionization and reverse osmosis systems), building cooling systems, and domestic use (restrooms, drinking fountains, etc.).

Sandia's Facilities Management and Operations Center 10800 seeks to identify potential reductions and implement water conservation measures. Additionally, a 1995 agreement with the City of Albuquerque requires Sandia to continually reduce water use to minimize its impact on the aquifer. Sandia's water conservation efforts have saved an estimated 130 million gallons annually since 1995.

Areas for improvement

Process water consumption accounts for approximately 28 percent of Sandia/New Mexico's annual water consumption. As part of a recent water conservation effort at Sandia, an existing reverse osmosis system was modified to increase water efficiency at MESA's Microfab building. The modified system, called the High Efficiency Reverse Osmosis (HERO) system, saves an estimated 35 million gallons of water per year.

Cooling towers (integral parts of the HVAC systems for buildings) are the second largest water user at the New Mexico site. As water evaporates in these systems, water is added to replace it. Sophisticated controllers, meters, and chemical control methods are used to achieve substantial water and energy conservation. An estimated 10 million gallons of water per year will be saved using these systems.

Domestic water consumption (water used for restrooms, janitors' closets, and drinking fountains, for example) accounts for about 16 percent of the site's total water use. Sandia's focus is on reducing water pressure to buildings and limiting the number of high-flow fixtures.

All new buildings contain low-flow fixtures. Waterless urinals are a relatively new approach to reducing water consumption. Two water-free urinals have been installed in one Sandia office building and are expected to save 20,000 gallons of water annually.

Irrigation and landscaping

Sandia is saving some 8 million gallons of water per year in irrigation. In recent years adoption of educational programs, innovative technologies, and sustainable design principles in new construction have changed the New Mexico site's landscape practices.

In 2005 the Grounds and Roads Services team in Center 10800 implemented a new computerized central irrigation control system — with a central computer, 30 local irrigation system controllers, meters, and a radio telemetry system — to minimize unnecessary watering in Tech Area 1. The system can detect a leak, such as a broken sprinkler head, within the first two minutes and automatically shut down within 30 seconds of detection.

Sandia is doing its part to address water issues on a regional and national level as well. Geoscience & Environment Center 6100 manages a number of programs designed to increase the safety, security, and sustainability of the nation's water infrastructure. For more information, visit the Sandia Water Initiative website at www.sandia.gov/water.

July 26 speaker, displays to address water conservation

To help Sandians learn more about reducing water use at work and at home, Sandia is hosting the 2nd Quarter Environmental Management System (EMS) Excellence Awards and Lecture Series at the Steve Schiff Auditorium on July 26.

Sandra Postel, director of the Global Water Policy Project in Amherst, Mass., and a senior fellow with Worldwatch Institute, will present a talk on global water issues at 10:30 a.m. Following her talk, information booths sponsored by Geoscience & Environment Center 6100, Facilities Management & Operations Center 10800, the City of Albuquerque, and others will be available to provide tips on residential landscaping and water conservation and efficiency.

Mileposts

New Mexico photos by Michelle Fleming
California photos by Bud Pellitier

David Renninger
40 1735

Bruce Dale
30 10542

Sid Domingues
30 1381

Rich Gay
30 8949

Charles Jakowatz
30 5937

Ashley McConnell
30 10312

Guy Northcutt
30 2993

Barry Schwartz
30 4221

David Stimmel
30 8235

Karl Wally
30 8125

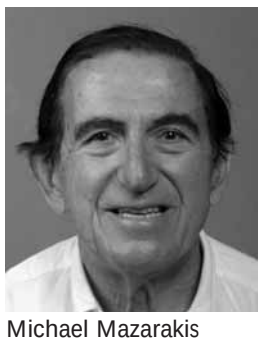
Robert Franssen
25 8236

Charles Harmon
25 6955

Gerald Hash
25 1731

Daniel Horschel
25 6221

Jane Ann Lamph
25 8750



Michael Mazarakis
25 1644

Marc Miller
25 4336

Mary Alice Padilla
25 4343

Pat Smith
25 8500

Bruce Tuttle
25 1816

Kim Mitchiner
20 6428

Ricardo De La Rosa
15 10844

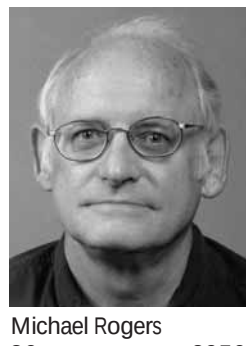
Muhammad El
15 2722

Arthur Hale
15 1900

Mark Koch
15 5433

Carol Manzanares
15 3512

Recent Retirees



Michael Rogers
36 2956

Sigfried Schneider
29 6952

John Rosenow
28 8244

Traffic, weather hotline debuts for commuters headed east

If there was ever a time for a new hotline and e-mail alert list for Sandians who are East Mountains residents to debut, it's now.

Commuters traveling on I-40 east through Tijeras Canyon late afternoon July 11 encountered a virtual parking lot as traffic was squeezed down to two lanes and funneled through a gauntlet of orange barrels. It was the first day of construction on a 10-mile resurfacing and bridge rehabilitation project from Carnuel to Tijeras that is expected to take about a year.

Sandians on a new East Mountains residents e-mail notification list received a message about the traffic jam, suggesting that commuters try Old Route 66. While it may have been too late for some, list manager Lydia Koch (1421) hopes that as the list expands and Sandians become more aware of it, notifications from the road will come earlier.

There are 320 people on the list, and it grows daily.

"Anyone can send alerts to the e-mail distribution," Lydia says, although she warns against hitting "reply all" and using the list to discuss traffic situations. (The list can be found in Outlook by creating a new message, clicking on "To," and typing "EAST MOUNTAIN RESIDENTS.")

She has compiled a separate database of contact information, work hours, and general residence locations (no addresses) submitted by Sandians. The list allows those interested in carpooling or needing a last-minute ride to work to find Sandians living nearby. Also, commuters already on the road could call in alerts to be e-mailed by Sandians still at work.

In addition to e-mail alerts, commuters can call the hotline at 845-3344, which provides road construction and weather updates. Lydia says the hotline is still new and she's figuring out exactly what to include and how often to update the hotline's outgoing message.

Lydia acquired an e-mail alert list maintained by Enid Sterling, who recently retired from Sandia. Enid's alerts primarily focused on weather conditions. Lydia wanted to expand on this.

"The main reason I wanted to do this is for safety — that's number one — but it's also to facilitate commuting and to provide updates on [road] construction," she says, adding that the alert system also could be useful in the event of a fire in the East Mountains.

To be added to the alert list, e-mail Lydia at lkkoch@sandia.gov.

This Sandian directs plays, not work

Taunya Crilly directs cast in Neil Simon's perennial favorite, 'Last of The Red Hot Lovers,' at Adobe Theater

By Iris Aboytes

During the week Taunya Crilly (1517) is an office administrative assistant; on evenings and weekends she unveils her talents as director of Neil Simon's "Last of the Red Hot Lovers," currently playing at the Adobe Theater in Albuquerque.

"The luck of the draw got me enrolled in a drama class in high school," says Taunya. "I was hooked. I love the adrenaline rush that comes with a live audience."

TAUNYA CRILLY

This is her first play as a director. While performing in high school plays she fell in love with Neil Simon's ability to create humor from the issues, troubles, and frustrations people face, so it was logical that her first shot at directing would be a Neil Simon play. "Simon forces one to look at one's own life and realize that maybe, just maybe, life isn't so bad after all."

The process began in March as a proposal. When her proposal was accepted, auditions dates were set. She looked for actors who would bring the play to life with their high energy and comedic timing. She wanted the audience to have a connection with each character.

Many things to think about besides character work with the actors — the set, props, music, costumes, lights — were her responsibility. As an actress she had always been responsible for just her own role, never for so many details.

Along the way, Taunya took time out for an out-of-state family emergency. Nevertheless, the five weeks of rehearsal ended with a sold-out opening weekend.

"It is very rewarding to watch a production that I've directed come to life," says Taunya. "On opening night, I didn't watch the play; I watched the audience. It was a thrill to see them laugh and enjoy the work the entire cast and crew put into our project. I've learned a lot about seeing the 'big picture' and have come to better appreciate the work that a director does. There were definite challenges along the way, but in the end it all came together marvelously."

Taunya plans to continue acting and directing. "The audience gives me such energy. They really do play an important character in every live performance," says Taunya.

"Last of the Red Hot Lovers" runs through July 23. For more information call Taunya at 228-8244.

Back to School
School Supplies Drive

Members of the Office Professionals Quality Council in partnership with the Community Involvement Department are sponsoring the annual Back to School school supplies drive through Aug. 3.

Collection boxes are placed throughout the Laboratories. Mail delivery personnel pick up school supplies while on their daily mail routes.

You can also contribute by transferring funds from your account to Sandia Volunteers at the Sandia Laboratory Federal Credit Union, Account 1070280, 90-01, or you can write a check payable to Sandia Volunteers. Mail checks to Patty Zamora, MS 1313.

For further information, contact Christine Johnson (OPQC) or Patty Zamora (Community Involvement).

This monthly column, compiled by Janet Carpenter, 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 . . . Sandia's Field Test Organization was selected to set up and operate a temporary ballistics test range for the Atomic Energy Commission on Air Force land southeast of Tonopah, Nev., replacing Salton Sea Test Base in California and Nevada's Yucca Flat as a site for testing ballistic characteristics of weapons shapes. . . . Sandia's active recruiting program brought in 662 new employees between January and July, bringing the total number on roll to nearly 6,000.

40 years ago . . . Remote inquiry stations were installed at Sandia Livermore, giving employees a fast and direct access to computer storage files without going to the computer center or interrupting the work of the computer operators. Remote inquiry stations typically consisted of a keyboard and printer unit and a control unit and could be placed anywhere within a building or dispersed among several buildings.

AN ACCIDENT-RESISTANT plutonium container developed by John Andersen (third from left) is shown in this 1976 photo before an accelerated impact test. After the test, the outside shell of the container was badly damaged, but the inside, protected canister remained intact.

30 years ago . . . Sandia's Solar Total Energy Test Facility was dedicated July 8 and ground was broken for the Five-Megawatt Solar Thermal Test Facility. . . . The Plutonium Accident-Resistant Container (PARC), which could survive an aircraft crash and resulting fire, was in development and testing in Coyote Canyon Test Area. PARC containers were developed for transporting plutonium dioxide between fuel reprocessing plants, storage sites, and fabrication plants. . . . A spark from a propellant landed on a dry hillside during testing at Coyote Canyon Test Area. Wind fanned the spark into a fire of "considerable proportions."

20 years ago . . . Transparent PLZT ceramics, "an electro-optical shutter technology that culminated in protective devices — aircraft windows and pilots' goggles — against thermal and flash effects was transferred from its Sandia home base to industry" after 17 years of research and development. The transparent ceramic material called "PLZT (an acronym for Pb — or lead — Lanthanum-modified Zirconate Titanate) is the key ingredient in devices that almost instantaneously turn dark in the presence of an intense light such as a nuclear flash."

10 years ago . . . NASA's Galileo spacecraft, equipped with radiation-hardened chips developed at Sandia, returned the first high-resolution images of Ganymede, the largest moon in the Jovian system. The Sandia chips were vital to the success of the Galileo mission because of the high-radiation environment of near-Jupiter space. . . . Although Sandians weren't officially a part of the Olympic security force, bomb-disabling expertise and devices — including the Percussion-Actuated Non-electric (PAN) Disrupter and the "Black Box" detonation disrupter — developed at Sandia were behind the scenes as insurance against a terrorist attack at the 1996 Summer Olympic Games in Atlanta.

THE PAN DISRUPTER — Chris Cherry (kneeling, center) discusses use of the Sandia-developed Percussion-Actuated Non-electric (PAN) Disrupter with members of several of the nation's elite bomb squads in this 1994 photo.